

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Technical Data Sheets
		Volume II Section-V
		Sub-Sec-01 Turbines, Governors and Main Inlet Valve

A – GUARANTEED TECHNICAL PARTICULARS OF TURBINE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
A.01	General			
a	Manufacturer			
b	Place of Manufacture			
c	Type Designation			
d	Applicable Standards			
A.02	Guaranteed output at generator terminal for the following heads:			
e	Guaranteed max. Output at rated head (201.8 m)	kW		
f	Guaranteed rated Output at rated head (201.8m)	kW		
g	Guaranteed max. Output at max. head	kW		
h	Guaranteed max. Output at min. head	kW		
i	Guaranteed max. Output at 75% of rated head	kW		
j	Guaranteed max. Output at 50% of rated head	kW		
A.03	Guaranteed turbine output for the following heads:			
a	Guaranteed max. Output at rated head (201.8 m)	kW		
b	Guaranteed rated Output at rated head (201.8m)	kW		
c	Guaranteed max. Output at max. head	kW		
d	Guaranteed max. Output at min. head	kW		
e	Guaranteed max. Output at 75% of rated head	kW		
f	Guaranteed max. Output at 50% of rated head	kW		
A.04	Turbine efficiency:			
	Guaranteed efficiency of Turbine at rated head for the following outputs:			
a	110%	%		
b	100%	%		
c	75%	%		
d	50%	%		
e	Weighted Average Efficiency of Turbine	%		
A.05	Weighted Average Efficiency of Turbine Generator Unit:	%		
A.06	Turbine Discharge for the following outputs:			
a	Guaranteed max. Output at rated head (201.8 m)	m ³ /sec		
b	Guaranteed rated Output at rated head (201.8m)	m ³ /sec		
c	Guaranteed max. Output at max. head	m ³ /sec		
d	Guaranteed max. Output at min. head	m ³ /sec		
e	Guaranteed max. Output at 75% of rated head	m ³ /sec		
f	Guaranteed max. Output at 50% of rated head	m ³ /sec		
A.07	Speeds:			
a	Specific speed in M.K.S. units			
b	Rated speed	rpm		
c	Maximum runaway speed	rpm		
d	Critical Speed for combined Turbine & Generator	rpm		
e	Direction of rotation when viewed from generator end			

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Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
A.08	Speed Rise:			
a	Momentary rise in speed on suddenly reducing load to zero from full load of rated speed.	% of rated speed		
b	Time of Guide Vane closing for regulation of above.	sec		
A.09	Speed Drop:			
a	Momentary drop in speed on increasing load from zero to full load.	% of rated speed		
b	Time of guide vane opening for regulation at (a) above	sec		
A.10	Flywheel Effect of:			
a	The Generating unit for regulation stated above			
b	Mass of Turbine rotating parts	kgs		
c	GD ² of Turbine rotating parts	kg-m ²		
d	Mass of Generator rotating parts	kgs		
e	GD ² of Generator rotating parts	kg-m ²		
f	Pressure Rise for full load throw off (above max. static pressure)	%		
g	Speed Rise (above rated speed) for full load throw off	%		
h	Mass GD ² of additional Fly wheel, if required	kg-m ²		
A.11	Factor of Safety:			
a	Guaranteed minimum factor of safety under Worst conditions based on yield point of the material.			
b	Name and location of the part having the factor of safety in (a) above.			
A.12	Max. Water Hammer Pressure:	% of rated head		
A.13	Runner:			
a	Type of Runner blank (Cast/Forge)			
b	Material and composition			
c	Runner coating material/process			
A.14	Guide Vane Apparatus:			
a	Material of Guide Vane			
b	No. of Guide Vanes			
c	Leakages			
	(i) Leakage through fully closed Guide Vanes			
	(ii) Torque on runner due to leakage			
d	Description of the method of lubrication			
e	Material of Link and Lever/Operating ring			
f	Guide Vane bearing type & Material			
g	Guide vane opening (%) for maximum output at rated head	≤90%		
A.15	Guide Vane Servomotor:			
a	No. of Servomotors,			

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A – GUARANTEED TECHNICAL PARTICULARS OF TURBINE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
b	Material of Servomotor body and piston			
c	Rating / Capacity	kg m		
d	Range of oil pressure for satisfactory operation	bar		
A.16	Inlet Casing & Stay Ring:			
a	Inlet diameter of Casing	m		
b	Dimensions of Casing	m		
c	Maximum / design / working pressure	bar		
d	Test pressure	bar		
e	Material of Casing			
f	No. of sections of Casing			
g	Material and construction of speed / stay ring			
h	No. of Vanes in speed /stay ring			
i	Thickness of Casing & Stay ring			
j	Weight	kg		
A.17	Centreline:			
a	Elevation of Centre Line of Runner	m		
b	Turbine Setting (w.r.t Min. TWL)	m		
A.18	Cavitation:			
a	Critical sigma value			
b	Cavitation guarantee in kg/1000 hours of operation			
A.19	Recommended Plant Sigma:			
A.20	Draft Tube:			
a	Type			
b	Material			
c	Thickness	mm		
d	Elevation of lowest point in Draft Tube	m		
e	Total length of Draft Tube Steel Liner from Runner axis	mm		
f	Velocity under full load at Draft Tube Steel Liner exit	m/s		
g	Velocity under full load at Draft Tube exit	m/s		
A.21	Weights:			
	Weight of finished-machined runner complete	kg		
	Weight of shaft	Kg		
	Weight and designation of heaviest part or assembly of the turbine as prepared for shipment	kg		
	Heaviest turbine assembly to be handled by powerhouse crane during installation	kg		
A.22	Dimensions:			
	Turbine shaft diameter	mm		
	Dimensions and designation of largest part or assembly of the turbine as prepared for shipment (LxBxH)	mm x mm x mm		
	Required entry opening in power house for largest turbine part (Width x Height)	mm x mm		

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B – GUARANTEED TECHNICAL PARTICULARS OF GOVERNOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
B.01	General			
a	Manufacturer			
b	Place of Manufacture			
c	Type Designation			
d	Applicable Standards			
e	Rating of Governor			
B.02	Governor Operation			
a	"Guaranteed sensitivity (minimum speed range to which governor will respond)"			
b	Range of adjustment of permanent speed droop	%		
c	Range of adjustment of temporary speed droop	%		
d	Range of adjustment in speed setting	%		
e	Governing opening and closing times	sec		
f	Description and method of operation			
g	Adjustment range in governor opening and closing time	sec		
h	Governor Operating Oil Pressure			
	i) Maximum			
	ii) Minimum			
B.03	Accumulator / Pressure Oil Receiver			
a	No. of Accumulators per unit	Nos.		
b	Capacity of Accumulator	LPM		
c	Normal volume of oil in each	m ³		
d	Normal working pressure	bar		
e	"No. of complete operation of Guide Vanes Servomotor possible without pumps running" C-O-C	Yes/No		
B.04	Oil Pressure Unit (OPU)			
a	No. of oil pump per unit			
b	Type / Make of pump			
c	Capacity of each pump	LPM		
d	Working pressure	kg/cm ²		
e	Type and grade of oil used			
f	Class of Insulation			
g	Size & type of Distributing Valve			

C – GUARANTEED TECHNICAL PARTICULARS OF MAIN INLET VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
C.01	General			
a	Manufacturer			

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C – GUARANTEED TECHNICAL PARTICULARS OF MAIN INLET VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
b	Place of Manufacture			
c	Type Designation			
d	Applicable Standards			
C.02	Valve Operation			
a	Maximum torque required to close the valve with a flow corresponding to;			
	i) Rated turbine output at rated net head	Nm		
	ii) Specified turbine overload output at rated net head	Nm		
	iii) Specified turbine overload output at maximum net head	Nm		
b	Maximum unbalanced pressure against which valve is capable of closing & opening			
c	Maximum head loss through the valve at a flow required for rated turbine output at rated net head	m		
d	Maximum leakage from main valve when fully closed against maximum head (with new seal)			
	i) through service seal	l/min		
	ii) through maintenance seal	l/min		
e	MIV Operating Oil Pressure			
	i) Maximum			
	ii) Minimum			
f	Lowest factor of safety (referred to design stress) for any hydraulically loaded part of the valve			
C.03	Accumulator / Pressure Oil Receiver			
a	No. of Accumulators per unit	Nos.		
b	Capacity of Accumulator	LPM		
c	Normal volume of oil in each	m ³		
d	Normal working pressure	bar		
e	"No. of complete operation of MIV Servomotor possible without pumps running" C-O-C	Yes/No		
C.04	Oil Pressure Unit (OPU)			
a	No. of oil pump per unit			
b	Type / Make of pump			
c	Capacity of each pump	LPM		
d	Working pressure	kg/cm ²		
e	Type and grade of oil used			
f	Class of Insulation			
g	Size & type of Distributing Valve			
C.05	Weights:			
	Weight and designation of heaviest part or assembly of the MIV as prepared for shipment	kg		
	Heaviest MIV assembly to be handled by powerhouse crane during installation	kg		

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C – GUARANTEED TECHNICAL PARTICULARS OF MAIN INLET VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
C.06	Dimensions:			
	Inside diameter	mm		
	length of valve body (excluding extensions)	mm		
	maximum distance from horizontal centreline of valve to lowest portion of assembly	mm		

D – TECHNICAL DATA OF TURBINE, GOVERNOR & MIV				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
D.1	Turbine Technical Data			
D.1.1	Turbine Design Data			
a	Net Head considered			
	i) Max. Net Head	m		
	ii) Min. Net Head	m		
	iii) Rated Net Head	m		
b	Discharge			
	i) Max. Discharge at max. head	m ³ /s		
	ii) Min. Discharge at min. head	m ³ /s		
c	Efficiency			
	i) Efficiency at max. head & max. discharge	%		
	ii) Efficiency at min. head & min. discharge	%		
D.1.2	Turbine Component / System Details			
a	Runner			
	i) Material			
	ii) Entrance Diameter of Runner (D1)	mm		
	iii) Min Opening Diameter of Runner (D2)	mm		
	iv) Discharge Diameter of Runner (D3)	mm		
	v) No. of Runner blades			
	vi) Source of Runner casting/forging			
	vii) Weight of Runner	ton		
	viii) Peripheral Velocity	m/s		
	ix) Velocity of water at Runner exit	m/s		
	x) Direction of rotation when viewed from Generator end			
b	Turbine Shaft			
	i) Material Grade			
	ii) Diameter and length	mm		
	iii) Diameter of Bore	mm		
	iv) Weight	kg		
c	Guide vane Apparatus			
	i) Clearance between fully closed Guide Vanes	mm		

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D – TECHNICAL DATA OF TURBINE, GOVERNOR & MIV				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	ii) Clearance of top of Guide Vanes	mm		
	iii) Clearance of bottom of Guide Vanes	mm		
	iv) Guide vane pitch circle diameter	mm		
	v) Guide Vane height	mm		
	vi) Weight of each Guide Vane	kg		
	vii) Method of coupling Guide Vane to operating ring / Levers			
	viii) No. of section of operating ring	nos.		
	ix) Diameter of operating ring	mm		
	x) Type and material of bearings supporting operating ring	mm		
d	Guide vane Apparatus			
	i) Piston diameter x stroke	mm x mm		
	ii) Weight of Servomotors	kg		
	iii) Range of adjustment of opening/closing time	sec		
	iv) Range of oil pressure for satisfactory operation	kg/cm ²		
e	Shaft Seal			
	i) Type			
	ii) Number of rings & material			
	iii) Cooling flushing water requirements/ Filtration Quality	LPM / Micron		
	iv) Pressure of cooling water required	kg/cm ²		
	v) Micro Water Strainer included	Yes/No		
f	Turbine Guide Bearing			
	i) Type of bearing			
	ii) Diameter and length	mm		
	iii) Working temperature of bearing surface	°C		
	iv) Medium of Lubrication			
	v) Cooling water flow and pressure, if required	LPM kg/cm ²		
	vi) Recommended grade and make of lubricated oil			
	vii) Quantity of lubricating oil	Litres		
g	Water Velocities			
	i) At inlet to Inlet Casing	m/s		
	ii) At Runner discharge	m/s		
h	Elevations			
	i) Bottom of Draft Tube exit	m		
	ii) Top of Draft Tube exit	m		
	iii) Highest elevation of Crane Hook	m		
i	Turbine Instrumentation			

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D – TECHNICAL DATA OF TURBINE, GOVERNOR & MIV				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	i) Instrumentation included as per Tender Specification	Yes/No		
	ii) If Not, Furnish the List			
j	Turbine Flow Measurement Apparatus			
	i) Make / Model			
	ii) Quantity	sets		
	iii) Flow Range	m ³ /h		
	iv) Designed to operate utilising the pressure differential obtained from Winter-Kennedy tapplings	Yes/No		
k	Surge Shaft Level Sensor			
	i) Make / Model			
	ii) Quantity			
	iii) Measurement Range	m		
l	Tail Water Level Sensor			
	i) Make / Model			
	ii) Quantity			
	iii) Measurement Range	m		
D.1.3	Turbine Safety Devices			
	i) Governor oil pressure low	Pressure S/W		
	ii) Oil level low in Sump Tank	Float S/W		
	iii) Mechanical Over Speed device	Centrifugal Switch		
	iv) Controlled action shut down	Trip Relay		
	v) Emergency shutdown	Trip Relay		
	vi) Cooling water flow low	Flow S/W		
	vii) Gear box bearing temperature	RTD DTT		
	viii) Turbine Bearing temperature high	RTD DTT		
D.2	Governor Technical Data			
D.2.1	Governor			
a	Power Supply			
	i) Main power supply required	Volt AC/DC		
	ii) Emergency power supply required	Volt AC/DC		
b	Ambient Conditions			
	i) Maximum & minimum temperature	°C		
	ii) Relative humidity	%		
c	Governor output current range	mA		
d	Whether built in test instruments are provided for testing purpose	Yes/No		
D.2.2	Oil Pressure Unit			
a	Oil Pumps			

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D – TECHNICAL DATA OF TURBINE, GOVERNOR & MIV				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	i) Make of pumps			
b	Sump tank			
	i) Volume of oil in the entire system	Litres		
	ii) Volume of oil Sump Tank	Litres		
	iii) Weight of Sump Tank empty	kg		
	iv) Dimension of Sump Tank	mxmxm		
c	Accumulator / Pressure Oil Receivers			
	i) Diameter and height of Accumulator	mm x mm		
	ii) All accessories like relief valve, level switches, pressure switches, Level Indicators etc. included.	Yes/No		
D.2.3	Tests & Inspection			
	i) Whether Governor testing as per IEC offered	Yes/No		
	ii) Whether operation test of the complete system will be offered at shop	Yes/No		
D.3	Main Inlet Valve Technical Data			
D.3.1	Design Data			
a	Applicable Code/Standard			
b	Design Pressure	bar		
c	Design Flow	m ³ /sec		
d	Maximum Flow	m ³ /sec		
e	Nominal Diameter of Valve	mm		
f	Corrosion Allowance	mm		
g	Test Pressure			
	i) Test Pressure for Valve Body	bar		
	ii) Test Pressure for Disc Strength Test	bar		
	iii) Test Pressure for Seal Test	bar		
h	Valve Operation Period			
	i) Valve Closure Time (Max./Min.)	sec		
	ii) Valve Opening Time with maximum friction coefficient (Max./Min.)	sec		
i	Pressure Drop across Valve			
	i) at maximum flow	m		
	ii) at normal flow	m		
D.3.2	Operating Mechanism			
a	Mode of Operation			
b	Number of Servomotors	nos.		
c	Servomotor design Pressure	bar		
d	Servomotor bore	mm		
e	Servomotor stroke	mm		
f	Weight of counter weights	t		
g	Maximum counterweight torque	N.m		
h	Operating torque required	N.m		

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D – TECHNICAL DATA OF TURBINE, GOVERNOR & MIV				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
i	Mode of tripping			
j	Tripping Velocity	m/s		
D.3.3	Seals			
a	Downstream Seal - Main valve			
	i) Seal fixing method			
	ii) Leakage rate	lpm		
b	Upstream/Maintenance Seal			
	i) Seal fixing method			
	ii) Method of inflation by oil	Yes/No		
D.3.4	Bypass Assembly			
a	Pipe diameter	mm		
b	Pipe material/type			
c	Type of By Pass valve-hydraulically operated (Needle Type)	Yes/No		
d	Provision of additional Gate Valve (Manual)	Yes/No		
e	Material of Needle & Gate Valves			
	i) Body (Cast Steel)	Yes/No		
	ii) Trim/Needle (SS)	Yes/No		
f	Provision of Dismantling joint	Yes/No		
g	Provision of DP Gauge Panel	Yes/No		
D.3.5	Material of Construction			
a	Valve Body			
b	Rotor/Disc			
c	Trunnion / Shaft			
d	Main Trunnion Sleeve			
e	Self-lubricating bushing for Trunnion			
f	Self-lubricating bushing for other mechanisms			
g	Companion Flanges of Main Valve			
h	Nuts & Bolts of Main Valve			
i	Downstream Seal - Main Valve	Material/ Shore hardness		
j	Upstream/Maintenance Seal	Material/ Shore hardness		
k	Flange Seal Rings - Upstream/Downstream	Material/ Shore hardness		
l	Seal Ring - dismantling joint	Material/ Shore hardness		
m	Upstream & Downstream Pipes			
n	Dismantling cum expansion joint			
	i) Main Valve			

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D – TECHNICAL DATA OF TURBINE, GOVERNOR & MIV				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	ii) By pass Assembly			
o	Levers			
p	Counter Weight			
q	Servomotor			
	i) Servomotor body			
	ii) Servomotor rod			
D.3.6	Accessories			
a	Air Release Valve	Yes/No		
	i) Make / Model			
	ii) Size			
	iii) Pressure Rating			
b	Anti-Vacuum Valve	Yes/No		
	i) Make / Model			
	ii) Size			
	iii) Pressure Rating			
c	Air Release Valve and Anti-Vacuum Valve are Common / Separate?	Common / Separate		
D.3.7	Dimensions & Weights			
a	Size of Valve (minimum inlet diameter of water passage)	mm		
b	Main Valve body flange to flange dimension	mm		
c	Flange to Flange dimension of Valve including dismantling joint & follower flange	mm		
d	Overall dimension of Valve (including upstream & downstream pipes)	mm		
e	Weight of Bare Valve (without counter weight)	t		
f	Weight of Valve including Counter Weight & Servomotors	t		
g	Weight of Complete Valve Assembly including U/P & D/S pipes	t		
h	Heaviest component to be lifted during erection - Name/Weight	name/ t		
i	Largest Part to be Shipped			
	i) Name			
	ii) Shipping Dimensions (L x B x H)	m		
	iii) Shipping Weight	t		

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		Sub-Sec-02 Generator & Excitation System

GENERATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
A.0	General			
a	Manufacturer			
b	Enclosure			
c	Phase/connection/no. of terminals			
A.1	Main Performance Data			
a	Rated load capacity at conditions stipulated in specification (RLC)	kVA		
b	Maximum overload capacity at conditions stipulated in specification	kVA		
c	Rated voltage	V		
d	Voltage adjustment range at RLC	±%		
e	Rated current (at RLC and rated voltage)	A		
f	Maximum permissible unbalanced load relative to rated current	%		
g	Rated frequency	Hz		
h	Rated power factor			
i	Rated speed	rpm		
j	Starting time			
	i) from run up to synchronous speed	s		
	ii) from no load to full load	s		
l	Rated ambient air temperature	°C		
m	Maximum design temperature rise (Rated)			
	i) stator winding	°C		
	ii) rotor winding	°C		
	iii) stator core	°C		
n	Maximum design temperature rise (Overload) with 10.% cooling tubes blocked in all coolers			
	i) stator winding	°C		
	ii) rotor winding	°C		
	iii) stator core	°C		
o	Efficiency, as per IEC 60034-2 at reference temp. of 95°C and inclusive of bearing losses attributable to Generator			
	i) Power at terminals (kW)			
p	Insulation			
	i) Stator	class		
	ii) rotor	class		
q	Maximum noise level at 1m from metallic surfaces	dBA		
r	Stator core maximum vibration limit	dBA		
s	Stator winding dielectric test voltage	kV AC		
t	Field winding dielectric test voltage	kV AC		
u	Saturation factor			
v	Maximum deviation from sine wave			

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		Sub-Sec-02 Generator & Excitation System

GENERATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
w	Acoustic enclosure included	(y/n)		
x	Maximum harmonic content in output	%		
y	Steady state 3 phase short-circuit (SC) current	KA		
z	Maximum initial SC current (peak)	KA		
aa	3 phase SC withstand time	S		
ab	Maximum continuous negative sequence current	A		
ac	Negative sequence withstand current $(I_2/I_n)^{2*} t$			
ad	Surge impedance			
A.2	Electrical Characteristics			
A.2.1	Generator			
	<i>Where quantities are stated in the per unit system they shall be based on 94.117 MVA and 11 000 V.</i>			
a	Short-circuit ratio			
b	Direct-axis synchronous reactance X_d at rated current	per unit		
c	Direct-axis transient reactance X'_d			
	i) at rated current	per unit		
	ii) at rated voltage	per unit		
d	Direct-axis sub-transient reactance X''_d			
	i) at rated current	per unit		
	ii) at rated voltage	per unit		
e	Quadrature-axis synchronous reactance X_q			
	i) at rated current	per unit		
f	Quadrature-axis transient reactance X'_q			
	i) at rated current	per unit		
	ii) at rated voltage	per unit		
g	Quadrature-axis sub-transient reactance X''_q			
	i) at rated current	per unit		
	ii) at rated voltage	per unit		
h	Negative sequence reactance X_2 at rated current	per unit		
i	Zero sequence reactance X_0 with zero sequence current equal to rated armature current	per unit		
j	Leakage reactance X_L of the stator winding	per unit		
k	Resistance of the stator winding (phase to neutral) at 40°C	ohms		
l	Direct-axis sub-transient open-circuit time constant T''_{do}	s		
m	Direct-axis transient open-circuit time constant T'_{do}	s		
n	Direct-axis sub-transient short-circuit time constant T''_d			
	i) at rated current	s		
	ii) at rated voltage	s		
o	Direct-axis transient short-circuit time constant T'_d			
	i) at rated current	s		

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		Sub-Sec-02 Generator & Excitation System

GENERATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	ii) at rated voltage	s		
p	Quadrature-axis sub-transient open-circuit time constant T''_{q0}	s		
q	Short-circuit time constant of armature winding T_a			
	i) at rated current	s		
	ii) at rated voltage	s		
r	Total losses of the generator at 94.117 MVA and rated terminal conditions will be subdivided as follows :			
	i) Stator I^2R losses	kw		
	ii) Field I^2R losses	kw		
	iii) Core losses	kw		
	iv) Windage and friction losses	kw		
	v) Stray losses	kw		
s	Total losses of the generator at 103.53 MVA and rated voltage, frequency and power factor conditions will be subdivided as follows :			
	i) Stator I^2R losses at 95°C	kw		
	ii) Field I^2R losses at 95°C	kw		
	iii) Core losses	kw		
	iv) Windage and friction losses	kw		
	v) Stray losses	kw		
	vi) Bearing losses attributable to generator	kw		
	vii) Total Losses	kw		
t	Zero sequence capacitance per phase	μF		
u	Number of slots			
v	Number of parallel circuits per phase			
w	Copper bar section (stator winding)	mm ²		
x	Design air gap (air gap designed for when the generator is running)	mm		
y	Air gap tolerance	$\pm \%$		
z	Inertia constant H	kW-sec/kVA		
A.2.II	Generator field			
a	The resistance of the generator field at 40°C will be	Ohm		
b	Under rated conditions of load 94.117 MVA, power factor, frequency and voltage			
	i) the rated field current will be	A		
	ii) the rated field voltage will be	V		
	iii) no load field voltage as calculated on the air gap line	V		
c	Under rated conditions of load 94.117 MVA, power factor, frequency and with terminal voltage five percent above rated voltage :			

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GENERATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	i) the field current will be	A		
	ii) the field voltage will be	V		
d	Under load conditions of 103.53 MVA at rated power factor and frequency, and with terminal voltage five percent above rated voltage :			
	i) the field current will be	A		
	ii) the field voltage will be	V		
e	Under reactive load conditions (maximum MVars), under-excited:			
	i) reactive load	MVARs		
	ii) the field current will be	A		
	iii) the field voltage will be	V		
A.3	Mechanical and Structural Characteristics			
a	Maximum V on Mises stresses which could occur in the rotor rim	MPa		
b	Percentage of the yield point of the rotor rim material (Von Mises stress computed by a fully converged finite element model):			
	i) at rest (shrinkage and weight)	%		
	ii) at rated speed	%		
	iii) at runaway speed	%		
c	Number of cooler assemblies			
d	Rated pressure of cooling water	Kg/cm ²		
e	Total rated cooling water flow (stator, bearings and excitation system)	m ³ /hr		
f	Materials of stator coolers:			
	i) Cooler tubes (Cu-Ni 90-10 or SS 304L)			
	ii) Extruded cooling fins			
	iii) Tube-sheet and box			
g	Rated capacity of thrust bearing	Kg		
h	Material of thrust pad liner :			
i	Thrust pad manufacturer:			
j	Average pressure on active surface of thrust bearing pads	MPa		
k	Number of thrust bearing shoes			
l	Number of guide bearing(s)			
A.4	Dimensions and Weights			
a	Width of generator pit	mm		
b	Rotor height	mm		
c	Rotor outside diameter (at rated load)	mm		
d	Depth of stator pit	mm		
e	Height of collector rings frame	mm		
f	Outside diameter of stator frame	mm		
g	Inside diameter of stator frame	mm		

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GENERATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
h	Stator core height	mm		
i	Stator frame height	mm		
j	Outside diameter of rotor rim	mm		
k	Inside diameter of rotor rim	mm		
l	Weight of complete generator	kg		
m	Weight of complete stator	kg		
n	Weight of complete rotor	kg		
o	Weight of thrust bearing	kg		
p	Weight of rotor rim	kg		
q	Weight of each pole	kg		
r	Weight of rotor and lifting apparatus to be handled by powerhouse overhead crane:	kg		
s	Minimum elevation of overhead crane main hook, for rotor handling purposes:	m		
t	Largest part for transportation			
	Description			
	i) Length	mm		
	ii) Width	mm		
	iii) Height	mm		
u	Heaviest Package for Shipment / Transport			
	Description			
	i) Length	mm		
	ii) Width	mm		
	iii) Height	mm		
A.5	Current Transformers			
a	Type and Model			
b	Turn Ratio			
c	Transient operating condition accuracy			
	i) Fault level	kA rms		
	ii) Maximum remanence	%		
d	Protection accuracy			
e	Metering accuracy			
f	Short time current			
	i) Instantaneous	kA peak		
	ii) One second	kA rms		
g	Codes and Standards			
PERFORMANCE GUARANTEES				
I	GENERATORS			
1	Rated capacity at the terminals with	kVA		
a	power factor			
b	frequency	Hz		
c	voltage	kV		
d	cooling water temperature	°C		

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GENERATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
2	Maximum capacity for continuous operation at the terminals with:	kVA		
a	power factor			
b	frequency	Hz		
c	voltage	kV		
d	cooling water temperature	°C		
3	Synchronous speed	RPM		
4	Direction of rotation			
5	The rated value of the direct-axis transient reactance at rated voltage	%		
6	Efficiencies of generator at			
	110 % of rated load	%		
	100% of rated load	%		
	75% of rated load	%		
	50% of rated load	%		
7	Weighted average efficiency of generator at rated terminal voltage, rated power factor & rated frequency	%		
8	Efficiencies of generating unit (including turbine) at reference temp. of 95°C and inclusive of bearing losses attributable to Generator:			
	110 % of rated load	%		
	100% of rated load	%		
	75% of rated load	%		
	50% of rated load	%		
9	Temperature rise at max current rating (MVA) with 40°C air temperature			
a	with all coolers in service			
	stator winding	°C		
	rotor winding	°C		
	Other parts	°C		
b	with one cooler out of service (or with 10% cooling tubes blocked in all coolers:)			
	stator winding	°C		
	rotor winding	°C		
	other parts	°C		
10	Maximum oil temperature in thrust bearing	°C		

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EXCITATION SYSTEM				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
B.1	Weight and Dimensions			
a	Net weight of a complete system:	Kg		
b	Shipping weight of a complete system:	Kg		
c	Description and net weight of main components:			
	i) Excitation Transformer	Kg		
	ii) Excitation cubicle	Kg		
d	Description and net shipping weight of main components:			
	i) Excitation Transformer	Kg		
	ii) Excitation cubicle	Kg		
e	Biggest component to ship:			
	Description:			
	i) Length	mm		
	ii) Width	mm		
	iii) Height	mm		
	iv) Weight	Kg		
f	Longest component to ship:			
	Description:			
	i) Length	mm		
	ii) Width	mm		
	iii) Height	mm		
	iv) Weight	Kg		
g	Number of panels per unit:			
B.2	Electrical Characteristics			
a	Total power required by each system at rated capacity (including all auxiliaries):	KW, KA		
b	Electrical losses			
	Rectifier Transformer			
	Total losses at rated capacity	KW		
	No-load losses (at rated voltage):			
	Rectifiers (at rated capacity):	KW		
	Others (at rated capacity):	KW		
c	Ceiling current			
	With "n" bridges in continuous operation:	A		
	Ceiling current during 30 seconds:			
	with "n" bridges :	A		
	with "n-1" bridges:	A		
d	Curves			
e	Thermal capacity of equipment to supply ceiling voltage to field windings :			

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EXCITATION SYSTEM				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	i) with all rectifying bridges in operation :	s		
	ii) with one rectifying bridge out of service :	s		
f	Maximum overvoltage possible in generator field circuit and duration:	V peak, S		
B.3	Field Circuit Breaker			
a	Rated voltage:	V DC		
b	Rated current:	A DC		
c	Maximum current allowed in continuous duty:	A DC		
d	Short time maximum voltage:	V DC		
e	Interrupting current of maximum contacts at short time maximum voltage:	A DC		
f	Maximum interrupting voltage of main contacts:	V DC		
g	Maximum short time current of main contacts:	A DC		
h	Closing current of main contacts:	A DC		
B.4	Rectifier Transformer			
a	Manufacturer and model:			
b	Insulation class:			
c	Temperature rise:	°C		
d	Rated capacity:	kVA		
e	Windings connection:			
	Primary:			
	Secondary:			
	Number of turns:			
	Primary:			
	Secondary:			
f	Turn ratio:			
g	Noise level at 1m from the transformer:	dB(A)		
h	Basic impulse level:	kV		
i	Rated impedance:	%		
j	Zero sequence capacitance:	pF		
k	Material used:			
	Conductors:			
	Insulating material (description, type, thickness and location where used):			
l	Design general description:			
	Drawing no. :			
m	Location and type of temperature sensors:			
n	Auxiliary Transformer			
	Rated capacity	kVA		
	Secondary voltage	V		
	Insulator class			

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EXCITATION SYSTEM				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
	Temperature rise			
	Winding connections			
B.5	System Response			
a	Voltage regulator time constant:			
b	Voltage regulator gain:			
c	Transfer function of system n° included			
d	Adjustment range of gains and time constants of stabilization signal:			
B.6	Minimum Operating Voltage			
a	Minimum feed AC supply voltage for adequate operation:	V		
b	Allowable duration of operation at minimum AC supply voltage:	hours		
c	DC output voltage at minimum AC supply voltage:	V		
6	Ceiling voltage at minimum AC supply voltage:			
7	Maximum continuous current and duration of use of batteries during field flashing at 220 V DC:	A DC, S, Ah		
8	Number of rectifying bridges used:			
9	Rated capacity of each rectifying bridge:	A DC		
10	Ceiling voltage with one rectifying bridge out of service:	V DC		
11	Total number of thyristors:			
12	Description and type of thyristors used:			
13	Maximum temperature at thyristors junctions during normal operation and at nominal conditions:			
	with "n" bridges :	°C		
	with "n-1" bridges :	°C		
	with "n+1" bridges :	°C		
14	List of relays:			
15	Excitation cubicle and metallic separator steel gage:			
	Static excitation system			
	Rectifier transformer			
16	Cooling requirements			
	Water flow	l/s		
	Maximum inlet water temperature	°C		
	Outlet water temperature rise	°C		

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		Sub-Sec-03 Cooling Water System

A – COOLING WATER SYSTEM FOR TG UNITS AND GENERATOR TRANSFORMERS				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
A.1	Cooling Water Requirement			
a	Generator Air Coolers	m ³ /hr		
b	Generator Thrust and Upper Guide Bearing	m ³ /hr		
c	Generator Lower Guide Bearing	m ³ /hr		
d	Turbine Guide Bearing	m ³ /hr		
e	Oil Pressure Unit	m ³ /hr		
f	Turbine Shaft Seal	m ³ /hr		
g	Generator Transformers	m ³ /hr		
h	Any other requirement (Pl. specify)	m ³ /hr		
i	Total for each TG Unit	m ³ /hr		
A.2	Cyclone Separators			
a	Make			
b	Type / Model			
c	Quantity (Working / Standby)	Nos.		
d	Rated flow	m ³ /hr		
e	Design Pressure	Bar		
f	Flanges (Size & Class)			
g	Body Material			
h	Body Material Hardness	(BHN)		
i	Internal Coating (if any)			
j	Pressure Drop across Cyclone Separator	Bar		
k	Filtration Efficiency down to particle size and specific gravity	%, Micron, Sp. Gr.		
l	Flushing Water Quantity	Litre/Sec		
m	Purging Valve (Type & Size)			
n	Purging Valve Material (Body / Trims)			
o	Purging Valve Motor			
	- Protection Class	IP		
	- Voltage	AC / DC V		
	- Rating	kW/P		
A.3	Motorized Automatic Online Self-cleaning Filters			
a	Make			
b	Type / Model			
c	Quantity (Working / Standby)	Nos.		
d	Rated flow	m ³ /hr		
e	Design Pressure	Bar		

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		Sub-Sec-03 Cooling Water System

A – COOLING WATER SYSTEM FOR TG UNITS AND GENERATOR TRANSFORMERS				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
f	Material of Strainer element (SS Wedge type)			
g	Material of Filter Housing			
h	No. of tubes	Nos.		
i	Dia. of tubes	mm		
j	Pressure drop across filter – clean / dirty	Bar		
k	Filtration Efficiency, Down to particle size	%, micron		
l	Minimum operating pressure at inlet to filter	Bar		
m	Rating of Geared Motor / Purging Motor	kW/P		
A.4	Valves			
a	Make			
b	Pressure Rating / Class	Bar		
c	Material (Body / Trim)			
A.5	Piping			
a	Pressure Rating / Class	Bar		
b	Pipe Material			
c	Lagging Material			
d	Cladding Material			
e	Type / Material of Fittings			

B – COOLING WATER SYSTEM FOR FIRE WATER STORAGE TANK				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
B.1	Water Requirement			
a	For Fire Water Storage Tank			
B.2	Motorized Automatic Online Self-cleaning Strainer			
a	Make			
b	Type / Model			
c	Quantity (Working / Standby)	Nos.		
d	Rated flow	m ³ /hr		
e	Design Pressure	Bar		
f	Material of Strainer element (SS Wedge type)			
g	Material of Filter Housing			
h	No. of tubes	Nos.		
i	Dia. of tubes	mm		
j	Pressure drop across filter – clean / dirty	Bar		

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B – COOLING WATER SYSTEM FOR FIRE WATER STORAGE TANK				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
k	Filtration Efficiency, Down to particle size	%, micron		
l	Minimum operating pressure at inlet to filter	Bar		
m	Rating of Geared Motor / Purging Motor	kW/P		
B.3	Pumps			
a	Make			
b	Type / Model			
c	Quantity (Working / Standby)	Nos.		
d	Flow Rate	m ³ /hr		
e	Total Discharge Head (TDH) at Pump outlet	M		
f	Material of Casing / Impeller / Shaft			
g	Power Requirement	BkW		
h	Motor Rating	kW/P		
B.4	Valves			
a	Make			
b	Pressure Rating / Class	Bar		
c	Material (Body / Trim)			
B.5	Piping			
a	Pressure Rating / Class	Bar		
b	Pipe Material			
c	Lagging Material			
d	Cladding Material			
e	Type / Material of Fittings			

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		Sub-Sec-04 Unit Dewatering & Drainage Water System

Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)
Guaranteed Technical Particulars					
A	Power House and Flood Water Drainage		PH Drainage	Flood Water Drainage	
A.1	Drainage Sumps				
a	Size of Sump	(LxBxH)			
A.2	Pumps				
a	Manufacturer				
b	Type				
c	Model				
d	Duty - continuous				
e	Applicable Standards				
f	Quantity (Working/Standby)	Nos.			
g	Rated flow of each pump	m³/hr			
h	Total discharge head	m			
i	Material of Casing/Impeller/Shaft				
j	Motor rating	kW/P			
k	Supply Voltage /Frequency	V/Hz			
l	Degree of Protection	IP			
m	Insulation class / Temp. rise (F/B)				
n	Weight of complete pump (with motor)	kg			
A.3	Provision of Standard Accessories				
a	Dismantling joint/Automatic Detachable Pedestal Coupling/Guide pipe/ Lifting chain etc.	Yes / No			
A.4	Level Switches				
a	Make / Type				
b	Quantity	Nos.			
c	Material (Body / Trim)				
A.5	Valves				
a	Make				
b	Pressure Rating/Class				
c	Material (body/trim)				
A.6	Piping				
a	Nominal Pressure				
b	Pipe Material				
c	Lagging Material				
d	Cladding Material				
A.7	Portable Submersible Pump for Valve Pit				
a	Make				
b	Type / Model				
c	Capacity (5 L/s)	L/s			
d	Total Discharge Head	m			
e	Motor Rating	kW/P			

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		Sub-Sec-04 Unit Dewatering & Drainage Water System

Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
B	Unit Dewatering System			
B.1	Power House Dewatering Sump			
a	Size of Sump	(LxBxH)		
B.2	Pumps			
a	Manufacturer			
b	Type			
c	Model			
d	Duty - continuous			
e	Applicable Standards			
f	Quantity (Working/Standby)	Nos.		
g	Rated flow of each pump	m ³ /hr		
h	Total discharge head	m		
i	Material of Casing/Impeller/Shaft			
j	Motor rating	kW/P		
k	Supply Voltage /Frequency	V/Hz		
l	Degree of Protection	IP		
m	Insulation class / Temp. rise (F/B)			
n	Weight of complete pump (with motor)	kg		
B.3	Provision of Standard Accessories			
a	Dismantling joint/Automatic Detachable Pedestal Coupling/Guide pipe/ Lifting chain etc.	Yes / No		
B.4	Level Switches			
a	Make / Type			
b	Quantity	Nos.		
c	Material (Body / Trim)			
B.5	Valves			
a	Make			
b	Pressure Rating/Class			
c	Material (body/trim)			
B.6	Piping			
a	Nominal Pressure			
b	Pipe Material			
c	Lagging Material			
d	Cladding Material			
B.7	Unit Dewatering Capacity			
a	Total time required for dewatering one unit	Hrs.		
B.8	Compressed Air Injection			
a	Provision of Compressed Air Injection connections for each Dewatering Line (Refer Flow Diagram)	Yes / No		

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		Sub-Sec-05 HP & LP Compressed Air System

HP & LP COMPRESSED AIR SYSTEMS				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
1	Compressors			
a	HP Compressors (Working / Standby)	Nos.		
b	Make			
c	Model			
d	Capacity of each Compressor	m ³ /hr		
e	Discharge Pressure	bar		
f	Type of drive	Direct / V-Belt		
g	No. of stages	Nos.		
h	Speed	rpm		
i	kW at Compressor shaft	kW		
j	Motor rating	kW/P		
k	Type of Motor			
l	Degree of Protection	IP		
m	Insulation Class/Temp. Rise (F/B)			
n	Type of Cooling			
o	Cooling water requirement (if water Cooled)	m ³ /min		
p	Temperature rise of Cooling water (if applicable)	°C		
2	HP Air Dryer			
a	Make			
b	Type			
c	Design Pressure	Bar		
d	% Purge air			
e	Dew point temperature	°C		
3	HP Air Receiver			
a	Applicable Standards			
b	Volume of Receiver	m ³		
c	Overall Dimensions (dia. x height)	mm x mm		
d	Design Pressure	Bar		
e	Working Pressure	Bar		
f	Test Pressure	Bar		
g	Type of Safety Device			
h	Safety Valve Setting	Bar		
i	Material			
4	LP Air Receiver			
a	Applicable Standards			
b	Volume of Receiver	m ³		

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		Sub-Sec-05 HP & LP Compressed Air System

HP & LP COMPRESSED AIR SYSTEMS				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
c	Overall Dimensions (dia. x height)	mm x mm		
d	Design Pressure	Bar		
e	Working Pressure	Bar		
f	Test Pressure	Bar		
g	Type of Safety Device			
h	Safety Valve Setting	Bar		
i	Material			
5	Pressure Reducer			
a	Make			
b	Type			
c	Pressure on both sides of Reducers	Bar		
6	Piping			
a	Material			
b	Pressure Rating / Class	Bar		
c	Pipe / Fittings – Galvanization thickness			

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		Sub-Sec-06 IPBD and Associated Equipment

GUARANTEED TECHNICAL PARTICULARS OF ISOLATED PHASE BUS DUCT AND ASSOCIATED EQUIPMENT / AUXILIARIES						
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)	
			Main	Delta	Tap-off	
1	General					
a	Manufacturer					
b	Place of Manufacture					
c	Type Designation					
d	Applicable Standards					
e	Rated voltage	kV				
f	Highest voltage for Equipment	kV				
g	Rated Frequency	Hz				
h	Basic impulse level peak	KV (peak)				
i	Insulation level					
j	Rated one min. Power frequency withstand voltage	KV (rms.)				
k	Rated lightning impulse withstand voltage	KV (peak)				
l	Rated Continuous current	A				
m	Temperature rise of above ambient temperature (as specified in project specific requirements.)					
n	conductor	°C				
o	Enclosure, supports	°C				
p	Short time Current					
	Short time current for 1s	kA (rms)				
	Short time dynamic withstand current	kA (peak)				
	Momentary over current	KA peak				
q	Phase to earth clearance	mm				
r	Degree of protection of enclosure					
s	Type of cooling arrangement					
t	Pressure, if applicable					
2	Bus Conductor					
a	Manufacturer					
b	Material					
c	Reference Standard					
d	Grade					
e	Size					
f	Shape					
g	Cross section area	mm ²				
h	Surface area	mm ² / m				
i	Current density	A/mm ²				
j	D.C. resistance					
	at 20 Deg.C	Ω / m / ph				
	at 85 Deg.C	Ω / m / ph				

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		Sub-Sec-06 IPBD and Associated Equipment

GUARANTEED TECHNICAL PARTICULARS OF ISOLATED PHASE BUS DUCT AND ASSOCIATED EQUIPMENT / AUXILIARIES						
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)	
			Main	Delta	Tap-off	
k	50 C/s reactance	Ω /m/ ph				
l	Capacitance	mFd/m/ph				
m	Losses	W/m				
n	Short circuit forces	Kg/m				
o	Support Span	mm				
p	Voltage drop at rated current	V/metre				
q	Emissivity					
r	Non-magnetic hardware provided.	Yes/No				
3	Bus Duct Enclosure					
a	Manufacturer					
b	Material					
c	Reference Standard					
d	Grade					
e	Enclosure diameter (Outside/Inside)	mm				
f	Enclosure thickness	mm				
g	Phase to phase center line spacing	mm				
h	Surface area	mm ² /m				
i	Conductivity	mho				
j	Emissivity					
k	DC Resistance					
	at 20 Deg.C	Ω				
	at operative temperature	Ω				
l	Losses	W/m				
m	Short circuit forces	Kg/m				
n	Calculations for determining conductor and enclosure size furnished?					
o	standard section length	m				
p	Weight of the complete bus duct per meter run	kg/m				
q	Painting (Specify shade no. as per IS, RAL)					
r	Bus enclosure					
	Inside					
	Outside					
s	Bus conductor					
	Inside					
	Outside					
4	Bus Insulator					
a	Type/ Material					
b	Make					

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GUARANTEED TECHNICAL PARTICULARS OF ISOLATED PHASE BUS DUCT AND ASSOCIATED EQUIPMENT / AUXILIARIES						
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)	
			Main	Delta	Tap-off	
c	Reference standard					
d	Voltage class					
e	Dry withstand Voltage for one (1) minute					
f	Wet withstand Voltage for one (1) minute (if applicable)					
g	Impulse withstand voltage					
h	Minimum creepage distance					
i	Cantilever strength	kg				
j	Compression strength	kg				
k	Tension Strength	kg				
l	Weight of each insulator	kg				
m	Insulator mounting resilient or rigid?					
n	Calculation for short circuit force withstand capability furnished?					
o	span length between two insulators fixing	m				
p	No. of insulators per conductor support point	nos				
q	Supporting steel structures					
r	Type					
s	Hot dip galvanized?	Yes/No				
t	Total weight per set	kg				
u	Grounding					
v	Nos. of grounding pads	no				
w	Details of grounding pads					
x	Generator terminal adapter box (if applicable)					
y	Material of enclosure					
z	Thickness of enclosure	mm				
aa	Material of inter phase barrier					
bb	Thickness of inter phase barrier	mm				
cc	Total weight of adopter box	kg				
dd	Dimensions of adopter box (L X B X H)					
ee	Mounting details of adopter box					
5	Current Transformer					
a	General Data					
b	Manufacturer					
c	Type Designation					
d	Standards					
e	Insulation type					
f	Ratings and Characteristics					

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Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)	
			Main	Delta	Tap-off	
g	Rated voltage	kV				
h	Rated primary current	A				
i	Rated frequency	Hz				
j	Rated short-time withstand current (1 sec)	kA				
k	Rated peak withstand current	kA (peak)				
l	Rated impulse withstand voltage (1.2/50 microseconds)	kV (peak)				
m	Rated power frequency withstand voltage (1 Minute)	kV (rms)				
n	Rated secondary current (s)	A				
o	Number of cores					
p	Rated burden	VA				
q	Accuracy and class					
r	Knee point voltage V_k	V				
s	Magnetising current I_{mag} at $V_k/2$	mA				
t	Weight of CT	kg				
u	Quantity of CTs					
	a) Generator Neutral side	Nos				
	b) Generator Phase side	Nos				
v	Tap off connections current transformer for dry type UAT and Excitation Transformer					
w	Rated primary current	A				
x	Rated secondary current	A				
y	Accuracy class	-				
z	Burden of core	VA				
aa	Rated short-time thermal current (1 sec)	kA rms				
bb	Rated dynamic current	kA peak				
6	LAVT Cubicle					
a	Manufacturer					
b	Type Designation					
c	Standards					
d	Insulation type					
e	Ratings and Characteristics					
f	Rated primary voltage (insulation level)	kV				
g	Extended primary voltage	kV				
h	Rated frequency	Hz				
i	Rated impulse withstand voltage (1.2/50 microseconds)	kV				

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GUARANTEED TECHNICAL PARTICULARS OF ISOLATED PHASE BUS DUCT AND ASSOCIATED EQUIPMENT / AUXILIARIES						
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)	
			Main	Delta	Tap-off	
j	Rated power frequency withstand voltage (1 minute)	kV				
k	Number of secondary windings					
l	Rated secondary voltage(s) (ratio)	kV				
m	Rated burden	VA				
n	Accuracy class					
o	Total mass	kg				
p	Surge Protection capacitors					
	Manufacturer					
	Max. voltage for equipment	kV				
	Rated Voltage	kV				
	Rated capacitance	mF				
	Dielectric Medium					
	Creepage distance of insulator	mm				
q	Degree of protection of enclosures					
r	Material and thickness of enclosure	mm				
s	Dimensions Of cubicle (LXBXH)	mm				
7	Neutral Grounding Cubicle					
a	Grounding Resistor					
b	Manufacturer					
c	Type Designation					
d	Standards					
e	Ratings and Characteristics					
f	Rated voltage	V				
g	Rated current	A				
h	Max. Current for one min.	A				
i	Permanent current rating	A				
j	Resistance	W				
k	Max. temperature rise at rated current and rated duration of current	°C				
l	Temperature rise of resistors at permanent rating	°C				
m	Temperature rise of enclosure at permanent rating	°C				
n	H.V. terminal power frequency withstand voltage(1 min)	kV				
o	H.V. terminal creepage distance to earth (outside)	mm				
p	Resistor material					

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GUARANTEED TECHNICAL PARTICULARS OF ISOLATED PHASE BUS DUCT AND ASSOCIATED EQUIPMENT / AUXILIARIES						
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)	
			Main	Delta	Tap-off	
q	Installation					
r	Material of enclosure					
s	Thickness of enclosure	mm				
t	Degree of protection of enclosure					
u	Overall dimensions (approx.) (LXBXH)					
v	Mass of complete resistor	kg				
8	Neutral Grounding Transformer					
a	Manufacturer					
b	Type					
c	Applicable standard					
d	Rated continuous power (both windings)	kVA				
e	Description	Unit				
f	Rated primary voltage	kV				
g	Rated secondary voltage	V				
h	Burden	VA				
i	1minute power frequency withstand voltage	kV				
j	Impulse withstand (1.2/50 micro seconds)	kV				
k	Type of winding					
l	Material of Enclosure					
m	Thickness of Enclosure	mm				
n	Degree of protection of Enclosure					

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		Sub-Sec-07 Unit Control, SCADA Automation & Communication System

Unit Control, SCADA, Automation & Communication				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
7.0	Unit Control, SCADA, Automation & Communication			
1	General			
1.1	Manufacturer			
1.2	Type / Designation			
1.3	System Structure			
1.4	Number of System Levels			
1.5	Number of System Components			
2	Performance Data			
2.1	System Guaranteed response times			
2.2	Order response time	ms		
2.3	Alarm response time	ms		
2.4	Event response time	ms		
2.5	Overall control and monitoring system availability for top order event "Availability to retrieve all process data from LCBs and operate all breakers"	%		
2.6	Availability data channel for real time, full duplex transmission at the rate of 1 Gbps between two remote stations	%		
2.7	Accuracy of Energy Meters	%		
2.8	No of years of archival of entire plant data base capacity	No. of Years		
2.9	Redundancy Provided: (Yes/No)			
	- Controller			
	- Power Supply			
	- Communication Network (Redundant Bus)			

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2.10	Communication Protocols Supported by SCADA System			
3	Characteristic Data			
3.1	Details of router and firewall provided between LAN and Process Control Networks			
3.1.1	Manufacturer			
3.1.2	Type			
3.2	Details of router and firewall used for RF Communication (To be given with detailed pamphlets)			
	Manufacturer			
3.2.1	Type			
3.3	Local Control Boards			
3.3.1	Manufacturer			
3.3.2	Type of interfaces/ ports provided at Local Control Boards for connection with mobile engineering stations			
3.4	Human Machine Interface - Operator Panels			
3.4.1	Manufacturer			
3.4.2	Type/Make			
3.4.3	Applicable Standard			
3.5	Power House Control Room with all necessary accessories:			
	- No. of workstations			
	- No. of Engineering Work Station			
	- No. of operator workstation			
	- Server for Data Storage			
3.6	Optical Fibre			
3.6.1	Manufacturer			

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3.6.2	Type			
3.6.3	Optical Fiber Material			
3.6.4	Optical Fiber core / cladding diameter	μm/ μm		
3.6.5	Type of cable used within power house	Single mode / multi mode		
3.6.6	Arrangement of Optical Fibre Cable termination			
3.6.7	Number of cores for Optical Fibre Cable provided for communication	Nos.		
3.7	Electrical Metering			
3.7.1	Type			
3.7.2	Make			
3.7.3	Communication Ports and I/O available			
3.8	Interposing Relays			
3.8.1	Type			
3.8.2	Power requirements	W		
3.8.3	Contacts permissible power	W		
3.9	Programmable Controllers (To be given separately for each type)			
3.9.1	Manufacturer			
3.9.2	Type			
3.9.3	Power requirements	kW		
3.9.4	Supply Voltage	V		
3.9.5	CPU Processing Speed			
3.9.6	Number and Type of Communication ports			
3.9.7	Method of clock synchronization with GPS clock reference	IRIG-B / PPM etc.		
3.10	Software Details			
3.10.1	Applicable Standard			
3.10.2	Software Details supplied with:			
3.10.2.1	- Operator Workstation			

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3.10.2.2	- Engineering Workstations (Both Fixed and Mobile)			
3.10.2.3	- Server for Server LAN			
3.10.2.4	- Data logger and data storage system			
3.10.2.5	- LAN Computers			
3.11	Large Video Screen			
3.11.1	Manufacturer			
3.11.2	Type			
3.11.3	Number of tiles for each Large Screen	Nos.		
3.11.4	Diagonal length of Large Video Screen	Inches		
3.11.5	Screen Resolution of LVS	pixels		
3.11.6	Details of Display Controller			
3.11.6.1	Manufacturer			
3.11.6.2	- Type			
3.11.6.3	- Applicable Standard			
3.11.6.4	- Software Used			
3.12	Data Logger and data storage System			
3.12.1	Manufacturer			
3.12.2	Type			
3.12.3	Offline Data Storage media for permanent backup			
3.12.3.1	- Type			
3.12.4	Type of Storage media provided for archival purposes			
3.13	Networks of Control System			
3.13.1	LAN			
3.13.1.1	Manufacturer			
3.13.1.2	-Type			

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3.13.1.3	- Topology (Ring/Bus etc.)			
3.13.1.4	- Applicable Standards			
3.13.1.5	- Data Transfer Rate	Gbps		
3.14	GPS System			
3.14.1	Manufacturer			
3.14.2	Type			
3.14.3	Other features			
3.15	Protection class of Panel enclosures (IP-Class)	IP-xx		
3.16	RTUs/PLCs			
	- No. of RTUs to be supplied	Nos.		
	- No. of RF Ports per RTU	Nos.		
	- No. of I/Os	Nos.		

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		Sub-Sec-08 Protection and Metering

Protection and Metering (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
8.0	Protection and Metering			
1	General			
1.1	Manufacturer			
1.2	Type/ designation			
2	Performance data			
2.1	Interoperability with plant SCADA	Yes / No		
3	Characteristic Data			
3.1	Protection cubicles			
	- type			
	- protection class	IP		
3.1.1	Trip circuit supervision			
	- type / designation			
	- auxiliary hand reset	Yes / No		
	- Max. trip circuit supervision current	mA		
	- Continuous / on command			
3.1.2	Test device			
	- type / designation			
	- provided for each assembly	Yes / No		
3.2	Relays and equipment			
3.2.1	DC infeed			
	- supply voltage	V		
	- DC/ DC converter included	Yes / No		
	- tolerance of supply voltage	%		
3.2.2	Power consumption per cubicle	W		
3.2.3	Indication with light emitting diodes	Yes / No		
3.2.4	Front panel display	Yes / No		
3.2.5	Communication protocols supported			
3.3	Differential relay used for Generators			
3.3.1	Type / designation/Make			
3.3.2	Current rating	A		
3.3.3	Current setting:			
	- differential elements			
	- differential current	%		

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	- bias	%		
3.3.4	High set overcurrent elements:			
	- operating time:			
	- at to1.5 times setting	ms		
3.3.5	Relay stability for through-fault	x IN		
3.4	Under Voltage relay			
3.4.1	Type / designation			
3.4.2	Setting ranges:			
	- Impedance			
	- ratio R/X			
	- time stage			
	t1	s		
	t2	s		
3.5	Stator 100% earth fault relay (Low frequency injection)			
3.5.1	Type/ designation and Make			
3.5.2	Voltage setting	%		
3.5.3	Time setting	s		
3.6	Split Phase protection relay			
3.6.1	Type / designation and Make			
3.6.2	Voltage setting	%		
3.6.3	Time setting	s		
3.7	Overcurrent Relay			
3.7.1	Type / designation and Make			
3.7.2	Setting range of time delay	s		
3.7.3	Setting range of instantaneous element	ms		
3.7.4	Setting range of overcurrent	%		
3.7.5	Setting range of instantaneous element	%		
3.8	Overvoltage relay			
3.8.1	Type/ designation and Make			
3.8.2	Setting range of the pick-up values:			
	- delayed trip			
	- Instantaneous trip			
3.8.3	Time setting range			
3.8.4	Reset ratio			
3.9	Under Voltage relay			
3.9.1	Type / designation and Make			
3.9.2	Definite time	Yes/ No		
3.9.3	Inverse time	Yes/ No		
3.9.4	Two setting levels	Yes/ No		
3.9.5	Voltage setting:			
	- setting range			
	- start element reset at			

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	- continuously variable			
	-steps			
3.9.6	Operating Time:			
	- Continuously variable			
	- steps			
	- setting range			
3.10	Voltage per hertz relay			
	Type / designation and Make			
	Setting range of the pick-up values:			
	- delayed trip	s		
	- instantaneous trip	ms		
	Time setting range	s		
	Reset ratio	s		
3.11	Stator thermal overload relay			
	Type / designation and Make			
	Pick-up setting	% IN		
	Selectable time constant	Yes / No		
	Instantaneous limit trip	Yes / No		
3.12	Rotor earth fault relay			
	Make			
	Type / designation			
	Impedance setting	k-ohm		
	Time setting	s		
	Harmonics filter	Yes / No		
3.13	Negative phase sequence relay (46)			
	Type / designation and Make			
	Adjustable pick-up value:			
	- First stage	% IN		
	- second stage	% IN		
	Tripping time-lag adjustable:			
	- first stage	s		
	- second stage	s		
3.14	Loss of excitation and out of step relay			
	Type / designation and Make			
	Setting range of pick-up generator Xd	%		
	Time setting:			
	- First stage	s		
	- Second stage	s		
	Time integrator setting:			
	- pick up	s		
	- drop out	s		
3.15	Rotor Excitation circuit overcurrent relay			

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	Type / designation and Make			
	Setting range of the time relay	s		
	Setting range for the instantaneous element	ms		
	Setting range of the overcurrent	%		
	Setting range of instantaneous element	%		
3.16	Under/ Over Frequency relay			
	Settings:			
	- level 1	% fn		
	- level 2	% fn		
	- level 3	% fn		
	- level 4	% fn		
	Continuous / steps			
	Time settings	s		
	Number of steps			
3.17	Reverse Power Relay			
3.17.1	Type / designation and Make			
3.17.2	Two setting ranges	Yes / No		
3.17.3	Pick-up range	% PN		
3.17.4	Pick-up second range	%		
3.17.5	Maximum torque angle	Grade		
3.17.6	Reset ratio	%		
3.17.7	Direction reversible during operation	Yes / No		
3.17.8	Operating time:			
	- Continuous variable	Yes / No		
	- step	Yes / No		
	- definitive	Yes / No		
	1st stage setting range	s		
	2nd stage setting range	s		
3.18	High-Speed distance relay			
	Make			
3.18.1	Type / designation			
3.18.2	Setting ranges (Impedance setting):			
	- Zone-1	Ohms		
	- Zone-2	Ohms		
	- Zone 3	Ohms		
	- Zone 4	Ohms		
	- R/X			
	- time stage			
	t1			
	t2			
	t3			
	t4			
3.18.3	Distance error			

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3.18.4	Time error			
3.18.5	Line Differential relay			
	Make			
	Type / designation			
	Current setting	%		
	Time setting	s		
3.19	Directional overcurrent and earth fault relay			
	Make			
3.19.1	Type / designation			
3.19.2	Current setting	%		
3.19.3	Time setting	s		
3.20	Fault Locator (21F)			
3.21	Synchro-check relay (25)			
3.21.1	Type / designation and Make			
3.22	Auto reclosing relay			
3.22.1	Type / designation and Make			
3.23	Shaft Current protection relay			
3.23.1	Type / designation and Make			
3.23.2	Setting range of current	%		
3.23.2	Setting range of time delay	s		
3.23.4	Ratio of current transformer	A		
3.24	Standalone Event & Disturbance recorder			
	Make			
	Type/ designation			
3.25	Voltage Transformer fuse monitoring relay			
3.25.1	Type / designation			
3.26	Generator Transformer overall differential protection relay			
	Make			
3.26.1	Type / designation			
3.27	CT wire supervision relay			
3.27.1	Type / designation			
3.28	Restricted E/F protection relay			
3.28.1	Type / designation			
3.29	95% stator ground faults protection relay			
3.29.1	Type / designation			
3.30	Local Breaker failure relay			

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	Make			
3.30.1	Type / designation			
3.31	Bus bar Protection			
	Make			
3.31.1	Type / designation			
3.31.2	Operating Time	ms		
3.31.3	Principle of operation			
3.32	Relay used for 220kV Lines to Switchyard			
3.32.1	Type / designation/Make			
3.32.2	Current rating	A		
3.32.3	Current setting:			
	- differential elements			
	- differential current	%		
	- bias	%		
3.32.4	High set overcurrent elements:			
	- operating time:			
	- at to1.5 times setting	ms		
3.32.5	Relay stability for through-fault	x IN		
3.32.6	Other Feathers			
3.33	Energy Meters			
3.33.1	Type / designation/Make			
3.33.2	Class of accuracy			
3.33.3	Standard applicable			
3.33.4	Frequency range			
3.33.5	Power factor range			
3.33.6	Ambient temperature range			
3.33.7	Power supply variation			
3.33.8	Communication port			
3.33.9	Number of Phase & wire			
3.33.10	Meter constant (Imp/KWh, KVArh, KVAh etc.)			
3.33.11	DISPLAY SEQUENCE			
3.33.12	Cumulative Active energy import (KWh)			
3.33.13	Cumulative Active energy export (KWh)			
3.33.14	Cumulative Reactive energy lag (KVArh lag)			
3.33.15	Cumulative Reactive energy lead (KAVrh lead)			
3.33.16	Cumulative Apparent energy KVAh)			
3.33.17	Instantaneous power factor (PF) (lag/lead/UPF)			
3.33.18	Cumulative maximum demand (KVA)			
3.33.19	Instantaneous phase voltage			
3.33.20	Instantaneous line current (amps.)			
3.33.21	Other Feathers			

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3.33.22	Energy Management System (EMS)			
3.33.23	Make			
3.33.24	Type / designation			
3.33.25	ABT Energy meters for EMS			
3.33.26	Make			
3.33.27	Type / designation			

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		Sub-Sec-09 Pressure Shaft Valve

A – GUARANTEED TECHNICAL PARTICULARS OF PRESSURE SHAFT BF VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
A.01	General			
a	Manufacturer			
b	Place of Manufacture			
c	Type Designation			
d	Applicable Standards			
A.02	Valve Operation			
a	Maximum torque required to close the valve with a flow corresponding to;			
	i) Rated station output at rated net head	Nm		
	ii) Specified station overload output at rated net head	Nm		
	iii) Specified station overload output at maximum net head	Nm		
b	Maximum unbalanced pressure against which valve is capable of closing & opening			
c	Maximum head loss through the valve at a flow required for rated turbine output at rated net head	m		
d	Maximum leakage from main valve when fully closed against maximum head (with new seal)			
	i) through service seal	l/min		
	ii) through maintenance seal	l/min		
e	Operating Oil Pressure			
	i) Maximum			
	ii) Minimum			
f	Lowest factor of safety (referred to design stress) for any hydraulically loaded part of the valve			
A.03	Accumulator / Pressure Oil Receiver			
a	No. of Accumulators per unit	Nos.		
b	Capacity of Accumulator	LPM		
c	Normal volume of oil in each	m ³		
d	Normal working pressure	bar		
e	"No. of complete operation of MIV Servomotor possible without pumps running" C-O-C	Yes/No		
A.04	Oil Pressure Unit (OPU)			
a	No. of oil pump per unit			
b	Type / Make of pump			
c	Capacity of each pump	LPM		
d	Working pressure	kg/cm ²		
e	Type and grade of oil used			
f	Class of Insulation			
g	Size & type of Distributing Valve			

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		Sub-Sec-09 Pressure Shaft Valve

A – GUARANTEED TECHNICAL PARTICULARS OF PRESSURE SHAFT BF VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
A.05	Weights:			
	Weight and designation of heaviest part or assembly of the Valve as prepared for shipment	kg		
	Heaviest Valve assembly to be handled by valvehouse crane during installation	kg		
C.06	Dimensions:			
	Inside diameter	mm		
	length of valve body (excluding extensions)	mm		
	maximum distance from horizontal centreline of valve to lowest portion of assembly	mm		

B – TECHNICAL DATA OF PRESSURE SHAFT VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
B	Pressure Shaft Valve Technical Data			
B.01	Design Data			
a	Applicable Code/Standard			
b	Design Pressure	bar		
c	Design Flow	m ³ /sec		
d	Maximum Flow	m ³ /sec		
e	Nominal Diameter of Valve	mm		
f	Corrosion Allowance	mm		
g	Test Pressure			
	i) Test Pressure for Valve Body	bar		
	ii) Test Pressure for Disc Strength Test	bar		
	iii) Test Pressure for Seal Test	bar		
h	Valve Operation Period			
	i) Valve Closure Time (Max./Min.)	sec		
	ii) Valve Opening Time with maximum friction coefficient (Max./Min.)	sec		
i	Pressure Drop across Valve			
	i) at maximum flow	m		
	ii) at normal flow	m		
B.02	Operating Mechanism			
a	Mode of Operation			
b	Number of Servomotors	nos.		

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B – TECHNICAL DATA OF PRESSURE SHAFT VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
c	Servomotor design Pressure	bar		
d	Servomotor bore	mm		
e	Servomotor stroke	mm		
f	Weight of counter weights	t		
g	Maximum counterweight torque	N.m		
h	Operating torque required	N.m		
i	Mode of tripping			
j	Tripping Velocity	m/s		
B.03	Seals			
a	Downstream Seal - Main valve			
	i) Seal fixing method			
	ii) Leakage rate	lpm		
b	Upstream/Maintenance Seal			
	i) Seal fixing method			
	ii) Method of inflation by oil	Yes/No		
B.04	Bypass Assembly			
a	Pipe diameter	mm		
b	Pipe material/type			
c	Type of By Pass valve-hydraulically operated (Needle Type)	Yes/No		
d	Provision of additional Gate Valve (Manual)	Yes/No		
e	Material of Needle & Gate Valves			
	i) Body (Cast Steel)	Yes/No		
	ii) Trim/Needle (SS)	Yes/No		
f	Provision of Dismantling joint	Yes/No		
g	Provision of DP Gauge Panel	Yes/No		
B.05	Material of Construction			
a	Valve Body			
b	Rotor/Disc			
c	Trunnion / Shaft			
d	Main Trunnion Sleeve			
e	Self-lubricating bushing for Trunnion			
f	Self-lubricating bushing for other mechanisms			
g	Companion Flanges of Main Valve			
h	Nuts & Bolts of Main Valve			
i	Downstream Seal - Main Valve	Material/ Shore hardness		
j	Upstream/Maintenance Seal	Material/ Shore hardness		

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B – TECHNICAL DATA OF PRESSURE SHAFT VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
k	Flange Seal Rings - Upstream/Downstream	Material/ Shore hardness		
l	Seal Ring - dismantling joint	Material/ Shore hardness		
m	Upstream & Downstream Pipes			
n	Dismantling cum expansion joint			
	i) Main Valve			
	ii) By pass Assembly			
o	Levers			
p	Counter Weight			
q	Servomotor			
	i) Servomotor body			
	ii) Servomotor rod			
B.06	Accessories			
a	Air Release Valve	Yes/No		
	i) Make / Model			
	ii) Size			
	iii) Pressure Rating			
b	Anti-Vacuum Valve	Yes/No		
	i) Make / Model			
	ii) Size			
	iii) Pressure Rating			
c	Air Release Valve and Anti-Vacuum Valve are Common / Separate?	Common / Separate		
B.07	Dimensions & Weights			
a	Size of Valve (minimum inlet diameter of water passage)	mm		
b	Main Valve body flange to flange dimension	mm		
c	Flange to Flange dimension of Valve including dismantling joint & follower flange	mm		
d	Overall dimension of Valve (including upstream & downstream pipes)	mm		
e	Weight of Bare Valve (without counter weight)	t		
f	Weight of Valve including Counter Weight & Servomotors	t		
g	Weight of Complete Valve Assembly including U/P & D/S pipes	t		

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B – TECHNICAL DATA OF PRESSURE SHAFT VALVE				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
h	Heaviest component to be lifted during erection - Name/Weight	name/ t		
i	Largest Part to be Shipped			
	i) Name			
	ii) Shipping Dimensions (L x B x H)	m		
	iii) Shipping Weight	t		

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		Sub-Sec- 10.1 33kV Switchgear

33kV Switchgear (SSB) (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Bidder	Remarks (if any)
11.1	33kV Switchgear (SSB)			
1.0	General			
1.1	Nominal voltage	kV		
1.2	Highest voltage for equipment	kV		
1.3	Rated frequency	Hz		
1.4	Power frequency withstand voltage, 1 minute			
	- for main circuits	kVrms		
	- for control circuits	kVrms		
1.5	Rated Lightning Impulse withstand voltage	kV		
1.6	Applicable standards			
2.0	Panel Board			
2.1	Cubicle assemblies			
2.1.1	Make			
2.1.2	Type designation			
2.1.3	Rated current of busbar and board	A		
2.1.4	Maximum temperature rise of busbar at rated current	K		
2.1.5	Short circuit rating of main circuits			
	- initial symmetrical short time current, 1 s	kArms		
	- peak withstand current	kApeak		
2.1.6	Protection class	IP		
2.1.7	Conductor Material			
2.1.8	Material of Encloures			
2.2	Circuit breaker (incoming & Outgoing circuit)			
2.2.1	Manufacturer			
2.2.2	Type			
2.2.3	Number of poles			
2.2.4	Arc quenching medium			
2.2.5	Rated current (at 40°C)	A		
2.2.6	Rated short circuit breaking current			
	- symmetrical	kArms		
	- asymmetrical	kArms		
2.2.7	Rated short circuit making current	kApeak		
2.2.8	Permissible short time current 1 s	kArms		
2.2.9	Dynamic short time current	kApeak		
2.2.10	Total opening time (instantaneous)	s		

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2.2.11	Total closing time	s		
2.2.12	Type of overcurrent relay			
2.2.13	Adjustable range of overcurrent protection	% Ir		
2.2.14	Adjustable range of delay time for overcurrent protection	s		
2.2.15	Rated Operating sequence			
2.2.16	Operating mechanism			
	-for closing			
	- for opening			
2.3	Current transformers (incoming circuits)			
2.3.1	Make			
2.3.2	Type			
2.3.3	Applicable standards			
2.3.4	Number of CT's			
2.3.5	Rated current primary side	A		
2.3.6	Rated current secondary side	A		
2.3.7	Thermal short time current 1 sec.	Arms		
2.3.8	Short time dynamic current	kApeak		
2.3.9	Number of measuring/protection cores			
2.3.10	Measuring cores			
	- accuracy class_			
	- rated burden	VA		
2.3.11	Protection cores			
	- accuracy class			
	- rated burden	VA		
2.4	Voltage Transformer			
2.4.1	Make			
2.4.2	Type			
2.4.3	Applicable Standard			
2.4.4	No. of VT's			

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2.4.5	Impulse withstand voltage			
2.4.6	Rated transformation ratio			
2.4.7	Max. temp rise over ambient			
2.4.8	Class of insulation			
2.4.9	No. of Secondary winding			
2.4.10	Winding connection			
2.4.11	Rated secondary voltage			
2.4.12	Rated output of each secondary winding			
2.4.13	Accuracy class of each secondary winding			
2.4.14	Rated voltage factor			
3.0	Weight & Dimensions			
3.1	Weight of complete board	kg		
3.2	Dimensions of complete board			
	-length	mm		
	-width	mm		
	-height	mm		
3.3	Weight of withdrawable portion of circuit breaker	kg		
3.4	CB motor drive (for stored-energy operating mechanism)			
	-nominal voltage	V		
	-power consumption	W		
3.5	CB closing and tripping coils			
	-nominal voltage	V		
	-power consumption	W		

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		Sub-Sec-10.2 LV Switchgear

415 V LV Switchgear (SAB, UAB & MDB(Remote sites)) (Guaranteed Technical Particulars)					
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)
11.2	415 V LV Switchgear (SAB, UAB & MDB (Remote sites))				
1.1	General				
	i) Manufacturer's Name				
	ii) Type designation				
	iii) Country of origin				
1.2	Rated voltage	V			
1.3	Symmetrical short circuit withstand current and rated voltage of switch gear / MCC	kA			
1.4	Peak short circuit withstand current	kA			
1.5	Rated current at ambient	A			
1.5	Degree of protection as per IS :13947				
1.6	i) Breaker cubicle				
	ii) Bus bar chamber				
1.7	Cubicle sheet material details				
	i) Cold rolled / hot rolled				
	ii) Thickness, structural & load bearing members				
	iii) Thickness, front & rear	mm			
	iv) Thickness, Sides & top	mm			
	v) Thickness of gland plates	mm			
1.8	Painting shade & Thickness as per IS				
	i) External surfaces (front & rear)				
	ii) Extreme end covers				
1.9	Minimum Clearances in air for Busbars				
	i) Between phases	mm			
	ii) Between phase & earth	mm			
1.10	Overall weight of circuit breaker panel				
	i) Incomer	Kg			
	ii) Outgoing	Kg			
1.11	Overall dimension of circuit breaker panel				
	i) Length	mm			
	ii) Depth	mm			

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	iii) Height	mm			
1.12	Overall dimension of outgoing feeder panel				
	i) Length	mm			
	ii) Depth	mm			
	iii) Height	mm			
1.13	Width of cable alley	mm			
1.14	Shrouding arrangement in cable alley provided or not	Yes / No			
1.15	Overall dimension of each switchboard				
	i) Length	mm			
	ii) Depth	mm			
	iii) Height (including base channel)	mm			
	iv) Base channel	mm			
1.16	Overall weight of each switchboard	Kg			
1.17	Number of shipping section	No.			
1.18	Overall weight and dimensions of largest shipping section				
	i) Weight	Kg			
	ii) Length	mm			
	iii) Depth	mm			
	iv) Height	mm			
1.19	Recommended clearances for Switchboard				
	i) Front	mm			
	ii) Rear	mm			
	iii) Above	mm			
1.20	Recommended dynamic loading for foundation design	Kg			
1.21	Internal Wiring (Power , Control & Signal)				
	a) Material				
	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor wheather solid / Stranded				
1.22	Power Terminals				
	a) Make				
	b) Size / Cat. No.				
1.23	Control Terminals				
	a) Make				
	b) Size / Cat. No.				

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	c) 20% Spare Terminal Furnished				
1.24	Ground Terminal Size				
1.25	General Arrangement Drawings furnished ?	Yes			
B	Busbar				
	Applicable Standards				
2.0	Main Horizontal Busbar				
2.1	Busbar current rating at design ambient current rating	A			
2.2	Main busbar size	mm ²			
	i) Phase	mm ²			
	ii) Neutral	mm ²			
2.3	Main busbar material	Cu			
2.4	Current density	A / mm ²			
2.5	Main bus bar location	Top / Bottom			
3.0	Vertical Busbar				
3.1	Busbar current rating at design ambient current rating	A			
3.2	Main busbar size	mm ²			
	i) Phase	mm ²			
	ii) Neutral	mm ²			
3.3	Main busbar material	Cu			
3.5	Current density	A / mm ²			
4.0	Earth busbar size & material	mm ² , Cu			
4.1	1 min power frequency voltage	kV			
4.2	1 sec short circuit withstand capacity	kA			
4.3	Peak dynamic withstand capacity	kA			
4.4	Safety shutter provided for test and drawout positions	Yes / No			
4.5	DC Resistance of the Bus	μΩ / m / phase			
	i) At 20°C				
	i) At 85°C				
4.6	Maximum temperature rise over design ambient temperature	°C			
4.7	Support spacing	mm			
4.8	Bas bar provide with				
	i) Insulating sleeve	Yes / No			
	ii) Phase barriers	Yes / No			

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	iii) Cast resin shrouds for joints	Yes / No			
4.9	Bus support insulator				
	i) Make				
	ii) Type				
	iii) Reference standard				
	iv) Total creepage distance				
	v) Type of insulator mounting (resilient / rigid)				
4.10	Bus bar sizing calculation furnished?	Yes / No			
C	Circuit Breaker				
5.1	Make				
5.2	Applicable standards				
5.3	Type / Cat. No.				
5.4	No. of poles / Phases				
5.5	No. of breakers per pole				
5.6	Rated voltage	V			
5.7	Rated operating duty				
5.8	Design ambient temperature	°C			
5.9	Rated current at design ambient temperature	A			
5.10	Derating factor for site operating conditions inside panel				
5.11	Continuous current at ambient temperature	A			
5.12	Rated symmetrical breaking current	kA			
5.13	Rated peak making current	kA			
5.14	Rated short time rating (for 1 sec)	kA			
5.15	1 min dry withstand volt (power frequency)	kV			
5.16	Rated peak momentary rating	kA			
5.17	Number of openings, the circuit breaker is capable of performing without inspection, replacement of contacts or other parts at 100% rated breaking current				
5.18	No. of breaker auxiliary contacts provided on fixed portion of breaker & their rating	NO + NC			
5.19	Trip free and anti pumping features have been provided (Furnish description)	Yes / No			
5.20	Closing mechanism				
5.21	Tripping mechanism				
5.22	Mechanical trip PB provided	Yes			

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5.23	Mechanical ON / OFF indicator provided	Yes			
5.24	Spring charging motor details				
	i) Type				
	ii) Rating Watts	W			
	iii) Rated voltage	V			
	iv) Class of insulation				
	v) Time for fully charging the closing spring	m sec			
5.25	Emergency Manual charging facility provided	Yes / No			
5.26	Breaker is trip free	Yes			
5.27	Limits of voltage for satisfactory operation of the following devices as percentage of normal voltage				
	i) Motor	%			
	ii) Closing coil	%			
	iii) Tripping coil	%			
5.28	Operation counter provided	Yes / No			
5.29	Manual operating mechanism				
	i) Type of Release provided				
	ii) Available range of following parameters for each type of release offered				
5.30	i) Maximum Tripping time	m sec			
	ii) Maximum Closing time	m sec			
5.31	i) Closing coil wattage	W			
	ii) Tripping coil wattage	W			
5.32	Telescopic Trolley				
	i) Make				
	ii) Type designation				
	iii) Dimensions	mmXmmXmm			
D	MCCB				
	(The following details shall be furnished for each type & rating)				
6.1	Make				
6.2	Type / Cat. No.				
6.3	Applicable standards				
6.4	Rated voltage	V			
6.5	Rated operating duty				
6.6	Design ambient temperature	°C			
6.7	Rated current at design ambient temperature	A			

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6.8	Derating factor for site operating conditions inside panel				
6.9	Continuous current at ambient temperature	A			
6.10	Number of Poles				
6.11	Ultimate Breaking Capacity (Icu)	kA			
6.12	Service Breaking Capacity (Ics)	kA			
6.13	Rated peak making current	kA			
6.14	Overload release setting				
6.15	Short circuit release setting				
6.16	Door operating handle provided	Yes / No			
6.17	Door interlock as specified has been provided?	Yes			
6.18	Auxiliary switches for ON & TRIP provided (2 c/o contacts for each) & their rating	Yes / No			
E	Control / Selector Switch				
	(The following details shall be furnished for each type & rating)				
7.1	Make				
7.2	Type / Cat. No.				
7.3	Applicable standards				
7.4	No. of poles				
7.5	Rated voltage	V			
7.6	Rated current	A			
F	Auxiliary Contactor				
	(The following details shall be furnished for each type & rating)				
8.1	Make				
8.2	Type / Cat. No.				
8.3	Applicable standards				
8.4	No. of poles				
8.5	Rated operating duty				
8.6	Rated voltage & variation	V			
8.7	Rated current	A			
8.8	No. of aux. contacts	NO + NC			
G	Fuses				
	(The following details shall be furnished for each type & rating)				
9.1	Make				
9.2	Type / Cat. No.				
9.3	Applicable standards				
9.4	Category				
9.5	Current rating	A			

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H	Current Transformers				
	(The following details shall be furnished for each type & rating)				
10.1	Make				
10.2	Type / Cat. No.				
10.3	Applicable standards				
10.4	Secondary Current, Metering / Protection	A			
10.5	Ratio, Metering / Protection				
10.6	VA Rating	VA			
10.7	Accuracy Class, Metering / Protection				
10.8	Class & type of insulation				
I	Voltage Transformers				
	(The following details shall be furnished for each type & rating)				
11.1	Make				
11.2	Type / Cat. No.				
11.3	Applicable standards				
11.4	Secondary voltage	V			
11.5	Ratio				
11.6	VA Rating	VA			
11.7	Accuracy class				
11.8	Over voltage factor				
11.9	Class & type of insulation				
J	Numerical Relay				
	(Bidder to furnish detail specs of numerical relays along with this GTP)				
12.1	Make				
12.2	Type / Cat. No.				
12.3	Applicable standards				
12.4	Catalogue furnished	Yes			
K	Electronic Power Meter				
	(Bidder to furnish detail specs of power meter along with this GTP)				
13.1	Make				
13.2	Type / Cat. No.				
13.3	Applicable standards				
13.4	Catalogue furnished	Yes			
L	Lockout Relay (86)				
14.1	Make				
14.2	Type / Cat. No.				
14.3	Applicable standards				
14.4	Contact rating	A			
14.5	No. of spare aux. contacts provided	NO + NC			

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M	Breaker Control Switch (TNC)				
15.1	Make				
15.2	Type / Cat. No.				
15.3	Applicable standards				
15.4	No. of poles				
15.5	Rated voltage	V			
15.6	Rated current	A			
N	Electronic Power Meter				
	(Bidder to furnish detail specs of power meter along with this GTP)				
16.1	Make				
16.2	Type / Cat. No.				
16.3	Applicable standards				
16.4	Catalogue furnished	Yes			
O	Push Buttons				
17.1	Make				
17.2	Type / Cat. No.				
17.3	Applicable standards				
17.4	Rated voltage	V			
17.5	Rated current	A			
17.6	No. of aux. contacts provided	NO + NC			
P	Indicating Lamps				
18.1	Make				
18.2	Type / Cat. No.				
18.3	Applicable standards				
Q	MCB				
19.1	Make				
19.2	Type / Cat. No.				
19.3	Applicable standards				
19.4	Continuous Rated current	A			
19.5	Number of Poles				
19.6	Ultimate Breaking Capacity (Icu)	kA			
19.7	Service Breaking Capacity (Ics)	kA			
R	Control Supply Transformer				
20.1	Make				
20.2	Type / Cat. No.				
20.3	Applicable standards				
20.4	Material & class of insulation				
20.5	Voltage rating & taps				
20.6	Continous rating	VA			
S	PLC + Text Display Unit				
	(Bidder to furnish detail specs of PLC, display unit along with this GTP)				

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21.1	Whether PLC included for 415 V Switchgear	Yes			
21.2	Make				
21.3	Type / Cat. No.				
21.4	Applicable standards				
21.5	Catalogue furnished	Yes			

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		Sub-Sec-11 DC System and UPS System

DC SYSTEM AND UPS SYSTEM (Guaranteed Technical Particulars)					
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)
12.0	DC SYSTEM AND UPS SYSTEM				
12.1	DC System		220V DC	48V DC	
A	Battery				
1.0	General				
1.1	Make				
1.2	Cat. No.				
1.3	Type Designation				
1.4	Reference Standard				
2.0	Rating				
2.1	Rated Voltage	V			
2.2	8-Hour rating at 27°C to 1.85 Volt per cell	AH			
2.3	1-hour discharge rate to 1.85 V per cell	AH			
2.4	1-minute discharge rate to 1.85V per cell	A			
2.5	Rated capacity at operating temperature 27 °C	AH			
3.0	Performance				
3.1	Does the battery meet the required duty cycle curve?	Yes / No			
3.2	Cell voltage characteristics during duty cycle furnished?	Yes / No			
3.3	Minimum cell voltage during duty cycle	V			
3.4	AH efficiency at 8-hour discharge rate	%			
3.5	Watt hour efficiency	%			
3.6	Expected life of Battery	Hours			
3.7	Margin considered	%			
3.8	Whether ageing compensation factor is required	Yes / No			
3.9	Temperature correction factor for specific gravity				
3.10	Duration of equalizing charge	Minutes			
3.11	Interval between successive equalizing charges	Hours			
4.0	Battery Characteristics				
4.1	Recommended charging rate for				
	a) Float charging in terms of both voltage and current	Volt per cell			

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	b) Equalizing charger (in terms of both voltage and current)	Volt per cell			
	c) Boost charging in 8 Hours				
	i) Start	Volt per cell			
	ii) Finish	Volt per cell			
4.2	Recommended Specific gravity at 27°C				
	a) For first filling				
	b) At full charge				
	c) At end of 8-Hour discharge				
4.3	Short circuit current of the battery bank				
	a) Float charging	kA			
	b) Boost charging	kA			
	c) Short circuit withstand time	sec.			
4.4	Battery internal resistance	Ω			
4.5	Short circuit calculation furnished?	Yes / No			
4.5	Cell Voltage Characteristics during charging furnished?	Yes / No			
5.0	Cells				
5.1	Nominal cell voltage	V			
5.2	Number of cells per battery bank				
5.3	Nominal system voltage	V			
5.4	Type & cat no. of the cell				
5.5	Cell designation as per I.S.				
5.6	Cell voltage at the end of full discharge at 8-Hour rate	V			
5.7	i) Max. safe boost charging rate	A			
	ii) Permissible ripple content				
5.8	Suggested boost charging rate	A			
5.9	Max. boost charging voltage per cell	V			
5.10	i) Float charging current range	A			
	ii) Permissible ripple content				
5.11	Float charging voltage per cell	V			
5.12	Material of the container				
5.13	Whether level indicating floats are provided or not?	Yes / No			
5.14	Overall dimensions of each cell	mm			
5.14	Weight of complete cell				
	a) Without acid	Kg			
	b) With acid	Kg			
5.15	Internal resistance of cell	Ω			

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5.16	Distance between centres of cells when erected	mm			
6.0	Intercell Connector				
6.1	Intercell connector furnished?				
6.2	Type of of intercell connector				
6.3	Material of the intercell connector				
7.0	Plates				
7.1	Number of positive plates per cell				
7.2	Type of positive plate				
7.3	Type of negative plate				
7.4	Whether positive plates of individual cells are interchangeable?	Yes / No			
7.5	Whether negative plates are interchangeable	Yes / No			
8.0	Separator				
8.1	Type				
8.2	Material				
8.3	Thickness				
9.0	Electrolyte (Acid / Alkali as applicable)				
9.1	Amount of electrolyte for first filling				
	a) Per cell	Ltrs.			
	b) Per set	Ltrs.			
9.2	First filling with 10% extra furnished?	Yes / No			
9.3	Electrolyte conform to				
9.4	Maximum allowable temperature of the electrolyte which cell can withstand without injurious effects				
	a) Continuously	°C			
	b) For a short period	°C			
10.0	Racks				
10.1	Number of racks per battery bank				
10.2	Number of cells per rack				
10.3	Type of racks	Rows / Tiers			
10.4	Material of rack				
10.5	Racks provided with				
	a) Numbering tags for cells				
	b) Clamps for cables				
10.6	Insulator with 5% extra furnished for				
	a) Cell	Yes / No			
	b) Stand	Yes / No			
10.7	Inter-row, Inter-tie connectors and end take-off furnished?	Yes / No			

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10.8	Connection hardware with 5% extra furnished?	Yes / No			
11.0	Dimensions and Weights of Battery Bank				
11.1	Overall dimensions (LXBXH)	mm x mm x mm			
11.2	Approximate weight	Kg			
11.3	Battery layout drawing furnished?	Yes / No			
11.4	Quantity of the battery sets offered				
12.0	Ventilation requirements				
12.1	Capacity required	m ³ /hour			
13.0	Accessories & Spares furnished				
13.1	Cell testing voltmeter (3-0-3) V with leads as per IS 1248				
13.2	Spanners of suitable size				
13.3	Rubber aprons				
13.4	Rubber hand gloves				
13.5	Extra cells with accessories				
13.6	Stand insulators				
14.0	Whether test certificates enclosed?	Yes / No			
15.0	Whether battery sizing calculations enclosed?	Yes / No			
B	Battery Charger				
16.0	General				
16.1	Make				
16.2	Cat. No				
16.3	Type				
16.4	Reference Standard				
17.0	Input and Output specifications				
17.1	A.C. Input				
	a) Voltage \pm % Variation	V			
	b) Phase	No.			
	c) Frequency \pm % Variation	Hz			
	d) Input current	A			
17.2	D.C Output		Float Mode Boost Mode	Float Mode Boost Mode	
	a) Voltage	V per Cell			
	b) Current	A			
17.3	Range of voltage control	V			
17.4	Method of battery current control				
	Method of voltage control				
17.5	Battery trickle charging current	A per AH			
17.6	Type of Cooling				

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17.7	Maximum temperature within cubicle above 27°C operating temp.				
	a) Rectifier Transformer	° C			
	b) SCR	° C			
17.8	AC Power Consumption	KVA			
18.0	Performance				
18.1	Regulation for 0-100% rated load with $\pm 10\%$ Input voltage and $\pm 5\%$ input frequency variation	%			
18.2	Ripple content in DC output				
	a) With Battery	%			
	b) Without Battery	%			
18.3	Guaranteed efficiency at				
	a) 100% Load	%			
	b) 75% Load	%			
	c) 50% Load	%			
18.4	Power factor at				
	a) 100% Load	%			
	b) 75% Load	%			
	c) 50% Load	%			
18.5	Total Harmonic Distortion at rated load				
	a) with battery connected				
	b) without battery connected				
19.0	Miscellaneous				
19.1	Charger provided with following features				
	a) Automatic voltage regulation				
	b) Current limiting circuitry				
	c) Smoothing filter circuit				
	d) Soft-start feature				
	e) Is manual operation permissible				
19.2	SCR elements provided with				
	a) Surge protection				
	b) Fast acting HRC fuse				
20.0	Rectifier Transformer				
20.1	Make				
20.2	Type / Cat. No.				
20.3	Reference Standard				
20.4	Ratings				
	a) KVA				
	b) Voltage ratio				
	c) Vector group				
	d) % impedance at 75° C				
20.5	Class of Insulation				

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20.6	Temperature Rise				
20.7	Method of Cooling				
21.0	Controlled Rectifier (SCR)				
21.1	Make				
21.2	Type / Cat. No.				
21.3	Reference Standard				
21.4	RMS Current Rating	A			
21.5	Surge Current				
	a) One - Cycle	A			
	b) Repetitive cycle	A			
21.6	Peak inverse voltage				
	a) Continuous	V			
	b) Surge	V			
22.0	Filter Choke				
22.1	Make				
22.2	Choke rating	mH			
22.3	Quantity				
22.4	Class of Insulation				
23.0	Filter Capacitor				
23.1	Make and Type				
23.2	Voltage Class	V			
23.3	Capacitance Rating	mF			
23.4	Quantity				
24.0	Blocking Diodes				
24.1	Make				
24.2	Type / Cat. No.				
24.3	Reference Standard				
24.4	Current Rating				
24.5	a) One - Minute	A			
	b) One - Hour	A			
24.6	Peak inverse voltage	V			
25.0	Switching and metering panel				
25.1	Make				
25.2	Type				
25.3	Reference Standard				
25.4	Enclosure				
	a) Degree of protection				
	b) Sheet Steel Thickness	mm			
25.5	Panel Provided with				
	a) Internal lamp With Door-Switch				
	b) Space heater with thermostat				
	c) 5 A 3 - Pin receptacle				
25.6	Internal Wiring				
	a) Material				

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	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor whether solid / Stranded				
25.7	Power Terminals				
	a) Make				
	b) Size / Cat. No.				
25.8	Control Terminals				
	a) Make				
	b) Size / Cat. No.				
	c) 20% Spare Terminal Furnished				
25.9	Ground Terminal Size				
25.10	Overall Dimensions(LXBXH)	mmXmmXmm			
25.11	Approximate weight	Kg			
25.12	General Arrangement Drawings furnished?				
25.13	All Accessories as specified furnished with Battery Charger?				
25.14	Painting				
	a) Colour				
	b) Finish				
	c) Details of painting				
25.15	Whether schematic diagram of the charger has been enclosed?				
C	DC Distribution Boards				
26.0	Main DCDB				
26.1	Make				
26.2	Type				
26.3	Reference Standard				
26.4	Enclosure				
	a) Degree of protection				
	b) Sheet Steel Thickness	mm			
26.5	Internal Wiring				
	a) Material				
	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor whether solid / Stranded				
26.6	Power Terminals				
	a) Make				
	b) Size / Cat. No.				

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26.7	Control Terminals				
	a) Make				
	b) Size / Cat. No.				
	c) 20% Spare Terminal Furnished				
26.8	Ground Terminal Size				
26.9	Overall Dimensions (LXBXH)	mmXmmXmm			
26.10	Approximate weight	Kg			
26.11	General Arrangement Drawings furnished ?				
26.12	Painting				
	a) Colour				
	b) Finish				
	c) Details of painting				
27.0	Secondary DCDB				
27.1	Make				
27.2	Type				
27.3	Reference Standard				
27.4	Enclosure				
	a) Degree of protection				
	b) Sheet Steel Thickness	mm			
27.5	Internal Wiring				
	a) Material				
	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor whether solid / Stranded				
27.6	Power Terminals				
	a) Make				
	b) Size / Cat. No.				
27.7	Control Terminals				
	a) Make				
	b) Size / Cat. No.				
	c) 20% Spare Terminal Furnished				
27.8	Ground Terminal Size				
27.9	Overall Dimensions (LXBXH)	mmXmmXmm			
27.10	Approximate weight	Kg			
27.11	General Arrangement Drawings furnished?				
27.12	Painting				

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	a) Colour				
	b) Finish				
	c) Details of painting				
28.0	Horizontal / Vertical Bus bars Battery Charger, SMP & DCDB				
28.1	Type & Material				
28.2	Continuous rated current with 10% design margin	A			
28.3	Rated short time thermal current for one sec	kA			
28.4	Bus bar size	mm x mm			
28.4	Minimum clearances in air				
	a) Phase to Phase				
	b) Phase to Earth				
28.5	Support Insulator				
29.0	Auxiliary Bus bars Battery Charger, SMP & DCDB				
29.1	Type & Material				
29.2	Continuous rated current with 10% design margin	A			
29.3	Rated short time thermal current for one sec	kA			
29.4	Bus bar size	mm x mm			
29.5	Minimum clearances in air				
	a) Phase to Phase				
	b) Phase to Earth				
29.6	Support Insulator				
29.0	Earthing Bus				
29.1	Material				
29.2	Size	mm x mm			
D	Components Details				
30.0	Indicating Lamps (Cluster LED type)				
30.1	Make				
30.2	Type / Cat. No.				
30.3	Reference Standard				
30.4	Wattage / Volts	W / V			
30.5	Series resistor	Ω			
31.0	Meters				
31.1	Make				
31.2	Type / Cat. No.				
31.3	Reference Standard				
31.4	Size	mmXmm			
31.5	Accuracy				
32.0	Alarm Annunciator				

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32.1	Make				
32.2	Type / Cat. No.				
32.3	Reference Standard				
32.4	No. of window				
32.5	Operating voltage				
33.0	Selector Switch				
33.1	Make				
33.2	Type / Cat. No.				
33.3	Reference Standard				
33.4	Rating	A			
33.5	No. of poles				
34.0	Transducer				
34.1	Make				
34.2	Type / Cat. No.				
34.3	Reference Standard				
34.4	Range	A			
34.5	Output				
34.6	Power Supply				
34.7	No. of wires				
34.8	Accuracy				
35.0	Semiconductor fuses				
35.1	Make				
35.2	Type / Cat. No.				
35.3	Reference Standard				
35.4	Current Rating				
	a) Continuous Rated current	A			
	b) Interrupting	kA			
36.0	AC - MCCB				
36.1	Make				
36.2	Type / Cat. No.				
36.3	Reference Standard				
36.4	Continuous Rated current	A			
36.5	Number of Poles				
36.6	Ultimate Breaking Capacity (Icu)	kA			
36.7	Service Breaking Capacity (Ics)	kA			
36.8	Overload release setting	%			
36.9	Short circuit release setting				
36.10	Door operating handle provided	Yes / No			
36.11	Auxiliary switches for ON & TRIP provided	Yes / No			
37.0	DC - MCCB				
37.1	Make				
37.2	Type / Cat. No.				

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37.3	Reference Standard				
37.4	Continuous Rated current	A			
37.5	Number of Poles				
37.6	Ultimate Breaking Capacity (Icu)	kA			
37.7	Service Breaking Capacity (Ics)	kA			
37.8	Overload release setting	%			
37.9	Short circuit release setting				
37.10	Door operating handle provided	Yes / No			
37.11	Auxiliary switches for ON & TRIP provided	Yes / No			
38.0	DC - MCB				
38.1	Make				
38.2	Type / Cat. No.				
38.3	Reference Standard				
38.4	Continuous Rated current	A			
38.5	Number of Poles				
38.6	Ultimate Breaking Capacity (Icu)	kA			
38.7	Service Breaking Capacity (Ics)	kA			
39.0	AC Contactor				
39.1	Make				
39.2	Type / Cat. No.				
39.3	Reference Standard				
39.4	Continuous Rated current	A			
39.5	Number of Poles				
39.6	Utilization category				
40.0	DC Contactor				
40.1	Make				
40.2	Type / Cat. No.				
40.3	Reference Standard				
40.4	Continuous Rated current	A			
40.5	Number of Poles				
40.6	Utilization category				
41.0	AC Under Voltage Relay				
41.1	Make				
41.2	Type / Cat. No.				
41.3	Standard Reference				
41.4	Range				
41.5	Contact Type (SPDT / DPDT)				
41.6	Contact Rating				
42.0	DC Under Voltage Relay				
42.1	Make				
42.2	Type / Cat. No.				
42.3	Standard Reference				

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42.4	Range				
42.5	Contact Type (SPDT / DPDT)				
42.6	Contact Rating				
43.0	DC Over Voltage Relay				
43.1	Make				
43.2	Type / Cat. No.				
43.3	Standard Reference				
43.4	Range				
43.5	Contact Type (SPDT / DPDT)				
43.6	Contact Rating				
44.0	Earth Fault Relay				
44.1	Make				
44.2	Type / Cat. No.				
44.3	Standard Reference				
44.4	Range				
44.5	Contact Type (SPDT / DPDT)				
44.6	Contact Rating				
45.0	Bimetal Overload Relay				
45.1	Make				
45.2	Type / Cat. No.				
45.3	Standard Reference				
45.4	Range				
45.5	Contact Type (SPDT / DPDT)				
45.6	Contact Rating				
46.0	220V DC to 48V DC Converter				
46.1	Make				
46.2	Reference Standard				
46.3	Rated Input Voltage				
46.4	Highest voltage for converter				
46.5	Rated output Voltage				
47.0	48V DC Distribution Board, SDB				
47.1	Make				
47.2	Type				
47.3	Reference Standard				
47.4	Enclosure				
	a) Degree of protection				
	b) Sheet Steel Thickness	mm			
47.5	Internal Wiring				
	a) Material				
	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor weather solid / Stranded				
47.6	Power Terminals				

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	a) Make				
	b) Size / Cat. No.				
47.7	Control Terminals				
	a) Make				
	b) Size / Cat. No.				
	c) 20% Spare Terminal Furnished				
47.8	Ground Terminal Size				
47.9	Overall Dimensions (LXBXH)	mmXmmXmm			
47.10	Approximate weight	Kg			
47.11	General Arrangement Drawings furnished?				
47.12	Painting				
	a) Color				
	b) Finish				
	c) Details of painting				
48.0	220V DC to 240V AC Converter				
48.1	Make				
48.2	Reference Standard				
48.3	Rated Input Voltage				
48.4	Highest voltage for converter				
48.5	Rated output Voltage				
49.0	240V AC Distribution Board, ACDB				
49.1	Make				
49.2	Type				
49.3	Reference Standard				
49.4	Enclosure				
	a) Degree of protection				
	b) Sheet Steel Thickness	mm			
49.5	Internal Wiring				
	a) Material				
	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor whether solid / Stranded				
49.6	Power Terminals				
	a) Make				
	b) Size / Cat. No.				
49.7	Control Terminals				
	a) Make				
	b) Size / Cat. No.				
	c) 20% Spare Terminal Furnished				

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49.8	Ground Terminal Size				
49.9	Overall Dimesions(LXBXH)	mmXmmXmm			
49.10	Approximate weight	Kg			
49.11	General Arrangement Drawings furnished?				
49.12	Painting				
	a) Color				
	b) Finish				
	c) Details of painting				
12.2	UPS System		25 kVA	6 kVA	
1	INPUT				
1.1	Input voltage	V			
1.2	Phase				
1.3	Input voltage tolerance	%			
1.4	Input frequency	Hz			
1.5	Input frequency tolerance	%			
1.6	Power factor				
1.7	No-load current				
1.8	full load current				
1.9	Max. input KW at rated load				
2	Input current limit	%			
2.1	Power walk - in period	seconds			
2.2	Input circuit(Thyristor)				
2.3	Inbuilt Input & Bypass Isolator with SFU				
2	OUTPUT				
2.1	Module full load rating KVA/ KW	KVA/KW			
2.2	Phase				
2.3	Rated voltage	V			
2.4	Rated current	Amp			
2.5	Phase Voltage asymmetry (For Three Phase output UPS only)				
	a) Balance load	%			
	b) 100% unbalanced load	%			
2.6	Voltage Phase shift (In case of three phase Output UPS)				
	- with balanced load	deg			
	- With Unbalanced load	deg			
2.7	Output voltage adjustment range	%			
2.8	Phase displacement (In case of three phase Output UPS)				
	a) Balance load	deg			

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	b] 100% unbalanced load	deg			
2.9	Output power factor range				
2.1	Internal oscillator stability	%			
2.11	Mains synchronisation tracking range	Hz			
2.12	Max. rate of change of frequency	Hz			
2.13	Output voltage harmonics				
	a] Linear load	%			
	b] Non-linear load (Crest factor of 3:1)	%			
2.14	Crest Factor				
2.15	Overload rating				
	a] at 110%	min			
	b] at 125%	min			
	c] at 150%	min			
2.16	Overload trip				
2.17	Inverter Efficiency	%			
2.18	Current limit short				
2.19	Transient voltage Response				
	a) 100% load change	%			
	b) Manual transfer of load from UPS to bypass and vice-versa	sec			
	c) Automatic transfer of load form UPS to bypass	sec			
2.2	Transient recovery time after 100% load change	sec			
2.3	efficiency at 0.8 pf				
	a) 50% loading	%			
	b)100%	%			
B	BATTERY				
1.0	General				
1.1	Make				
1.2	Cat.No.				
1.3	Type Designation				
1.4	Reference Standard				
2.0	Rating				
2.1	Rated Voltage	V			
2.2	2-Hours rating at 27°C to 1.85 Volt per cell	AH			
2.3	2-hours discharge rate to 1.85 V per cell	AH			
2.4	1-minute discharge rate to 1.85V per cell	A			
2.5	Rated capacity at operating temperature 27 °C	AH			
3.0	Performance				

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3.1	Does the battery meet the required duty cycle curve?	Yes / No			
3.2	Cell voltage characteristics during duty cycle furnished?	Yes / No			
3.3	Minimum cell voltage during duty cycle	V			
3.4	AH efficiency at 2 hours discharge rate	%			
3.5	Watt hour efficiency	%			
3.6	Expected life of Battery	Hours			
3.7	Margin considered	%			
3.8	Whether ageing compensation factor is required	Yes / No			
3.9	Temperature correction factor for specific gravity				
3.10	Duration of equalizing charge	Minutes			
3.11	Interval between successive equalizing charges	Hours			
4.0	Battery Characteristics				
4.1	Recommended charging rate for				
	a) Float charging in terms of both voltage and current	Volt per cell			
	b) Boost charging in 8 Hours				
	i) Start	Volt per cell			
	ii) Finish	Volt per cell			
4.2	Recommended Specific gravity at 27°C				
	a) For first filling				
4.3	Short circuit current of the battery bank				
	a) Float charging	kA			
	b) Boost charging	kA			
	c) Short circuit withstand time	sec.			
4.4	Battery internal resistance	Ω			
4.5	Short circuit calculation furnished?	Yes / No			
4.5	Cell Voltage Characteristics during charging furnished?	Yes / No			
5.0	Cells				
5.1	Nominal cell voltage	V			
5.2	Number of cells per battery bank				
5.3	Nominal system voltage	V			
5.4	Type & cat no. of the cell				
5.5	Cell designation as per I.S.				
5.6	Cell voltage at the end of full discharge at 2-Hours rate	V			

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5.7	i) Max. safe boost charging rate	A			
	ii) Permissible ripple content				
5.8	Suggested boost charging rate	A			
5.9	Max. boost charging voltage per cell	V			
5.10	i) Float charging current range	A			
	ii) Permissible ripple content				
5.11	Float charging voltage per cell	V			
5.12	Material of the container				
5.13	Whether level indicating floats are provided or not?	Yes / No			
5.11	Overall dimensions of each cell	mm			
5.11	Weight of complete cell				
	a) Without acid	Kg			
	b) With acid	Kg			
5.10	Internal resistance of cell	Ω			
5.11	Distance between centres of cells when erected	mm			
6.0	Intercell Connector				
6.1	Intercell connector furnished?				
6.2	Type of intercell connector				
6.3	Material of the intercell connector				
7.0	Plates				
7.1	Number of positive plates per cell				
7.2	Type of positive plate				
7.3	Type of negative plate				
7.4	Whether positive plates of individual cells are interchangeable?	Yes / No			
7.5	Whether negative plates are interchangeable	Yes / No			
8.0	Separator				
8.1	Type				
8.2	Material				
8.3	Thickness				
9.0	Electrolyte (Acid / Alkali as applicable)				
9.1	Amount of electrolyte for first filling				
	a) Per cell	Ltrs.			
	b) Per set	Ltrs.			
9.2	First filling with 10% extra furnished?	Yes / No			
9.3	Electrolyte conform to				
9.4	Maximum allowable temperature of the electrolyte which cell can withstand without injurious effects				
	a) Continuously	$^{\circ}\text{C}$			
	b) For a short period	$^{\circ}\text{C}$			

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10.0	Racks				
10.1	Number of racks per battery bank				
10.2	Number of cells per rack				
10.3	Type of racks	Rows / Tiers			
10.4	Material of rack				
10.5	Racks provided with				
	a) Numbering tags for cells				
	b) Clamps for cables				
10.6	Insulator with 5% extra furnished for				
	a) Cell	Yes / No			
	b) Stand	Yes / No			
10.7	Inter-row, Inter-tie connectors and end take-off furnished?	Yes / No			
10.8	Connection hardware with 5% extra furnished?	Yes / No			
11.0	Dimensions and Weights of Battery Bank				
11.1	Overall dimensions (LXBXH)	mm x mm x mm			
11.2	Approximate weight	Kg			
11.3	Battery layout drawing furnished?	Yes / No			
11.4	Quantity of the battery sets offered				
12.0	Ventilation requirements				
12.1	Capacity required	m ³ /hour			
13.0	Accessories & Spares furnished				
13.1	Cell testing voltmeter(3-0-3)V with leads as per IS 1248				
13.2	Spanners of suitable size				
13.3	Rubber aprons				
13.4	Rubber hand gloves				
13.5	Extra cells with accessories				
13.6	Stand insulators				
14.0	Whether test certificates enclosed?	Yes / No			
15.0	Whether battery sizing calculations enclosed?	Yes / No			
C	UPS POWER DISTRIBUTION BOARD				
1.0	DISTRIBUTION BOARD PANEL				
1.1	Make				
1.2	Type				
1.3	Reference Standard				
1.4	Enclosure				
1.5	a) Degree of protection				

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	b) Sheet Steel Thickness	mm			
1.6	Internal Wiring				
	a) Material				
	b) Installation				
	c) Voltage grade	V			
	d) Minimum conductor size				
	e) Conductor whether solid / Stranded				
1.7	Power Terminals				
	a) Make				
	b) Size / Cat. No.				
1.8	Control Terminals				
	a) Make				
	b) Size / Cat. No.				
	c) 20% Spare Terminal Furnished				
1.9	Ground Terminal Size				
1.1	Overall Dimensions(LXBXH)	mmXmmXm m			
1.11	Approximate weight	Kg			
1.12	General Arrangement Drawings furnished ?				
1.13	Painting				
	a) Color				
	b) Finish				
	c) Details of painting				
2.0	Horizontal / Vertical Bus bar				
2.1	Type & Material				
2.2	Continuous rated current with 10% design margin	A			
2.3	Rated short time thermal current for one sec	kA			
2.4	Bus bar size	mm x mm			
2.5	Minimum clearances in air				
	a) Phase to Phase				
	b) Phase to Earth				
2.6	Support Insulator				
3.0	AC - MCCB				
3.1	Make				
3.2	Type / Cat. No.				
3.3	Reference Standard				
3.4	Continuous Rated current	A			
3.5	Number of Poles				
3.6	Ultimate Breaking Capacity (Icu)	kA			
3.7	Service Breaking Capacity (Ics)	kA			
3.8	Overload release setting	%			

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3.9	Short circuit release setting				
3.10	Door operating handle provided	Yes / No			
3.11	Auxiliary switches for ON & TRIP provided	Yes / No			
D	Input/output Isolation Transformers				
1.0	KVA Rating	KVA			
2.0	Dry-type transformer primary rated Voltage	V			
3.0	K-Factor (if required)				
4.0	Secondary rated Voltage	V			
5.0	Connection type				
6.0	Frequency	Hz			
7.0	Harmonic Distortion:	%			
8.0	Temp. rise	°C			
9.0	Class insulation				
10.0	Basic impulse level	kV			
11.0	Hot temp rise limit	°C			
12.0	Impedance limit (at rated load)	%			
13.0	Type of Grounding (specify)				
14.0	Noise Level (Common & Normal mode)	db			
15.0	Efficiency	%			
E	MISCELLANEOUS				
1.0	Charger input Isolator				
2.0	Battery circuit breaker (mounted separately in its own enclosure)				
3.0	Inverter output Isolator				
4.0	Bypass line Isolator				
5.0	Maintenance Bypass Isolator				
6.0	Alarm acknowledge / Reset button				
7.0	Inverter On-Off Pushbutton for Manually switching of the Inverter				
8.0	Emergency off push button				
F	MEASURING INSTRUMENTS				
1.0	LCD panel for Measuring Input Voltage, Current and frequency Output voltages, Output currents and Frequency, Battery Voltage and Charging / Discharging current.				
2.0	LCD panel should display status of the Battery capacity and backup Time in minutes.				
G	PROTECTIONS				
1	RC surge suppressor.				

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2	Sustained under voltage on input side				
3	Phase loss on input side.				
4	Negative sequence on input side				
5	Semiconductor fuses in the lines for thyristor				
6	Snubber circuit for device dv/ dt protection				
7	Charger input current limit				
8	HRC fuses for filter capacitors and control panel				
9	Battery current limit				
10	DC over voltage				
11	Low battery				
12	Semiconductor fuses at inverter output				
13	Overload				
14	Over temperature for the inverter				
15	HRC fuses in the control circuit				
H	INDICATIONS (ALARMS)				
1	Inverter Failure				
2	Overload (if load exceeds 100%)				
3	Overload shutdown				
4	Emergency shutdown				
5	Equipment over temperature				
6	Maintenance Bypass ON				
7	DC over voltage				
8	Low battery				
9	Battery circuit breaker open				
10	Battery on load				

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11	Mains failure				
12	Rectifier Failed or Off				
13	Inverter Unsynchronized				
14	Load on bypass				
15	Output voltage error				
16	O/V and U/V surge at output				
J	CONTROL WIRING				
1	Make				
2	Voltage grade				
3	Type				
	Size				
5	Termination				
6	Make of Lugs				
K	Mechanical Dimensions				
1	Weight of UPS – Kg				
2	Dimension of UPS (L x D x H) in mm				
3	Ventilation				
4	Protection Level:				
L	Environmental				
1	Ambient Temperature	deg.C.			
2	Working Temperature	deg.C.			
3	Altitude	mtr.			
M	COOLING				
1	Type				
2	Fan details				
	a) Make				
	b) Rating				
	c) Supply voltage	V			
3	Derating in case of forced air cooling failure	%			
4	Heat loss to surrounding				
	a) At 100% load				
	b) At 50% load				
N	CABINET DETAILS				
1	Type of enclosure as per IS 2147				
2	Access				
3	Cable entry				
4	Sheet material				
5	Sheet thickness				
6	Gasket material				

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7	Space heater with thermostat to be provided	Yes			
0	TERMINAL BLOCK				
	Make				
	Voltage grade	V			
	Type				
	Size	sq. mm			
	Current rating	Amps.			
P	STATIC SWITCH				
1	Type				
2	make				
3	Rated voltage				
4	Continuous rating	Amps.			
5	short time rating	Amps.			
6	max. transfer time of UPS to by pass				
	a) synchronous mode	msec			
	b) asynchronous mode	msec			

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Emergency Diesel Generator (Guaranteed Technical Particulars)					
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)
13.0	Emergency Diesel Generator		630 kVA	200 kVA	
1.0	Source				
2.0	Manufacturer				
3.0	Engine				
3.1	Engine Make				
3.2	Applicable Standards				
3.3	Engine Model				
3.4	Engine Rating				
3.5	Engine Power				
-	Gross BHP				
-	Net BHP				
3.6	No. of Cylinders				
3.7	Engine RPM				
3.8	Type of Starting				
3.9	Battery Details				
-	Rated Voltage of Battery	V _{DC}			
-	Rated Voltage of Battery Charger	V _{DC} / V _{AC}			
-	Type of Battery				
-	Battery Capacity	AH			
-	Time to Charge battery	Hours			
3.10	Aspiration				
3.11	Bore X Stroke	mm			
3.12	Displacement				
3.13	Type of fuel				
3.14	Fuel consumption @ 75% load	ltr/hr			
3.15	Fuel consumption @ 100% load	ltr/hr			
3.16	Typical oil consumption @ 100% load	ltr/hr			
3.17	Governor / Class				
3.18	Lubricating oil system capacity	ltrs			
3.19	Recommended lube oil change	hrs			
3.20	Type of Cooling				
3.21	Coolant capacity (engine + radiator)	ltrs			
3.22	Combustion air intake @ 100% load	m ³ /min			
3.23	Fan air flow across radiator	ltrs/sec			
3.24	Exhaust temperature	°C			
3.25	Type of coupling				
3.26	Type of silencer				

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3.27	Max. ambient temperature	°C			
3.28	Speed regulation				
3.29	Efficiency				
3.30	Systems (flow diagram is to be enclosed)				
-	Governing arrangement				
-	Cooling systems				
-	Fuel				
-	Lubrication				
-	Exhaust				
-	Air filtration, dry type / other type				
-	Protection				
3.31	Engine Protections provided	Yes / No			
3.32	Engine Control Panel provided	Yes / No			
3.33	Standard / optional accessories				
3.34	Dimension of engine	LXBXH mm			
3.35	Weight of the engine	Kg			
3.36	Engine Protections provided	Yes / No			
3.37	Noise level at 1 mtr from the set	dB(A)			
4.0	Alternator				
4.1	Make				
4.2	Applicable Standards				
4.3	Model				
4.4	Rating (design)	KVA			
4.5	Continuous output rating	KVA			
4.6	Rated voltage & variation in Output	V			
4.7	Rated frequency & variation in Output	Hz			
4.8	Power Factor				
4.9	No. of phases				
4.10	Voltage Regulation	%			
4.11	Insulation class				
4.12	Full load current	Amps			
4.13	Overload capacity				
4.14	Degree of protection				
4.15	Stator winding				
4.16	Rotor				
4.17	Harmonic distortion level				
4.18	Excitation System				
-	Type				
-	Excitation voltage, DC volts	V			
-	Excitation current	Amps			
4.19	Alternator Protections provided	Yes / No			

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4.20	Standard / optional accessories				
4.21	Dimension of alternator	LXBXH mm			
4.22	Weight of the alternator	Kg			
4.23	Noise level at 1 mtr from the set	dB(A)			
5.0	DG set in Accoustic Enclosure				
5.1	Overall dimensions	LXBXH mm			
5.2	Weight of the total set				
5.3	Foundation details provided	Yes / No			
5.4	Sound level at 1 mtr from the enclosure	dB(A)			
6.0	AMF Panel				
6.1	Type				
6.2	Make				
6.3	Applicable Standards				
6.4	Rated voltage				
6.5	Symmetrical short circuit withstand current and rated voltage				
6.6	Peak short circuit withstand current				
6.7	Rated current at ambient				
6.8	Degree of protection				
6.9	Cubicle sheet material details				
-	Cold rolled / hot rolled				
-	Thickness, structural & load bearing members				
-	Thickness, front & rear				
-	iv) Thickness, Sides & top				
-	v) Thickness of gland plates				
6.10	Painting shade & Thickness as per IS				
-	External surfaces (front & rear)				
-	Extreme end covers				
6.11	Minimum Clearances in air for Busbars				
-	Between phases	mm			
-	Between phase & earth	mm			
6.12	Overall weight of circuit breaker panel	Kg			
6.13	Overall dimension of circuit breaker panel				
-	Length	mm			
-	Depth	mm			
-	Height	mm			
6.14	Overall dimension				
-	Length	mm			

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-	Depth	mm			
-	Height (including base channel)	mm			
-	Base channel	mm			
6.15	Overall weight	Kg			
-	Number of shipping section				
6.16	Internal Wiring (Power , Control & Signal)				
-	Material				
-	Installation				
-	Voltage grade				
-	Minimum conductor size				
-	Conductor wheather solid / Stranded				
6.17	Power Terminals				
-	Make				
-	Size / Cat. No.				
6.18	Control Terminals				
-	Make				
-	Size / Cat. No.				
-	20% Spare Terminal considered	Yes / No			
6.19	Ground Terminal Size				
6.20	General Arrangement Drawings furnished ?	Yes / No			
6.21	Bus Bars				
-	Applicable Standards				
-	Main Busbar				
-	Busbar current rating at design ambient	A			
-	Main busbar size	mm ²			
-	i) Phase	mm ²			
-	ii) Neutral	mm ²			
-	Main busbar material	Cu			
-	Current density	A / mm ²			
7.0	ACB (Drawout type)				
7.1	Make				
7.2	Applicable standards				
7.3	Type / Cat. No.				
7.4	No. of poles / Phases				
7.5	Rated voltage	V			
7.6	Rated operating duty				
7.7	Design ambient temperature	°C			
7.8	Rated current at design ambient temperature	A			

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7.9	Derating factor for site operating conditions inside panel				
7.10	Continuous current at ambient temperature	A			
7.11	Rated symmetrical breaking current	kA			
7.12	Rated peak making current	kA			
7.13	Rated short time rating (for 1 sec)	kA			
7.14	1 min dry withstand volt (power frequency)	kV			
7.15	Rated peak momentary rating	kA			
7.16	Number of openings, the circuit breaker is capable of performing without inspection, replacement of contacts or other parts at 100% rated breaking current				
7.17	No. of breaker auxiliary contacts provided on fixed portion of breaker & their rating	NO + NC			
7.18	Trip free and anti pumping features have been provided (Furnish description)	Yes / No			
7.19	Closing mechanism				
7.20	Tripping mechanism				
7.21	Mechanical trip PB provided	Yes			
7.22	Mechanical ON / OFF indicator provided	Yes			
7.23	Spring charging motor details				
-	Type				
-	Rated power	W			
-	Rated voltage	V			
-	Class of insulation				
-	Time for fully charging the closing spring	sec			
7.24	Emergency Manual charging facility provided	Yes / No			
7.25	Breaker is trip free	Yes			
7.26	Limits of voltage for satisfactory operation of the following devices as percentage of normal voltage				
-	Motor	%			
-	Closing coil	%			
-	Tripping coil	%			
7.27	Operation counter provided	Yes / No			
7.28	Manual operating mechanism				

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-	Type of Release provided				
-	Available range of following parameters for each type of release offered				
7.29	Maximum Tripping time	m sec			
-	Maximum Closing time	m sec			
7.30	Closing coil wattage	W			
-	Tripping coil wattage	W			
7.31	Drawout Trolley				
-	Make				
-	Type designation				
-	Dimensions	mmXmmXmm			
8.0	Current Transformers				
	(The following details shall be furnished for each type & rating)				
8.1	Make				
8.2	Type / Cat. No.				
8.3	Applicable standards				
8.4	Secondary Current, Metering / Protection	A			
8.5	Ratio, Metering / Protection				
8.6	VA Rating	VA			
8.7	Accuracy Class, Metering / Protection				
8.8	Class & type of insulation				
9.0	Voltage Transformers				
	(The following details shall be furnished for each type & rating)				
9.1	Make				
9.2	Type / Cat. No.				
9.3	Applicable standards				
9.4	Secondary voltage	V			
9.5	Ratio				
9.6	VA Rating	VA			
9.7	Accuracy class				
9.8	Over voltage factor				
9.9	Class & type of insulation				
10.0	Protection Relay				
	(Bidder to furnish detail specs of numerical relays along with this GTP)				
10.1	Make				
10.2	Type / Cat. No.				
10.3	Applicable standards				

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10.4	Catalogue furnished	Yes / No			
11.0	Electronic Power Meter				
	(Bidder to furnish detail specs of power meter along with this GTP)				
11.1	Make				
11.2	Type / Cat. No.				
11.3	Applicable standards				
11.4	Catalogue furnished				
12.0	Control / Selector Switch				
12.1	Make				
12.2	Type / Cat. No.				
12.3	Applicable standards				
12.4	No. of poles				
12.5	Rated voltage	V			
12.6	Rated current	A			
13.0	Breaker Control Switch				
13.1	Make				
13.2	Type / Cat. No.				
13.3	Applicable standards				
13.4	No. of poles				
13.5	Rated voltage	V			
13.6	Rated current	A			
14.0	Fuses				
	(The following details shall be furnished for each type & rating)				
14.1	Make				
14.2	Type / Cat. No.				
14.3	Applicable standards				
14.4	Category				
14.5	Current rating	A			
15.0	Push Buttons				
15.1	Make				
15.2	Type / Cat. No.				
15.3	Applicable standards				
15.4	Rated voltage	V			
15.5	Rated current	A			
15.6	No. of aux. contacts provided	NO + NC			
16.0	Indicating Lamps				
16.1	Make				
16.2	Type / Cat. No.				
16.3	Applicable standards				

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		Sub-Sec-13 Power and Control Cables

Power & Control Cables (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Bidder	Remarks (if any)
14.0	Power & Control Cables			
A	HV Power Cables (To be filled in for every type)			
1.1	Type / designation			
1.2	Name of manufacturer			
1.3	Rated Voltage	kV		
1.4	Insulation			
1.3.1	Material of Insulation			
1.3.2	Minimum thickness of insulation	mm		
1.4	Conductor			
1.4.1	Material of Conductor			
1.4.2	Form of conductor (circular/ shaped)			
1.4.3	Size of Conductor	mm ²		
1.5	Screen			
1.5.1	Type of Screen			
1.5.2	Material of Screen			
1.5.3	Minimum thickness of screen	mm		
1.6	Armour, if applicable			
1.6.1	Type			
1.6.2	Material			
1.6.3	Size/ Diameter of strip/Wire	mm		
1.7	Overall Diameter of cable	mm		
1.8	Power frequency withstand voltage			
1.9	Highest Voltage V _m			
1.10	Maximum conductor temperature in			
1.10.1	- Fault condition	°C		
1.10.2	-Service condition	°C		
1.11	Current rating (continuous in air)	Amp		
1.12	Short circuit current rating for 1 sec	kA		
1.13	Test voltage at factory	kVrms		
1.13.1	Period of test voltage	minutes		
B	Low Voltage Power Cables (To be filled in for every type)			

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2.1	Type / designation			
2.2	Name of manufacturer			
2.3	Rated Voltage	kV		
2.4	Insulation			
2.3.1	Material of Insulation			
2.3.2	Minimum thickness of insulation	mm		
2.4	Conductor			
2.4.1	Material of Conductor			
2.4.2	Form of conductor (circular/ shaped)			
2.4.3	Size of Conductor	mm ²		
2.5	Screen			
2.5.1	Type of Screen			
2.5.2	Material of Screen			
2.5.3	Minimum thickness of screen	mm		
2.6	Armour, if applicable			
2.6.1	Type			
2.6.2	Material			
2.6.3	Size/ Diameter of Strip/Wire	mm		
2.7	Overall Diameter of cable	mm		
2.8	Maximum conductor temperature in			
2.8.1	- Fault condition	°C		
2.8.2	- Service condition	°C		
2.9	Current rating (continuous in air)	Amp		
2.10	Short circuit current rating for 1 sec	kA		
2.11	Test voltage at factory	kVrms		
2.12	Period of test voltage	minutes		
3.0	Control and Instrumentation Cables (To be filled in for every type)			
3.1	Type / designation			
3.2	Name of manufacturer			
3.4	Voltage Rating	kV		
3.3	Insulation			
3.3.1	Material of Insulation			
3.3.2	Minimum thickness of insulation	mm		
3.4	Conductor			
3.4.1	Material of Conductor			
3.4.2	Form of conductor (circular/ shaped)			
3.4.3	Size of Conductor	mm ²		
3.5	Screen			
3.5.1	Type of Screen			

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3.5.2	Material of Screen			
3.5.3	Minimum thickness of screen	mm		
3.6	Armour, if applicable			
3.6.1	Type			
3.6.2	Material			
3.6.3	Size/ Diameter of Strip/Wire	mm		
3.7	Overall Diameter of cable	mm		
3.8.	Test voltage at factory	kV		
3.9	Period of test voltage	minutes		

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		Sub-Sec-14 Cable Trays

Cable Trays (All Type) (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
15.0	Cable Trays (All Type)			
a	Type/ Designation			
b	Manufacturer			
c	Standards			
d	Material			
e	Materials of nut, bolts etc.			
f	Corrosion protection			
g	Minimum Spacing between tiers	mm		
h	Proposed sizes (LXWXH) of cable trays	mm x mm x mm		

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		Sub-Sec-15 Communication System & CCTV

Communication System & CCTV System (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
16.0	Communication System & CCTV System			
A	PUBLIC ADDRESS SYSTEM			
1	Type / designation			
2	Manufacturer			
3	Echo interference	yes/ no		
4	Integration with PLCC/FO exchange	yes/ no		
5	Master Control Station			
	- Mounting arrangement	-		
	-Display	-		
	- Dial Pad	-		
6	Central Switching system			
	- Communication Link type	-		
	- Processor	bits		
	- Power supply (built in)	V		
7	Central paging control and amplifier rack			
	- Mounting Arrangement			
8	Power Amplifier			
	- Power Supply	V		
	-RMS Power	watts		
	- Tone Control			
	- bass	dB		
	- treble	dB		
	- Power Bandwidth			
	- Signal / Noise ratio			
9	Field handset station			
	Type / designation	-		
	Mounting arrangement	-		
	Microphone type	-		
	Power source	-		
	Dial pad	-		
	Protection to handset shord	-		
	Degree of protection	IP		
10	Head Microphone			
	Type / designation			
	Minimum number of head microphones	Nos.		
11	Loudspeakers (indoor)			
	Type / designation	-		
	Sound level of loudspeakers	db(A)		

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	Rated power (rms)	watts		
	Effective frequency range	Hz		
	Degree of protection	IP		
	Minimum number of loudspeakers for indoor area	Nos.		
12	Loudspeakers (outdoor)			
	Type / designation	-		
	Sound level of loudspeakers	db(A)		
	Rated power (rms)	watts		
	Effective frequency range	Hz		
	Degree of protection	IP		
	Minimum number of loudspeakers for outdoor area	Nos.		
13	Junction Box			
	Type	-		
	Connection	-		
	Degree of protection	IP		
	No. of Junction Box for loudspeakers	Nos.		
	No. of Junction Box for field handset stations	Nos.		
14	Cables			
	Type of cables for loudspeaker	-		
	Type of Cables for filed handset station	-		
	Power Cables			
B	EPABX System			
1	Type / designation	-		
2	Manufacturer			
3	Electromagnetic interference	yes/no		
4	Capacity of subscribers	Nos.		
5	Capacity of trunk line	Nos.		
6	Number of connections to parallel exchange	Nos.		
7	Minimum number of telephone sets	Nos.		
8	Type of telephone sets			
9	Telephone Socket			
	Make			
	Applicable Standard			
9	Telephone Jack			
	Make			
	Applicable Standard			
C	CCTV System			
1	Name of manufacturer			

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2	Camera			
	Type / designation/ Make			
3	Camera lens			
	Type / designation/ Make			
4	Camera mounting platform			
	Type / designation			
5	Receiver Driver Unit			
	Type / designation			
6	Microprocessor based Matrix Switcher			
	Type / designation			
7	Digital Color Multiplexer Cum Recorder			
	Type / designation			
8	CCTV Monitors			
	Type / designation			
9	Control Console			
	Type / designation			
10	Video cable equalizers			
	Type / designation			
11	Surge Protection			
	Type / designation			

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		Sub-Sec-16 Earthing System

Earthing System (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
17.0	Earthing System			
1	Expected Total earthing impedance of earthing system (Informative)	ohm		
2	Design short-circuit and ground fault current, 3s			
2.1	11kV generator and Isolated Phase bus duct	kA rms		
2.2	GSU area	kA rms		
2.3	33 kV system	kA rms		
2.4	400V Low voltage System	kA rms		
2.5	Fault Clearing Time	sec		
3	Type, Material and size of earthing conductors			
3.1	Buried in Ground	-		
3.2	Size of earthing conductor	mm x mm		
3.3	Embedded in concrete	-		
3.4	Installed above ground/ floor	-		
4	Minimum conductor size for underground network and riser	mm ²		
5	Corrosion Allowance			
6	Material of conductor for earth mat, riser, equipment connection			
7	Size of the grid	m x m		
8	Whether penstocks included in the Earth Mat calculation			

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Illumination System (Powerhouse and Remote Sites) (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
18.0	Illumination System (Powerhouse and Remote Sites)			
1	Main Lighting Distribution Board			
1.1	Make			
1.2	Applicable standard			
1.3	Rated Voltage	V		
1.4	Current Rating			
1.4.1	Incomer	A		
1.4.2	Outgoing feeders	A		
1.4.3	Busbars	A		
1.5	No. of outgoing feeders & Rating			
1.6	Degree of protection			
1.7	Thickness of sheet steel	mm		
1.8	Overall dimensions			
1.9	Weight	kg		
1.10	Miniature Circuit breaker			
1.10.1	Make			
1.10.2	Type designation			
1.10.3	Applicable standard			
1.10.4	Rated voltage	V		
1.10.5	Rated current	A		
1.10.6	Breaking capacity	kA		
1.10.7	Type of tripping device			
1.10.8	No. of poles			
1.10.9	Overall dimensions.			
1.10.10	Category			
1.11	ELCB			
1.11.1	Make			
1.11.2	Type designation			
1.11.3	Applicable standard			
1.11.4	Rated voltage	V		
1.11.5	Rated current	A		
1.11.6.	Rated breaking current	kA		
1.11.7	No. of poles			
1.11.8	Category			
2	Fuses			
2.1	Make			
2.2	Type designation			
2.3	Applicable standard			

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2.4	Type			
2.5	Rated voltage	V		
2.6	Rated current	A		
2.7	Rupturing capacity	kA		
3	Contactor			
3.1	Make			
3.2	Type designation			
3.3	Applicable standard			
3.4	Rated voltage	V		
3.5	Rated current	A		
3.6	permissible variation in current.			
3.7	Coil voltage	V		
3.8	No. of NO/NC contacts			
3.9	Rated burden	VA		
3.1	Pick-up voltage	V		
3.11	Drop-off voltage	V		
3.12	Duty class			
4	Synchronous timer			
4.1	Make			
4.2	Type designation			
4.3	Applicable standard			
4.4	Rating	A		
4.5	Coil voltage	V		
4.6	Timing range	sec		
4.7	No. of contacts			
4.8	Rated burden	VA		
5	Lighting Transformers			
5.1	Make			
5.2	Type designation			
5.3	Applicable standard			
5.4	Rated KVA			
5.5	Rated voltage	V		
5.6	Rated current			
	-Primary	A		
	-secondary	A		
5.7	Vector group			
5.8	Winding material			
5.9	Insulation material & class of insulation			
	At rated current at 75°C			
5.10	Per unit resistance	p.u		
5.11	Per unit reactance	p.u		
5.12	Per unit impedance	p.u		
5.13	Iron loss at 50 Hz and at rated voltage	W		

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5.14	Copper loss at rated output at 75°C	W		
5.15	No. of steps of tap change			
5.16	Type of cooling			
5.17	Efficiency at 75°C	%		
5.18	Short circuit withstand capacity for 1 sec.	kA		
5.19	Insulation strength (1 min. power frequency withstand voltage)			
5.20	Overall dimensions			
5.21	Weight	kg		
6	Lighting fixtures & accessories			
6.1	For each type of fixture:			
6.1.1	Make of lighting fixture			
6.1.2	Type designation			
6.1.3	Applicable standard			
6.1.4	Nominal working voltage variation	(± %)		
6.1.5	Max. permissible frequency variation	(± %)		
6.1.6	Power factor at nominal voltage			
6.1.7	Size of conduit entry	mm		
6.1.8	Size & Material of earthing terminal			
6.1.9	Weight of fixture	kg		
6.2	For each type of Lamp:			
6.2.1	Make & Type			
6.2.2	Applicable standard			
6.2.3	Nominal voltage & rating			
6.2.4	Lamp lumen output at design temp.	lumens		
	- after 100 burning hours			
	- after 2000 burning hours			
	- at the end of life period			
6.2.5	Average expected life at nominal voltage	years		
6.2.6	Average expected life at 110% nominal voltage	years		
6.3	Copper ballast			
6.3.1	Make			
6.3.2	Applicable standard			
6.3.4	Nominal voltage & rating			
6.3.5	Class of insulation			
6.3.6	Tap setting range			
6.3.7	Average expected life at nominal voltage	years		
6.3.8	Power loss at nominal voltage & frequency	W		

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6.4	Electronic Ballast			
6.4.1	Make			
6.4.2	Applicable standard			
6.4.3	Nominal voltage & rating			
6.4.4	Operating frequency			
6.4.5	Degree of protection			
6.4.6	Average expected life at nominal voltage	years		
6.4.7	Power loss at nominal voltage & frequency	W		
6.5	Ignitor			
6.5.1	Make & Type			
6.5.2	Applicable standard			
6.5.3	Nominal voltage & rating			
6.6	Capacitor			
6.6.1	Make & Type			
6.6.2	Applicable standard			
6.6.3	Rating	W		
6.6.4	Nominal voltage	V		
6.6.5	Capacitance	m F		
6.7	Starter			
6.7.1	Make & Type			
6.7.2	Applicable standard			
6.7.3	Nominal voltage & rating			
7.8	Emergency lighting fixture			
6.8.1	Make & Type designation			
6.8.2	Applicable standard			
6.8.3	Rating			
6.8.4	Nominal working voltage	V		
6.8.5	Make & Type of Battery			
6.8.6	Voltage rating of Battery	V		
6.8.7	Capacity of battery	AH		
6.8.8	Make & Type Charging device			
6.8.9	Make & Type of Lamp			
6.8.10	Rating & voltage of lamp			
6.8.11	Expected life of the unit	years		
7	Switch Boxes			
7.1	Make & Type			
7.2	Degree of protection			
7.3	Thickness of sheet steel			
7.4	Construction (deep drawn/welded			
7.5	Make & Type of switch			
7.6	Current & voltage rating of switch			
7.7	Make & Type of Sockets			

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7.8	Current & Voltage rating			
	of Sockets			
7.9	Make & Type of Terminal Blocks			
7.1	Current rating of TB.			
7.11	Voltage grade OF TB.			
7.12	Material of TB.			
7.13	Surface finish of Switchbox.			
8	Receptacles			
8.1	Make			
8.2	Type			
8.3	Rating			
8.4	Applicable standard			
8.5	Degree of protection			
8.6	Type of construction			
8.7	Enclosure (sheet steel/diecast aluminium)			
8.8	Make & Type of Switch			
8.9	Rating of Switch			
8.10	Make & Type of Terminal Blocks			
8.11	Current rating of TB.			
8.12	Voltage grade OF TB.			
8.13	Surface finish			
9	Junction Boxes			
9.1	Make & Type			
9.2	Degree of protection			
9.3	Type of construction (Deep drawn/welded)			
9.4	Thickness of sheet steel			
9.5	Fuse			
9.5.1	Make			
9.5.2	Type			
9.5.3	Rating			
9.5.4	Applicable standard			
9.5.5	Rupturing capacity			
9.6	Terminal blocks			
9.6.1	Make			
9.6.2	Type			
9.6.3	Rating			
10	Rigid steel conduits -fittings & accessories			
10.1	Make & Type			
10.2	Applicable standard			
10.3	Size			
10.4	Material of coating			



	-Inside surface			
	-Outside surface			
10.5	Standard length of conduit			
10.6	Wall thickness			
10.7	Outer dia.			
10.8	Inner Dia.			
11	Lighting Wires and Cables			
11.1	Make & Type			
11.2	Applicable standard			
11.3	Voltage grade			
11.4	Size			
11.5	Conductor material			
11.6	No. of strands			
11.7	Conductor dia.			
11.8	Conductor resistance			
11.9	Insulation material			
11.1	Current rating			
11.11	Insulation thickness			
11.12	Colour Coding			
11.13	Volume resistivity at 27°C			
11.14	Overall dia			
13	Cable glands			
12.1	Make			
12.2	Type			
12.3	Applicable standard			
12.4	Size			
12.5	Voltage grade			
13	Cable lugs			
13.1	Make			
13.2	Type			
13.3	Applicable standard			
13.4	Size			
13.5	Material			
14	Lighting Poles			
14.1	Make			
14.2	Type			
14.3	Applicable standard			
14.4	Pole height & Weight			
14.5	Material and dimensions of different sections			
14.6	Overhang length			
14.7	Swaged/stepped			
14.8	Painting			
	-Inside			

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	-Outside			
15	Lighting Mast			
15.1	Make			
15.2	Type			
15.3	Applicable standard			
15.4	Height & Weight			
15.5	Material and dimensions of different sections			
15.6	Overhang length			
15.7	Swaged/stepped			
15.8	Painting			
	-Inside			
	-Outside			
16	Isolator			
16.1	Make			
16.2	Type designation			
16.3	Applicable standard			
16.4	Rated voltage	V		
16.5	Rated current at 50°C	A		
16.6	ambient			
16.7	Rated breaking current	kA		
16.8	No. of poles			
16.9	Category			

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		Sub-Sec-18 Electrical Workshop

Electrical Workshop (Guaranteed Technical Particulars)				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
19.0	Electrical Workshop			
1	Measuring Devices			
1.1	DC Insulation tester (Megger)			
1.1.1	Make			
1.1.2	Type/ Designation			
1.1.3	Measuring Range	M ohm		
1.1.4	Voltage Level	V		
1.2	AC Mains operated insulation tester (Megger)			
1.2.1	Make			
1.2.2	Type/ Designation			
1.2.3	Measuring Range	M ohm		
1.2.4	Voltage Level	V		
1.3	Portable Universal Bridge			
1.3.1	Make			
1.3.2	Type/ Designation			
1.3.3	Measuring Range			
	-Resistance	Ohm		
	-Inductivity	H		
	-Capacity	F		
	-Dissipation factor			
	-Frequency Range	Hz		
1.4	Digital Multimeter			
1.4.1	Make			
1.4.2	Type/ Designation			
1.4.3	Measuring Range			
	-Voltage	V		
	-Current	I		
	-Resistance	Ohm		
1.5	Analog Multimeter			
1.5.1	Make			
1.5.2	Type/ Designation			
1.5.3	Measuring Range			
	-Voltage	V		
	-Current	I		

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	-Resistance	Ohm		
1.6	Single phase Toroidal Transformer			
1.6.1	Make			
1.6.2	Type/ designation			
1.6.3	Primary voltage	V		
1.6.4	Secondary Voltage	V		
1.6.5	Rated Power	VA		
1.7	Phase sequence indicator			
1.7.1	Make			
1.7.2	Type/ designation			
1.7.3	Voltage range	V		
1.7.4	Frequency range	Hz		
1.8	Portable Digital frequency Meter			
1.8.1	Make			
1.8.2	Type/ designation			
1.8.3	Range			
1.9	Portable temperature measuring instrument			
1.9.1	Make			
1.9.2	Type/ designation			
1.9.3	Measuring range	°C		
1.10	Digital mechanical revolution counter			
1.10.1	Make			
1.10.2	Type/ designation			
1.10.3	Measuring range	rpm		
1.11	Portable earth resistance measuring device			
1.11.1	Make			
1.11.2	Type/ designation			
1.11.3	Measuring range	ohm		
1.12	Portable micro ohm-meter			
1.12.1	Make			
1.12.2	Type/ designation			
1.12.3	Measuring range	μ-ohm		

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		Sub-Sec-18 Electrical Workshop

2.0	Testing Devices			
2.1	Make			
2.2	Automatic turns ratio Tester			
2.3	Type/ designation			
2.4	Accuracy	of FSD		
2.5	Operating Voltage	V		
3.0	Transformer oil testing devices			
3.1	Make			
3.2	High Voltage insulation oil testing device			
3.3	Type/ designation			
3.4	Range	V		
4.0	Silica gel drying oven			
4.1	Make			
4.2	Type/ designation			
4.3	Temperatur Range	°C		
5.0	Workbenches			
5.1	Universal laboratory workbench with powe supply			
5.1.1	Make			
5.1.2	Type/ designation			
5.2	Workbench for repair of hydraulic/ pneumatic devices			
5.2.1	Make			
5.2.2	Type/ designation			
5.3	Workbench for repair of Electronic devices			
5.3.1	Make			
5.3.2	Type/ designation			
6.0	Transformer Oil Resistivity Kit			
6.1	Make			
6.2	Type/ designation			
7	Karl Fischer type Moisture Measurement kit			
7.1	Make			
7.2	Type/ designation			
8.0	Dew Point Meter			
8.1	Make			
8.2	Type/ designation			
9.0	Transformer DC Winding Resistance Measurement test kit			

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9.1	Make			
9.2	Type/ designation			
10.0	Automatic Turns Ratio Tester			
10.1	Make			
10.2	Type/ designation			

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		Sub-Sec-19 EOT Cranes

POWERHOUSE EOT CRANE								
Sl. No.	Description	Units	To be filled by the Tenderer					
Guaranteed Technical Particulars								
A)	General details:							
1	Crane to be Installed at							
2	No. of Cranes							
3	Capacity of the Crane-Safe working load		Main Hoist		Aux. Hoist		Monorail Hoist	
4	Type of Cranes							
5	Span (Centre to Centre of Rails)	m						
6	Longitudinal Travel	m						
7	Altitude of the Place							
8	Class of Crane							
9	Class of AH, CT & LT							
10	Standards to which Crane conforms							
11	Operational Speeds (loaded)		MH	AH	CT	LT	Monorail Hoist	
							Hoist	Travel
a)	Main Motion	m/min.						
b)	Micro Motion	m/min.						
12	Acceleration values	cm/sec ²						
13	Lift of Crane		MH		AH		Monorail Hoist	
a)	Maximum lift of hook above Service bay/Floor level	m						
b)	Maximum drop of hook below Service bay/Floor level	m						
c)	Total Lift	m						
14	Terminal position (CT)		Upstream		Downstream			
a)	of Main hook from center of rails	mm						
b)	of the Auxiliary hook from the center of rails	mm						
15	Maximum Travel (LT)		Service Bay		Other End			
a)	of the Main hook from the inner edge of walls	mm						
b)	of the Auxiliary hook from the inner edge of walls	mm						

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POWERHOUSE EOT CRANE						
Sl. No.	Description	Units	To be filled by the Tenderer			
16	Minimum working clearances required		Upstream	Downstream		
a)	Between center of rail and the nearest side obstruction	mm				
b)	Between the top of Crane beam and the lowest overhead obstruction	mm				
c)	Height of the End-buffers above the top of the LT crane Rail	mm				
17 a)	Height of LT Rails	mm				
b)	Distance between centre line of MH hook to top of LT Rails	mm				
18	Controls					
a)	Cabin operated		Yes / No			
b)	Radio Control operated / Range		Yes / No			
c)	Type of remote control					
d)	Warning device provided		Yes / No			
19	Tolerance to be confirmed					
	Minimum possible travel, with all Brakes adjusted and Hook carrying rated load shall be :	mm	MH	AH	CT	LT
a)						Monorail Hoist
b)	The motor speed not to exceed 105% of synchronous speed while lowering a rated load		Yes / No			
c)	The vertical deflection of the crane girders caused by the rated load plus all dead loads not to exceed 1/1000 of the crane span		Yes / No			
d)	Camber provided	mm				
B)	Mechanical Details:					
1	Crane Bridge					

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POWERHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
a)	Type / Construction details			
2	Platform details (as applicable)			
a)	Number, Type & Position of access points			
b)	Length and Width of each Platform	m		
c)	Type of access Platform to cabin			
3	Provision of clamping while in motion during Earthquake		Yes / No	
4	Provision of "Holding Clamps" when crane is not in operation		Yes / No	
5	End Truck			
a)	Number			
b)	Number of Wheels per Truck			
c)	LT Wheel Base diagram - attached		Yes/No	
6	Trolley			
a)	CT Wheel Base diagram - attached		Yes/No	
7	Wheels		Bridge / Truck	Trolley/ Crab
a)	Number			
b)	Wheel Base	mm		
c)	Spacing details	mm		
d)	Diameter	mm		
e)	Width of Wheel tread	mm		
f)	Material / Chemical composition			
g)	Hardness of Wheels			
h)	Depth of Hardness	mm		
i)	Method and type lubrication for bearing			
j)	Position of Wheels with respect to end buffers	mm	Oneside	Otherside
8	Rails		For Bridge	For Trolley
a)	Section/designation (Furnish Cross Sectional diagram of the rail in the bid)			
b)	Weight per meter run	kg/m		

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POWERHOUSE EOT CRANE							
Sl. No.	Description	Units	To be filled by the Tenderer				
c)	Name of the manufacturer						
9	Rail End Stops						
a)	Type						
i)	Number Provided						
ii)	Material						
b)	Buffers (Type)						
i)	Numbers provided						
ii)	Material						
10	Winding Drum						
a)	Material						
b)	Diameter and Length	mm					
c)	Depth of Groove	mm					
d)	Pitch of Groove	m					
e)	Hardness of Drum	BHN					
11	Sheaves		MH		AH		Monorail Hoist
a)	Material						
b)	Diameter of Sheaves (Main/Equaliser)						
c)	Groove diameter	mm					
d)	Lead angle						
e)	Type of Sheave Guards provided						
12	Hoisting Rope		MH		AH		Monorail Hoist
a)	Construction						
b)	Diameter of rope	mm					
c)	Material						
d)	Number of falls						
e)	Minimum factor of safety						
f)	Minimum Breaking load	ton					
13	Crane Hook		MH		AH		Monorail Hoist
a)	Type						
b)	Lifting Capacity	ton					
c)	Material						
d)	Whether Swiveling?	Yes/No					
14	Gears Box Details		MH	AH	CT	LT	Monorail Hoist
a)	Type						
b)	Total No. of reduction						
c)	Reduction ratio						
d)	Method of Lubrication						
e)	Hardness (Gear/Pinion)						
f)	Materials (Gears/Pinion)						
15	Loads						

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POWERHOUSE EOT CRANE							
Sl. No.	Description	Units	To be filled by the Tenderer				
a)	Load of Crane without Trolley / Crab	ton					
b)	Independent Trolley / Crab load	ton					
c)	Max. Load per Wheel & Total Load on each Crane Rail:						
i)	When Main Hook is at the center position of two LT rails	ton					
ii)	When Main Hook is at the nearest position to center line of LT rails	ton					
d)	Traction forces and impact allowance	ton	Traverse direction		Longitudenal direction		
16	Crane surges in transverse and longitudinal directions	ton	CT		LT		
17	Crane Testing load		125% SWL				
C)	Electrical Details:						
1	Motor particulars		MH	AH	CT	LT	Monorail Hoist
a)	Number of Motors						
b)	Type						
c)	Relative Duty factor		40%				
d)	Voltage/No. of Phase/Frequency						
e)	Speed	rpm					
f)	Rating	kW					
g)	Degree of Protection						
h)	Class of Insulation / Max. temperature rise limit	°C					
i)	Rating in minutes of continuous operation						
j)	Starting Torque	N-m					
k)	Breakdown Torque	N-m					
l)	Locked rotor current	Amp					
m)	Name of the manufacturer						
2	Brake particulars		MH	AH	CT	LT	
a)	Type of Brake used						
b)	Name of the manufacturer						

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POWERHOUSE EOT CRANE							
Sl. No.	Description	Units	To be filled by the Tenderer				
c)	Total number of Brakes used						
d)	Braking Torque	N-m					
i)	EHT						
ii)	DCEM						
e)	Brake Drum diameter : EHT/DCEM	mm					
f)	Brake Shoe width	mm					
g)	Material of Brake lining						
3	Limit switch		MH	AH	CT	LT	
a)	Number						
b)	Type						
c)	Manufacturer						
d)	Current Rating						
4	Controllers (for each motion)		MH	AH	CT	LT	
a)	Type of Controller						
b)	Number of Steps						
c)	Manufacturer						
5	Type of Long Travel Collectors (DSL)						
a)	AC or DC Voltage						
b)	Type/ Material						
c)	Type of Earthing provided						
6	Type/ Material of Transverse Current Collection System						
7	Lighting & Other Accessories						
a)	Bridge Lighting (type, rating & numbers)						
b)	Underbridge (type, rating & numbers)						
c)	Cabin (type, rating & numbers)						
d)	Warning Lights & Alarm System						
8	Other Electrical Details						
a)	Rating of Incoming Feeder						
b)	Cable size						
c)	Rating of Incoming MCCB						

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POWERHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
d)	Normal rating, Fault level and numbers of O/G Feeders for			
i)	Main Hoist Feeders			
ii)	Aux. Hoist Feeders			
iii)	CT Feeders			
iv)	LT Feeders			
v)	Lighting Feeders			
vi)	Misc Feeders			
vii)	Any other Feeder, describe			
e)	Rating of Contactors			
i)	Main Hoist Feeders			
ii)	Aux. Hoist Feeders			
iii)	CT Feeders			
iv)	LT Feeders			
v)	Lighting Feeders			
vi)	Misc Feeders			
vii)	Any other Feeder, describe			
f)	Maximum Current flowing to motor at the time of starting with Voltage & Frequency being at the lowest			
D)	Other Details			
1	Type of Operator's Cabin			
a)	Fixed/Moving and Open/Glazed			
b)	Location on Bridge			
c)	Type of Fire Extinguisher provided			
d)	Seating arrangement			
2	Slenderness Ratio			
a)	Main Compression member			
b)	Bracing and Secondary member			
c)	Ratio of unsupported length of the horizontal projection of any riveted member of Gyration			
3	Minimum Factor of Safety			

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POWERHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
a)	For most strained structural Crane part			
b)	For Wire Rope			
4	Maximum Vertical deflection of Bridge Girder			
a)	At Rated Load + Dead load	mm		
b)	At Test load	mm		
5	List Safety devices			
6	Load Limiting Device (Load Cell)		MH	AH
a)	Digital Display unit		Yes/No	N/A
b)	Overload Switch		Yes/No	Yes/No
c)	Compression/Tension Type			
d)	Make/Model			
7	Weight of Major Components			
a)	Weight of Girder (Single)	ton		
b)	Weight of End Carriage with Wheels	ton		
c)	Weight of Cabin	ton		
d)	Weight of Trolley (complete assembly)	ton		
e)	Weight of Crane (without trolley)	ton		
f)	Total Weight of Crane	ton		
8	List of Tools & accessories supplied		Attach separate list	
9	Heaviest package of shipment			
a)	Name			
b)	Weight	ton		
c)	Dimension (L x B x H)	m		
10	Largest Package for Shipment			
a)	Name			
b)	Weight	kg		
c)	Dimension (L x B x H)	m		
11	Painting on Equipment			
a)	Type & Quality			
b)	Extent (no. of coats Primer/Finishing)			

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POWERHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
c)	Total dry film thickness (DFT)	microns		

VALVEHOUSE EOT CRANE								
Sl. No.	Description	Units	To be filled by the Tenderer					
Guaranteed Technical Particulars								
A)	General details:							
1	Crane to be Installed at							
2	No. of Cranes							
3	Capacity of the Crane-Safe working load		Main Hoist		Aux. Hoist		Monorail Hoist	
4	Type of Cranes							
5	Span (Centre to Centre of Rails)	m						
6	Longitudinal Travel	m						
7	Altitude of the Place							
8	Class of Crane							
9	Class of AH, CT & LT							
10	Standards to which Crane conforms							
11	Operational Speeds (loaded)		MH	AH	CT	LT	Monorail Hoist	
							Hoist	Travel
a)	Main Motion	m/min.						
b)	Micro Motion	m/min.						
12	Acceleration values	cm/sec ²						
13	Lift of Crane		MH		AH		Monorail Hoist	
a)	Maximum lift of hook above Service bay/Floor level	m						
b)	Maximum drop of hook below Service bay/Floor level	m						
c)	Total Lift	m						
14	Terminal position (CT)		Upstream		Downstream			
a)	of Main hook from center of rails	mm						
b)	of the Auxiliary hook from the center of rails	mm						
15	Maximum Travel (LT)		Service Bay		Other End			

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VALVEHOUSE EOT CRANE							
Sl. No.	Description	Units	To be filled by the Tenderer				
a)	of the Main hook from the inner edge of walls	mm					
b)	of the Auxiliary hook from the inner edge of walls	mm					
16	Minimum working clearances required		Upstream	Downstream			
a)	Between center of rail and the nearest side obstruction	mm					
b)	Between the top of Crane beam and the lowest overhead obstruction	mm					
c)	Height of the End-buffers above the top of the LT crane Rail	mm					
17 a)	Height of LT Rails	mm					
b)	Distance between centre line of MH hook to top of LT Rails	mm					
18	Controls						
a)	Cabin operated		Yes / No				
b)	Radio Control operated / Range		Yes / No				
c)	Type of remote control						
d)	Warning device provided		Yes / No				
19	Tolerance to be confirmed						
a)	Minimum possible travel, with all Brakes adjusted and Hook carrying rated load shall be :	mm	MH	AH	CT	LT	Monorail Hoist
b)	The motor speed not to exceed 105% of synchronous speed while lowering a rated load		Yes / No				
c)	The vertical deflection of the crane girders caused by the rated load plus all dead loads not to		Yes / No				

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VALVEHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
	exceed 1/1000 of the crane span			
d)	Camber provided	mm		
B)	Mechanical Details:			
1	Crane Bridge			
a)	Type / Construction details			
2	Platform details (as applicable)			
a)	Number, Type & Position of access points			
b)	Length and Width of each Platform	m		
c)	Type of access Platform to cabin			
3	Provision of clamping while in motion during Earthquake		Yes / No	
4	Provision of "Holding Clamps" when crane is not in operation		Yes / No	
5	End Truck			
a)	Number			
b)	Number of Wheels per Truck			
c)	LT Wheel Base diagram - attached		Yes/No	
6	Trolley			
a)	CT Wheel Base diagram - attached		Yes/No	
7	Wheels		Bridge / Truck	Trolley/ Crab
a)	Number			
b)	Wheel Base	mm		
c)	Spacing details	mm		
d)	Diameter	mm		
e)	Width of Wheel tread	mm		
f)	Material / Chemical composition			
g)	Hardness of Wheels			
h)	Depth of Hardness	mm		
i)	Method and type lubrication for bearing			
j)	Position of Wheels with respect to end buffers	mm	Oneside	Otherside
8	Rails		For Bridge	For Trolley

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VALVEHOUSE EOT CRANE						
Sl. No.	Description	Units	To be filled by the Tenderer			
a)	Section/designation (Furnish Cross Sectional diagram of the rail in the bid)					
b)	Weight per meter run	kg/m				
c)	Name of the manufacturer					
9	Rail End Stops					
a)	Type					
i)	Number Provided					
ii)	Material					
b)	Buffers (Type)					
i)	Numbers provided					
ii)	Material					
10	Winding Drum					
a)	Material					
b)	Diameter and Length	mm				
c)	Depth of Groove	mm				
d)	Pitch of Groove	m				
e)	Hardness of Drum	BHN				
11	Sheaves		MH	AH		Monorail Hoist
a)	Material					
b)	Diameter of Sheaves (Main/Equaliser)					
c)	Groove diameter	mm				
d)	Lead angle					
e)	Type of Sheave Guards provided					
12	Hoisting Rope		MH	AH		Monorail Hoist
a)	Construction					
b)	Diameter of rope	mm				
c)	Material					
d)	Number of falls					
e)	Minimum factor of safety					
f)	Minimum Breaking load	ton				
13	Crane Hook		MH	AH		Monorail Hoist
a)	Type					
b)	Lifting Capacity	ton				
c)	Material					
d)	Whether Swiveling?	Yes/No				
14	Gears Box Details		MH	AH	CT	LT
a)	Type					
b)	Total No. of reduction					
c)	Reduction ratio					
d)	Method of Lubrication					

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VALVEHOUSE EOT CRANE							
Sl. No.	Description	Units	To be filled by the Tenderer				
e)	Hardness (Gear/Pinion)						
f)	Materials (Gears/Pinion)						
15	Loads						
a)	Load of Crane without Trolley / Crab	ton					
b)	Independent Trolley / Crab load	ton					
c)	Max. Load per Wheel & Total Load on each Crane Rail:						
i)	When Main Hook is at the center position of two LT rails	ton					
ii)	When Main Hook is at the nearest position to center line of LT rails	ton					
d)	Traction forces and impact allowance	ton	Traverse direction		Longitudenal direction		
16	Crane surges in transverse and longitudinal directions	ton	CT		LT		
17	Crane Testing load		125% SWL				
C)	Electrical Details:						
1	Motor particulars		MH	AH	CT	LT	Monorail Hoist
a)	Number of Motors						
b)	Type						
c)	Relative Duty factor		40%				
d)	Voltage/No. of Phase/Frequency						
e)	Speed	rpm					
f)	Rating	kW					
g)	Degree of Protection						
h)	Class of Insulation / Max. temperature rise limit	°C					
i)	Rating in minutes of continuous operation						
j)	Starting Torque	N-m					
k)	Breakdown Torque	N-m					
l)	Locked rotor current	Amp					
m)	Name of the manufacturer						

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VALVEHOUSE EOT CRANE							
Sl. No.	Description	Units	To be filled by the Tenderer				
2	Brake particulars		MH	AH	CT	LT	
a)	Type of Brake used						
b)	Name of the manufacturer						
c)	Total number of Brakes used						
d)	Braking Torque	N-m					
i)	EHT						
ii)	DCEM						
e)	Brake Drum diameter : EHT/DCEM	mm					
f)	Brake Shoe width	mm					
g)	Material of Brake lining						
3	Limit switch		MH	AH	CT	LT	
a)	Number						
b)	Type						
c)	Manufacturer						
d)	Current Rating						
4	Controllers (for each motion)		MH	AH	CT	LT	
a)	Type of Controller						
b)	Number of Steps						
c)	Manufacturer						
5	Type of Long Travel Collectors (DSL)						
a)	AC or DC Voltage						
b)	Type/ Material						
c)	Type of Earthing provided						
6	Type/ Material of Transverse Current Collection System						
7	Lighting & Other Accessories						
a)	Bridge Lighting (type, rating & numbers)						
b)	Underbridge (type, rating & numbers)						
c)	Cabin (type, rating & numbers)						
d)	Warning Lights & Alarm System						
8	Other Electrical Details						
a)	Rating of Incoming Feeder						

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VALVEHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
b)	Cable size			
c)	Rating of Incoming MCCB			
d)	Normal rating, Fault level and numbers of O/G Feeders for			
i)	Main Hoist Feeders			
ii)	Aux. Hoist Feeders			
iii)	CT Feeders			
iv)	LT Feeders			
v)	Lighting Feeders			
vi)	Misc Feeders			
vii)	Any other Feeder, describe			
e)	Rating of Contactors			
i)	Main Hoist Feeders			
ii)	Aux. Hoist Feeders			
iii)	CT Feeders			
iv)	LT Feeders			
v)	Lighting Feeders			
vi)	Misc Feeders			
vii)	Any other Feeder, describe			
f)	Maximum Current flowing to motor at the time of starting with Voltage & Frequency being at the lowest			
D)	Other Details			
1	Type of Operator's Cabin			
a)	Fixed/Moving and Open/Glazed			
b)	Location on Bridge			
c)	Type of Fire Extinguisher provided			
d)	Seating arrangement			
2	Slenderness Ratio			
a)	Main Compression member			
b)	Bracing and Secondary member			
c)	Ratio of unsupported length of the horizontal projection			

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VALVEHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
	of any riveted member of Gyration			
3	Minimum Factor of Safety			
a)	For most strained structural Crane part			
b)	For Wire Rope			
4	Maximum Vertical deflection of Bridge Girder			
a)	At Rated Load + Dead load	mm		
b)	At Test load	mm		
5	List Safety devices			
6	Load Limiting Device (Load Cell)		MH	AH
a)	Digital Display unit		Yes/No	N/A
b)	Overload Switch		Yes/No	Yes/No
c)	Compression/Tension Type			
d)	Make/Model			
7	Weight of Major Components			
a)	Weight of Girder (Single)	ton		
b)	Weight of End Carriage with Wheels	ton		
c)	Weight of Cabin	ton		
d)	Weight of Trolley (complete assembly)	ton		
e)	Weight of Crane (without trolley)	ton		
f)	Total Weight of Crane	ton		
8	List of Tools & accessories supplied		Attach separate list	
9	Heaviest package of shipment			
a)	Name			
b)	Weight	ton		
c)	Dimension (L x B x H)	m		
10	Largest Package for Shipment			
a)	Name			
b)	Weight	kg		
c)	Dimension (L x B x H)	m		

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VALVEHOUSE EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
11	Painting on Equipment			
a)	Type & Quality			
b)	Extent (no. of coats Primer/Finishing)			
c)	Total dry film thickness (DFT)	microns		

GIS HALL EOT CRANE						
Sl. No.	Description	Units	To be filled by the Tenderer			
Guaranteed Technical Particulars						
A)	General details:					
1	Crane to be Installed at					
2	No. of Cranes					
3	Capacity of the Crane-Safe working load		Main Hoist		Aux. Hoist	
4	Type of Cranes					
5	Span (Centre to Centre of Rails)	m				
6	Longitudinal Travel	m				
7	Altitude of the Place					
8	Class of Crane					
9	Class of AH, CT & LT					
10	Standards to which Crane conforms					
11	Operational Speeds (loaded)		MH	AH	CT	LT
a)	Main Motion	m/min.				
b)	Micro Motion	m/min.				
12	Acceleration values	cm/sec ²				
13	Lift of Crane		MH		AH	
a)	Maximum lift of hook above Service bay/Floor level	m				
b)	Maximum drop of hook below Service bay/Floor level	m				
c)	Total Lift	m				
14	Terminal position (CT)		Upstream		Downstream	
a)	of Main hook from center of rails	mm				
b)	of the Auxiliary hook from the center of rails	mm				
15	Maximum Travel (LT)		Service Bay		Other End	
a)	of the Main hook from the inner edge of walls	mm				
b)	of the Auxiliary hook from the inner edge of walls	mm				
16	Minimum working clearances required		Upstream		Downstream	

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GIS HALL EOT CRANE						
Sl. No.	Description	Units	To be filled by the Tenderer			
a)	Between center of rail and the nearest side obstruction	mm				
b)	Between the top of Crane beam and the lowest overhead obstruction	mm				
c)	Height of the End-buffers above the top of the LT crane Rail	mm				
17 a)	Height of LT Rails	mm				
b)	Distance between centre line of MH hook to top of LT Rails	mm				
18	Controls					
a)	Cabin operated		Yes / No			
b)	Radio Control operated / Range		Yes / No			
c)	Type of remote control					
d)	Warning device provided		Yes / No			
19	Tolerance to be confirmed					
a)	Minimum possible travel, with all Brakes adjusted and Hook carrying rated load shall be :	mm	MH	AH	CT	LT
b)	The motor speed not to exceed 105% of synchronous speed while lowering a rated load		Yes / No			
c)	The vertical deflection of the crane girders caused by the rated load plus all dead loads not to exceed 1/1000 of the crane span		Yes / No			
d)	Camber provided	mm				
B)	Mechanical Details:					
1	Crane Bridge					
a)	Type / Construction details					
2	Platform details (as applicable)					
a)	Number, Type & Position of access points					
b)	Length and Width of each Platform	m				
c)	Type of access Platform to cabin					
3	Provision of clamping while in motion during Earthquake		Yes / No			
4	Provision of “Holding Clamps” when crane is not in operation		Yes / No			
5	End Truck					
a)	Number					
b)	Number of Wheels per Truck					
c)	LT Wheel Base diagram - attached		Yes/No			
6	Trolley					
a)	CT Wheel Base diagram - attached		Yes/No			
7	Wheels		Bridge / Truck		Trolley/ Crab	
a)	Number					
b)	Wheel Base	mm				

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GIS HALL EOT CRANE					
Sl. No.	Description	Units	To be filled by the Tenderer		
c)	Spacing details	mm			
d)	Diameter	mm			
e)	Width of Wheel tread	mm			
f)	Material / Chemical composition				
g)	Hardness of Wheels				
h)	Depth of Hardness	mm			
i)	Method and type lubrication for bearing				
j)	Position of Wheels with respect to end buffers	mm	Oneside	Otherside	
8	Rails		For Bridge	For Trolley	
a)	Section/designation (Furnish Cross Sectional diagram of the rail in the bid)				
b)	Weight per meter run	kg/m			
c)	Name of the manufacturer				
9	Rail End Stops				
a)	Type				
i)	Number Provided				
ii)	Material				
b)	Buffers (Type)				
i)	Numbers provided				
ii)	Material				
10	Winding Drum				
a)	Material				
b)	Diameter and Length	mm			
c)	Depth of Groove	mm			
d)	Pitch of Groove	m			
e)	Hardness of Drum	BHN			
11	Sheaves		MH	AH	
a)	Material				
b)	Diameter of Sheaves (Main/Equaliser)				
c)	Groove diameter	mm			
d)	Lead angle				
e)	Type of Sheave Guards provided				
12	Hoisting Rope		MH	AH	
a)	Construction				
b)	Diameter of rope	mm			
c)	Material				
d)	Number of falls				
e)	Minimum factor of safety				
f)	Minimum Breaking load	ton			
13	Crane Hook		MH	AH	
a)	Type				
b)	Lifting Capacity	ton			
c)	Material				
d)	Whether Swiveling?	Yes/No			
14	Gears Box Details		MH	AH	CT LT
a)	Type				

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GIS HALL EOT CRANE						
Sl. No.	Description	Units	To be filled by the Tenderer			
b)	Total No. of reduction					
c)	Reduction ratio					
d)	Method of Lubrication					
e)	Hardness (Gear/Pinion)					
f)	Materials (Gears/Pinion)					
15	Loads					
a)	Load of Crane without Trolley / Crab	ton				
b)	Independent Trolley / Crab load	ton				
c)	Max. Load per Wheel & Total Load on each Crane Rail:					
i)	When Main Hook is at the center position of two LT rails	ton				
ii)	When Main Hook is at the nearest position to center line of LT rails	ton				
d)	Traction forces and impact allowance	ton	Traverse direction		Longitudinal direction	
16	Crane surges in transverse and longitudinal directions	ton	CT		LT	
17	Crane Testing load		125% SWL			
C)	Electrical Details:					
1	Motor particulars		MH	AH	CT	LT
a)	Number of Motors					
b)	Type					
c)	Relative Duty factor		40%			
d)	Voltage/No. of Phase/Frequency					
e)	Speed	rpm				
f)	Rating	kW				
g)	Degree of Protection					
h)	Class of Insulation / Max. temperature rise limit	°C				
i)	Rating in minutes of continuous operation					
j)	Starting Torque	N-m				
k)	Breakdown Torque	N-m				
l)	Locked rotor current	Amp				
m)	Name of the manufacturer					
2	Brake particulars		MH	AH	CT	LT
a)	Type of Brake used					
b)	Name of the manufacturer					
c)	Total number of Brakes used					
d)	Braking Torque	N-m				
i)	EHT					
ii)	DCEM					
e)	Brake Drum diameter : EHT/DCEM	mm				
f)	Brake Shoe width	mm				
g)	Material of Brake lining					

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GIS HALL EOT CRANE						
Sl. No.	Description	Units	To be filled by the Tenderer			
3	Limit switch		MH	AH	CT	LT
a)	Number					
b)	Type					
c)	Manufacturer					
d)	Current Rating					
4	Controllers (for each motion)		MH	AH	CT	LT
a)	Type of Controller					
b)	Number of Steps					
c)	Manufacturer					
5	Type of Long Travel Collectors (DSL)					
a)	AC or DC Voltage					
b)	Type/ Material					
c)	Type of Earthing provided					
6	Type/ Material of Transverse Current Collection System					
7	Lighting & Other Accessories					
a)	Bridge Lighting (type, rating & numbers)					
b)	Underbridge (type, rating & numbers)					
c)	Cabin (type, rating & numbers)					
d)	Warning Lights & Alarm System					
8	Other Electrical Details					
a)	Rating of Incoming Feeder					
b)	Cable size					
c)	Rating of Incoming MCCB					
d)	Normal rating, Fault level and numbers of O/G Feeders for					
i)	Main Hoist Feeders					
ii)	Aux. Hoist Feeders					
iii)	CT Feeders					
iv)	LT Feeders					
v)	Lighting Feeders					
vi)	Misc Feeders					
vii)	Any other Feeder, describe					
e)	Rating of Contactors					
i)	Main Hoist Feeders					
ii)	Aux. Hoist Feeders					
iii)	CT Feeders					
iv)	LT Feeders					
v)	Lighting Feeders					
vi)	Misc Feeders					
vii)	Any other Feeder, describe					
f)	Maximum Current flowing to motor at the time of starting with Voltage & Frequency being at the lowest					
D)	Other Details					
1	Type of Operator's Cabin					
a)	Fixed/Moving and Open/Glazed					

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GIS HALL EOT CRANE				
Sl. No.	Description	Units	To be filled by the Tenderer	
b)	Location on Bridge			
c)	Type of Fire Extinguisher provided			
d)	Seating arrangement			
2	Slenderness Ratio			
a)	Main Compression member			
b)	Bracing and Secondary member			
c)	Ratio of unsupported length of the horizontal projection of any riveted member of Gyration			
3	Minimum Factor of Safety			
a)	For most strained structural Crane part			
b)	For Wire Rope			
4	Maximum Vertical deflection of Bridge Girder			
a)	At Rated Load + Dead load	mm		
b)	At Test load	mm		
5	List Safety devices			
6	Load Limiting Device (Load Cell)		MH	AH
a)	Digital Display unit		Yes/No	N/A
b)	Overload Switch		Yes/No	Yes/No
c)	Compression/Tension Type			
d)	Make/Model			
7	Weight of Major Components			
a)	Weight of Girder (Single)	ton		
b)	Weight of End Carriage with Wheels	ton		
c)	Weight of Cabin	ton		
d)	Weight of Trolley (complete assembly)	ton		
e)	Weight of Crane (without trolley)	ton		
f)	Total Weight of Crane	ton		
8	List of Tools & accessories supplied		Attach separate list	
9	Heaviest package of shipment			
a)	Name			
b)	Weight	ton		
c)	Dimension (L x B x H)	m		
10	Largest Package for Shipment			
a)	Name			
b)	Weight	kg		
c)	Dimension (L x B x H)	m		
11	Painting on Equipment			
a)	Type & Quality			
b)	Extent (no. of coats Primer/Finishing)			
c)	Total dry film thickness (DFT)	microns		

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Technical Data Sheets
		Volume II Section-V
		Sub-Sec-20 Electric Lifts & Elevator

POWERHOUSE ELEVATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
1	General			
a	Manufacturer			
b	Place of Manufacture			
c	Type Designation	-		
d	Applicable Standards	-		
2	Main Data of Powerhouse Elevator			
a	Rated Capacity of Elevator	kg		
b	Corresponding to Number of Persons	Nos.		
c	Rated Speed (at rated load)	m/s		
d	Number of landings	Nos.		
e	Travel	m		
	Landing No. 1 (Service Bay)	m		
	Landing No. 2 (Machine Hall Floor)	m		
	Landing No. 3 (Turbine Floor)	m		
	Landing No. 4 (MIV Floor)	m		
f	Car Leveling tolerance at each floor	mm		
g	Rated Power of motor	kW		
	Rated Voltage	V		
	Rated Frequency	Hz		
	Relative Duty Factor (motor)			
Informative Data				
A	Power House Elevator			
a	Dimensions of Cabin			
	Width	mm		
	Depth	mm		
	Height	mm		
b	Opening Width	mm		
c	Machine Room (width X Depth)	mm		
d	Machine Room Clear Height	mm		
e	Overhead	mm		
f	Pit Depth	mm		
B	Hoist way dimensions	mm		
C	Size of door openings in civil work	mm		
D	Method of operation			
	Drive			
E	Position of counter weight			
F	Car			
a	Car frame			
b	Car panels			
c	Car interior			
d	Car ceiling			
	False ceiling			
e	Car floor			
f	Light fittings			
g	Ventilation			

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		Sub-Sec-20 Electric Lifts & Elevator

POWERHOUSE ELEVATOR				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
h	Car and landing doors			
G	Car Entrance			
a	Size	mm		
b	Operation and type of doors			
H	Landing entrance			
a	Size	mm		
b	Operation and type of doors			
I	Signals available			
J	Features Provided			
a	Overload indication			
b	Emergency stop button			
c	Infra-red light curtain safety			
d	Pressure limit switch safety for car door			
e	Over run Limit Switches			
f	Adjustable door opening and closing time			
g	Automatic operation of Fan			
h	Attendant mode			
i	Home Landing	-		
j	Phase Failure and Phase reversal Protection			
k	Fireman's emergency operation			
l	Automatic Rescue Device (ARD)			
m	Repeated door closing in the event of lock failure			
n	Digital direction and floor indications with Up/Down indications at all landing floors.			
o	Digital direction and car position indicators inside the car.			
p	Rechargeable battery operated alarm bell and emergency light.			
q	Inter communication system inside the car extended upto control room			
r	Push Button Control inside the car			
s	Push Button Control at all landings			
t	Provision of Overspeed Governor Device to apply safety gear in the event if speed of lift car and counter weight exceeds the predetermined limit specified in relevant Standard			
K	Painting Specification			
a	Surface preparation			
b	Prim Coat 1x50 micron DFT			
c	Intermediate Coat 2x80 micron DFT			

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Technical Data Sheets
		Volume II Section-V
		Sub-Sec-21 Fire Detection, Alarm & Protection System

FIRE FIGHTING SYSTEM					
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS					
01	Fire Tank Filling Pump / Booster Pump		Fire Tank Filling Pump	Booster Pump	
a	Type of Pump offered				
b	Design Code				
c	Quantity	nos.			
d	Make/Model				
e	Capacity	m³/hr.			
f	Total Discharge Head- TDH (Bidder to Select)	mWC			
g	Speed	rpm			
h	No. Impeller/Stage	nos.			
i	Efficiency at Operating Point	%			
j	Type of Bearing				
k	Material of Impeller				
l	Material of Casing				
m	Material of Shaft				
n	Drive Motor type				
o	Drive Motor Rating	kW/P			
p	Drive Motor Enclosure/Insulation				
q	List Safety Devices				
r	Type of Strainers				
s	Quantity of Strainers	nos.			
t	Filtering Efficiency of Strainers	% / particle size			
02	Hydrant System				
a	Design Code	NFPA			
b	Design Pressure	kg/m²			
c	No. of Hydrants	nos.			
d	Diameter of Main Pipe	mm			
e	Material/Thickness of Pipe	mm			
f	Design Code of Pipe				
g	Size of Hose Cabinet	mmxmm			
h	Material of Hose Cabinet				
i	Diameter/Length of Fire Hose	mm/m			
j	Design Code of Fire Hose	NFPA			
k	Test Pressure of Fire Hose				
l	Material of Fire Hose				
m	No. of Fire Hose per Hose Cabinet	nos.			
n	Diameter/Length of Fire Hose Reel	mm/m			
o	Material of Fire Hose Reel				

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		Volume II Section-V
		Sub-Sec-21 Fire Detection, Alarm & Protection System

FIRE FIGHTING SYSTEM					
Sl. No.	Description	Units	To be filled by the Tenderer		Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS					
p	Nozzle size of Fire Hose Reel				
q	Design Code of Fire Hose Reel	NFPA			
r	Test Pressure of Fire Hose Reel				
s	No. of Fire Hose Reels	nos.			
t	Type/Thickness of Painting of Hydrant Piping	DFT			
u	Type of wrapping/coating for underground hydrant pipes	mm			
03	Water Spray Systems		HWWS	MVWS / Sprinkler	
a	Design Code	NFPA			
b	Design Pressure at Deluge Valve (DV) inlet	kg/m²			
c	Water Discharge Density	L/min/m²			
d	Total water flow requirement considered for each system	m³/hr.			
e	Size/nos. of Deluge Valve	mm/nos.			
f	Operating Mechanism of Deluge Valve	Hydraulic/ Electric			
g	No. of Rings & dia. Of ring pipe				
h	Dia / Nos. of Spray Nozzles				
i	Make/Type of Fire Detectors				
j	Design Code of Detectors				
k	No. of Fire Detectors				
l	Minimum pressure at most remote sprinkler				
04	Inert Gas Clean Agent System				
a	Type				
b	Applicable Standards				
c	Agent / Gas in Cylinder				
d	Agent / Gas Cylinder Pressure	Bar			
e	Agent / Gas Cylinder Capacity & Number	Litres / Nos.			
f	Nozzles Type and material				
g	Valves type				
h	Valves MOC				
05	Nitrogen Injection System (NIFPES)				
a	Type				
b	Applicable Standards				
c	System Activation Mechanism				
d	Nitrogen Cylinder Pressure	Bar			

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		Sub-Sec-21 Fire Detection, Alarm & Protection System

FIRE FIGHTING SYSTEM						
Sl. No.	Description	Units	To be filled by the Tenderer			Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS						
e	Nitrogen Cylinder Capacity & Number	Litres / Nos.				
f	Testing Pressure of Piping System	Bar				
g	Material of Piping System					
h	Oil drain Valve Type, size & MOC	Nb				
i	Nitrogen Injection Valve Type, size & MOC	Nb				
j	Control Box mounting method					
k	Degree of Protection of Control box					
06	Hydrant & Deluge Valves		Hydrant Valve	Deluge Valve		
a	Make					
b	Type					
c	Design Code					
d	Design/ Pressure Rating	kg/m ²				
e	Material of Construction					
i)	Body					
ii)	Trim					
iii)	Washer, Gasket etc.					
iv)	Quick Coupling Connection					
v)	Spring					
vi)	Cap & Chain					
vii)	Strainer Type & Efficiency					
viii)	Pressure Gauge Type & Make					
ix)	Actuation Device	rpm				
x)	Main & Automatic Drain Valve	rpm				
xi)	Control Valve Type	rpm				
07	Valves		Globe	B-fly	Gate	NRV
a	Make					
b	Design/ Pressure Rating	kg/m ²				
c	Design Code					
d	Material of Construction					
i)	Body					
ii)	Trims					
iii)	Disc					
iv)	Seats rings					
v)	Seals					
vi)	Shaft/Spindle					
vii)	Gland Packing					
viii)	Bonnet Stud/Nut					

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		Sub-Sec-21 Fire Detection, Alarm & Protection System

FIRE FIGHTING SYSTEM							
Sl. No.	Description	Units	To be filled by the Tenderer				Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS							
ix)	Yoke Nut						
08	Fire Detection Equipment						
a	Multi Sensors						
i)	Design Standards						
ii)	Whether UL Listed	Yes / No					
iii)	Location						
b	Photoelectric Sensors						
i)	Design Standards						
ii)	Whether UL Listed						
iii)	Location						
c	Heat Sensors						
i)	Design Standards						
ii)	Whether UL Listed						
iii)	Location						
d	Aspiration Type Smoke detector						
i)	Design Standards						
ii)	Whether UL Listed						
iii)	Location						
e	Linear Heat Sensing Cables						
i)	Design Standards						
ii)	Whether UL Listed						
iii)	Operating Voltage						
iv)	Operating Temperature (Min)						
v)	Conductor Material						
vi)	Protective Cover						
f	Type & Nos. of Manual Call Points (MCP)						
g	Rating/Specification of Hooters						
h	Public Address System	Yes/No					
i	No. of Microphones/Speakers	nos.					
j	Provision of Exit Signs	Yes/No					
k	Portable Extinguishers Location Signs	Yes/No					
l	Fire Safety Equipment; Furnish List	Yes/No					
09	Portable Fire Extinguishers						
a	Pressurised Water Type (9 lit Cap.)						
i)	Design Standard	NFPA					
ii)	Quantity	Nos.					
b	CO ² type (4.5 kg Cap.)						
i)	Design Standard	NFPA					

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FIRE FIGHTING SYSTEM				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS				
ii)	Quantity	Nos.		
c	CO2 type-trolley mounted (22.5 kg Cap.)			
i)	Design Standard	NFPA		
ii)	Quantity	Nos.		
d	DCP type (5 kg Cap.)			
i)	Design Standard	NFPA		
ii)	Quantity	Nos.		
e	Foam type (9 lit Cap.)			
i)	Design Standard	NFPA		
ii)	Quantity	Nos.		
f	Wet Chemical Type (6 lit Cap.)	For Kitchen		
i)	Design Standard	NFPA		
ii)	Quantity	Nos.		
g	Any Other type, specify			
i)				
ii)				

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Technical Data Sheets
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Sub-Sec-22 HVAC System

HVAC SYSTEM									
Sl. No.	Description	Units	To be filled by the Tenderer						
Guaranteed Technical Particulars									
A)	Ventilation System								
1.1	Propeller / Tube Axial Fans								
1.1.1			Machine Hall	Battery Room	Battery Charger & UPS Room	Mech-W-shop	Elec-W-shop	Lift M/c Room	Toilets
a)	Make								
b)	Type								
c)	Quantity								
d)	Flow rate	m ³ /hr							
e)	Total Pressure of Fan	Pa							
f)	Diameter of Fan	mm							
g)	Rated Speed of Fan	rpm							
h)	Noise Level	dB(A)							
i)	Motor Rating	kW/P							
j)	Degree of Protection of Motor	IP 55							
k)	Class of Insulation of Motor & Temp.rise	F/B							
l)	Provision of accessories such as Vibration mounts, Rain Cowl, Bird screen etc.	Yes/No							
B)	Air Conditioning								
1.2	Air Conditioning Units / System								
I	Indoor Units (IDU)		Control Room						
a)	Cooling Load of each Room	kcal/hr.							
b)	Make / Model								
c)	Capacity of IDU	kcal/hr.							
d)	Quantity	nos.							
e)	Fan Air Flow	m ³ /hr.							
f)	Fan Motor rating	kW/P							
g)	Noise Level	dB(A)							
h)	Type of Filter Material								
i)	Type of Mounting - Wall Type	Yes/No							
j)	Controller								
	• Make / Model								
	• Type - Fixed / Remote								

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		Sub-Sec-22 HVAC System

HVAC SYSTEM			
Sl. No.	Description	Units	To be filled by the Tenderer
k)	Humidifier - Make/Type		
l)	Humidifier - Capacity		
II	Outdoor Unit (ODU)		
a)	Quantity / Make		
b)	Cooling capacity of each ODU	kcal/hr.	
c)	Type of Compressor	Scroll / Screw	
d)	No. of Compressor in each ODU	nos.	
e)	Power requirement of each Compressor	kWh	
f)	Total Power Requirement of each ODU	kWh	
g)	Unit Dimensions (LxWxH)	mm	
h)	Noise Level	dB(A)	
i)	Controller		
	• Make / Model		
	• Type - Fixed / Remote		
III	Refrigerant Used	R 22	
IV	Dia. / Material of Refrigerant Piping		

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		Sub-Sec-23 Oil Handling Equipment

LUBRICATING OIL TREATMENT PLANT				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
Guaranteed Technical Particulars				
a	Make			
b	Type / Model			
c	Quantity			
d	Performance Parameters			
	i) Free water (100% reduction)			
	ii) Moisture content (<50 PPM)			
	iii) Filtration (<1 Micron)			
e	Capacity	LPH		
f	Centrifuge (Make)			
g	Rating - Heater bank	kW		
h	Inlet Pumps			
	i) Quantity	Nos.		
	ii) Type/ Model			
	iii) Flow	m ³ /hr		
	iv) Motor Rating	kW/P		
i	Discharge Pumps			
	i) Quantity	Nos.		
	ii) Type/ Model			
	iii) Flow	m ³ /hr		
	iv) Motor Rating	kW/P		
j	Vacuum Pump			
	i) Quantity	Nos.		
	ii) Type/ Model			
	iii) Flow	m ³ /hr		
	iv) Motor Rating	kW/P		
k	Hoses			
	i) Make			
	ii) Type/ Model			
	iii) Quantity	Nos.		
	iv) Size (Dia. x Length)	mm		
	v) Pressure Rating	Bar		

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		Sub-Sec-24 Mechanical Workshop

MECHANICAL WORKSHOP				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS				
01	Universal Milling Machine			
a	Manufacturer/Model			
b	Type			
c	Table – Length x width	mm x mm		
d	Table swivel	deg		
e	No. of Spindle Speed	nos.		
f	Speed range	rpm		
g	Traverses (Longitudinal x Transversal x Vertical)	mm		
h	No. of Feeds			
02	Lathe Machine			
a	Manufacturer/Model			
b	Type			
c	Max. & Min dia. and height which can be machined.	mm		
d	Admit between Centres	mm		
e	Bed (length x width)	mm		
f	Swing over Bed	deg		
g	Number of Spindle speeds	nos.		
h	Feed Range			
i	Threads Range	Inch		
03	Radial Drilling Machine			
a	Manufacturer/Model			
b	Type			
c	Capacity (drilling in Steel and Cast Iron)	Dia. (mm)		
d	No. of spindle speeds			
e	Range of Spindle speeds	rpm		
f	No. of Power Feeds			
g	Range of Power Feeds	mm/rev		
h	Drilling Radius (Max /Min)	mm		
i	Quill Traverse	mm		
j	Base plate to Spindle (Max/ Min)	mm		
k	Drilling Head Traverse	mm		
l	Arm Traverse	mm		
04	Electrical Hand Drilling Machine			
a	Manufacture/ Model			
b	Type			
c	Capacity (drilling in Steel and Cast Iron)	mm		
05	Table Drilling Machine			
a	Manufacturer/ Model			
b	Drilling capacity (in steel)	mm		
c	Size of working table			
d	Range of Spindle speeds			

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		Sub-Sec-24 Mechanical Workshop

MECHANICAL WORKSHOP				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS				
06	Shaper Machine			
a	Manufacturer/ Model			
b	Maximum Stroke	mm		
c	Maximum distance table to ram	mm		
07	Power Hacksaw			
a	Manufacturer/Model			
b	Type			
c	Cutting capacity dia/square	mm		
d	Stroke per minute			
e	Weight			
08	Double-ended Pedestal Grinding Machine			
a	Manufacturer/Model			
b	Type			
c	Wheel Size	mm		
d	Wheel Center distance	mm		
e	Weight	kg		
09	Thyristorized Welding Rectifier			
a	Manufacturer/Model			
b	Type			
c	Size	mm		
d	Current Range	Amp		
e	Welding Current Control type			
f	Class of Insulation			
g	Type of cooling			
h	Weight	kg		
10	Electric Welding Machine			
a	Manufacture/ Model			
b	Type			
c	Current Range			
11	Bench Drill			
a	Manufacturer/Model			
b	Type			
c	Size	mm		
12	Oxygen Acetylene Set with Accessories			
d	Manufacturer/Model			
e	Type			
f	Size	mm		
13	Portable Tools			
a	Portable Electrical Drilling Machine with magnetic base			
i)	Manufacturer			
ii)	Type/Model			

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		Sub-Sec-24 Mechanical Workshop

MECHANICAL WORKSHOP				
Sl. No.	Description	Units	To be filled by the Tenderer	Remarks (if any)
GUARANTEED TECHNICAL PARTICULARS				
iii)	Quantity	nos.		
iv)	Size/ Capacity	mm		
b	Portable Straight Grinder			
i)	Manufacturer			
ii)	Type/Model			
iii)	Quantity	nos.		
iv)	Size/ Capacity	mm		
c	Portable Angle Grinder			
i)	Manufacturer			
ii)	Type/Model			
iii)	Quantity	nos.		
iv)	Size/ Capacity	mm		
d	Portable type of Electric Oven for welding rod preheating			
i)	Manufacturer			
ii)	Type/Model			
iii)	Quantity	nos.		
iv)	Size/ Capacity	mm		
e	Portable Electric Blower			
i)	Manufacturer			
ii)	Type/Model			
iii)	Capacity	m ³ /min		
f	Portable Flexible Shaft Grinder			
i)	Manufacturer			
ii)	Type/Model			
iii)	Quantity	nos.		
iv)	Size/ Capacity	mm		
g	Portable Sander / Polisher			
i)	Manufacturer			
ii)	Capacity			
h	Multiple Socket with default Circuit Breaker and Cable Reel			
i)	Manufacturer			
ii)	Type			
14	Vacuum Cleaner (Wet & Dry)			
a	Manufacturer			
b	Capacity			
15	Manual Trolley (4 Wheeled)			
a	Manufacturer			
b	Capacity	Ton		
c	Platform Size	mm		