SECTION VI

TECHNICAL SCHEDULES

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TECHNICAL SCHEDULES

PREAMBLE

- 1.1 The Technical Schedules shall be filled in and completed by the Bidder, and submitted with the Bid. The type test reports and the relevant manufacturer's technical documents shall be provided for reference.
- 1.2 All documentation necessary to evaluate whether the equipment offered is in accordance with this Specification shall be submitted with the Bid.
- 1.3 All data entered in the Schedules of Technical Guarantees are guaranteed values by the Bidder and cannot be departed from whatsoever.
- 1.4 All data entered in the Schedules of Informative. Data are also guaranteed values by the Bidder. These data may only be altered following the Project Manager's written consent.

TECHNICAL SCHEDULES SUBSTATIONS

SCHEDULE VI-1a TECHNICAL GUARANTEES, OUTDOOR SWITCHGEAR

OUTDOOR SWITCHGEAR			33kV	66KV	Reference Doc	
Item	Particu	lars	Unit	Guar. Fig	Guar. Fig	
a.2	Circui	t Breakers (Type)				
	Breaki	ng Medium	SF ₆ /Vacuum			
	Manufa	acturer				
	-	Rated voltage	kV			
	-	Maximum service voltage	kV			
	-	Rated frequency	Hz			
	-	Rated continuous current	А			
	- One minute power frequency withstand voltage, dry and wet					
		- to earth	kV rms			
		- across open breaker pole	kV rms			
	-	Impulse withstand voltage 1.2/50 ms				
		- to earth	kV peak			
		- across open breaker				
	-	Breaking capacity at rated voltage				
		- symmetrical	kA rms			
		- asymmetrical	kA rms			
	-	Making capacity	kA peak			
	-	Breaking capacity of capacitive current	А			

OUTDO	OOR SWITCHGEAR		33 kV	
Item	Particulars	Unit	Guar. Fig	Reference Doc
	Circuit breakers continued			
	- Overvoltage factor for disconnection of unloaded transformers (without voltage limitation by lightning arresters)			
	- Rated inductive current switching capacity	А		
	- Permissible 1 second short-time current	kA rms		
	- Dynamic short-time current	kA peak		
	- Opening time, interval of time between the instant of application of tripping impulse to the instant when the main contacts have separated in all poles	m.sec.		
	- Make time, interval of time between the initiation of closing operation and the instant when the current begins to flow in the main circuit	m.sec.		
	- Total break time, interval of time between the instant of application of tripping impulse to the instant of final arc extinction in all poles			
	- at 100% breaking capacity	m.sec.		
	- under phase opposition	m.sec.		
	- Rate of rise of recovery voltage (RRRV) at 100% short circuit current			
	- 3-phase	kV/msec		
	- 1-phase			
	- RRRV out of phase duty	kV/msec		
	- Minimum temperature rise at rated current of main contact	°C		
a.3	Earthing Switches			
	- Rated short-time current 1 sec.	kA rms		
	- Rated dynamic short-circuit current			

		-			
Particulars	Unit	Guar. Fig	Guar. Fig	Reference Doc	
Current Transformers					_
Manufacturer					
- Rated voltage	kV				
- Maximum service voltage	kV				
- Rated frequency	Hz				
- One-minute power frequency test voltage of					
- primary winding	kV rms				
- secondary winding	kV rms				
- Lightning impulse withstand voltage	kV peak				
- Rated primary currents	А				
- Rated secondary current	А				
- Short-time thermal rating					
- 1 second	kA rms				
- Short-time dynamic rating	kA peak				
- Burden and accuracy class of					
- measuring core					
- protection core					
- Instrument security factor of the measuring core					
- Accuracy limit factor of the					
- protection core					
Voltage Transformers, Type					_
Manufacturer					
- Rated voltage	kV				
- Maximum service voltage	kV rms				
- One-minute power frequency test voltage					
- primary winding	kV rms				
- secondary winding	kV rms				
- Lightning impulse withstand voltage	kV peak				
- Burden and accuracy class of					
a. measuring winding protection winding					
- Ratio	kV				
Country of Manufacture					
- Cubicles					
- Circuit breakers					
- Current transformers					
	Current Transformers Manufacturer - Rated voltage - Rated frequency - One-minute power frequency test voltage of - primary winding - Rated primary currents - Rated primary currents - Rated secondary current - Short-time thermal rating - I second - Burden and accuracy class of - protection core - Instrument security factor of the measuring core - protection core - Nated voltage - Accuracy limit factor of the measuring core - protection core - Nated voltage - Accuracy limit factor of the measuring core - protection core - Manufacturer - Rated voltage - Maximum service voltage - One-minute power frequency test voltage - primary winding - secondary winding - secondary winding	Current Transformers Manufacturer KV - Rated voltage KV - Rated frequency Hz - Rated frequency Hz - One-minute power frequency test voltage of KV rms - primary winding kV rms - secondary winding KV rms - secondary currents A - Rated primary currents A - Rated secondary current A - Short-time thermal rating - - I second KA rms - Short-time dynamic rating KA peak - I second KA rms - Burden and accuracy class of - - protection core - - Instrument security factor of the measuring core - - protection core - - Rated voltage KV - Rated voltage KV - primary winding KV rms - maufacturer -	Current Transformers kV Manufacturer kV Rated voltage kV Rated frequency Hz One-minute power frequency test voltage of kV rms Lightning impulse withstand voltage kV peak Rated primary currents A Rated secondary unrents A Rated secondary current A Short-time thermal rating kA rms Isscond kA rms Short-time dynamic rating kA peak Burden and accuracy class of measuring core protection core protection core Accuracy limit factor of the measuring core kV rms Natimum service voltage kV Manufacturer kV Rated voltage kV Manufacturer kV Rated voltage kV massing core protection core Manufacturer kV Rated voltage kV Maximum service voltage kV Maximum service voltage kV Maximum service voltage kV Maximum service voltage kV Primary winding kV Secondary winding kV rms Secondary winding kV rms Secondary w	Current Transformers kV Manufacturer kV - Rated voltage - Maximum service voltage of kV - Rated frequency - Dne-minute power frequency test voltage of - primary winding - secondary winding - secondary winding - secondary currents - Rated secondary current - Rated secondary current - Short-time thermal rating - 1 second - Burden and accuracy class of - measuring core - protection core - Instrument security factor of the measuring core - protection core - Maximum service voltage - Maximum service voltage - primary winding - secondary winding - primary winding - secondary winding - masing core - protection core	Current Transformers Image: Second symmetry of the symmetry of t

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SCHEDULE VI-1b INFORMATIVE DATA OUTDOOR SWITCHGEAR

					Sheet 1 of 3
Item	Particu	lars	Unit	33 kV	
b.2	Circuit	t Breakers			
	-	Reference standard			
	-	Type of breaker and designation			
	-	Voltage drop across main contacts at rated current	mV		
	-	Type of main contact	mm		
	-	Type of arch control device	m/s		
	-	Method of closing			
	-	Method of tripping			
	-	Max. percentage of recovery voltage across any break	%		
	-	Minimum clearance between live parts and earth, in SF6 or vacuum	mm		
	-	Min distances between phases			

SCHEDULE VI-1bINFORMATIVE DATA, OUTDOOR SWITCHGEAR

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Sheet 2 of 3

Item	Particulars	Unit	33 kV	Reference Doc
	- Number of opening operations permissible before inspection and maintenance of contacts, gas treatment etc.			
	- at rated current			
	- at maximum short circuit current			
	For SF ₆ breakers			
	- Normal gas density for SF6 circuit breaker (represented by gas pressure)			
	- at 20°C	Bar		
	- at 40°C	Bar		
	- Minimum gas density for safe operation			
	- at 20°C	Bar		
	- at 40°C	Bar		
	- Quantity of gas required per 3-pole breaker	kg		
	- Operating pressure of relief device	Bar		
	- Method of monitoring pressure and temperature compensation			
	- Max. permissible dew point temp.	°C		
	- Max. permissible acidity level			
	- Max. permissible leak rate	%/year		
	For vacuum breakers			
	- Vacuum in break chamber	torr		
	- Max. permissible leak rate	%		
	For all breakers			
	- Control voltage	V DC		
	- Type of operating device			
	- Motor voltage			
	- AC of DC			
	- Max. permissible service voltage	V		
	- Min. service voltage	V		
	- Starting current of motor			
	- Power consumption of motor			
	- When starting	W		
	- When running	W		
	- Power consumption of			
	- Closing coil	W		
	- Trip coil	W		
	- Heater	W		

SCHE	DULE	DULE VI-1bINFORMATIVE DATA, OUTDOOR SWITCHGEAR				
Item	Particul	lars	Unit	33 kV	Reference Doc	
	-	Auxiliary switch				
		- Rupturing current at 110 V DC	А			
		- Number of free NO contacts				
		- Number of free NC contacts				
		- Test voltage 50Hz, 1 min.	V			
	Manufa	acturer's of:				
	-	Support insulators				
	-	Breaker insulators				
	-	Operating mechanism				
	NOTE					
	-	In addition to the characteristics listed above, the following information shall be given for all switchgear:				
		- Layout and overall dimensions drawings				
		- descriptions				
b.3	Earthi	ng Switches				
	-	Reference standard				
	-	Type of isolating switch				
	-	Min. creepage distance (live parts to earth)	mm			
	-	Min. isolating distance (clearance between open contacts)	mm			
	-	Material of contact surface				
	-	Total contact pressure				
	-	Type of operating device				
	-	weight of earthing switch				
b.4	Currer	nt Transformers				
	-	Reference standard				
	-	Type designation				
	-	Overall dimensions				
	-	Total weight of one current transformer	kg			
	-	Type of insulation				
b.5	Voltag	e transformers				
	-	Reference standard				
	-	Type designation				
	-	Overall dimensions				
	-	Total weight of one current transformer	kg			
	-	Type of insulation				
	-	Type of insulation				

SCHEDULE VI-2a TECHNICAL GUARANTEES, INDOOR MV INDOOR SWITCHGEAR Sheet 1 of 6

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SCHEDULE VI-2a TECHNICAL GUARANTEES, MV INDOOR SWITCHGEAR Sheet 2 of 6

SCHEDULE VI-2a TECHNICAL GUARANTEES, MV INDOOR SWITCHGEAR Sheet 3 of 6

SCHE	SCHEDULE VI-2a TECHNICAL GUARANTEES, MV INDOOR SWITCHGEAR					
MV IN	DOOR	SWITCHGEAR		33 kV		
Item	Parti	iculars	Unit	Guar. Fig	Guar. Fig.	Reference Doc
a.1	Cub	icles				
	Man	ufacturer				
	-	Rated Voltage	kV			
	-	Maximum service voltage	kV			
	-	Rated frequency	Hz			
	-	Rated continuous busbar current	А			
	-	One minute power frequency withstand voltage, dry and wet				
		- to earth	kV rms			
	-	Impulse withstand voltage 1.2/50 ms				
		- to earth	kV peak			
	-	Permissible 1 second short-time current	kA rms			
	-	Dynamic short-time current	kA peak			
	Arch	n tested in accordance with IEC 60280 amendment 2	Yes/no			
a.6	Cou	ntry of Manufacture				
	-	Cubicles				

SCHEDULE VI-2b INFORMATIVE DATA MV INDOOR VOLTAGE SWITCHGEAR

SCHEDULE VI-2bINFORMATIVE DATA, MV INDOOR SWITCHGEAR Sheet 2 of 6

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SCHEDULE VI-2bINFORMATIVE DATA, MV INDOOR SWITCHGEAR

SCHEDULE VI-2b INFORMATIVE DATA MV INDOOR VOLTAGE SWITCHGEAR

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SCHEDULE VI-2bINFORMATIVE DATA, MV INDOOR SWITCHGEAR Sheet 5 of 6

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SCHEDULE VI-2bINFORMATIVE DATA, MV INDOOR SWITCHGEAR

Contract A31 Technical Specifications and Drawings

SCHEDULE VI 3a TECHNICAL GUARANTEES, CONTROL SYSTEM

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SUBST	ATION C	CONTROL SYSTEM (SCS)		
Item	Particu	lars	Unit	Guar. Fig
a.1	Contro conditi	ol system response and update time under ''moderate load'' ions		
	The continues u	ntrol system shall be designed to yield the following response and update under "moderate load" conditions		
	-	Time taken to completely refresh data held with the SCS: a. maximum b. average	S S	
	-	Time taken to carry out a complete status check of all indications and alarms		
		a. maximum b. average	S S	
	-	The time between selection and display of a VDU diagram fully updated from the existing main computer data base shall not exceed	s	
	-	The time between selection of a control function and check back shall not exceed	s	
	-	The time between execution of a control function and successful completion being displayed at the Operation Workshop shall not exceed for		
		a. Circuit breaker (operating time = 250 ms)	s	
		b. Isolator (operating time = 10s)	s	
	-	The time between the occurrence of the first change of state/alarm and display at the Operator Workstation shall not exceed		
	-	The time between selecting display of analogue measurements and the corresponding value in the database being displayed shall not exceed	S	
	-	The time between successive updates of the data base with analogue measurements shall not exceed	S	
		a. Network MW measurementsb. Other analogue measurements	S S	
a.2	Equip	ment Reliability		
	Mean t	ime between failure shall be not less that:		
	-	Each computer	h	
	-	VDU	h	
	-	Logging printer	h	
	-	System console	h	
	-	Communication system	h	

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SCHEDULE VI 3b INFORMATIVE DATA, CONTROL SYSTEM

SUBSTAT	ION CONTROL SYSTEM (SCS)		
Item	Description	Unit	Data
b.1	General System Considerations		
	- Software		
	- Package		
	- Which RTU communication protocols are supported		
	- Real-time database		
	- Package		
	- Is an SQL interface supported		
	- Database Management Tool		
	- Package		
	- Is an SQL interface supported?		
	- Man-machine Interface		
	- Package		
	- State type of man-machine interface software		
b.2	Operator Workstation		
	- Reference standard		
	- Type designation		
	- Weight	kg	
	- Mounting arrangement		
	VDU		
	- Reference standard		
	- Type designation		
	- Diagonal screen size	mm	
	- Usable display area	max. mm	
	- Weight	kg	
	- Mounting arrangement		
	Alphanumeric Keyboard		
	- Reference standard		
	- Type designation		
	- Mounting arrangement		

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SCHEDULE VI 4a TECHNICAL GUARANTEES, PROTECTION ETC.

CONTROL	CONTROL, PROTECTION, METERING, SIGNALLING					
Item	Particulars	Unit	Guar. Fig	Reference Doc		
a.1	Indicating Instruments					
	- To be filled in for each AC and DC Ampere meter and Voltmeter and for each Wattmeter, VAr-meter, Frequency-meter and other indicating instruments:					
	- Instrument for: (A, V (AC), V (DC), W, etc.)					
	- Error	%				
	- Max. admissible current	%.I _N				
	- Max. admissible voltage	%.I _N				
a.2	Meters					
	- To be filled in for each meter					
	- Meter for (MWh, MVArh):					
	- Error with 5% load	%				
	- Error with 10% load	%				
	- Error with 20% load	%				
	- Error with 100% load	%				
	- Max. admissible current	%.I _N				
a.3	Metering Converters (Transducers)					
	- Converter for (MW, MVAr, A, etc):					
	- Error	%				
	- Linearity	%				
	- Max. admissible current for 0.5 seconds	%.I _N				
	- Max. admissible current continuously	%.I _N				
	- Max. admissible voltage for 0.5 seconds	%.I _N				
	- Max. admissible voltage continuously	%.I _N				

SCHEDULE VI 4a TECHNICAL GUARANTEES, PROTECTION ETC.

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CONTROL, PROTECTION, METERING, SIGNALLING

Sheet 2 of 3

	, PROTECTION, METERING, SP	GINALLING			· · ·
Item	Particulars		Unit	Guar. Fig	Reference Doc
a.4	 To be copied and filled i applicable 	n for each type of relay as			
	Relay for	:			
	- Accuracy of the adjustab	le tripping time	sec.		
	- Min. possible tripping tir	ne	ms		
	- Drop out ratio		%		
	- Directional sensitivity (d	ist. relay only)	$\%.U_N$		
	- Max. admissible current	during 0.5 sec.	%.I _N		
	- Max. admissible current	continuously	%.I _N		
	- Relation between trippin coil current (diff. relay or	g coil current and holding nly)	%		
	- Limit value of the adjusta (O.C.R.)	able tripping current	%.I _N		
	- Limit value of the instant (O.C.R.)	aneous tripping current	%.I _N		
	- Limit value of the adjusta (O.V.R.)	able tripping voltage	%.I _N		
	- Limit value of the instantaneous tripping voltage (O.V.R.)		%.I _N		
	Ratings: AC In phase).	puts: 110V, 1Amp (three	Shall		
	 Power Supp (Universal p 300VDC is pre The relays sha Impedance critical 	bly Voltage: 110VDC. hower supply of 30- eferred). Ill be of Numeric design. hteria.	all the features as listed		
	 Three zones p Three zones p Additional Zon Automatic Sw Independent s 	hase –phase Protection. hase –earth Protection ne 4 Protection itch on to fault. settings for each zone.			
	 Distance to fai Display: On op display the fai zone of operational sectors and the fai context of the	ult measurement. beration, the relay should ulted phase(s), time and tion and distance to fault.			
	 IDM'T Three Phase/Over current & Earth fault Protection. Fuse failure supervision. Auto- reclose logic 1 and/or 3 phases. 				
	 Disturbance including sol analysis. Fault record s 	and event records ftware for disturbance hould be incorporated.			
	 At least six (6) Mho/Quadrila 	Binary inputs.			

Sha	 Stability against Switching inrust currents and Reverse faults. Clear fault identification even foboundary conditions. Software necessary for all above functions shall be provided. Three sets of Installation Commissioning and maintenance manuals shall be provided. Three phase numeric directional over current and earth fault relay Il incorporate the following features: Relay must be of Numerical design. Current setting range for over current relay 0.5In-2.4In Current setting range for over current near 0.05In-0.8In Quadrature connection for polarising voltage (Vn=110) Applicable on the LV side of a Dyn transformer High set Element, with a setting range on 1-32In The phase and earth directional element should be individually selectable. I.D.M.T characteristics according to Bt 142 or IEC 60255 and Definite time characteristic The normal operating boundary shall b +/-90 degrees from relay characteristic angle Relay sensitivity should be 1% or rated value of current and curren polarising voltage tan angle equal to the relay characteristic angle. Time setting multiplier 0.05 - 1.0 Broken conductor protection Feature Highset Element for both over curren and earth fault Protection, with a setting range of 1-30In. Thermal Protection. Dedicated Breaker Fail Protection. Circuit Breaker Fail Protection. Circuit Breaker Fail Protection. Configurable output relays with ability to output starting elements to contro Tripping of other upstream Protection relays. Must provide all technical and operation manuals and configurations and setting software. 	Shall incorporate all the features as listed		
-----	--	--	--	--

a.4 P	Protection Relays		
-	To be copied and filled in for each type of relay as applicable		
R	elay for:		
-	Accuracy of the adjustable tripping time	sec.	
-	Min. possible tripping time	ms	
-	Drop out ratio	%	
-	Directional sensitivity (dist. relay only)	%.U _N	
-	Max. admissible current during 0.5 sec.	%.I _N	
-	Max. admissible current continuously	%.I _N	
-	Relation between tripping coil current and holding coil current (diff. relay only)	%	
-	Limit value of the adjustable tripping current (O.C.R.)	%.I _N	
-	Limit value of the instantaneous tripping current (O.C.R.)	%.I _N	
-	Limit value of the adjustable tripping voltage (O.V.R.)	%.I _N	
-	Limit value of the instantaneous tripping voltage (O.V.R.)	%.I _N	
	 Relay Must be of Numerical design Pick up setting range, 0.1 to 0.5In Should incorporate a high-set Element with a setting range of up to 20In. Magnetising current inrush restraint Integral CT ratio compensation (0.1-2) and vector group compensation Measurement and indication on the MMI, of phase, differential and bias currents Storage of Fault records and Event records; the Fault flags should be accessible on the relay LCD screen without opening the relay cover. Overfluxing restraint Overfluxing protection with Alarm and Trip functions 5th harmonic restraint feature on the differential Element. Appropriate Dual Bias characteristic to ensure relay stability for heavy through faults Should incorporate a disturbance recorder feature. Red L.E.D to indicate Tripping Relay Self diagnostic and Alarm feature Ability to Latch output contacts to prevent TX re-energizing before carrying out investigations. 	Shall incorporate all the features as listed	

Three phase numeric IDMTL over current and earth fault relay		
 Should incorporate the following Features; Relay must be of Numerical Type Current setting range for over current relay 0.5In-2.4In Current setting range for earth fault relay 0.05In-0.8In I.D.M.T characteristics according to BS142 or IEC 60255 i.e. SI,VI,EI,LTI, including definite time for the high-set Elements. Time setting multiplier 0.05 - 1.0 Broken conductor protection feature Negative sequence Protection Feature Highset Element for both over current and earth fault Protection, with a setting range of 1-30In. Thermal Protection Dedicated Breaker Fail Protection. Circuit Breaker Maintenance Fault records, Event Records and disturbance records. Configurable output relays with ability to output starting elements to control Tripping of other upstream Protection relays. Drop off /pickup ratio >90% Low transient overreach < 10% 	Shall incorporate all the features as listed	
 <u>Restricted Earth fault relay</u> Relay must be of Numerical type Relay should reject harmonics produced by C.T saturation The offer should include the associated stabilising resistor and voltage dependent resistor (metrosil) Current setting range 0.05-0.8In Operating time < 25ms at 5 times the setting 	Shall incorporate all the features as listed	

SCHEDULE VI 4a TECHNICAL GUARANTEES, PROTECTION ETC.

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CONTROL, PROTECTION, METERING, SIGNALLING

Sheet 3 of 3

Item	Partie	culars	Unit	Guar. Fig	Reference Doc
a.5	Auxi	liary Circuit Breakers			
	-	To be filled in for each type of AC and DC breaker:			
		- Min. operating voltage	$\%.U_N$		
		- Max. operating voltage	%.U _N		
		- Drop out voltage	V		
		- Service life (min. number of contact operation)			
a.6	Man	ufacturer's Name			
	-	Control room boards			
	-	Local relay boards			
	-	Protection relays			
	-	Auxiliary contactors			
a.7	Cour	ntry of Manufacture			
	-	Control room boards			
	-	Local relay boards			
	-	Protection relays			
	-	Auxiliary contactors			

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SCHEDULE VI 4b INFORMATIVE DATA, PROTECTION ETC.

CONTI	ROL, PROTECTION, METERING, SIGNALLING		r	
Item	Particulars	Unit	Data	Reference Doc
b.1	Indicating Instruments			
	To be filled in for each type of instrument:			
	- Reference standard			
	- Type (moving coil, iron type, etc.)			
	- Consumption of internal resistance	VA/ohm		
	- Size	mm		
b.2	Meters			
	To be filled in for each type of meter:			
	- Reference standard			
	- Type			
	- Consumption of internal resistance	VA/ohm		
	- Size	mm		
b.3	Metering Converters (Transducers)			
	To be filled in for each type for converter:			
	- Reference standard			
	- Type			
	- Consumption, current	VA		
	- Consumption, voltage	VA		
	- Time constant	ms		
	- Size	mm		
b.4	Alarm Annunciators			
	To be filled in for each annunciator panel:			
	- Reference standard			
	- Type			
	- Number of annunciators			
	- Size of each annunciator (area of the cap)	mm		
	- Total size of panel	mm		
b.5	Control Room Board			
	- Height	mm		
	- Width	mm		
	- Length	mm		
	- Relay boards			
	- Height			
	- Width			
	- Length			

SCHEDULE VI 4b INFORMATIVE DATA, PROTECTION ETC. CONTROL, PROTECTION, METERING, SIGNALLING

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Sheet 2 of 2

Item	Particulars	Unit	Data	Reference Doc
b.6	Protection Relays			
	To be copied and filled in for each relay with the applicable items of the data below:			
	Relay for:			
	- Reference standard			
	- Consumption	VA		
	- Limit values of the adjustable tripping time	sec.		
	- Limit values of the adjustable sensitivity	%		
	- Limit values of the adjustable operating quantity (current, voltage, frequency, etc.) in % of normal	%		
	- Limit values of the instantaneous operating quintet in % of nominal value	%		
	- Size	mm		
	For distance relay only:			
	- Starting impedance adjustable between	ohm/ph		
	- Earth fault tripping current adjustable between	x.I _N		
b.6	Protection Relays			
	To be filled in for each relay with the applicable items of the data below:			
	Relay for:			
	- Reference standard			
	- Consumption	VA		
	- Limit values of the adjustable tripping time	sec.		
	- Limit values of the adjustable sensitivity	%		
	- Limit values of the adjustable operating quantity (current, voltage, frequency, etc.) in % of normal	%		
	- Limit values of the instantaneous operating quintet in % of nominal value	%		
	- Size	mm		
	For distance relay only:			
	- Starting impedance adjustable between	ohm/ph		
	- Earth fault tripping current adjustable between	x.I _N		

SCHEDULE VI 5b INFORMATIVE DATA, CABLES

4.3Contr A31-Section VI-techsched-substation for editing.FEB 2014

				Sheet 1 of 2
POWER	CABLES, CONTROL CABLES, CABLE RACKS			
Item	Particulars	Unit	Data	Reference Doc
b.1	Low Voltage Cables			
	- Conductor material			
	- Insulation material			
	- Armouring/screen			
	- Protective coating			
	- Overall diameter of cable of biggest cable	mm		
	- Weight of heaviest reel, including cable	kg		
	- Size of biggest reel, diameter/width	mm/mm		
b.2	Control and Measuring Cables			
	- Conductor material			
	- Insulation material			
	- Armouring/screen			
	- Protective coating			
	- Overall diameter of cable of biggest cable	mm		
	- Weight of heaviest reel, including cable	kg		
	- Size of biggest reel, diameter/width	mm/mm		
b.3	Special Cables			
	To be used for:			
	- Relevant informative data			

SCHEDULE VI 5b INFORMATIVE DATA, CABLES

Technical Specifications and Drawings

Sheet 2 of 2

Contract A31

POWER	CABLES, CONTROL CABLES, CABLE RACKS			
Item	Particulars	Unit	Data	Reference Doc
	11 kV Voltage Cables			
	- Conductor material			
	- Insulation material			
	- Armouring/screen			
	- Protective coating			
	- Overall diameter of cable of biggest cable	mm		
	- Weight of heaviest reel, including cable	kg		
	- Size of biggest reel, diameter/width	mm/mm		
	33 kV Voltage Cables			
	- Conductor material			
	- Insulation material			
	- Armouring/screen			
	- Protective coating			
	- Overall diameter of cable of biggest cable	mm		
	- Weight of heaviest reel, including cable	kg		
	- Size of biggest reel, diameter/width	mm/mm		
	66 kV Voltage Cables			
	- Conductor material			
	- Insulation material			
	- Armouring/screen			
	- Protective coating			
	- Overall diameter of cable of biggest cable	mm		
	- Weight of heaviest reel, including cable	kg		
	- Size of biggest reel, diameter/width	mm/mm		
	Special Cables, Optical fibre			
	- Relevant informative data			

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SCHEDULE VI 6a TECHNICAL GUARANTEES, EARTHING

Item	Partic	culars	Unit	Guar. Fig	Reference Doc
a.1	Resistance to Earth of Earthing Electrode System (for each substation)				
	-	Under the control building max.	ohms		
	-	Under the switchyard max.	ohms		
	-	Complete earthing system	ohms		

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SCHEDULE VI 6b INFORMATIVE DATA, EARTHING

Item	Partic	culars	Unit	Data	Reference Doc
b.1	-	Reference standard			
	-	Material of earth conductor			
	-	Max. temp of any earth conductor during 1 sec. rated phase - ground fault			
	-	Method of interconnecting earth grid conductors			

SCHEDULE VI-7a - TECHNICAL GUARANTEES, POWER TRANSFORMERS

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Sheet 2 of 7

	HV POWER TRANSFORMERS		G	uaranteed Dat	ta
Item	Description	Unit	7.5MVA	2.5MVA	
7.	Load losses at 75°C at rated currents, the third winding being open:				
	HV - LV, ONAN HV - TV, ONAN LV - TV, ONAN HV - LV, ONAF HV - TV, ONAF LV - TV, ONAF	kW kW kW kW kW	- - - - -		
8.	Cooling plant power consumption	kW			
9.	Total losses at 75°C on principal tapping and unity power factor and rated currents:				
	ONAN ONAF including input to cooling plant	kW kW			
10.	Impedance voltages at 75° referred to mutual capacities at rated frequency and 100% rating:				
	Principal tapping:				
	HV - LV, ONAN HV - TV, ONAN LV - TV, ONAN HV - LV, ONAF HV - TV, ONAF LV - TV, ONAF	% % % %	- - -		

SCHEDULE VI-7a - TECHNICAL GUARANTEES, POWER TRANSFORMERS Sheet 3 of 7

	HV POWER TRANSFORMERS		G	uaranteed Dat	a
Item	Description	Unit	7.5MVA	2.5MVA	
	Extreme plus tapping:				
	HV - LV, ONAN HV - TV, ONAN LV - TV, ONAN HV - LV, ONAF HV - TV, ONAF LV - TV, ONAF Extreme minus tapping: HV - LV, ONAN	% % % % %			
	HV - TV, ONAN LV - TV, ONAN HV - LV, ONAF HV - TV, ONAF LV - TV, ONAF	% % % %			
11.	Temperature rise after continuous operation with rated MVA, under the ambient conditions specified in Section VI, Clause 4.1.3.2.1 and the rated conditions giving the highest losses: Top oil (by thermometer) Windings (by resistance) Efficiency on principal tapping max.	°C °C			
	temperature of winding and unity power factor and TV winding open: - 120% load, ONAN - 100% load, ONAN - 50% load, ONAN - 120% load, ONAF - 100% load, ONAF - 50% load, ONAF	% % % %			

SCHEDULE VI-7a - TECHNICAL GUARANTEES, POWER TRANSFORMERS Sheet 4 of 7

	HV POWER TRANSFORMERS		G	uaranteed Da	ta
Item	Description	Unit	7.5MVA	2.5MVA	
13.	Inherent voltage regulation on principal tapping, 75°C and unity power factor:				
	 TV winding open 80% of full load on LV winding and 20% on TV winding 	% %			
14.	Inherent voltage regulation on principal tapping, 75°C and 0.8 power factor lagging:				
	 TV winding open 80% of full load on LV winding and 20% on TV winding 	%			
15.	Vector group	-			
16.	No. of phases per transformer	-			
17.	Type of cooling	-			
18.	Whether star connected windings shall be fully insulated or graded				
	HV windingLV winding	- -			
19.	Insulation levels of star points				
	HV windingLV winding	kV kV			
20.	Method of system earthing:				
	HV systemLV system	-			

SCHEDULE VI-7a - TECHNICAL GUARANTEES, POWER TRANSFORMERS Sheet 5 of 7

	HV POWER TRANSFORMERS		G	uaranteed Da	ta
Item	Description	Unit	7.5MVA	2.5MVA	
21.	Method of transformer earthing:				
	 HV windings - star point LV windings - star point TV winding - one corner of closed delta 	- - -			
22.	Whether TV windings are to be brought out to separate bushing insulators	-			
23.	Indoor or outdoor installation	-			
24.	System highest voltage according to IEC:				
	- HV - LV - TV	kV kV kV	-		
25.	Maximum flux density at rated voltage on principal tapping and rated frequency:				
	Transformer legsTransformer yokes	T T			
26.	Maximum flux density at most onerous voltage and frequency conditions:				
	Transformer legsTransformer yokes	T T			
27.	Specific core loss	W/kg			

SCHEDULE VI-7a - TECHNICAL GUARANTEES, POWER TRANSFORMERS Sheet 6 of 7

	HV POWER TRANSFORMERS		G	uaranteed Da	ta
Item	Description	Unit	7.5MVA	2.5MVA	
28.	Maximum current density in windings at rated output:				
	HV, higher voltage, ONAN HV, lower voltage, ONAF LV, ONAN LV, ONAF TV, ONAN TV, ONAF	A/mm ² A/mm ² A/mm ² A/mm ² A/mm ²			
29.	Magnetising current at rated nominal voltage on principal tapping	А			
30.	Maximum hot spot temperature of winding	°C			
31.	Equivalent resistance referred to HV side	ohms			
32.	Equivalent reactance referred to HV side	ohms			
33.	Maximum current carrying capacity of bushings:				
	HV LV TV	A A A			
34.	Rated service voltage of bushings:				
	HV LV TV HV, neutral LV, neutral	kV kV kV kV			

SCHEDULE VI-7a - TECHNICAL GUARANTEES, POWER TRANSFORMERS Sheet 7 of 7

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	HV POWER TRANSFORMERS		(Guaranteed Da	ata
Item	Description	Unit	7.5MVA	2.5MVA	
35.	1 minute, 50 Hz dry withstand voltage:				
	HV bushing LV bushing TV bushing HV, LV neutral bushings	kV kV kV kV			
36.	1 minute, 50 Hz wet withstand voltage: HV bushing LV bushing TV bushing HV, LV neutral bushings	kV kV kV kV			
37.	Impulse withstand voltage: HV bushing LV bushing	kV kV			
38.	 Maximum noise level Transformer and tap changing equipment energised and at no-load with ONAN cooling Same as above but with ONAF cooling (fans running) 	dB dB			

SCHEDULE VI-7b - INFORMATIVE DATA, POWER TRANSFORMERS

	HV POWER TRANSFORMERS				
Item	Description	Unit	7.5MVA	2.5MVA	
1.	Type of transformer (core or shell type)	-			
2.	Number of core legs	-			
3.	Type of windings: HV LV TV	- - -			
4.	Type of insulation:				
	HV, winding LV, winding TV, winding	- - -			
	Tappings Tapping connection Core bolts (if any) Core bolt washers (if any) Core lamination designation Specific core loss	- - - w/cm ³			
5.	Type of axial coil supports: HV winding LV winding TV winding				
6.	Winding conductor material HV LV	- - -			
7.	Type of joints in the magnetic core (butt type, interleaved etc.)				
8.	Calculated thermal time constant: ONAN ONAF	hours hours			

	HV POWER TRANSFORMERS				
Item	Description	Unit	7.5MVA	2.5MVA	
9.	Type of bushings:				
	HV	-			
	LV	-			
	TV	_			
	HV, LV neutral	-			
10.	Principal bushing insulator materials:				
	HV	-			
	LV	-			
	TV	-			
	HV, LV neutral	-			
11	Total creenage distance over porcelain				
11.	externally.				
	HV bushing	mm			
	LV bushing	mm			
12.	Protected leakage distance over porcelain				
	externally (90° shadow)				
	HV bushing	mm			
	LV bushing	mm			
13.	Thickness of transformer tank:				
	Sides	mm			
	Bottom	mm			
	Тор	mm			
	-				
14.	Thickness of radiator plates	mm			
15.	Number of radiators per transformer	-			

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	HV POWER TRANSFORMERS				
Item	Description	Unit	7.5MVA	2.5MVA	
16.	On-load tap changer:				
	Type (resistor type, reactor type, etc.) Total number of tappings including principal Rated currents of:	-			
	- Selector switch	А			
	- Diverter switch	А			
	- Resistors	А			
	Maximum overcurrent of:				
	- Selector switch	А			
	- Diverter switch	А			
	- Resistors	А			
	Driving motor input	kW			
	Type of driving motor (3-phase etc.)	-			
	Monitoring contact:				
	 Closing time in advance of parting of diverter switch Opening time after diverter switch 	sec.			
	contacts have fully opened	sec.			
	Diverter switch opening time Time from "point of no return" to parting of	sec.			
	diverter switch contacts	sec.			
17.	Whether outdoor cabinets/kiosks are provided with heaters	-			

SCHEDULE VI-7b - INFORMATIVE DATA, POWER TRANSFORMER Sheet 4 of 9

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	HV POWER TRANSFORMERS				
Item	Description	Unit	7.5MVA	2.5MVA	
18.	Forced air cooling system:				
	State if fans are blowing directly on radiators	-			
	Total number of fan units per transformer	-			
	system	kW			
19.	Total oil quantity in completely filled transformer	kp			
20.	Total weight of oil in completely filled transformer	1			
21.	Total oil quantity in conservator	1			
22.	Total quantity of oil in conservator between highest and lowest level	1			
23.	Volume of conservator tank	1			
24.	Weight of copper in windings	kg			
25.	Weight of core/winding assembly	kg			
26.	Weight of each radiator:				
	Filled with oil	kg ka			
77	Empty Total weight of hushings:	ĸg			
27.	Total weight of businings.				
	HV LV	kg/each kg/each			
		ing such			

	HV POWER TRANSFORMERS				
Item	Description	Unit	7.5MVA	2.5MVA	
28.	Total weight of complete transformer erected at site	tons			
29.	Weight of transformer as arranged for transport	tons			
30.	Filling medium during transport	-			
31.	Overall dimensions of transformer completely erected at site, including bushings, radiators:				
	Length Width Height	mm mm mm			
32.	Overall dimensions of transformer arranged for transport:				
	Length Width Height	mm mm mm			
33.	Maximum lift of core/winding assembly incl. lifting beam, slings, etc. for untanking	mm			
34.	Rated output per fan unit	m ³ /min.			
35.	Speed of fan motors	rpm			
36.	Continuous rating of fan motors	Нр			
37.	Starting current of fan motors	А			

	HV POWER TRANSFORMERS				
[tem	Description	Unit	7.5MVA	2.5MVA	
38.	Efficiency of fan motors	%			
39.	Power factor of fan motors at rated output	%			
40.	Material in rating and diagram plates	-			
41.	Are on-load tap changing equipment prepared for fully automatic operation	-			
42.	Are on-load tap changing equipment prepared for local, remote control (control room) and supervisory (NCC) operation and indication	-			
43.	Are on-load tap changing equipment prepared for fully automatic parallel operation with similar transformers	-			
44.	Whether first filling of oil is included	-			
45.	Whether tap changer cubicle and wiring cabinet are provided	-			
46.	Whether winding, and top oil indicators are provided	-			
47.	Whether cooling fans are automatically operated from the winding temperature indicators	-			
48.	Whether pressure relief device is to be fitted	-			
	Whether Buchholz relay is fitted	-			

4.3Contr A31-Section VI-techsched-substation for editing.FEB 2014

SCHEDULE VI-7b - INFORMATIVE DATA, POWER TRANSFORMER

Sheet	7	of	9	
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	HV POWER TRANSFORMERS			
Item	Description	Unit	MVA	MVA
50.	Whether all internal cabling/wiring on transformer is supplied to form a complete self contained unit	-		
51.	Are the following alarms/trip signals provided:	-		
52.	Tap changer not operating, alarm Tap changers out of step, alarm Voltage transformer failure Fan failure, alarm Oil/gas flow transformer, alarm Oil/gas flow transformer, trip On load tap changer protective relay operated, trip Oil gauge low level, alarm Oil gauge low level, trip Tap changer oil gauge level low, alarm Tap changer oil gauge level critical, trip Top oil temp. high, alarm Top oil temp. high, alarm Winding temp. critical, trip Are the following temperature indicators provided: HV winding LV or common winding TV winding			

SCHEDULE VI-7b - INFORMATIVE DATA, POWER TRANSFORMER Sheet 8 of 9 **HV POWER TRANSFORMERS** Item Description Unit MVA MVA 53. Are the following oil level gauges provided: - Main conservator tank - On-load tap changer conservator tank 54. Tap change indicator provided 55. Tap change in progress indicator 56. Tap changer out of step indicator 57. Potentiometer switch for remote/supervisory on-load tap changer position indicator 58. Will the tests specified in Section 3-II -Clause 10 be adhered to? If deviations, please state underneath

	HV POWER TRANSFORMERS				
Item	Description	Unit	7.5MVA	2.5MVA	
59.	State all Standards applied underneath:				
60.	State identity of transformer manufacturer and all sub-manufacturers including the parts manufactured below: Transformer: Cooling equipment On-load tap changer Current transformers Bushings Core steel Oil Buchholz relay Breather Thermometer Other equipment to be listed by the Bidder: - - -				

SCHEDULE VI 8a - TECHNICAL GUARANTEES, DISTRIBUTION TRANSFORMERS

		1	Sheet 1 of 2
	DISTRIBUTION TRANSFORMER		Guaranteed Data
Item	Particulars	Unit	33/0.4 kV
1.	Continuous Maximum Rating C.M.R.	kVA	
2.	Normal voltage between phases at no load		
	a) H.V. b) L.V.	Volts Volts	
3.	Tappings		
	a) Plus b) Minus	% %	
4.	Performance Data at Sea Level, corrected at 75%		
	 a) No load loss at normal primary voltage b) No load loss at 10% primary over voltage c) Load loss at C.M.R. d) Impedance volts at C.M.R. and normal ratio e) Regulation at C.M.R. and unity power factor f) Regulation at C.M.R. and 0.8 power factor g) Max temperature rise at C.M.R.: i) Top oil by thermometer ii) Average winding by resistance iii) "Hot Spot" corresponding to (ii) 	watts watts % % % °C	

	DISTRIBUTION TRANSFORMER		Guaranteed Data	
Item	Particulars	Unit		33/0.4 kV
5.	Type of insulation used on windings			
	a) H.V.			
	b) L.V.			
6.	Lightning Impulse Insulation level of:			
	a) H.V. winding	kVpk		
	b) L.V. winding	kVpk		
	i) To earth	kVpk		
	ii) Between contacts	kVpk		
7.	Are test certificates supplied supporting the level			
	stated in Clause 6	Yes/No		
8.	Silica gel Breather			
	a) Make of unit fitted			
	b) Size of unit			

SCHEDULE VI-8a - TECHNICAL GUARANTEES, DISTR. TRANSFORMERS Sheet 2 of 2

SCHEDULE VI-8b - INFORMATIVE DATA, DISTRIBUTION TRANSFORMER

			Sheet I of 2
	DISTRIBUTION TRANSFORMER		
Item	Particulars	Unit	33/0.4 kV
1.	Transformer type (sealed or breathing)		
2.	Type of windings		
	HV LV		
3.	Type of insulation		
	HV winding LV winding		
4.	Type of tap changer		
5.	Tap changer designation		
6.	Type of axial coil supports		
	HV winding LV winding		
7.	Winding conductor material		
	HV winding LV winding		
8.	Core laminations designation	-	
9.	Specific core loss	w/cm ³	
10.	Type of bushings		
	HV LV		

SCHEDULE VI-8b - INFORMATIVE DATA DISTRIBUTION TRANSFORMERS Sheet 2 of 2

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	DISTRIBUTION TRANSFORMER		
Item	Particulars	Unit	33/0.4 kV
11.	Bushing insulator material		
	HV LV		
12.	Creepage distance across bushings		
	HV LV	mm mm	
13.	Type of cooling system		
14.	Total oil quantity	k	
15.	Total weight		
16.	Volume of conservator tank	1	
17.	Overall dimensions		
	Length Width Height	mm mm mm	
18.	State all standards applied underneath:		
19.	State identity of manufacturer underneath:		

SCHEDULE VI-9a- GAURANTEE DATA TELECOMMUNICATIONS SYSTEM: UHF, Point to Point Radio

Tender Schedules	Unit	Required	Tendered
2			
General Mapufacturar of			
	<u> </u>		
• UHF Radio Equipment	-		
 Data communication Equipment, DCE 	-		
Type(s) of			
• UHF Radio Equipment	-		
 Data communication Equipment, DCE 	-		
Channel size Transmission mode	_	Full duplex	
Protection class (es) of Radio equipment cards.	-		
Construction Requirements			
Modulation technique:	-	Yes	
Operating range of radio	kbps	64	
equipment.			
Transmitter parameters	٩Ŀ		
Freq Stability	UB DDM		
Output power	dBm	30	
Residual BER	-	<1 x 10 ⁻⁶	
Interfaces			
Data	-	Acc. To EIA	
Order wire	-	530/G.703	
Ethernet NMS	-	yes	
Config port	-	10 Base T	
Alarms	- Ohms	RS-ZSZ OL	
Ancennae	OIIIIIS	Ves	
		50 50	
EMC		ETS 300 385, FCC Part 15	
System Performance			
Receiver sensitivity (at 10-6 BER)	dBm	<-90dbm	
System Gain at 10-6 BER	dB	>120dB	

SCHEDULE VI-9b- GAURANTEE DATA TELECOMMUNICATIONS SYSTEM UHF POINT TO MULTIPOINT RADIO

Tender Schedules	Unit	Required	Tendered
Remote Radio		_	
General			
Manufacturer of			
• UHF Radio equipment	-		
• Data communication equipment	-		
Type(s) of			
• UHF Radio equipment	-		
 Data communication equipment Digital Modulation type 	-		
Frequency bands.	MHz	330-512	
Range.	Miles	50	
Data rates(Data)	bps	110-19200,	
Transmission mode		asynchronous	
		Hall-duplex	
Freq. Stability: Carrier newer(programmable)	ppm Watte	0.1 ± 0.5	
Duty cycle	-	Continuous	
Output impedance	Ohms	50	
Beceiver	011110		
Selectivity.	dB	>70	
Bit error rate @-110dBm RSSI	-	$<1 \times 10^{-6}$	
Interfaces			
Data	_	EIA RS-232	
Diagnostic	-	yes	
Management		-	
Network wide	-	yes	
Local	-	LED display-	
		RX activity,	
		TX activity,	
		DCD	
Mechanical	ppm		
Rack Mount	-	1 U	
Weight			
Electrical			
Primary power	V	148 VCC <30 nominal	
rower required	VV		
Agency Approvals	_	FCC part	
110110111001011		90,74,22, IC	
EMC	-	ETS 300 113, EN,	
-		300, 279	

SCHEDULE VI-9c- GAURANTEE DATA TELECOMMUNICATIONS SYSTEM UHF POINT TO MULTIPOINT RADIO

Tender Schedules	Unit	Required	Tendered
VHF 2-Way Base Radio		_	
General			
Manufacturer of			
• VHF 2-way radios	-		
_	-		
Type(s) of			
VHF, 2-way communication devices	-		
	-		
Maximum no. of Channels available Extension of no. of channels thro' selector switch. APCO Project 25 compatible	_ _ _	Yes Yes	
Protocol	-	Project 25-CAI	
Modulation type.	-	C4FM of QPSK-C	
Frequency Range.	MHz	136-174	
Channel Bandwidth			
Analogue Digital	kHz kHz	12.5/25/30 12.5	
Voice Coder			
Voice coding method		IMBE	
Frame resync interval	msec	180	
Forward Error Correction		Golay code	
Signaling			
Signaling rate	kbps	9.6	
Transmitter			
Rf power	W	10-50	
Max freq Separation	-	Full Band split	
Freq Stability	ppm		
Electrical		acc. to G.823	
Power supply	V	13.8 VDC±20% - veGND	

SCHEDULE VI-9d- Guaranteed Technical specifications for fig-8 and OPGW Particular technical specifications Telecommunication) fiber optic cable

Particulars	Unit	Employer's	Tender value
		requirement	
Number of fibres	OPGW	<u>>48</u>	
	ADSS	<u>> 24</u>	
Core diameter	μm	8.3 or 9 with a	
		3% tolerance	
Cladding design, either matched or			
depressed			
Clad diameter	μm	125.0 <u>+</u> 2	
Core-clad concentricity		< 2%	
Coating diameter	μm	250.0 <u>+</u> 15	
Coating concentricity	\geq	0.70	
Attenuation: 1310 nm	dB/km	<u>≤</u> 0.40	
1550 nm		<u>≤</u> 0.25	
Bending attenuation: 1310 nm	dB/km	<u>≤</u> 0.40	
1550 nm		<u><</u> 0.25	
Temperature dependence	dB/km	≤0.05 (-20°C-	
		+85°C)	
Cut-off wavelength	nm	<u>< 1250</u>	
Chromatic dispersion:			
Zero dispersion at	nm	1310 ± 12	
-		1550 ± 15	
Zero dispersion slope (max.)	ps/nm^2	0.092	
	(km)	0.085	
Mode field diameter:			
1300 nm	mm	9.30 + 0.50	
1550 nm	mm	10.50 + 1.00	
IL-proof test level	g/m2	35 x 106	
Splice attenuation	dB/	0.02	
	splice		
Connector loss	dB/connect	< 0.5	
	or		
ODF			
Manufacturer	-		
Туре	-		
Number of fiber interconnections	-	96	
		48	
Connector loss	dB/connect	< 0.5	
	or		
Screw on type connectors	-	yes	
designed for 19" cubicles	-	yes	
U U			

SCHEDULE VI-9e- Guaranteed Technical specifications for PLC

Particulars	Unit	Employer's requirement	Tender value
Manufacturer			
Туре			
Number of speech channels per link (analogue)	min.	1	
" " ditto (analogue, for 8 kHz	min.	3	
bandwidth)			
" " ditto (digital)	min.	8	
Number of data channels per link (analogue)	min.	4	
" " ditto (digital)	min.	8	
Compatibility with existing analogue PLC		yes	
equipment			
S/N ratio for complete link (without	dB	>35	
compandors)			
Line attenuation	dB		
Carrier frequency range	kHz	40 - 500	
Gross channel bandwidth	kHz	4 / 8	
Usable AF bandwidth	Hz	300 - 3600	
Max. usable data transmission rate	kBit/s	76.8	
RF output power	W PEP		
Spurious emission suppression	dB		
Selectivity of receiver	dB		
Automatic gain control		yes	
RF level range	dB		
Number of teleprotection commands			
Protection class of equipment racks, cubicles			
EMC standards:			
• EN 50081-2, class A		yes	
• EN 50082-2			
Power supply:			
• Supply voltage	VDC	48 + 20% -	
		15%	
Power consumption	W		
Ambient conditions:			
(according to IEC 721-3)		yes	

SCHEDULE VI-9f- Guaranteed Technical specifications SDH Multiplexer and Access Multiplexer

Particulars	Unit	Employer's requirement	Tender value
General			
Manufacturer			
• N x 2 MBit multiplexer equipment	-		
• terminal equipment	-		
Type(s) of			
• N x 2 MBit multiplexer	-		
• terminal equipment	-		
Maximum extension of transmission capacity of	-		
individual terminal by adding plug in cards.			
Ditto. for multiplexer based on 2 MBit-	-		
hierarchy.			
Maximum extension for multiplexer and	-		
terminal equipment racks.			
Protection class(es) of terminal equipment	-		
racks.			
Construction Requirements			
Operating principle of amplifiers:	-	Yes	
optical - optical (bit rate insensitive)			
Operating range of fibre optic terminals.	MB1t/s	155 (STM-1)	
Operating principle of optical transmitter.			
Optical Parameters			
Nominal operating wavelength.			
Remaining overall system margin at start of life/end of life.			
Receiver sensitivity (at BER of 10 ⁻¹⁰) at start of			
life/end of life.			
Transmission Parameters			
Bit error rate (path including terminals) at			
• n x 2 MBit/s	-	$<1 \times 10^{-10}$	
Jitter performance			
• n x 2 MBit/s		acc. to	
		G.823	
Accuracy of internal clock	ppm		
Line code (optical)			
Line code (electrical)			
ITU/CCITT standards (PCM equipment)			

Feature		Minimum requirement	Tendered offer
	VI 4 3 - 6	1	Contract A31
	VI 4.5 0	Technical	Specifications and Drawings
Maximum		9000 N	
Operatin			
<u> </u>			
Bending		20x0.D.	
Radius		10x0.D.	
Installa			
tion			
Long			
Term			
Max.		4000 N / 10 cm	
Compress			
ive			
 Loading			
Impact		4.4 J, 3 X Z	
Ce		CIMES	
Twist		10 turns of 180°	
(Torsion		on	
)		125xO.D.sample,	
		both ways.	
Storage		- 50° C to +70° C	
lemperat			
Range			
Operatin		- 40° C to +70° C	
g			
Temperat			
Range			
Core		1 m sample, 1 m	
Fluid		water head for 24	
Penetrat		Hrs	
Distance		Up to 100M	
Between		1	
Poles			
Warranty		15 years	
UV			
Resistan			
 ce			
Outer		Property of Kenya	
Cable Markings		Power & Lightening	
Harkings		Company	
Packing		Rolls for	
		various sections	
		to be determined	
		between section	
		poles but not	
		less than 1000M	
Length		Every meter	
		Grev (to make it	
COTOT		unique)	
Performa	liting.FEB 2014	Allowed	Contract A31
nce		attenuation per	
	1	$\kappa m + \alpha r + \alpha - \alpha / 1 / 5$	

SCHEDULE VI-9d-Guaranteed Technical specifications for ADSS specified in particular technical specification -Gauranteed General specifications for Approach cable

ite	Feature	Descripti	Tendere
m		on	d offer
1	Maximum Operating Load	63 9000 N Technica	Contract A31 Specifications and Drawings
2	Minimum		
	Bending	20x0.D.	
	Radius	10x0.D.	
	Installation		
	Long Term		
	Max.	4000 N	
		/ 10 Cm	
3	Impact	А. Ат	
	Resistance	3×2	
		times	
4	Twist	10	
	(Torsion)	turns	
		of 180°	
		on	
		125x0.D	
		.sample	
		, both	
		ways.	
5	Storage	- 50° C	
	Temperatur	to +70°	
	e Range	С	
6	Operating	- 40° C	
	Temperatur	to +70°	
	e Range	С	
7	Core Fluid	1 m	
	Penetratio	sample,	
	n	1 m	
		water	
		nead	
		IOI 24 Hrs	
8	Warranty	1115	
0	Warrancy	vears	
9	Manufactur	<u> </u>	
	er Factory		
	Location		
1	UV		
0	Resistance Outor	Proport	
1	Cable	Propert v of	
1	Markings	Kenva	
	1101111190	Power &	
		Lighten	
		ing	
		Company	
1	packing	Rolls	
2		of	
		1000M	
		per	
1	Tongth		
⊥ 3	marking	meter	
1	Color	Grev	
4		(to	
		make it	Contract A31
		unique)	
1	Performanc	Loss	

SCHEDULE VI-9e-Guaranteed Technical specifications for ADSS specified in particular technical specification -GauranteedGeneral specifications for Optical Distribution frame (ODF)

Featu	re	Minimum requirement	Tendered offer
Fiber optic	ODF	Fiber optic patch panel 48 ports SM wall mounted with enclosure	
		splice tray cassette,	
		pigtails terminated on SC connectors	