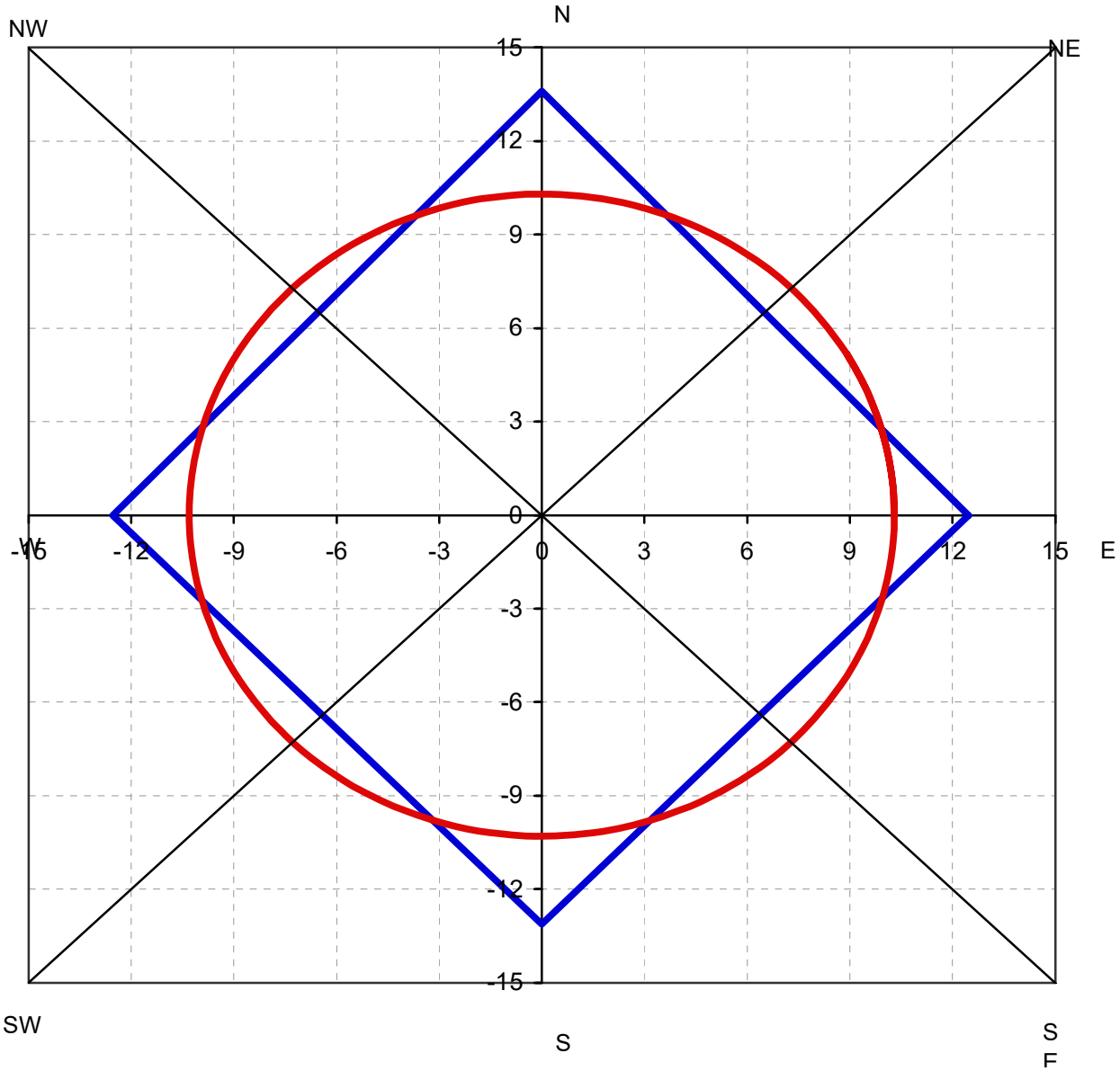
E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-3
Co-ordinate : 786234E, 3118900N



Total Area of Polygon : 334

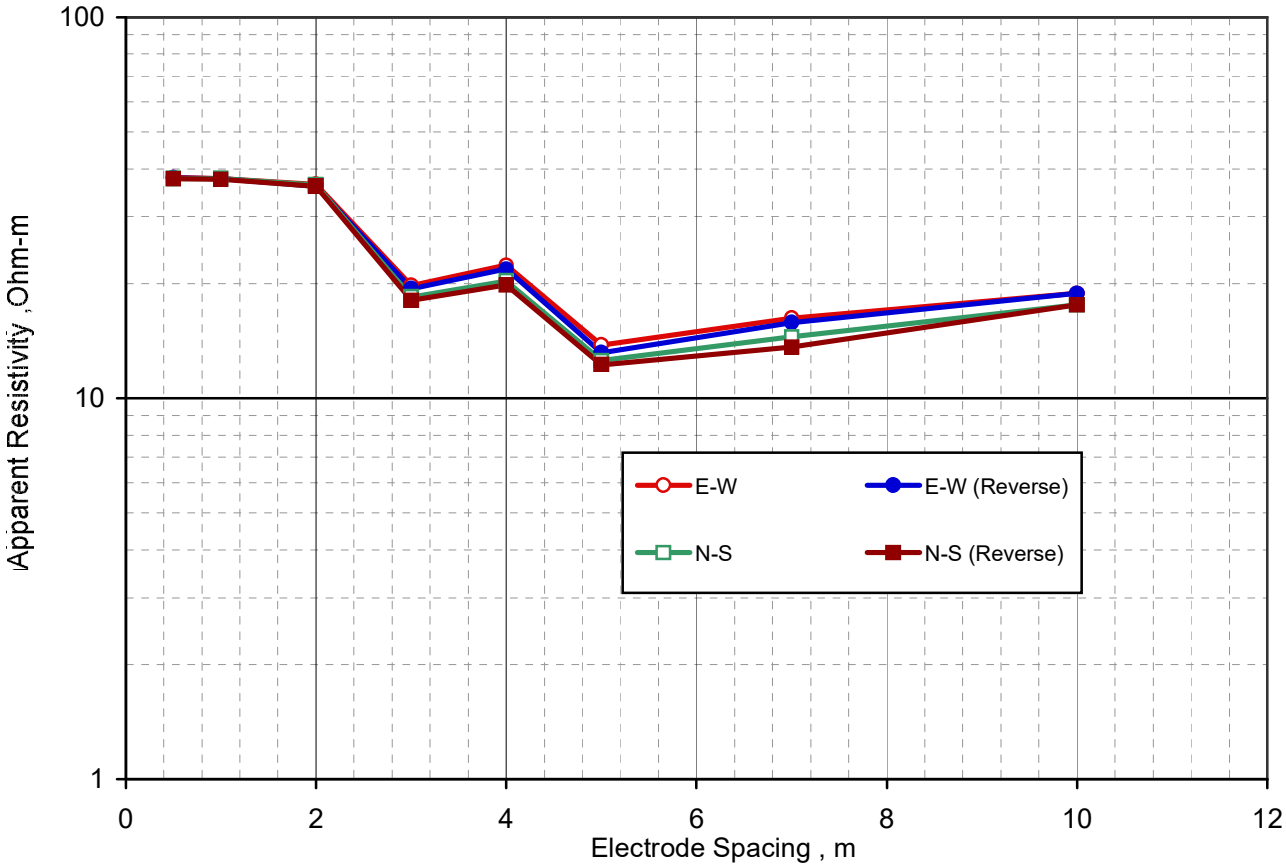
Radius of Equivalent Circle=Mean Resistivity : 10 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-4
Co-ordinate : 786175E, 3119228N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	38.0	37.9	37.7	37.7
1.0	37.7	37.7	37.8	37.6
2.0	36.4	36.1	36.3	36.1
3.0	19.8	19.4	18.5	18.1
4.0	22.4	21.9	20.4	19.9
5.0	13.8	13.2	12.6	12.3
7.0	16.3	15.8	14.5	13.6
10.0	18.8	18.8	17.6	17.6
Mean Resistivity	25	25	24	24

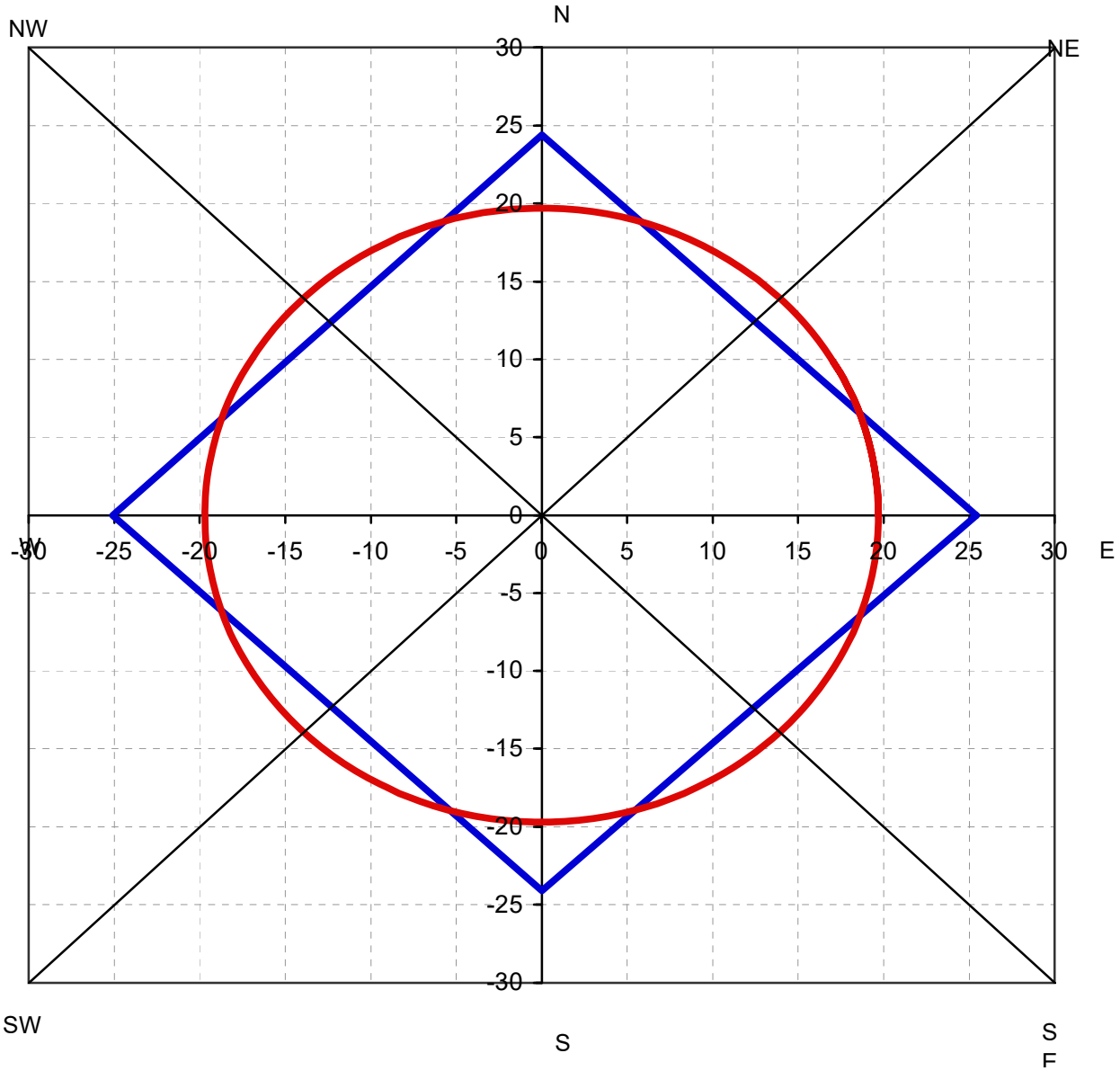
Mean Resistivity Value, ohm-m : 19.7 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-4
Co-ordinate : 786175E, 3119228N



Total Area of Polygon : 1225

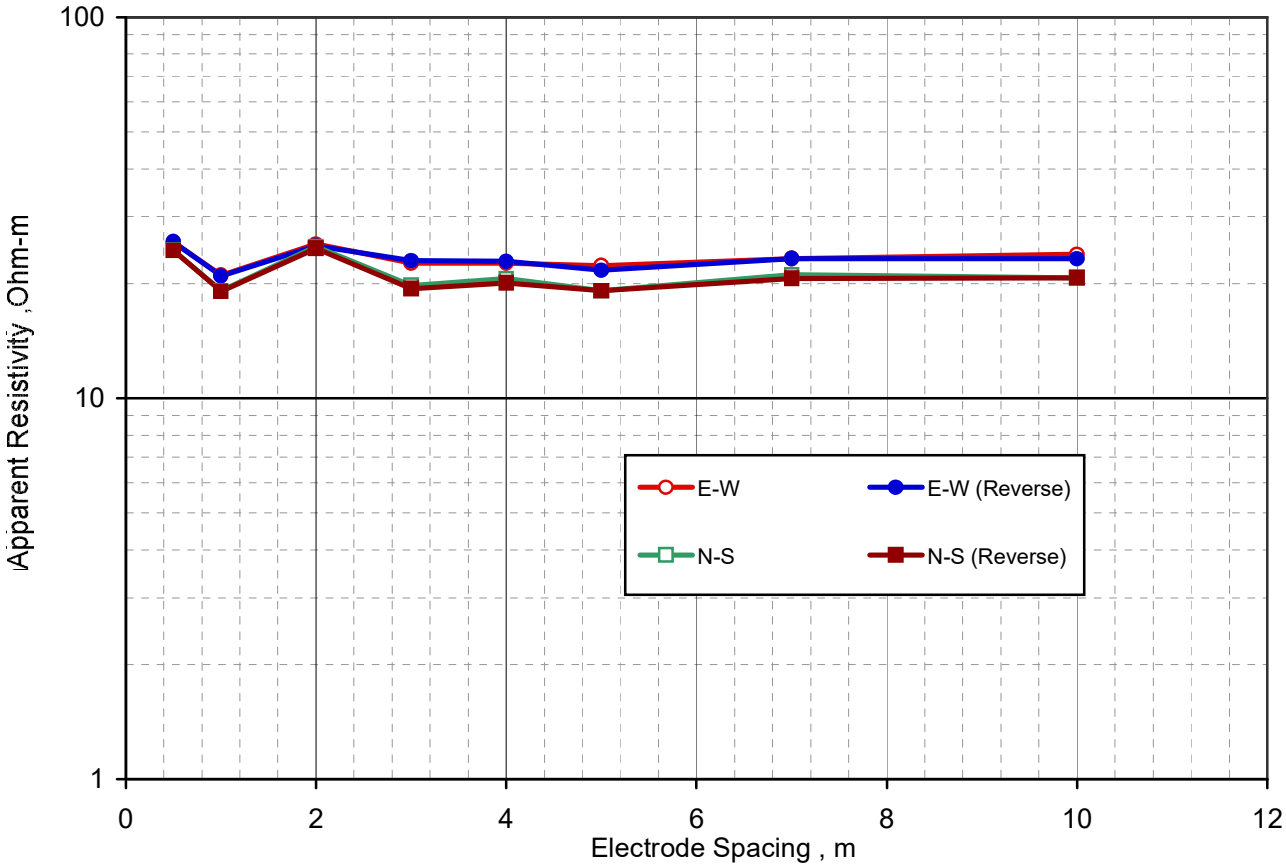
Radius of Equivalent Circle=Mean Resistivity : 20 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-5
Co-ordinate : 785973E, 3118944N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	25.8	25.7	24.5	24.4
1.0	21.0	20.9	19.2	19.1
2.0	25.4	25.1	25.0	24.8
3.0	22.6	23.0	19.8	19.4
4.0	22.6	22.9	20.6	20.1
5.0	22.3	21.7	19.2	19.2
7.0	23.3	23.3	21.1	20.7
10.0	23.9	23.2	20.7	20.7
Mean Resistivity	23	23	21	21

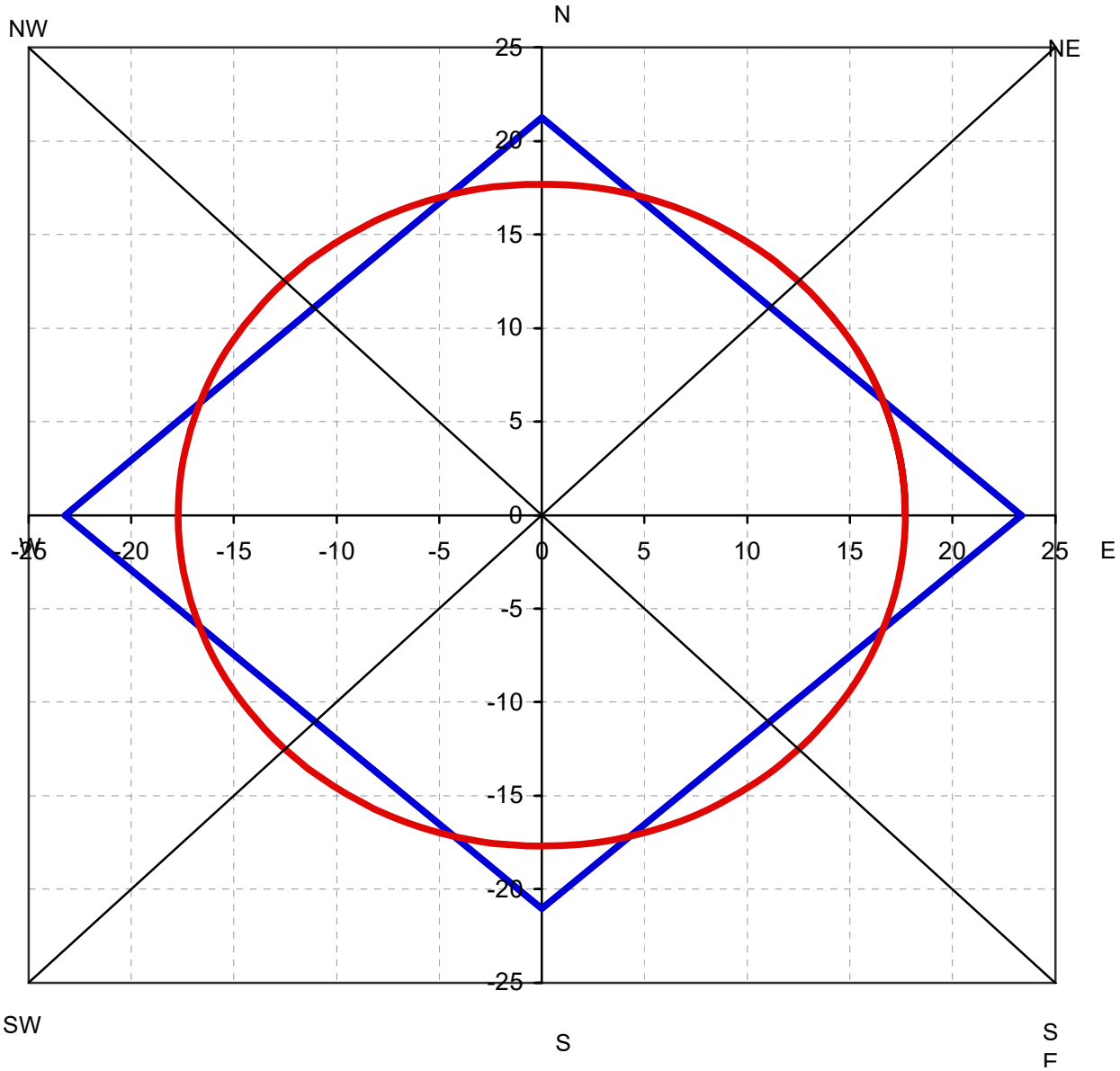
Mean Resistivity Value, ohm-m : 17.7 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-5
Co-ordinate : 785973E, 3118944N



Total Area of Polygon : 986

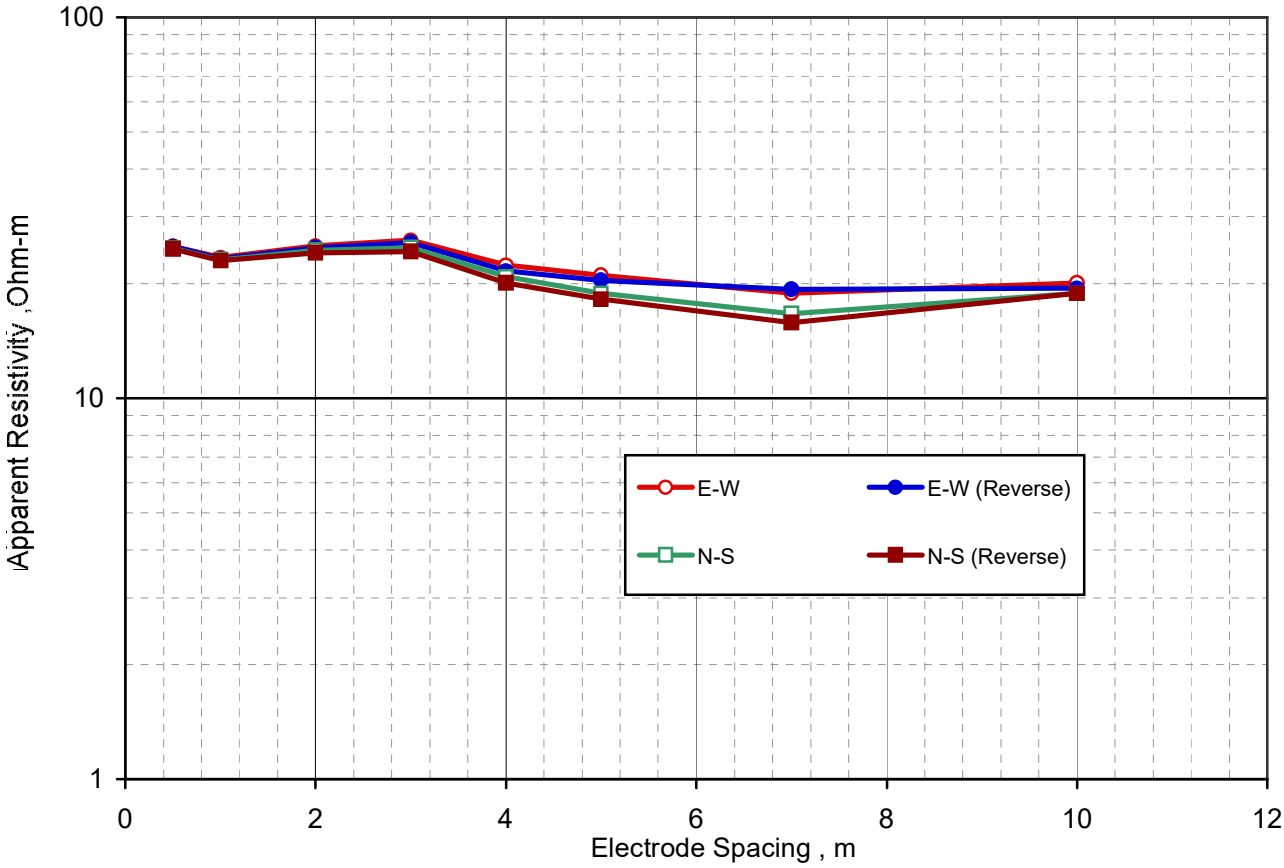
Radius of Equivalent Circle=Mean Resistivity : 18 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-6
Co-ordinate : 786142E, 3118643N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	25.1	25.0	24.8	24.7
1.0	23.4	23.2	23.1	23.0
2.0	25.1	24.9	24.5	24.1
3.0	26.0	25.6	24.9	24.3
4.0	22.4	21.6	20.9	20.1
5.0	21.0	20.4	18.8	18.2
7.0	18.9	19.4	16.7	15.8
10.0	20.1	19.5	18.8	18.8
Mean Resistivity	23	22	22	21

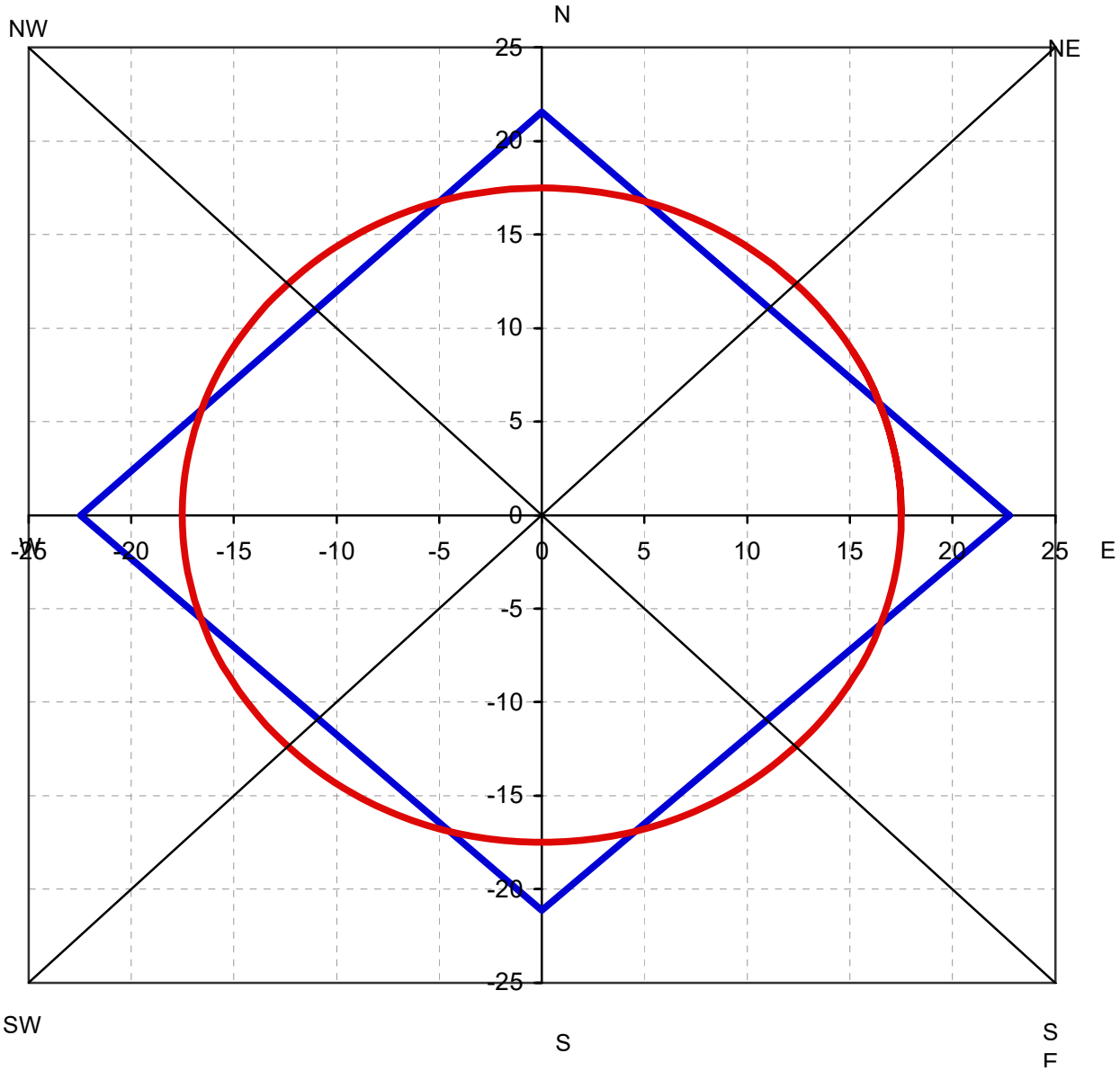
Mean Resistivity Value, ohm-m : 17.5 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-6
Co-ordinate : 786142E, 3118643N



Total Area of Polygon : 966

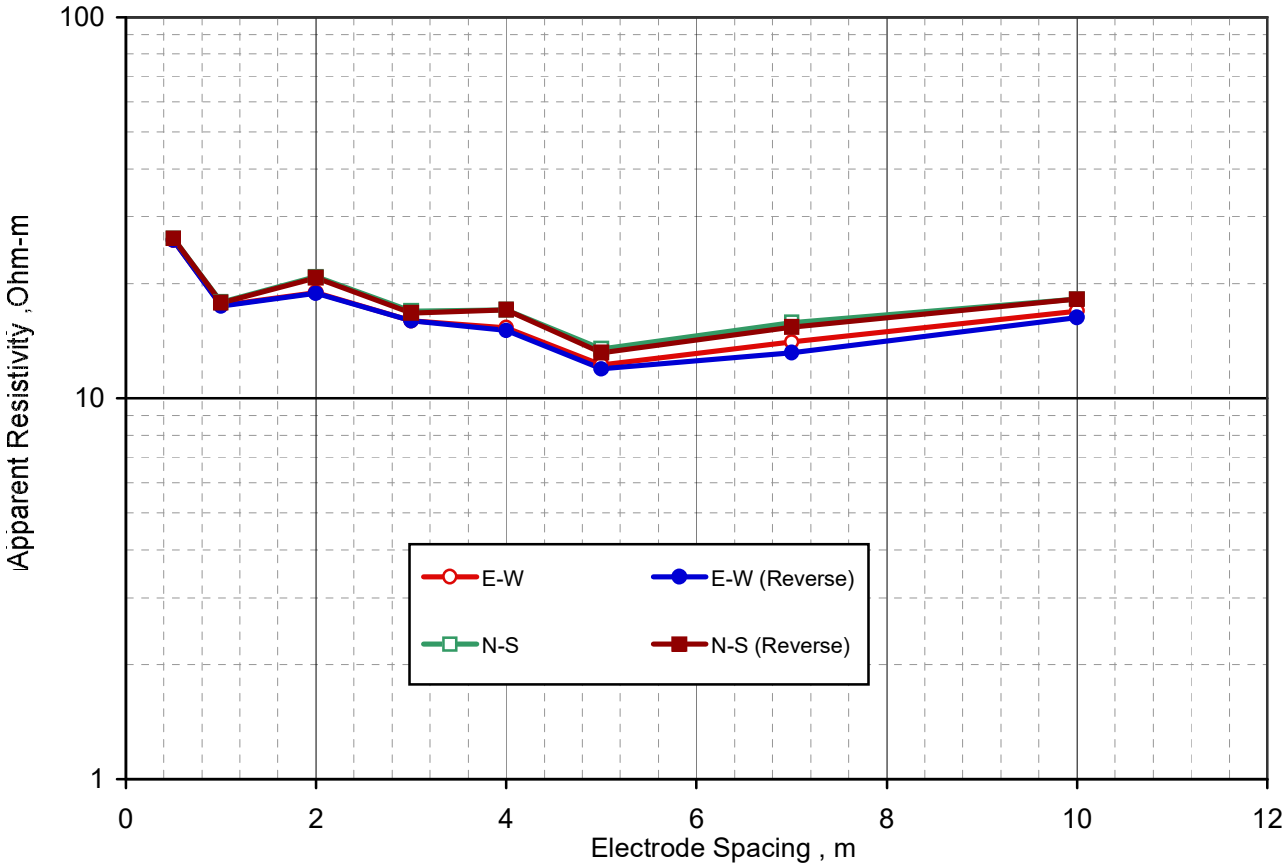
Radius of Equivalent Circle=Mean Resistivity : 18 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-7
Co-ordinate : 785964E, 3118820N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	26.1	26.0	26.3	26.3
1.0	17.5	17.5	17.9	17.8
2.0	19.0	18.8	20.9	20.7
3.0	16.0	16.0	17.0	16.8
4.0	15.3	15.1	17.1	17.1
5.0	12.3	11.9	13.5	13.2
7.0	14.1	13.2	15.8	15.4
10.0	17.0	16.3	18.2	18.2
Mean Resistivity	17	17	18	18

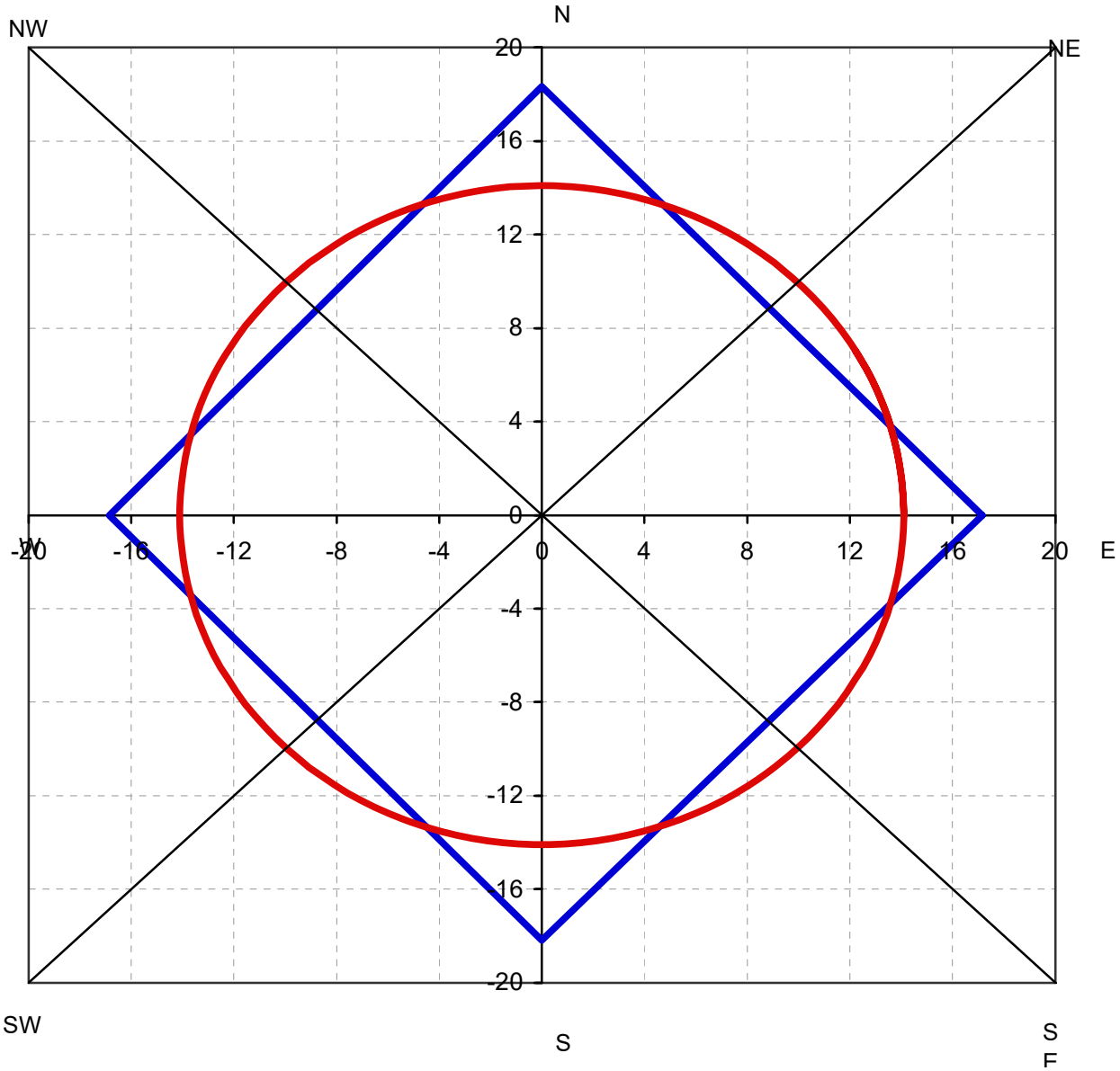
Mean Resistivity Value, ohm-m : 14.1 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-7
Co-ordinate : 785964E, 3118820N



Total Area of Polygon : 621

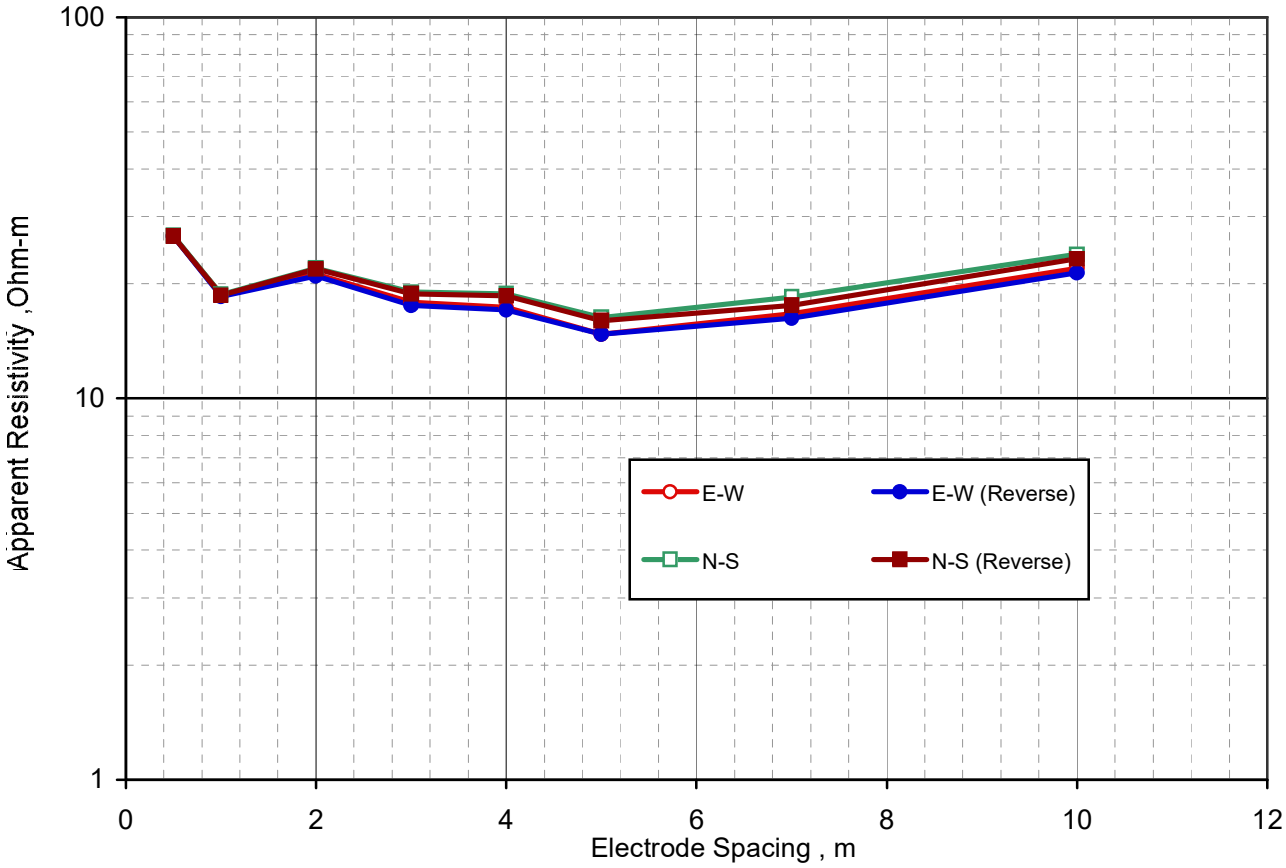
Radius of Equivalent Circle=Mean Resistivity : 14 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-8
Co-ordinate : 785939E, 3118664N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	26.7	26.6	26.8	26.7
1.0	18.7	18.5	18.8	18.7
2.0	21.2	21.0	22.0	21.9
3.0	17.9	17.5	19.0	18.8
4.0	17.3	17.1	18.8	18.6
5.0	14.8	14.8	16.3	16.0
7.0	16.7	16.3	18.5	17.6
10.0	22.0	21.4	23.9	23.2
Mean Resistivity	19	19	21	20

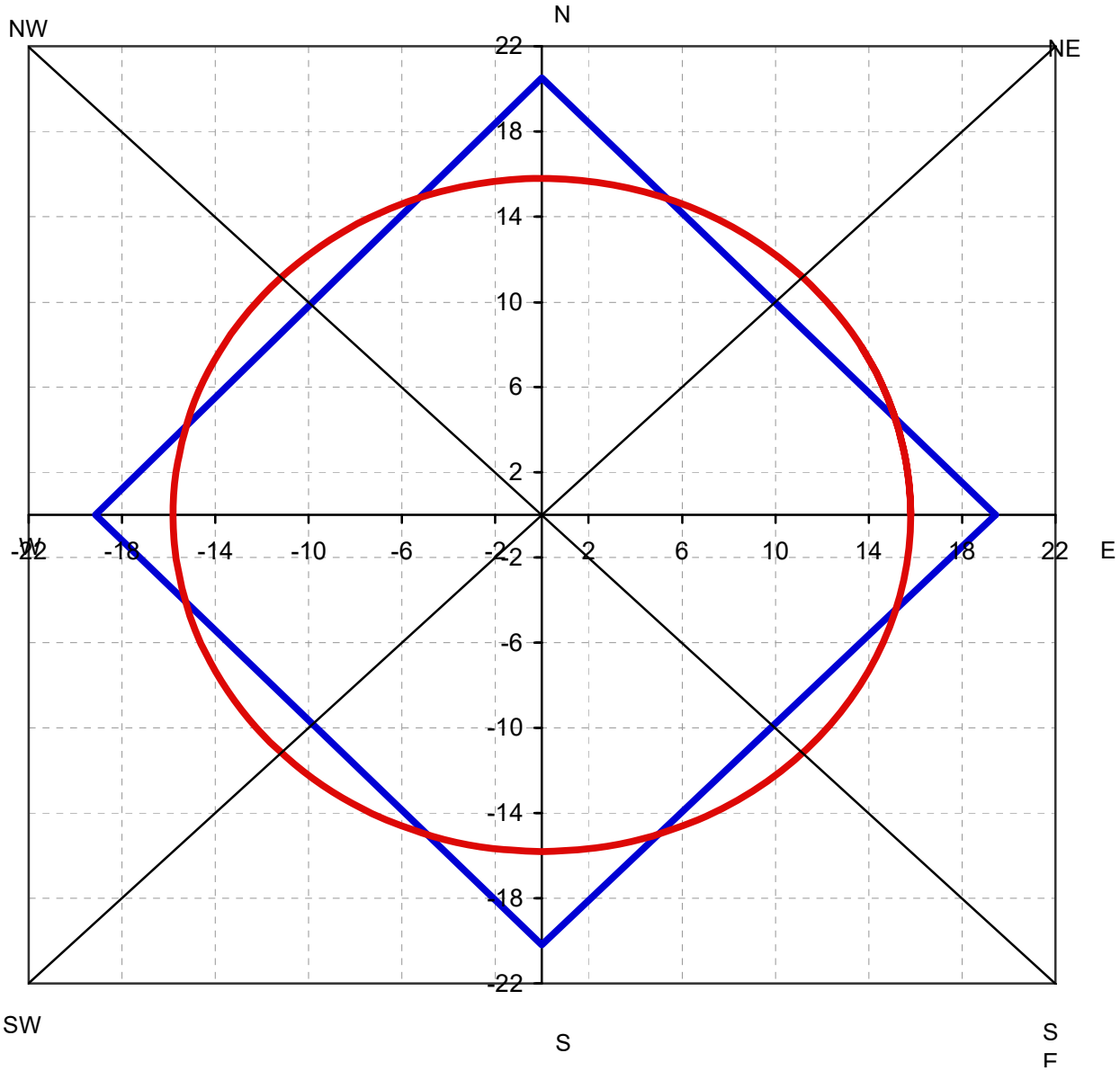
Mean Resistivity Value, ohm-m : 15.8 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-8
Co-ordinate : 785939E, 3118664N



Total Area of Polygon : 785

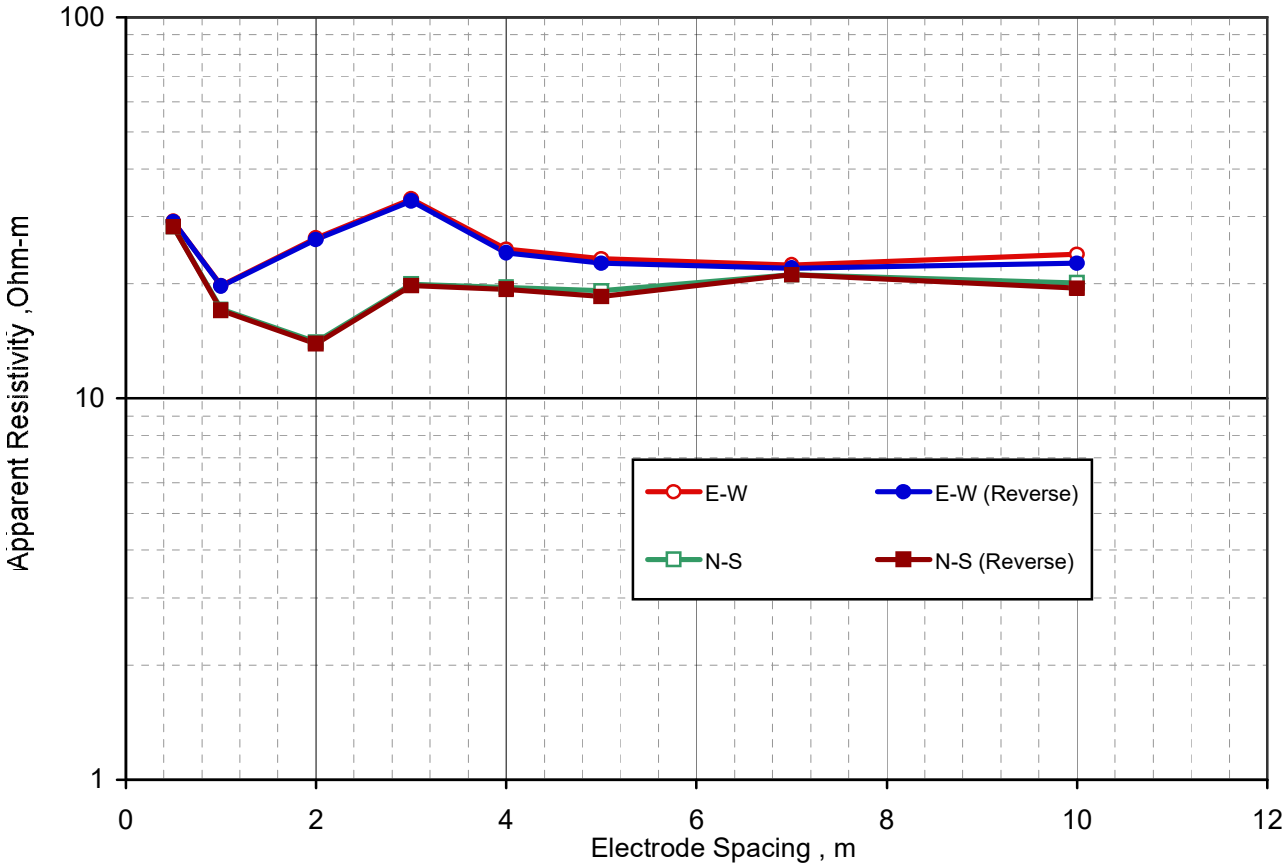
Radius of Equivalent Circle=Mean Resistivity : 16 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-9
Co-ordinate : 785834E, 3118652N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	29.2	29.1	28.2	28.2
1.0	19.8	19.7	17.2	17.0
2.0	26.4	26.1	14.1	13.9
3.0	33.4	33.0	20.0	19.8
4.0	24.6	24.1	19.6	19.4
5.0	23.2	22.6	19.2	18.5
7.0	22.4	22.0	21.1	21.1
10.0	23.9	22.6	20.1	19.5
Mean Resistivity	25	25	20	20

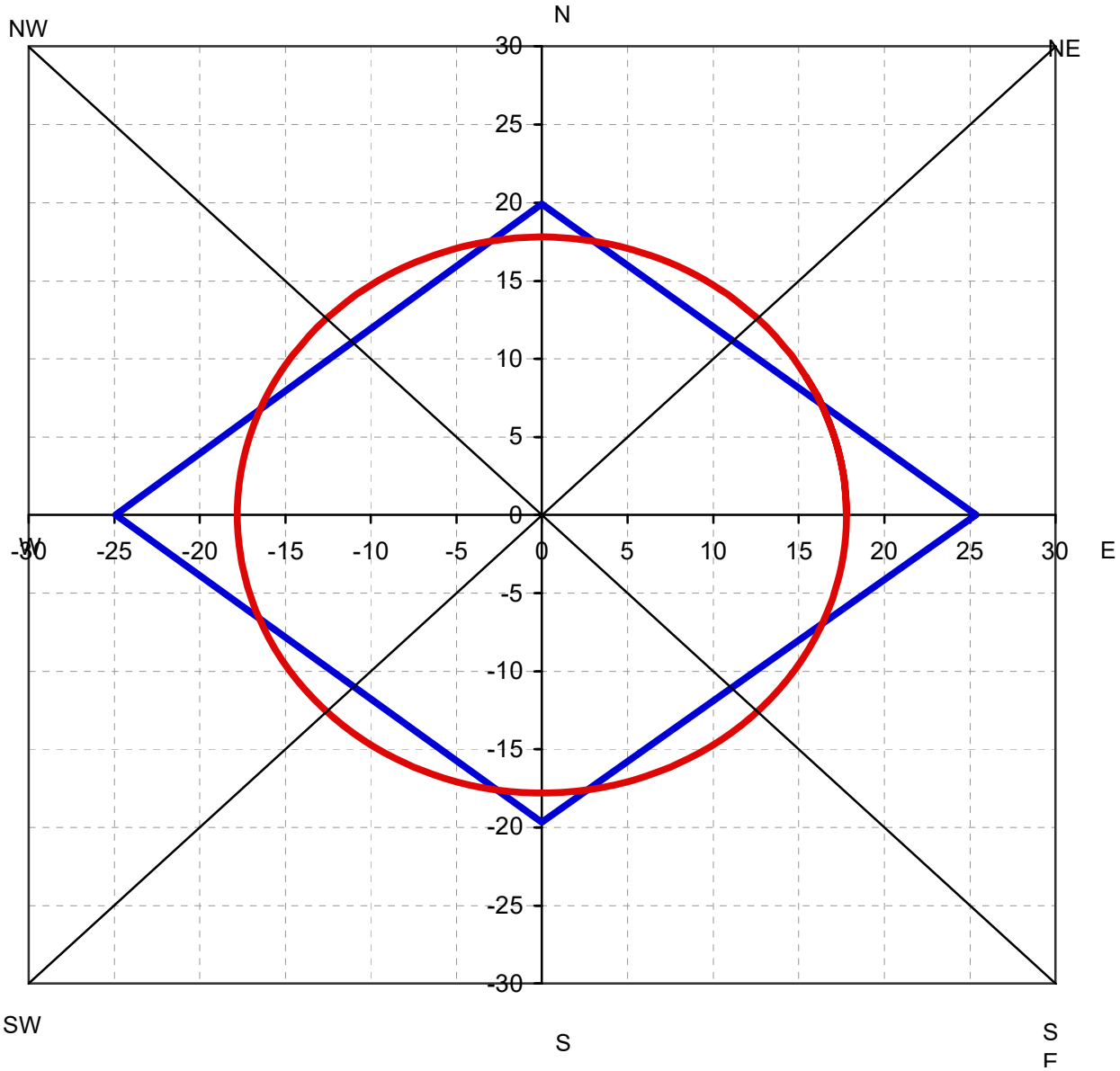
Mean Resistivity Value, ohm-m : 17.8 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-9
Co-ordinate : 785834E, 3118652N



Total Area of Polygon : 996

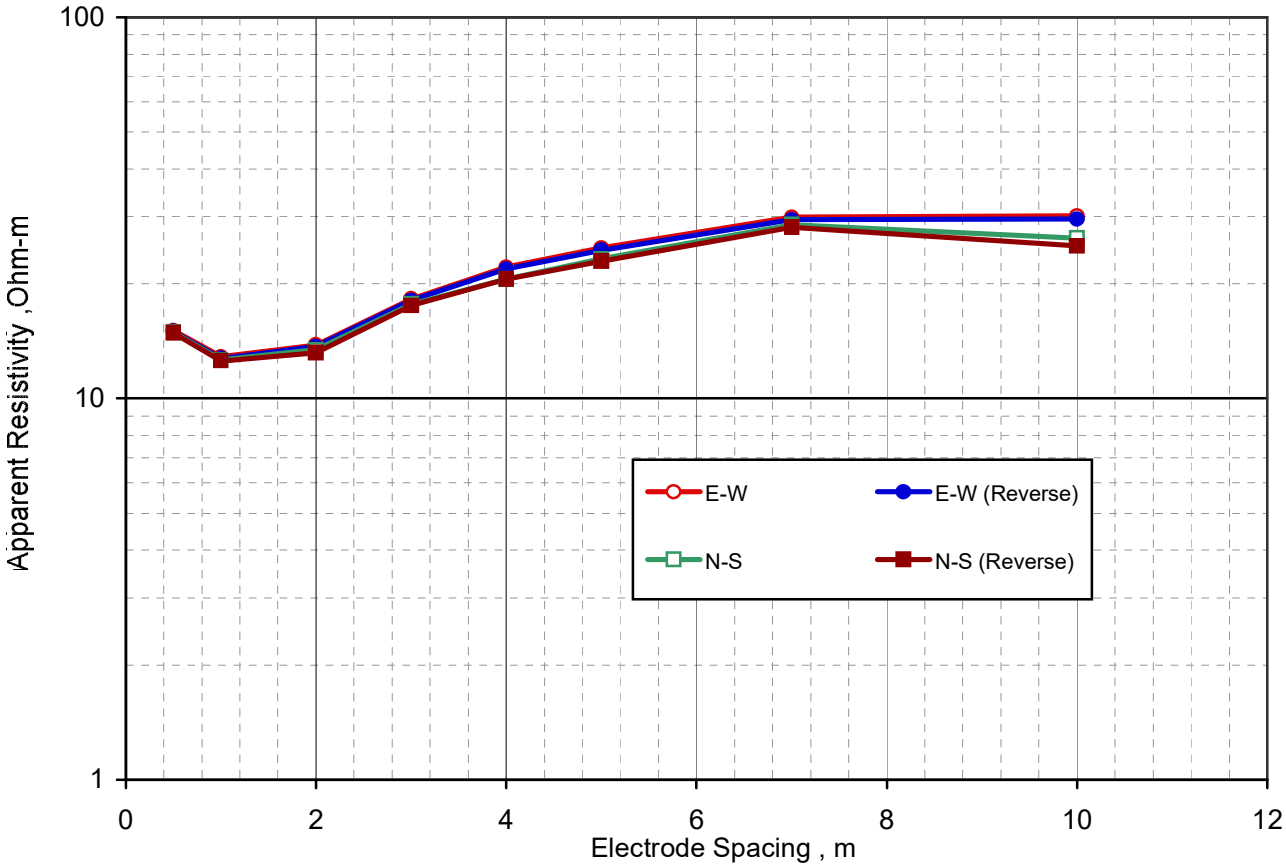
Radius of Equivalent Circle=Mean Resistivity : 18 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-10
Co-ordinate : 785502E, 3118672N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	15.1	15.0	15.0	14.9
1.0	12.9	12.8	12.6	12.6
2.0	13.8	13.7	13.4	13.2
3.0	18.3	18.1	17.7	17.5
4.0	22.1	21.9	20.6	20.6
5.0	24.8	24.5	23.2	22.9
7.0	29.9	29.5	28.6	28.1
10.0	30.2	29.5	26.4	25.1
Mean Resistivity	21	21	20	19

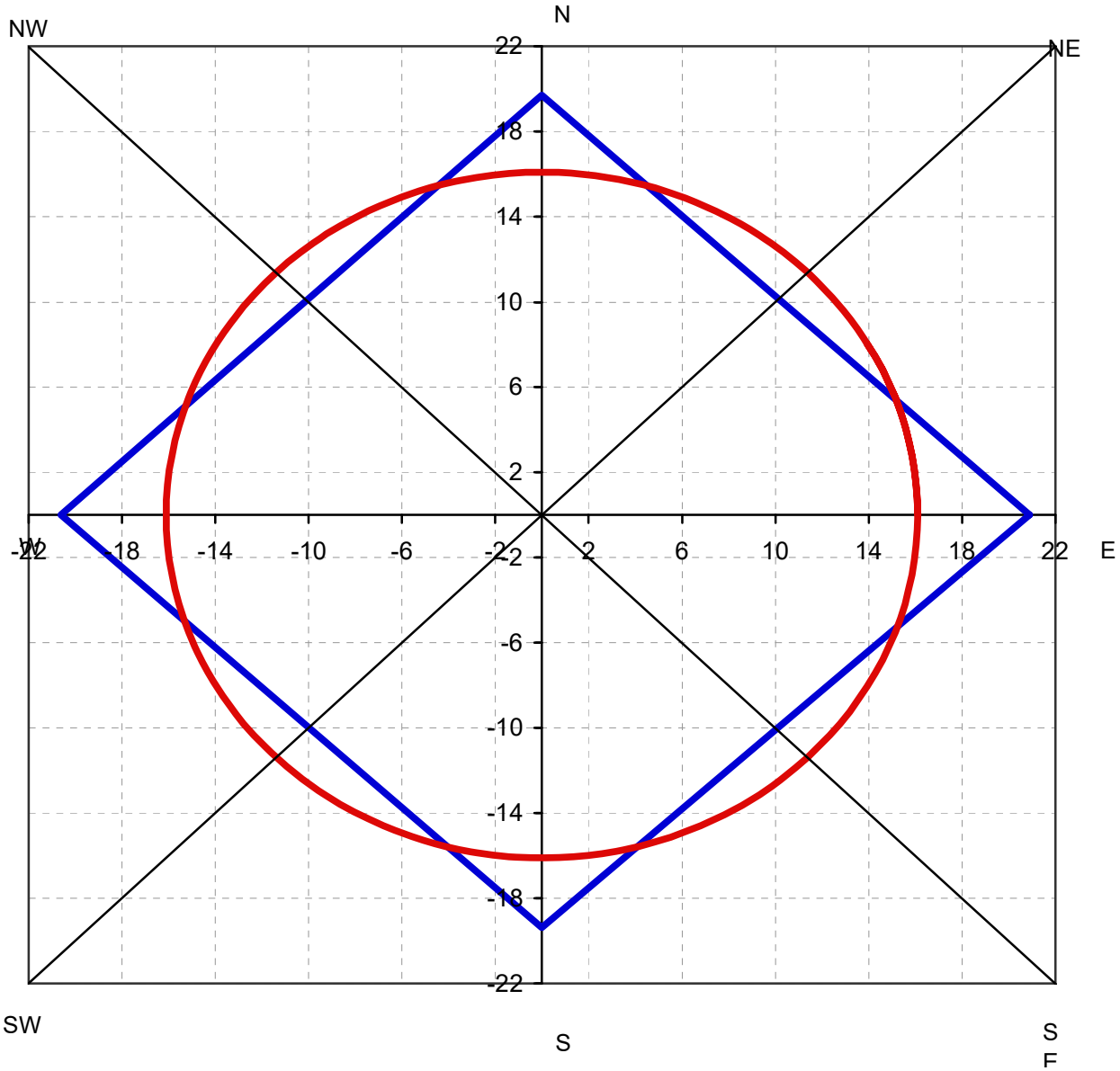
Mean Resistivity Value, ohm-m : 16.1 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-10
Co-ordinate : 785502E, 3118672N



Total Area of Polygon : 811

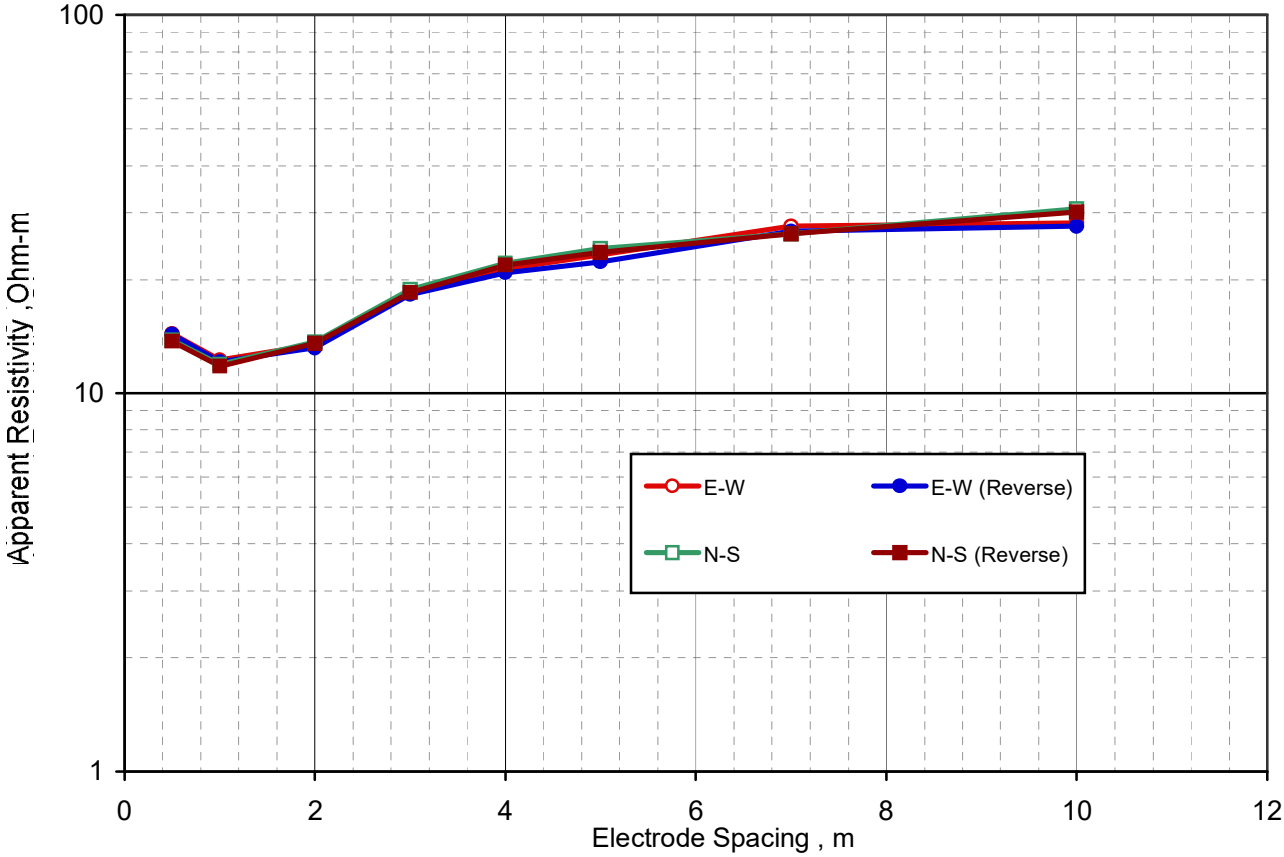
Radius of Equivalent Circle=Mean Resistivity : 16 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-11
Co-ordinate : 785346E, 3118656N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	14.4	14.3	13.8	13.8
1.0	12.3	12.1	11.9	11.8
2.0	13.4	13.2	13.7	13.6
3.0	18.5	18.3	18.8	18.5
4.0	21.4	20.9	22.1	21.9
5.0	23.2	22.3	24.2	23.6
7.0	27.7	26.8	26.4	26.4
10.0	28.3	27.6	30.8	30.2
Mean Resistivity	20	19	20	20

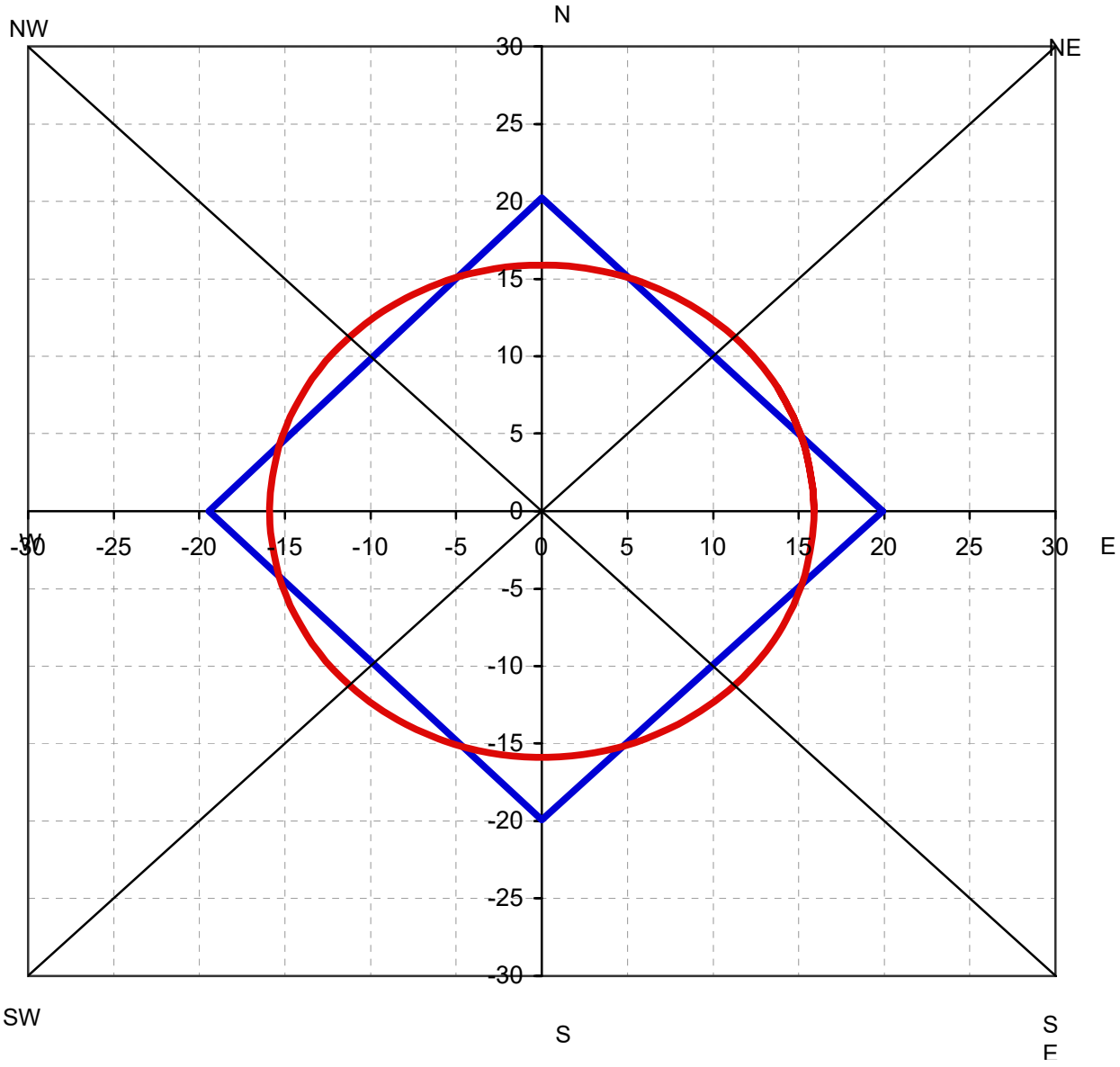
Mean Resistivity Value, ohm-m : 15.9 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-11
Co-ordinate : 785346E, 3118656N



Total Area of Polygon : 790

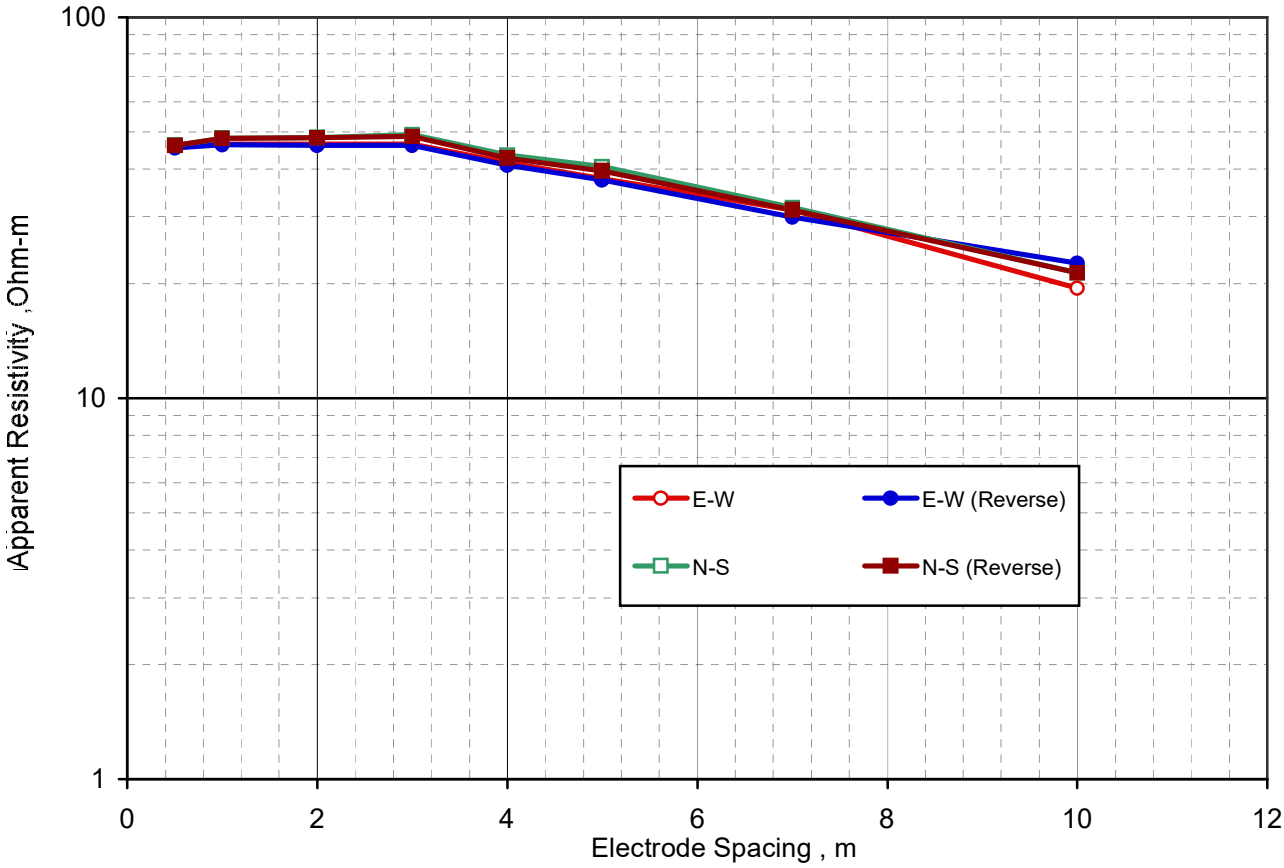
Radius of Equivalent Circle=Mean Resistivity : 16 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-12
Co-ordinate : 785735E, 3117990N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	45.6	45.4	46.2	46.1
1.0	46.5	46.3	48.2	48.1
2.0	46.5	46.1	48.4	48.3
3.0	46.6	46.2	49.2	48.6
4.0	41.5	41.0	43.5	42.7
5.0	37.7	37.4	40.5	39.6
7.0	31.2	29.9	31.7	31.2
10.0	19.5	22.6	21.4	21.4
Mean Resistivity	39	39	41	41

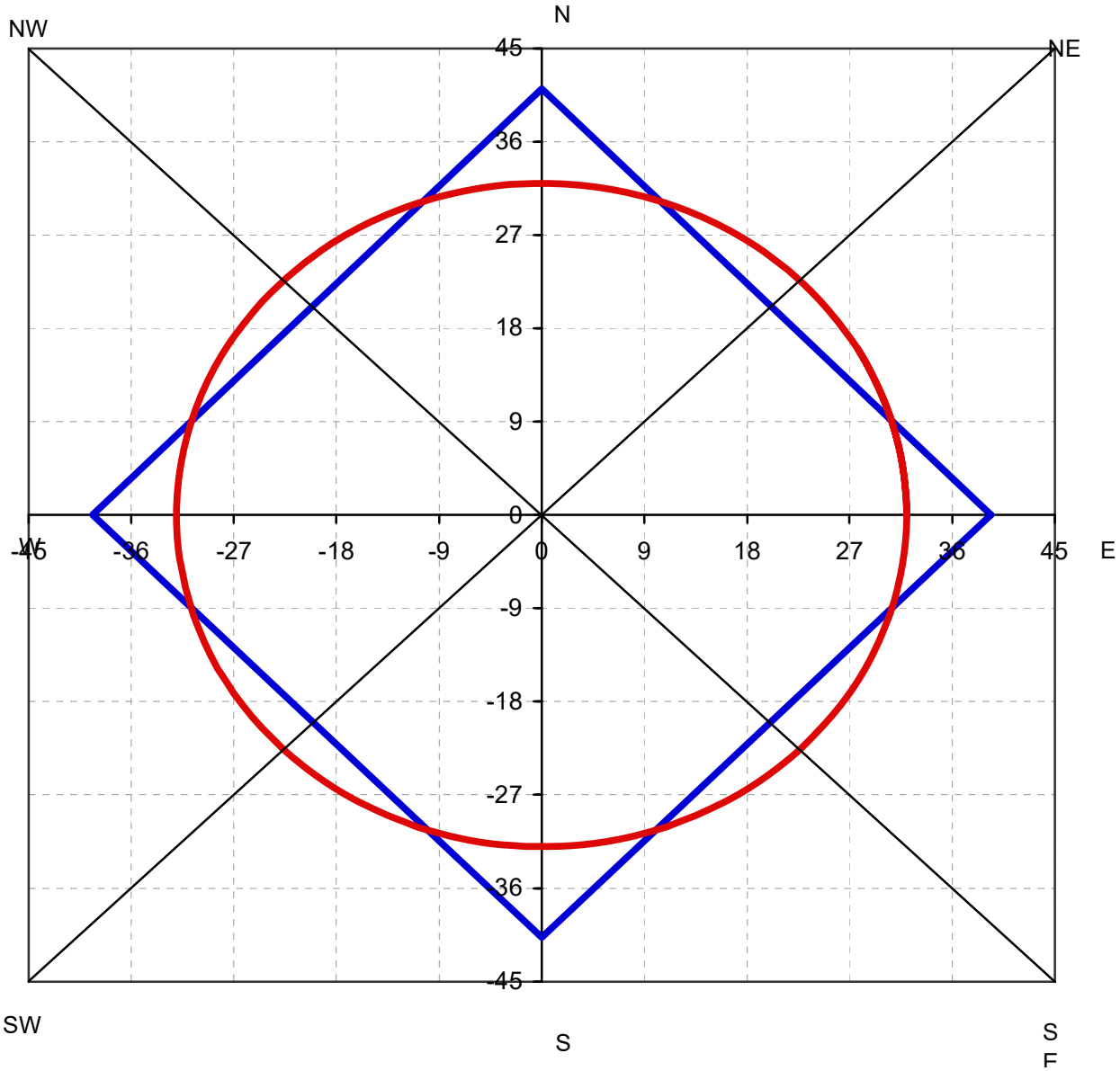
Mean Resistivity Value, ohm-m : 32 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-12
Co-ordinate : 785735E, 3117990N



Total Area of Polygon : 3223

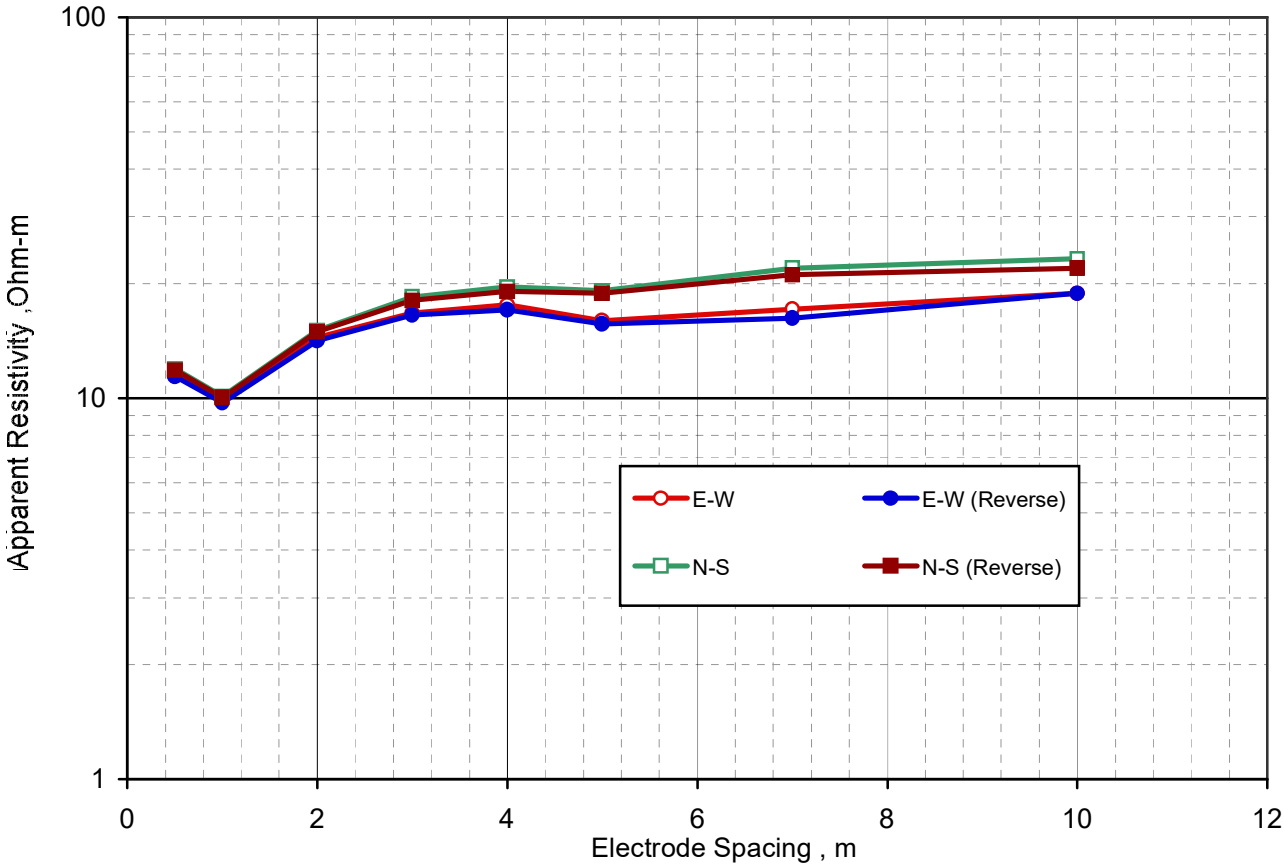
Radius of Equivalent Circle=Mean Resistivity : 32 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-13
Co-ordinate : 785995E, 3117973N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	11.5	11.4	11.9	11.9
1.0	9.9	9.7	10.1	10.1
2.0	14.5	14.2	15.1	15.0
3.0	16.8	16.6	18.5	18.1
4.0	17.6	17.1	19.6	19.1
5.0	16.0	15.7	19.2	18.8
7.0	17.2	16.3	22.0	21.1
10.0	18.8	18.8	23.2	22.0
Mean Resistivity	15	15	17	17

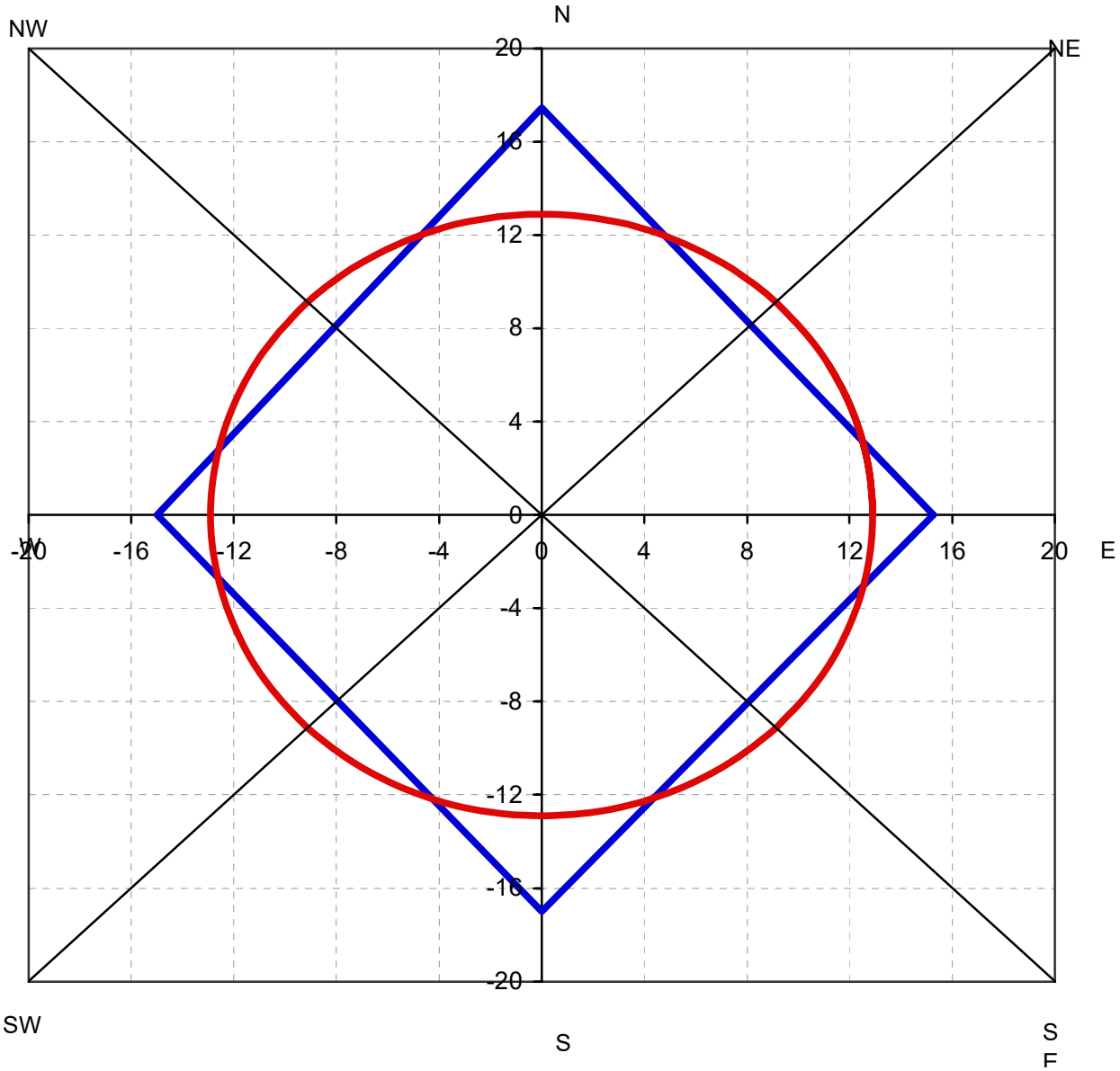
Mean Resistivity Value, ohm-m : 12.9 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-13
Co-ordinate : 785995E, 3117973N



Total Area of Polygon : 521

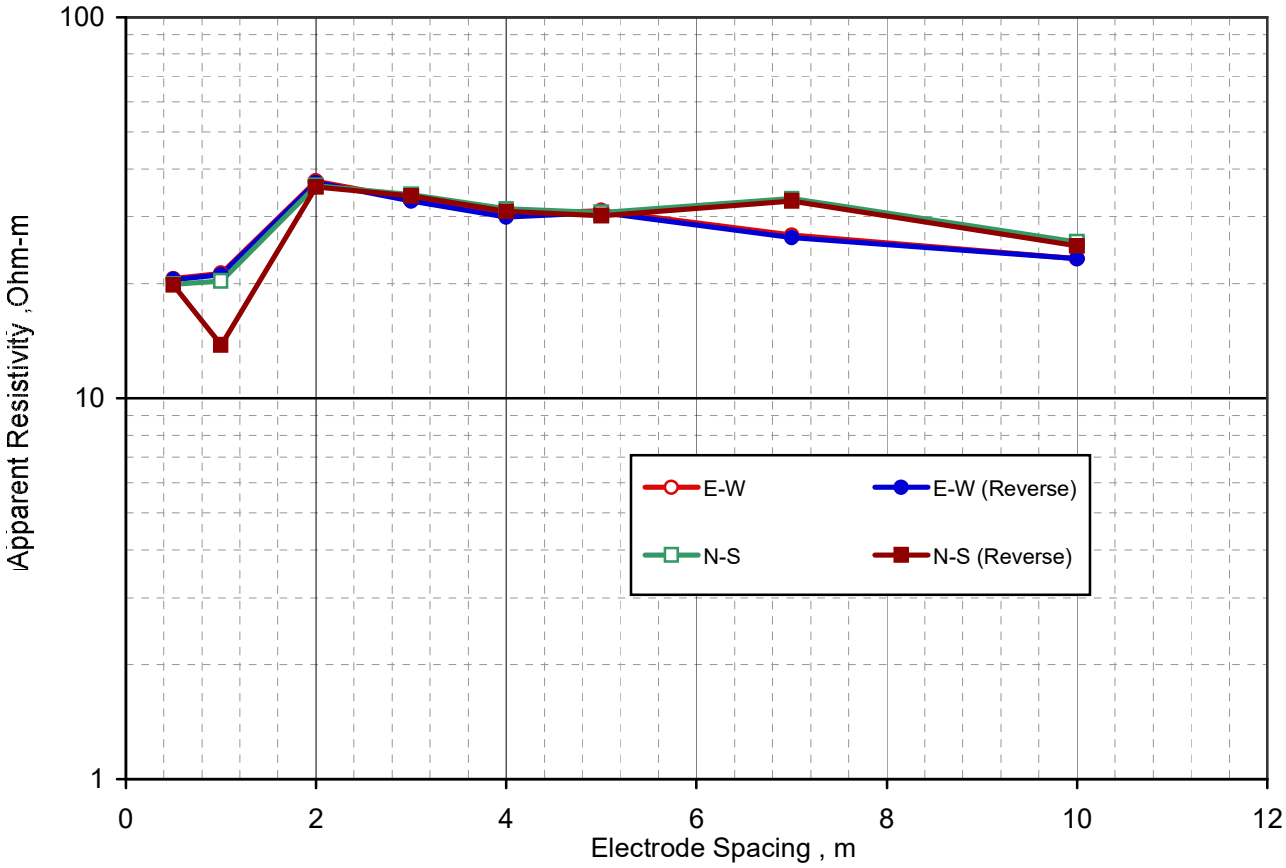
Radius of Equivalent Circle=Mean Resistivity : 13 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-14
Co-ordinate : 785304E, 3117715N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	20.6	20.5	19.9	19.8
1.0	21.3	21.1	20.4	13.8
2.0	37.2	36.8	36.2	35.8
3.0	33.4	33.0	34.3	33.9
4.0	30.4	29.9	31.4	30.9
5.0	31.1	30.8	30.8	30.2
7.0	26.8	26.4	33.4	33.0
10.0	23.2	23.2	25.8	25.1
Mean Resistivity	28	28	29	28

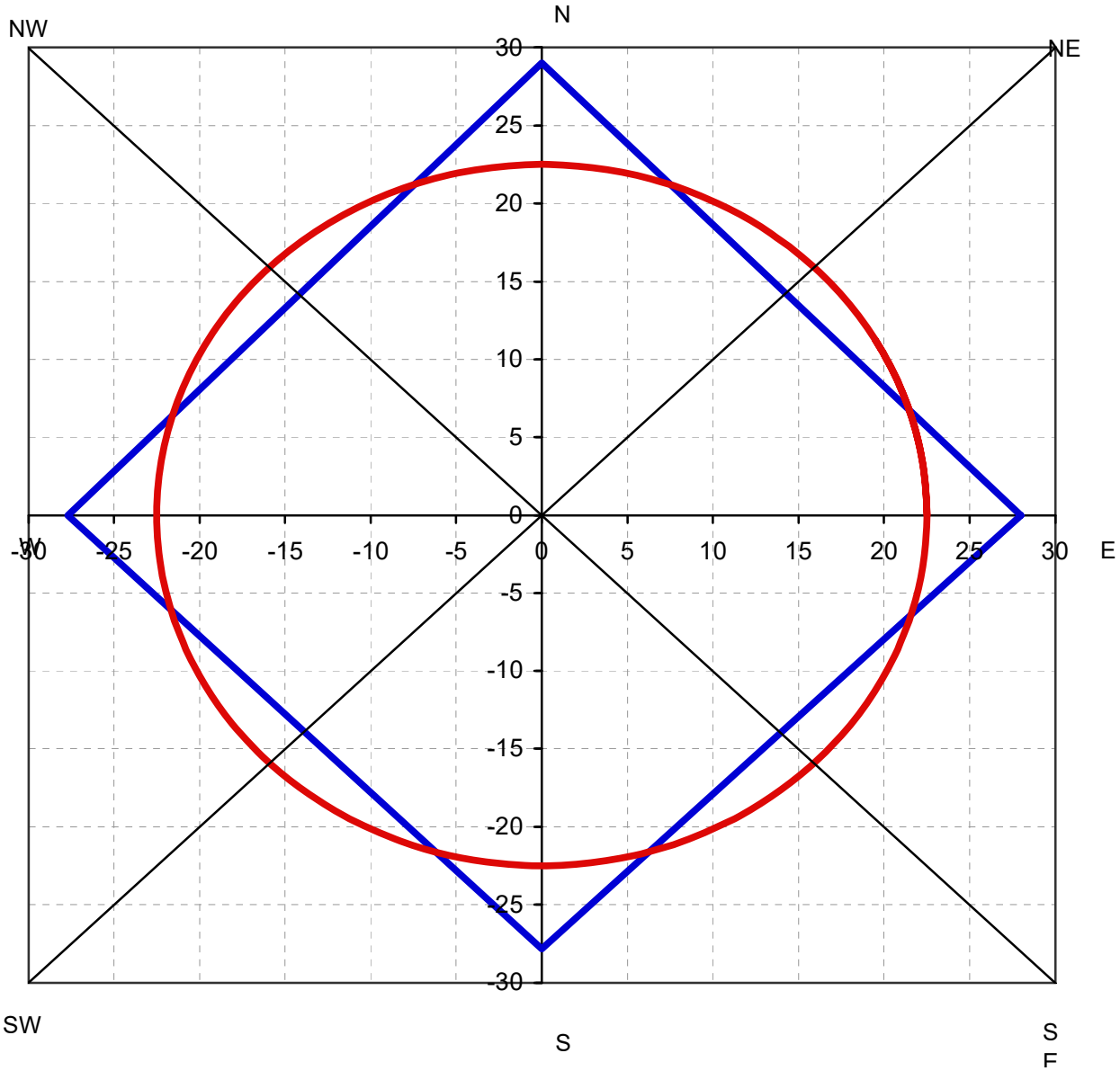
Mean Resistivity Value, ohm-m : 22.5 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-14
Co-ordinate : 785304E, 3117715N



Total Area of Polygon : 1584

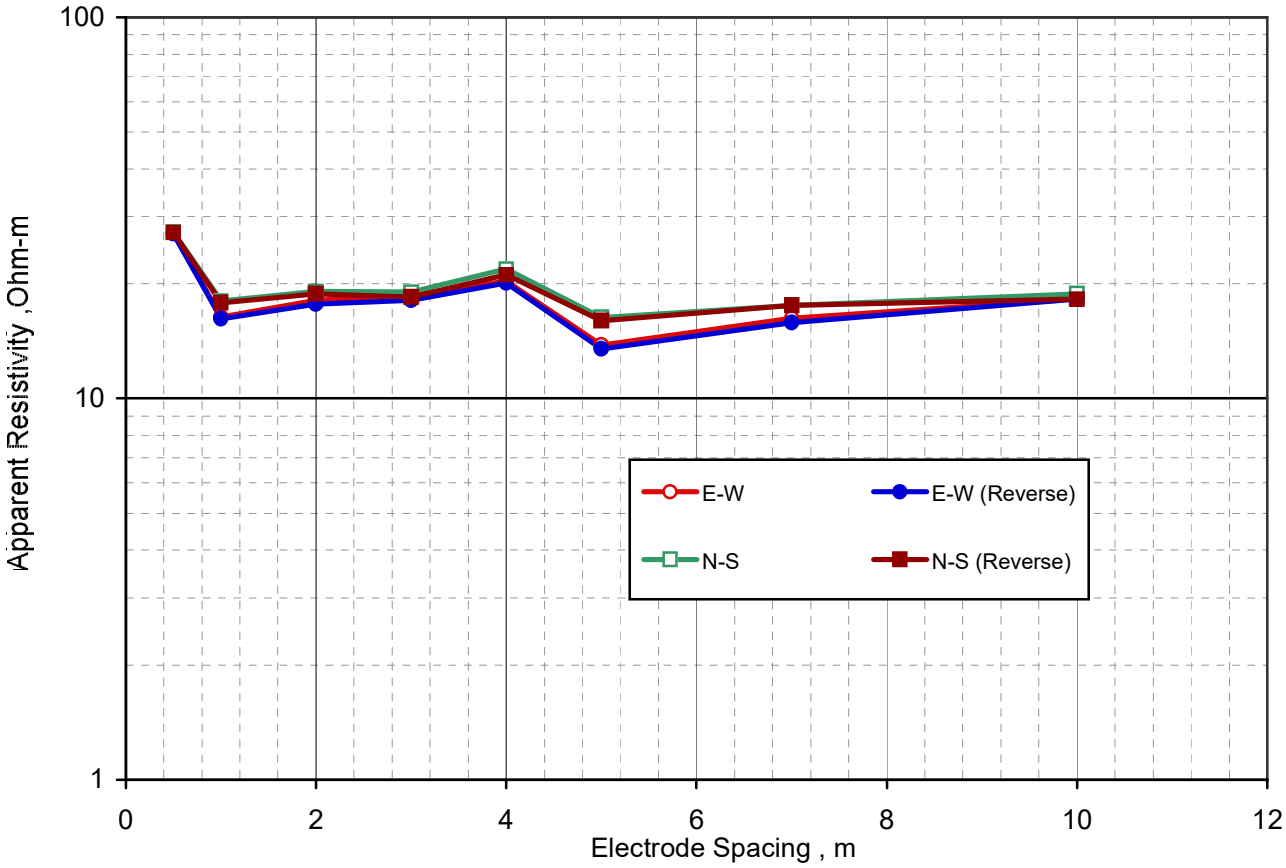
Radius of Equivalent Circle=Mean Resistivity : 23 ohm-m

P r R C r ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-15
Co-ordinate : 785238E, 3118282N



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
0.5	27.1	27.0	27.3	27.2
1.0	16.4	16.2	18.0	17.8
2.0	18.1	17.7	19.1	18.8
3.0	18.7	18.1	19.0	18.5
4.0	20.4	20.1	21.9	21.1
5.0	13.8	13.5	16.3	16.0
7.0	16.3	15.8	17.6	17.6
10.0	18.2	18.2	18.8	18.2
Mean Resistivity	19	18	20	19

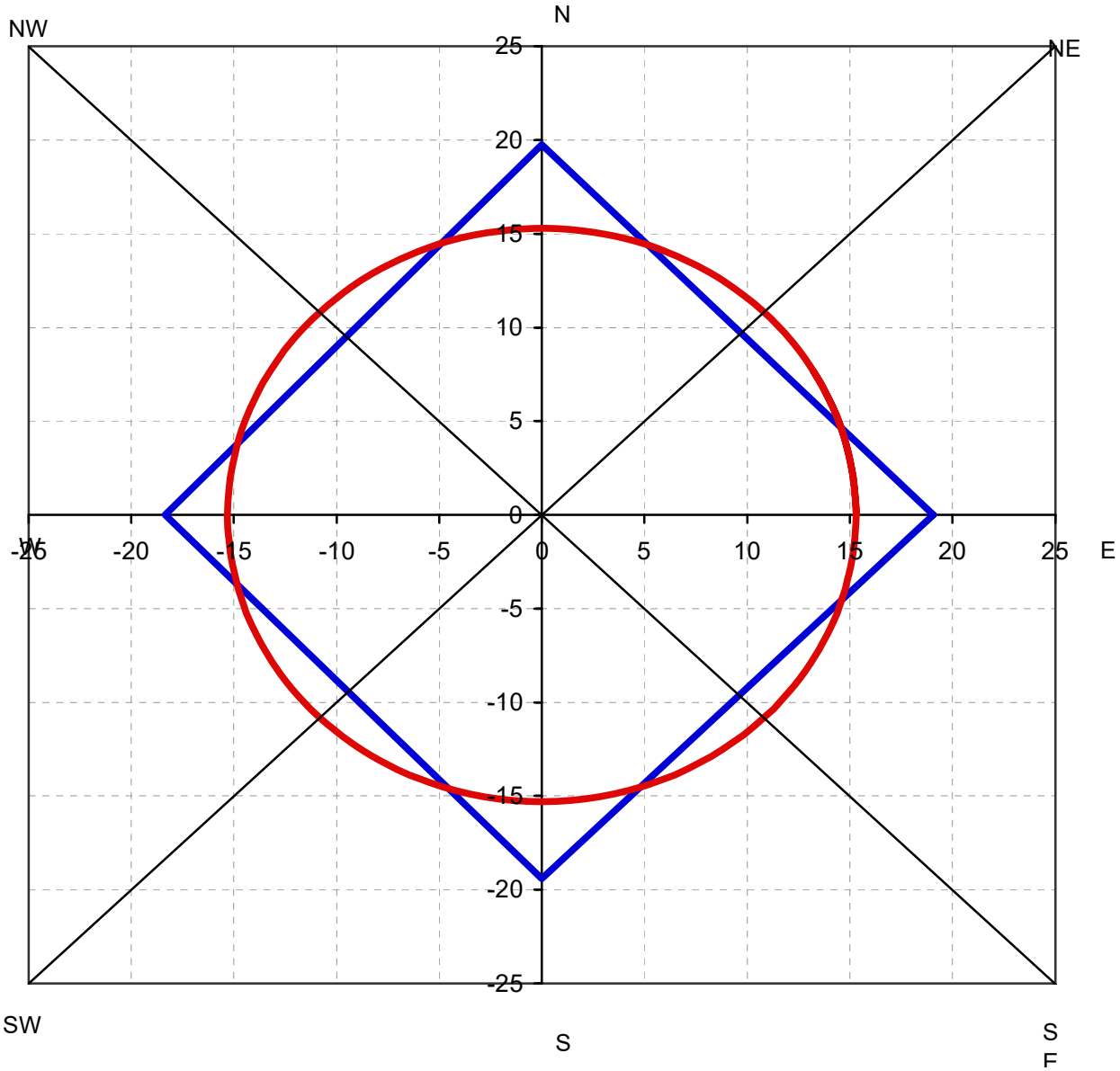
Mean Resistivity Value, ohm-m : 15.3 ohm-m

A r R ERT

E r R T N ERT

IS: 3043-1987, RA-2006

Test Details
Test Designation : ERT-15
Co-ordinate : 785238E, 3118282N



Total Area of Polygon : 733

Radius of Equivalent Circle=Mean Resistivity : 15 ohm-m

P r R C r ERT

LO PRESSURE PIPIN

1.00.00 **E UIPMENT SI IN CRITERIA**

1.01.00 All the piping systems and equipment supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of 30 years, and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.

1.02.00 For all Low Pressure piping systems covered under this specification, sizing and system design shall be to the requirements of relevant codes and standard indicated. In addition to this, requirements of any statutory code as applicable shall also be taken into consideration.

1.03.00 Inside diameters of piping shall be calculated for the flow requirements of various systems. The velocities for calculating the inside diameters shall be limited to the following:

a) **r A**

		P S	**B r**	
(a)	Pump suction	------	1.2-1.5	1.2-1.8
(b)	Pump discharge and recirculation	1.2-1.8	1.8-2.4	2.1-2.5
(c)	Header	------	1.5-2.4	2.1-2.4

Pipe line under gravity flow shall be restricted to a flow velocity of 1 m/sec generally. Channels under gravity flow shall be sized for a maximum flow velocity of 0.6 m/sec.

WILLIAM & HAZEN formula shall be used for calculating the friction loss in piping systems with the following "C" value:

(i)	Carbon steel pipe	100
(ii)	Ductile Iron.	140
(iii)	Rubber lined steel pipe	120
(iv)	Stainless steel pipe	100

For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/ sump/ reservoir from which the pumps draw water.

(b) **C r d A r A**

Compressed air 15.0 m/sec.(under Average Pressure & Temp. conditions)

1.04.00 The pipes shall be sized for the worst (i.e. maximum flow, temp. and pressure values) operating conditions.

1.05.00 Based on the inside dia. so established, thickness calculation shall be made as per ANSI B 31.1 OD and thickness of pipes shall than be selected as per ANSI B 36.10/IS-1239 Heavy grade/IS-3589/ASTM-A-53/API-5L/ANSI B 36.19 as the case may be.

1.06.00 Corrosion allowance of 1.6 mm will be added to the calculated thickness being considered (except stainless steel piping).

1.07.00 Bend thinning allowance/manufacturing allowance etc. shall be as per the requirement of the design code provision.

1.08.00 High points in piping system shall be provided with vents along with valves as per the system requirement. Low points shall be provided with drains along with drain valves as per the system requirement. Drain lines shall be adequately sized so as to clear condensate in the lines. Material for drain and vent lines shall be compatible with that of the parent pipe material.

1.09.00 Material of construction for pipes carrying various fluids shall be as specified elsewhere.

1.10.00 Compressed air pipe work shall be adequately drained to prevent internal moisture accumulation and moisture traps shall be provided at strategic locations in the piping systems.

1.11.00 Depending upon the size and system pressure, joints in compressed air pipe work shall be screwed or flanged. The flange shall be welded with the parent pipe at shop and shall be hot dip galvanized before dispatch to site. Alternatively, the flanges on GI pipes may be screwed-on flanges also.

1.12.00 Threaded joints shall be provided with Teflon sealant tapes.

1.13.00 Following types of valves shall be used for the system/service indicated.

SYSTEM	**TYPES O AL ES**					
	Butterfly	Gate	Globe	Check	Ball	Plug
Water	x	x	x	x	x	
Air		x	x	x	x	
Drains & vents		x	x	x		
Fuel oil (if any)		x	x	x	x	x

1.14.0 Recirculation pipes along with valves, breakdown orifices etc. shall be provided for important pumping systems as indicated in respective process and instrumentation diagrams (P&IDs). The recirculation pipe shall be sized for minimum 30%design flow of single pump operation or the recommended flow of the pump manufacturer whichever is higher.

2.00.00 **TEC NICAL SPECI ICATION**

2.01.00 **ENERAL**

Specific technical requirements of low-pressure piping, fittings, supports, valves, specialties and tanks etc. have been covered under this Sub-section. It includes details pertaining to design and material of construction for piping, fittings, valves, equipment, etc. cleaning/surface preparation application of primer and painting on over ground piping. It also includes detailed technical requirement of laying underground/buried piping including water proofing/anti corrosive protection. It also covers design, engineering, manufacturing, fabrication, technical details of piping, valves, specialties, piping hangers / supports, tanks etc.

2.02.00 **P d**

2.02.01 All low pressure piping systems shall be capable of withstanding the maximum pressure in the corresponding lines at the relevant temperatures. However, the minimum thickness as specified in the following clauses and or respective codes for pipes and fittings shall be adhered to. The bidder shall furnish the pipe sizing/ thickness calculation as per the criteria mentioned above under LP piping equipment sizing criteria of this Technical Specification.

2.02.02 Piping and fittings coming under the purview of IBR shall be designed satisfying the requirements of IBR as a minimum.

2.02.03 Supporting arrangement of piping systems shall be properly designed for systems where hydraulic shocks and pressure surges may arise in the system during operation. Bidder should provide necessary protective arrangement like anchor blocks/anchor bolt etc. for the safeguard of the piping systems under above mentioned conditions. The requirement will be, however, worked out by the contractor and he will submit the detailed drawings for thrust/anchor block to the Employer. External, and internal, attachments to piping shall be designed so as not to cause flattening of pipes and excessive localized bending stresses.

2.02.04 Bends, loops, off sets, expansion or flexible joints shall be used as required in order to prevent overstressing the piping system and to provide adequate flexibility. Flexibility analysis (using software packages such as Caesar-II etc.) shall be carried out for sufficiently long piping (straight run more than 300M).

2.02.05 Wherever Bidder's piping coming under this specification, terminates at an equipments or terminal point not included in this specification, the reaction and the thermal movement imposed by bidder's piping on equipment terminal point shall be within limits to be approved by the Employer.

2.02.06 The hot lines shall be supported with flexible connections to permit axial and lateral movements. Flexibility analysis shall be carried out for pipelines which have considerable straight run as indicated above and necessary loops/ expansion joint etc. shall be provided as may be necessary depending on layout.

2.02.07 Piping and fittings shall be manufactured by an approved manufacturer of repute. They should be truly cylindrical of clear internal diameter, of uniform thickness, smooth and strong, free from dents, cracks and holes and other defects.

2.02.08 For rubber lined ERW pipes, beads shall be removed for pipe size 80 NB and above.

2.02.09 Inspection holes shall be provided at suitable locations for pipes 800 Nb and above as required for periodic observations and inspection purposes.

2.02.10 At all intersection joints, it is Contractor's responsibility to design and provide suitable reinforcements as per the applicable codes and standards.

2.02.11 For large size pipes/ducts, at high point and bends/change of direction of flow, air release valves shall be provided as dictated by the system requirement and operation philosophy & tripping conditions of pumping system. Sizing criteria for air release valves shall be generally on the basis of valve size to pipe diameter ratio of 1:8. Requirement shall be decided as per relevant code.

Transient analysis /surge analysis where ever specified and required shall be conducted in order to determine the location , number and size of the Air-Release valve on certain long distance/high volume piping systems, if applicable within the scope of work of the package.

2.03.00 **M r**

2.03.01 Alternate materials offered by Bidder against those specified. shall either be equal to or superior to those specified, The responsibility for establishing equality or superiority of the alternate materials offered rests entirely with the Bidder and any standard code required for establishing the same shall be in English language.

2.03.02 No extra credit would be given to offers containing materials superior to those specified. Likewise no extra credit would be given to offers containing pipe thickness more than specified.

2.03.03 All materials shall be new and procured directly from the manufacturers. Materials procured from traders or stockists are not acceptable.

2.03.04 All materials shall be certified by proper material test certificates. All material test certificates shall carry proper heat number or other acceptable references to enable identification of the certificate that certifies the material.

2.03.05 Material of construction for pipes carrying various fluids shall be as follows:

S N	T d	M r
1.	i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH-corrected & ACW drain water)	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E'Gr.B/IS-3589 Gr. 410 /IS-1239 Heavy.
2.	i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)	Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below
3.	i) Drinking (potable) water ii)Compressed air (Instrument & service air)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.
4.	(Condensate) spill water	ASTM A 106 Gr. B
5.	Effluents from Neutralization pit	MSRL

2.03.06	In water lines, pipes upto 150mm Nb shall conform to ANSI B36.10/ASTM-A-53, Type-E Gr.B /IS:1239 Gr. Heavy and minimum selected thickness shall not be less than IS:1239 Grade Heavy except for demineralised water, drinking water and condensate spill lines.
2.03.07	Pipes of above 150mm Nb shall be to AWWA-C200/ANSI B 36.10/ASTM A-53/IS 3589 Gr.410. Pipe to be fabricated by the bidder shall be rolled and butt welded from plates conforming to ASTM A-53 type 'E' Gr. B/IS 2062 Gr.E-250B/ASTM-A-36. However, larger pipes, i.e. 1000mm Nb and above shall be made from plates conforming to ASTM A 36/IS 2062 Gr.E-250B and shall meet the requirements of AWWA-M-11 (for deflection & buckling criteria considering water filled pipe as well as vacuum condition that may prevail during transient/surge conditions, truck-load, rail-load and weight density for compacted soil or any other load as the case may be).
2.03.08	In demineralised water service, the pipes upto 50 Nb shall be of stainless steel ASTM A 312, Gr. 304 sch. 40 Seamless. The size for these pipes shall be to ANSI B 36.19. These shall be socket welded. The material for pipe from 65mm NB upto and including 400 NB shall be to ASTM A 312, Gr. 304 (welded). In no case the thickness of fittings shall be less than parent pipe thickness. Bidder/Contractor shall note that pipes offered as per a particular code shall conform to that code in all respects i.e. Dimension, tolerances, manufacturing methods, material, heat treatment, testing requirements, etc. unless otherwise mentioned elsewhere in the specification.
2.03.09	Instrument air, Plant (service) air lines and Drinking water lines shall be to ASTM A 53 type E grade B/ANSI B 36. 10/IS 3589, Gr. 410 / IS: 1239 Heavy (in case thickness calculated is more than gr. Heavy, ANSI B 36.10 Schedule numbers shall be followed) and galvanized to IS 4736 or any equivalent internationally reputed standard. The material of the pipes shall be to ASTM A 53 type 'E' Gr. B / IS: 3589, Gr. 410 / IS: 1239 Gr. Heavy. The fittings shall be of either same as parent material or malleable iron to IS-1879 (galvanized).
2.03.10	Spiral welded pipes as per API-5L/IS-3589 are also acceptable for pipe of size above 150 NB. However minimum thickness of the pipes shall be as elaborated in above clauses.
2.03.11	Condensate lines shall be to ASTM A 106 Gr. B and dimension to ANSI B 36.10 schedule "standard" as minimum to be maintained.
2.03.12	If carbon steel plates of thickness more than 12 mm are used for manufacture of pipes, fittings and other appurtenances, then the same shall be control-cooled or normalized as the case may be following the guidelines of the governing code.
2.04.00	**d r d**
2.04.01	Pipe lines of NB 50 size and below are regarded as field run piping. It is Bidder's responsibility to plan suitable layouts for these system insitu. Bidder shall prepare drawings indicating the layout of field run pipe work. These drawings shall be approved by Project Manager to the installation of the field run pipe work. Based on these approved layouts the Bidder shall prepare the BOQ of field run-pipes and submit to Employer for approval.
2.05.00	**S Dr d**
2.05.01	Suitable slope shall be provided for all pipelines towards drain points. It is Bidder responsibility to identify the requirements of drains and vents, and supply the necessary pipe work, valves, fittings, hangers and supports etc. As per the system requirement low points in the pipelines shall be provided with suitable draining arrangement and high points shall be provided with vent connections where air or gas pockets may occur. Vent for use during hydrostatic test shall be plugged after the completion of the test. Vent shall not be less than 15mm size. Drains shall be provided at low points and at pockets in piping such that complete drainage of all systems is possible. Drain shall not be less than 15mm for line size

up to 150mm, not less than 20mm up to 300mm and not less than 25mm for 350mm to 600mm pipes and not less than 50mm for 600mm and above pipes.

2.05.02 Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.

2.06.00 **P**

In general all water lines 65mm NB and above, are to be joined generally by butt welding except the locations where valves/fittings are to be installed with flanged connections and 50mm and below by socket welding unless mentioned otherwise specifically. All air lines shall be of screwed connection and rubber lined pipes of flanged connections.

2.06.01 **S r d**

(a) Threading of pipes shall be carried out after bending, heat treatment etc. If not possible, threading may be done prior to these operations but proper care should be taken to protect them from damage. Threads shall be to ANSI B 2.1 (taper) NPT/ ANSI B1.20.1 (taper) NPT / IS: 554 unless specified otherwise.

(b) Galvanized pipe shall generally be joined by screwing into sockets. The exposed threaded portion on the outside of the pipes shall be given a zinc silicate coating. Galvanized pipes shall not be field joined by welding for protection of Galvanising Zinc layer. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing. For galvanized pipe sizes above 150 mm NB, screw & socket jointing as per ASTM-A-865 shall be employed for both pipe-to-pipe and pipe-to-fitting jointing. For pipe to fitting connection since no direct threading can be done on the fittings (supplied as per ASTM-A-234 Gr. WPB and ANSI B-16.9) necessary straight pipe lengths acting as match pieces shall be welded to the fitting at both ends and subsequently the free ends of the straight lengths shall be threaded as per ASTM A-865 for jointing with main pipe. Once welding of fittings with match pieces and threading of free ends of match pieces are over, the entire fabricated piece shall be galvanized, or in case match pipes and fittings are already galvanized before the above mentioned fabrication then suitable application of Zinc-Silicate paste adequately at the welded surface (both in side & out side) after welding with zinc rich electrode, along with the nascent threaded metal portions at both free ends given the same application of Zinc Silicate paste. Alternatively flanged jointing may be employed for pipe sizes 100 NB and above. However, the bidder shall ensure the galvanized pipe joints do not fail during hydro test.

(c) Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be reamed and all chips shall be removed. Screwed flanges shall be attached by screwing the pipe through the flange and the pipe and flange shall be refaced accurately.

(d) For pipe sizes from 350 mm NB to 550 mm NB (including 350 NB & 550 NB) the GI pipes shall be of flanged connection. However, the pipes after welding of flanges shall be completely galvanized. Any site welding done on galvanized pipes shall be done with zinc-rich special electrodes and the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges with zinc-rich electrode will be permitted only when any flange is leak-prone during hydro testing.

(e) For pipe sizes 600 mm NB and above, the GI pipes shall be of welded connection (with zinc-rich special electrodes) followed by application of zinc silicate coating at welded surfaces both inside and outside the pipe, except for the last blank/blind flange, or, equipment connection where application of zinc-silicate paste after welding cannot be done due to inaccessibility of the inside welded surface and where

galvanic protection has been impaired due to welding of pipe-to-pipe joint. Thus the last erection joint shall be flanged joint.

2.06.02 **d d**

(a) For making up welded joints (butt weld or socket weld) the welding shall be performed by manual shielded metal arc process in accordance with the requirements specified elsewhere in the spec. Any welder employed for carrying butt welding shall be qualified as per ASME section IX for the type of joints he is going to weld. Jointing by butt weld, or socket weld shall depend upon the respective piping material specifications.

2.06.03 **d**

(a) Flanged connections for pipes are to be kept to the minimum and used only for connections to vessel, equipments, flanged valves and other fittings like strainer/traps/orifices etc. for ease of connection and maintenance etc. Rubber lined pipes shall be flange joined only.

(b) All flanged valves intended for installation on steel piping system, shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class stated in their respective piping material specification.

(c) Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed.

2.07.00 **B d r d T R d r r**

2.07.01 For pipe fittings such as elbows (long radius), reducers, tees, etc. the material shall be to ASTM-A-234 Gr. WPB/ASTM-105 up to 300 NB. For pipe fittings above 300 NB, the fittings may be fabricated conforming to parent pipe material. Provision of compensation pads shall be kept as per ANSI B 31.1. The fitting shall conform to the dimensional standard of ANSI B-16.9/ 16.11.Further branching in pipes for sizes 65nb and above is also acceptable (ANSI B 31.1).

However, for pipes up to 150 NB, pipe fittings may be supplied with material and dimension conforming to IS 1239 in case parent pipes also conform to IS 1239.

2.07.02 For pipe size 350Nb and above mitre bends may be used for all pipes except rubber lined pipes. However, mitre bends are also acceptable for rubber lined pipes above 1200 NB. The bend radius shall be 1½ times the nominal pipe diameter. 90 deg. bends (mitre) shall be in 4 pieces (3 cuts) and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534.

2.07.03 For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208.

2.07.04 Stainless steel fittings shall conform to either ASTM-A-182 Gr. 304 or ASTM-A-403 Grade WP. 304 Class-S, for sizes upto and including 50 mm NB, i.e. the fittings shall be of seamless construction. However, for stainless fittings above 50 mm NB, the same shall conform to ASTM-A-403 Gr. WP 304 Class W i.e. the fittings shall be of welded construction strictly in accordance with ASTM-A-403.

2.07.07 In no case, the thickness of fittings shall be less than the thickness of parent pipe, irrespective of material of construction.

2.08.00

2.08.01 Flanges shall be slip on type or weld neck type. Welding of flanges in tension is not permitted.

2.08.02 All flanges and-flanged drilling shall be to ANSI B 16.5 / BS EN-1092 / AWWA C - 207 of relevant pressure/temperature class. Flanges shall be fabricated from steel plates conforming to ASTM A 105/IS 2062 Gr. E-250B. However stainless steel flanges shall be fabricated from SS plates to ASTM-A-240, Gr. 304 or equivalent.

2.09.00 **S r r r d rr r**

The pipe in general shall be laid with the top of the pipe minimum 1.0 (one) meter below finished general ground level.

2.09.01 **Tr**

(a) The trench shall be cut true to the line and level and shall follow the gradient of the pipeline. The width of the trench shall be sufficient to give free working space on each side of the pipe. Trenches shall conform to IS 5822 or any international standard.

2.09.02 **Pr r d**

(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand or grit blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Certain inaccessible portions of the pipeline (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary with specific permission of the Project Manager.

(b) On the internal surface for pipes 1000 Nb and above, a coat of primer followed by a hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.

2.09.03 **C d r A rr Pr C r**

a. Buried piping shall be coated and wrapped, as per specification, after completion of welded and/or flanged connections, and after completion and approval of Hydro testing. Materials to be used for coating and wrapping of underground pipelines are:

(1) Coating primer (coal tar primer)

(2) Coating enamel (coal tar enamel)

(3) Wrapping materials.

All primer/coating/wrapping materials and methods of application shall conform to IS: 10221 except asphalt/bitumen material. Materials (primer/coating/wrapping) as per AWWA-C-203 are also acceptable.

Protective coating shall consist of coal tar primer, coal tar enamel coating, glass fiber, tissue inner wrap followed by glass fiber or coal tar impregnated Kraft outer wrap or finish coat.
Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221. Number of. Coats and wraps shall be decided based on soil corrosivity/resistivity as indicated in IS-10221. Soil data-for this purpose shall be made available.

Total thickness of completed coating and wrapping shall not be less than 4.0 mm.

b. Alternatively, the anti-corrosive protection for buried pipes can consist of anti-corrosive protection Coal-tar tapes. Material and application of tapes shall conform to IS 15337 or equivalent. These-tapes shall be applied hot over the cold coal tar primer in steps of 2mm thickness so as to cover the spiral edges of the first tape by the application of second tape. The total thickness of the finished protective coating shall be 4.0 mm minimum.

2.09.04 **Tr d r r d**

Prior to lowering and laying pipe in any excavated trench, the bottom of the trench may require to be back filled and compacted (or as the case may be) to provide an acceptable bed for placing the pipe. Bed preparation in general shall be as per IS: 5822.

2.09.05 **L d I**

All the joints shall be screwed with socket or flanged. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing Threaded portion on either side of the socket joint shall be applied with Zinc silicate paste.

All the provisions for trenching' bed preparation' laying the pipe application of primer' coating' wrapping with tapes and back filling etc. as indicated for "laying of buried piping" and " anti corrosive protection for buried piping" are applicable for buried galvanized steel (GI) pipes also.

2.10.00 **C d**

2.10.01 All piping shall be cleaned by the Bidder before and after erection to remove grease, dirt, dust, scale and welding slag.

2.10.02 Before erection all pipe work, assemblies, sub-assemblies, fittings, and components, etc. shall be thoroughly cleaned internally and externally by blast cleaning or by power driven wire brushes and followed by air-blowing . However for pipe sizes below 100nb the pipes may be cleaned internally by compressed air blowing as an alternative to internal blast cleaning. The brushes shall be of the same or similar material as the metal being cleaned. Cleaning of Galvanized pipes shall be done by air blowing only.

2.10.03 After erection, all water lines shall be mass flushed with water. The cleaning velocities in water lines shall be 1.2-1.5 times the operating velocities in the pipelines.

2.10.04 All compressed air pipe work shall be cleaned by blowing compressed air.

2.11.00 **S r r d r**

2.11.01 All supports and parts shall conform to the requirement of power piping code ANSI B 31.1 or approved equivalent.

2.11.02 The maximum spans of the supports of straight length shall not exceed the recommended values indicated in ANSI B 31.1.

2.11.03 At all sliding surfaces of supports suitable arrangement is to be provided to minimize sliding friction.

2.12.00 **D C r M r P r r C B r B A r r M r Tr**

2.12.01 **ENERAL**

(a) All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined.

(b) Special attention shall be given to operating mechanism for large size valves with a view to obtaining quick and easy operation ensuring that a minimum of maintenance is required.

(c) The valves coming in vacuum lines shall be of extended gland type and/or water sealed.

(d) The actuator-operated valves shall be designed on the basis of the following:

(1) The internal parts shall be suitable to support the pressure caused by the actuators;

(2) The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc.

(3) All actuator-operated valves shall be provided with hand operated gearing mechanism also.

(4) All actuators operated valves shall open/ close fully within time required by the process.

(e) Valves coming under the purview of IBR shall meet IBR requirements.

(f) All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.

(g) Wherever required valves shall be provided with chain operator, extension spindles and floor stands or any other arrangement approved by employer so that they can be operated with ease from the nearest operating floor. Wherever necessary for safety purpose locking device shall be provided. Further, necessary small platforms for facilitating easy valve operation shall be provided by the contractor wherever necessary in consultation with project manager within the bid price at no extra cost to employer

2.12.02 **AL E BODY MATERIAL**

Valve body material for various services shall be as follows:

Valve body material for water application like Secondary circuit auxiliary cooling water of ECW system, Raw water, Ash water make-up, service water, clarified water, DM cooling water (pH corrected) , drinking water etc. shall be cast iron for sizes 65NB and above; gun-metal for sizes 50 Nb and below.

For compressed air application, valve body material shall be cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.

DM water: SS body and disc along with SS internals. However for butterfly valves, Cast Iron /Ductile Iron/SG iron/carbon steel body and disc with elastomer lining are also acceptable.

Condensate: Cast Carbon Steel / Forged Carbon Steel.

2.12.03 The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed. The valves shall conform to the latest editions of

applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. Valves in general shall conform to the requirements of the following standards.

S d rd d C d

AWWA-C-504	Rubber seated butterfly valves.
BS-5155/EN-593	Cast iron and steel body butterfly valves for general purpose.
IS-778	Gun-metal gate, globe and check valves for general purpose.
BS-5154	Copper alloy globe/globe stop and check and gate valves for general purpose.
IS-780	Sluice valves for water works purpose (50-300 mm size)
IS-2906	Sluice valves for water works purpose (350-1200 mm size)
IS-5150	Cast iron wedge and double disc gate for general purpose.
BS-5152	Specification for cast iron globe valves.
BS-5153	Cast iron check valves for general purpose.
IS-5312	Swing check type reflux (non-return) valves.
ANSI B 16.34	Standard for valves.
API-594	Standard for Dual-check valves.
API-600	Steel gate valves.
ANSI-B-16.10	Valves face to face and other relevant dimension.
API-598	Valves inspection test.

2.12.04 **E d C**

The end connections, shall comply with the following:

Socket welding (SW) - ANSI B 16.11

Butt Welding (BW) - ANSI B 16.25.

Threaded (SC) - ANSI B 2.1

Flanged (FL) - ANSI B 16.5& AWWA-C-207 (steel flanges), ANSI B 16.1 (Cast Iron flanges).

2.13.00 **C**

(a) All cast iron body valves (gate, globe and non-return) shall have flanged end connections; (screwed ends for Ductile D.2NI body valves are not acceptable).

(b) All steel and stainless steel body valves of sizes 65 mm and above shall have flanged or butt welding ends. Valves of sizes below 65mm shall have flanged or

socket welded ends. Compatibility of welding between valve body material and connecting pipe material is a pre-requisite in case of butt-welded joints.

(c) All gun metal body valves shall have screwed ends.

(d) All flanged end valves/specialties. shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints.

(e) Gate/sluice valves shall be used for isolation of flow. All gate valves shall be of the full-way type, and when in the full open position the bore of the valve shall not be constricted by any part of the gate.

Gate valves shall be of the solid/elastic or articulated wedge disc. Gate valves shall be provided with the following accessories in addition to other standard items:

(1) Hand wheel

(2) Position indicator (for above 50 mm NB valve size)

(3) Draining arrangement wherever required.

(f) Globe valves shall be used for regulation purposes. They shall be provided with hand wheel, position indicator, draining arrangement (wherever required) and arrow indicating flow direction. Preferably, the valves shall be of the vertical stem type. Globe valves shall preferably have radiused or spherical seating and discs shall be free to revolve on the spindle.

The pressure shall preferably be under the disc of the valve. However, globe valves, with pressure over the disc shall also be accepted provided (i) no possibility exists that flow from above the disc can remove either the disc from stem or component from disc (ii) manual globe valves can easily be operated by hand. If the fluid load on the top of the disc is higher than 40-60 KN, bypass valve shall be provided which permits the downstream system to be pressurized before the globe valve is opened.

(g) Check valves shall be used for non-return service. They shall be swing. check type or double door (Dual plate)check type with a permanent arrow inscription on the valve body indicating the fluid flow direction. In long distance pipes lines with possibility of surge-occurrence, dual plate check valves are preferable for its spring controlled opening /closing of flaps/doors against flow reversals. However, dual plate check valves shall not be used for sizes more than 600mm NB.

(h) For bore greater than 2" the valves must be swing check type or dual plate check type suitable for installation in all positions (vertical and horizontal);

(i) For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position.

(j) All gate and globe valves shall be provided with back seating arrangement to enable on line changing of gland packing. The valves shall be preferably outside screw & yoke type.

(k) All gate and globe valves shall be rising stem type and shall have limit switches for full OPEN and full CLOSED indication wherever required. This will include motor-operated valves also wherever required. In such cases the limit switches shall form an integral part of the valve. Stop-gap arrangement in this respect is not acceptable.

(l) All valves except those with rising stems shall be provided with continuous mechanical position indicators; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50 mm nominal bore.

(m) For CI gate, globe and check valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS- 1538 for fitting shall be applicable.

2.13.01 **MATERIAL O CONSTRUCTION ATE LOBE C ECK AL E**

(a) The materials shall generally comply with the following:

(1) **C S**

Body & bonnet	ASTM A 216 Gr. WCB/ ASTM A 105
Disc for non-return Valves	ASTM A 216 Gr. WCB/ ASTM A 105
Trim.	ASTM A 182 Gr. F6 or Equivalent

(2) **S**

Body & Bonnet	SS 304
Disc	-do-
Trim.	SS 316

(3) **C r**

Body & bonnet	BS 1452 Gr. 14/ IS-210 Gr. FG 260
Seating surfaces and rings	13% chromium steel/ 13% Chrome overlay
Disc for non-return valves	BS 1452 Gr. 14/IS-210 Gr FG 260
Hinge pin for non-return valves	AISI 316
Stem for gate globe valves	13% chromium steel or Equivalent
Back seat	13 % chromium steel / 13% Chrome overlay

(4) **M**

Body and bonnet	IS 318 Gr. 2/ Equivalent Standard
Trim.	-do-

(b) Cast iron body valves shall have high alloy steel stem and seat.

(c) Material for counter flanges shall be the same as for the piping.

(d) Forged carbon steel valves are also acceptable in place of Gun metal valves.

2.14.00 **A r R**

(a) The air release valves shall be of automatic double air valve with two orifices and two floats. The float shall not close the valve at higher air velocities. The orifice contact joint with the float shall be leak tight joint.

(b) The valve shall efficiently discharge the displaced air automatically from ducts/pipes while filling them and admit air automatically into the ducts/pipes while they are being emptied. The valve shall also automatically release trapped air from ducts/pipes during operation at the normal working pressure.

(c) Body material of automatic air release valves shall comply generally with BS 1452 Gr. 14/IS: 210 Gr. FG 260. and spindle shall conform to high tensile brass.

(d) Air release valves shall not have any integral isolation device within them. Each Air release valve shall be mounted, preceded by a separate isolation gate/ butterfly valve.

2.15.00 **B r**

2.15.01 **D C r**

(a) The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or AWWA-C-516 or any other approved equivalent standard latest edition depending on size. Fabricated steel (IS: 2062 GR. E-250B) butterfly valves instead of cast iron body valves are also acceptable for size above 300 mm nb diameter.

(b) The valves shall be suitable for installation in any position (horizontal/vertical etc.) and shall be generally of double-flanged construction. However for sizes 600 NB and below the valves of Wafer construction are also acceptable

(c) Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same.

(d) Valves-200Nb and above shall also be provided with gear operator arrangement as a standard practice suitable for manual operation. Manual operation of valve shall be through gear arrangement having totally enclosed gearing with hand wheel diameter and gear ratio designed to meet the required operating torque It shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering. Adjustable stops shall be provided to prevent over travel in either direction.

Limit and torque switches (if applicable) shall be enclosed in water tight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.

2.15.02 **M r C r B r**

Materials and other design details shall be as indicated below :

(a) **C Ir B r**

Body & Disc ASTM A48, Gr. 40 with 2% Ni /
IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated

Shaft	BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better.
Seat ring	18-8 Stainless steel
Seal	Nitrile Rubber

(b) **S S B r**

Body & Disc	SS 304
Shaft	SS 316
Seat Rings	EPT/BUNA-N/Neoprene

(c) **C r B r**

Body & Disc	ASTM A 216, Gr. WCB
Shaft	SS 304
Disc & Seat Rings	EPT/BUNA-N/Neoprene

(d) **E r d B r**

Body & Disc	ASTM A48, Gr. 40 / IS: 210. Gr. FG-260 / SG Iron (ductile iron) IS 1865 Gr 400-15 or BSEN 1563, Gr EN GJS-400-15 / ASTM A 216, Gr. WCB with elastomer lining.
Shaft	SS 316

2.15.03 **Pr D T T T r B r**

Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder.

All valves that are designed and manufactured as per AWWA-C-504 / AWWA-C-516 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504/AWWA-C-516. For Butterfly valves, designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirements of P.O.D. test of AWWA-C-504/AWWA-C-516.

2.16.00 **r d**

(a) Valve shall automatically control the rate of filling and will shut off when a predetermined level is reached and close to prevent over flow on pre-set maximum water level. Valve shall also open and close in direct proportion to rise or fall of water level.

(b) DESIGN AND CONSTRUCTION FEATURES

The following design and construction feature of the valve shall be the minimum acceptable.

(c) Valves shall be right-angled or globe pattern.

(d) Valves shall be balance piston type with float ball.

(e) Leather liner shall not be provided.

(f) The body and cover material shall be cast iron conforming to ASTM-A 126 Grade 'B' or IS: 210 Grade 200 or equivalent, and Float shall be of copper with epoxy painting of two (2) coats.

(g) Valves shall be suitable for flow velocities of 2 to 2.5m/sec.

(h) The valves shall have flanged connections.

2.17.00 **T d A r**

2.17.01 The designer and manufacturer of storage tanks shall comply with and obtain approval of all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The tanks shall conform to IS 803/IS804/IS 805/ IS 2825/ API 650/ IS 4049/ IS 4682 (part-I) and IS 4864 to 4870/ ASME B & PV code Sec.-VIII as the case may be.

2.17.02 **DESI N AND CONSTRUCTION**

(a) Design of all vertical atmospheric storage tanks containing water, acid, alkali and other chemical shall conform to IS:803 & API 650.

(b) Design of all horizontal atmospheric storage tanks containing water, acid, alkali and other chemicals shall generally conform to IS:2825 as regards to fabrication and general construction taking care of combined bending, shear & hoop stresses developed due to supporting arrangement.

(c) Tank shall be made from mild steel plates to BS 4360/IS-2062 Gr.E-250B (or equivalent) for ordinary wafer application when it is not corrosive in nature.

(f) Tank shall be provided with suitable supporting joints. All vessels shall be provided with lifting lugs, eye bolts etc. for effective handling during erection.

(j) Tanks shall be provided with float operated level indicators/level gauges/level transmitters and level switches, as required, with complete assembly. Suitable flanged pads for level switches mounting shall also be provided. The level indicator can be top or side mounted as the case may be.

(k) In addition to inlet and outlet nozzles, the tanks shall be provided with vents, overflow, drain nozzles complete for various connections on tanks. Overflow lines from storage tanks is to be routed to the nearest surface drains. For tanks containing dm water, alkaline water or power cycle water the vent to atmosphere shall be through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber vessel shall be provided with the initial fill of chemicals.

(l) Tanks shall have suitable stairs/ladders on inside and outside of the tanks, manholes/inspection covers as required and also platform suitably located.

(m) Tank supporting arrangement as approved by Employer shall be provided with all plates/angles/joints/flats and supporting attachment including lugs, saddles, legs etc.

(o) Tank fabrication drg. and design calculations shall be approved by the Project Manager.

2.17.03

C rr r

(a) A corrosion allowance, applicable to surface in contact with corrosive media, when required after thorough cleaning by blast cleaning preceded by wire brushing shall be taken into consideration.

(b) Manholes shall be provided for easy access into the vessels. The size shall be minimum 500 mm and will be with cover plate, nuts bolts, etc. to ensure leak tightness at the test pressure.

(c) Each tank shall be provided with drilled cleats welded to the tank for electrical grounding. Material of cleats shall be same as that of the shell.

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S N D r		**T P r r**
DRINKIN ATER TANK		
a)	Quantity	One per each Unit
b)	Liquid to be handled	Drinking Water
c)	Size and Min. Plate Thickness	5m long x 2.5m wide x 2.5m high; Plate Thk. (min.) 8mm Overall Cap.= 31.25 M^3 (Effective cap.: 25M^3).
d)	Type	Pressed steel rectangular tank Closed top/ welded construction
e)	Design pressure	Atmospheric
f)	Tank Standard	BS-1564/IS-804 (Latest Edition)
g)	Material of Construction	Plates to ASTM-A-36/IS-2062 Gr.B
h)	Flange Material Standard	ASTM-A-105/IS-2062-Gr. B
i)	Accessories	
	(i) Vent, Overflow, drain piping & valve	To be provided
	(ii) Manhole	To be provided
	(iii) Stair/Platform	To be provided
	(iv) Supporting structure	To be provided
	(v) Internal ladder	To be provided
	(vi) Level indicator	To be provided
	(vii) Root valve for level transmitter	To be provided
j)	Protection of Internal surface	Two coats of food grade epoxy paint

k)	Protection of external surface	Two coats of EPOXY based paint preceded by one(1) coat of primer. (minimum DFT 100 micron)
l)	Location	On Power House roof.
1.00	**CONDENSATE STORA E TANKS**	
1.01	Number required	one for each unit
1.02	Capacity of each tank (Effective)	350 Cu.m (for 660MW units),
1.03	Size (Dia & Height)/Plate Thickness	8.6mX7.2m minimum, Shell & Roof plate Thickness 8mm and Base plate thickness 10mm
1.04	Type and pressure class	Vertical, cylindrical, atmospheric
1.05	Material of construction	MS- (IS-2062 Gr.B or equivalent) as per specified code, 8mm thickness (minimum)
1.06	Location	Outdoor
1.07	Overflow, drain, vent and Sample connection(piping &valve)	required
1.08	Level Indicator	
	a) Number	One for each tank
	b) Type	Mechanical float type with dial type indicator (Guide wire, Float and Housing of Stainless steel - 316 Gr. construction)
1.09	Manhole (minimum 500mm size)	Two (2)-one on shell and the other on roof
1.10	Special Fittings	
	a) Hydraulic Seal of Overflow/Drain	Required

b)	Additional nozzle Connection	number and size to be indicated to successful Bidder
c)	Nozzle connection for Instrument/spare	Three (3) nos. for each tank
d)	CO2 Absorber for vent (not to be kept on roof of tank, but to be kept on ground level)	required
e)	Outside stair case (spiral)	required
f)	Inside Ladder	Required
g)	Draw off sump	required
h)	Root valve for level Transmitter	Root valves for two (2) nos. level transmitter for each tank Required

2.18.00 **RUBBER E PANSION OINTS**

2.18.01 All parts of expansion joints shall be suitably designed for all stresses that may occur during continuous operation and for any additional stresses that may occur during installation and also during transient condition.

2.18.02 The expansion joints shall be single bellow rubber expansion joints. The arches of the expansion joints shall be filled with soft rubber.

2.18.03 The tube (i.e. inner cover) and the cover (outer) shall be made of natural or synthetic rubber of adequate hardness. The shore hardness shall not be less than 60 deg. A for outer and 50 deg. A for inner cover.

2.18.04 The carcass between the tube and the cover shall be made of high quality cotton duck, preferably, square woven to provide equal strength in both directions of the weave. The fabric plies shall be impregnated with age resistant rubber or synthetic compound and laminated into a unit.

2.18.05 Reinforcement, consisting of solid metal rings embedded in carcass shall be provided.

2.18.06 Expansion joints shall be complete with stretcher bolt assembly. The expansion joints shall be suitable to absorb piping movements and accommodate mismatch between pipe lines.

2.18.07 The expansion joints shall be of heavy duty construction made of high grade abrasion-resistant natural or synthetic rubber compound. The basic fabric for the' duck' shall be either a superior quality braided cotton or synthetic fibre having maximum flexibility and non-set characteristic.

2.18.08 The expansion joints shall be adequately reinforced, with solid steel rings, to meet the service conditions under which they are to operate.

2.18.09 All expansion joints shall be provided with stainless steel retaining rings for DM water application and IS 2062 Gr E-250B galvanized steel retaining rings for ordinary water for use on the inner face of the rubber flanges, to prevent any possibility of damage to the rubber

when the bolts are tightened. These rings shall be split and beveled type for easy installation and replacement and shall be drilled to match the drilling on the end rubber flanges and shall be in two or more pieces.

2.18.10 The expansion joints shall have integral fabric reinforced full-face rubber flanges. The bolt on one flange shall have no eccentricity in relation to the corresponding bolt hole on the flange on the other face. The end rubber flanges shall be drilled to suit the companion pipe flanges. The flanges shall be as per ANSI B 16.5. For higher sizes, not covered under ANSI B 16.5, the same shall be as per AWWA.

2.18.11 All exposed surfaces of the expansion joint shall be given a 3 mm thick coating of neoprene. This surface shall be reasonably uniform and free from any blisters, porosity and other surface defects.

2.18.12 Each control unit shall consist of two (2) numbers of triangular stretcher bolt plates, a stretcher bolt with washers, nuts, and lock nuts. Each plate shall be drilled with three holes, two for fixing the plate on to the companion steel flange and the third for fixing the stretcher bolt.

2.18.13 Each joint shall have a permanently attached brass or stainless steel metal tag indicating the tag numbers and other salient design features.

2.18.14 Bidder to note that any metallic part which comes in contact with DM /corrosive water shall be of Stainless Steel material.

2.18.15 **L r RE C d r C I O**

Life cycle test certificates shall be furnished by the bidder for each type and size of RE joints supplied by the Bidder, in the absence of which actual Life cycle test shall be conducted on one rubber expansion joint of each type and size .

2.19.00 **STRAINERS**

2.19.01 **S**

The strainers shall be basket type and of simplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe lines. The strainer element shall be 20 mesh. Pressure drop across the strainers in new condition shall not exceed 1.5 MCW at full flow. Wire mesh of the strainers shall be suitably reinforced, to avoid buckling under operation. Strainer shall have screwed blow off connection fitted with a removable plug. The material of construction of various parts shall be as follows:

(a)	Body	IS: 318, Gr. 2 up to 50 mm Nb, and IS: 210 Gr. FG 260 above 50 mm Nb. (For DM water/ -Body: AISI 316 or equivalent)
(b)	Strainer Element	Stainless steel (AISI 316)
(c)	End connection	Screwed upto 50 mm Nb, and Flanged above 50 mm Nb

2.19.02 **D**

(a) The strainers shall be basket type and of duplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting

pipe. The mesh of strainer element shall be commensurate with the actual service required. Pressure drop across the strainer in new condition shall not exceed 4.0 MWC at full flow.

(b) Wire mesh (if applicable) of the strainers shall be suitably reinforced. The material of construction of various parts shall be as follows.

Body	IS: 318, Gr. 2 up to 50 mm Nb, and IS:210, Gr. FG 260 or ASTM-A-515 Gr. 75/IS-2062 Gr. E-250B and internally epoxy-painted above 50 mm NB.
Strainer element	Stainless steel (AISI 316)
End connection	Screwed up to 50mm Nb, and Flanged above 50 mm Nb. Gasket shall be of full face type

(c) The strainer will have a permanent stainless steel tag fixed on the strainer body indicating the strainer tag number and service and other salient data.

(d) The size of the strainer and the flow direction will be indicated on the strainer body casting.

(e) Thickness of the strainer element should be designed to withstand the pressure developed within the strainer due to 100% clogged condition exerting shut-off pressure on the element.

P r P

E UIPMENT SI IN CRITERIA

1.01.00 r

(a.) All the piping systems and equipment supplied shall be designed to operate without replacement and with normal maintenance for a plant life of not less than twenty five (25) years and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.

(b.) The design, Engineering, fabrication, erection, testing & commissioning etc. of the complete piping systems shall be to the requirements of power piping code ASME B 31.1 (latest edition). In addition to this, requirements as laid down in Indian Boiler Regulations (latest edition) shall also be met completely for piping systems under the purview of IBR.

1.02.00 P S

(a.) Inside diameters of piping shall first be calculated for the flow requirement of various systems. The velocity limits for calculating the inside diameters are listed below.

Main steam piping	76 M/sec
Hot reheat piping	76 M/sec
LP bypass downstream	100 M/sec
Feed Water Suction (up to BFP suction)	2.0-3.5 M/sec
Boiler Feed water pump Discharge	4.0-6.0 M/sec.
Extraction steam (Super heated)	60 M/sec
Extraction steam (saturated)	30 M/sec
Condensate suction	1.5 M/sec
Condensate discharge	3.0-5.0 M/sec
Auxiliary steam	60 M/sec
BFP-T Exhaust Piping	60- 120 m /sec
Other piping	As per good engg. Practice

(b.) Inside diameters thus calculated for various piping systems shall be checked for the allowable pressure drop as per the HBDs.

(c.) Design parameters shall be selected based on the provisions of latest editions of ASME B31.1 and IBR 1950. Pipe shall be sized for the worst (i.e. maximum flow, temperature and pressure values) operating conditions for each system considering the maximum occasional pressure and temperature variations expected in each system during its service. In case of BFP suction sizing, “transient analysis” shall be carried out for optimum sizing of the system in order to establish the pipe inside diameter for minimum pressure drop in system to match with the pump NPSH requirement under worst operating conditions. Further, notwithstanding anything contained in these codes, standard & regulations, following specific requirements shall also be met.

(d.) The design pressure for BFP discharge piping up to and including first isolation valve downstream of feed water regulating station (FRS) shall be selected such that the minimum calculated thickness for various pipes at design temperature is sufficient for the following conditions, considering allowable stresses as per ASME B31.1.

(i) Discharge Pressure corresponding to Turbine driven BFP trip speed at shut off head flow condition, If TDBFP characteristics is governing for calculation of boiler feed discharge piping design pressure.

(ii) Discharge pressure corresponding to Motor driven BFP trip speed (frequency 51.5Hz) at shut off head flow condition If MDBFP characteristics is governing for calculation of boiler feed discharge piping design pressure.

(e.) The design pressure of complete feed water discharge piping system downstream FRS first isolation valve shall not be less than maximum of the following:

(i) 1.05 times the maximum operating pressure (including BMCR condition) at BFP discharge.

(ii) Pressure required at BFP discharge under lowest spring loaded safety valve on boiler separator blowing condition.

(iii) Design pressure as required by IBR / ASME.

1.03.00 **M r S**

Piping system shall be of carbon steel for design temperature up to 400 deg. C and alloy steel for design temperature above 400 deg. C.

1.04.00 **P T**

1. Thickness calculation shall be made on the basis of procedure and formula given in ANSI/ASME B 31.1. Thickness thus calculated shall then be checked based on the procedure and formula given in IBR. Then, based on the higher value of the two calculations (after adding manufacturing tolerance), the next heavier commercial wall thickness shall then be selected from thickness schedules (eg. sch.40, sch.80, etc.) as contained in ASME B36.10 for OD controlled pipes and from manufacturer's schedules for ID controlled pipes.

   However, in such cases where the calculated thickness for OD controlled pipe falls beyond the thickness corresponding to the listed schedule nos. as given in ANSI B36.10 for the pipe size, both ID and OD controlled pipes to manufacturer's schedules are acceptable.

2. OD controlled pipes shall be to the dimensional standards ANSI B36.10 for carbon & alloy steels pipes and ANSI B36.19 for stainless steel pipes.

3. To account for losses due to corrosion, erosion etc. during the plant service life, an allowance of 1.6 mm/0.75mm shall be considered in the minimum wall thickness calculation of pipes as per ASME B31.1/IBR respectively.

4. The design pressure and temperature, down-stream of any pressure reducing valve up to and including the first block valve shall be the same as that at up-stream of pressure reducing valve.

5. The piping at Downstream of de-super heater, for the spray mixing length, shall be of alloy steel material. The minimum straight length of piping to be considered at downstream of de-super heater for spray mixing shall not be less than the length required for proper mixing & evaporation of spray water as recommended by respective de-super heater manufacture. First bend downstream of any de-super heater shall be provided only after de-super heater manufacturer's recommended minimum required straight pipe length for proper mixing of spray water with steam.

6. The selected piping for the spray mixing length at downstream of desuperheater / LP Bypass valves shall be checked (as per Clause 102.2.4 of ASME B 31.1) to meet the design requirement corresponding to the temperature derived from the equivalent enthalpy method between upstream and downstream of the de-super heater valves.

7. Complete boiler feed pump recirculation piping up-to last block valve (downstream of re-circulation control valve) shall be designed for full pump shut-off head. However, if IBR/ASME calls for any provision of safety valve at the downstream of last isolation valve on recirculation piping, then the same shall be provided by bidder.

8. However, in no case, the selected pipe thickness shall be less than (a) Sch XS for LP Bypass downstream piping (b) Sch.80 for alloy steel & carbon steel pipes of sizes 50 NB & below and (c) Sch. 40S of ANSI B 36.19 for Stainless steel piping. Further, for the piping systems likely to be subjected to two phase flow, i.e. downstream of control valves on heater drain lines etc., the selected thickness shall not be less than the Sch XS or one schedule higher than the calculated thickness, whichever is higher.

1.05.00 **L**

(a.) All high points in piping system shall be provided with vents. All low points shall be provided with drains. Provisions of drains on steam piping shall be as per ASME code TDP-1. Drain lines shall be adequately sized so as to clear condensate in the line and prevent water hammer and damage to turbine due to water induction. However, in no case the min. ID of drain pipe selected shall be less than 19mm. All piping shall be sloped towards the system low point such that slope is maintained in both hot and cold condition.

(b.) All drain, vent, air release, sampling and instrument root lines in piping system with design pressure 40 Kg/cm2 (g) and above or with temperature above 350 deg.C or with vacuum service shall be provided with two (2) valves in series (i.e. double valved).

(c.) The pipe routing shall be such that clear headroom of not less than 2.1 meters above the walkways/working area is available. The contractor shall ensure correct orientation of and easy access to valves and instruments etc. and sufficient clearance for removal and maintenance of the same. The piping shall not encroach on withdrawal space of various equipment and walking space.

(d.) Wherever there is possibility of ingress of rainwater through floor/ceiling opening at points where any pipe passes through floor/ceiling suitable weather protection hood shall be provided.

1.06.00 **S r A**

(a.) Flexibility and stress analysis for various piping systems shall be carried out by the contractor as per the requirement of ASME B31.1. Analysis results shall satisfy the following.

(1.) Calculated stresses in the piping system shall be within the allowable limits stipulated in ASME B 31.1 as well as in IBR for piping under the purview of IBR.

(2.) Calculated forces and moments on equipment nozzles/TP are not more than the allowable loading provided by respective equipment manufacturer(s)/contractors. Flexibility analysis also calculates the deflections in all directions (translational and rotational) to enable design and selection of hanger/support system.

(b.) Cold pulling is not permitted. The contractor shall so design the piping systems that there will be no requirement of cold pull for meeting allowable reaction/stress values.

1.07.00 **r d S r**

All hangers and supports shall be erected such that vertical angulation in hot condition (rated parameters) shall not exceed the limits as specified in MSSP-58. However, in piping system connected to the rotating equipment nozzles, it may be required to design and erect the hangers/supports in the piping near the equipment nozzle as per the requirements/recommendations, if any, of rotating equipment manufacturer(s).

1.08.00 **T r**

(a.) Thermal insulation shall be provided mainly for the following reasons.

(1.) Conservation of heat and maintenance of temperature as per design cycle.

(2.) Personnel protection.

(b.) Design for personnel protection

For the piping and the equipment with surface operating temperature of 60 deg. C and above, the personnel protection insulation shall be applied such that the temperature of protective cladding shall not exceed 60 deg. C

(c.) For First Layer, Ceramic Fiber insulation is to be used in following circumstances :

Operating Temperature	Insulation material selection
500 deg. C and above	75 mm Ceramic fiber followed by LBM

(d.) The Contractor shall prepare an insulation thickness schedule covering both the cases of heat conservation and personnel protection based on the following design data.

Design ambient temperature	40 deg. C for inside and 45 deg. C for outside the Main plant building.
Maximum cladding temperature	60 deg. C
Wind speed	0.5m/sec. for inside and 0.25m/sec for outside the Main plant building
Emissivity of cladding	0.2
Pipe/Equipment wall temp.	Maximum operating temperature.
Thickness calculation	As per ASTM C-680 or equivalent

Note : Thickness of Ceramic fiber and LBM is to be calculated layer wise considering first layer of ceramic fiber insulation thickness as per clause 1.08.00 (c) followed by mineral wool/LBM of appropriate thickness to reach cladding surface temperature 60 deg. C or less)

1.09.00 **T**

(a.) The flash tanks shall be adequately sized to take care of the total drains in the complete power cycle piping system. There shall be sufficient margin to accommodate the possible variation in drain quantities as well as flash steam. Flash tanks shall be designed as per the requirement of ASME Boiler and Pressure Vessels (B&PV) codes, & ANSI standard. The contractor shall submit design calculation for flash tanks and basis of design parameter selection for Employer's review.

(b.) However the minimum design pressure and temperature for the flash tanks shall be 3.5 Kg/cm2 (g) and 210 deg. C respectively. Flash tanks shall also be designed for full vacuum condition.

(c.) Corrosion allowance of 3.0 mm shall be added to the design thickness of the shell and head of the vessels. The minimum thickness of the vessels including corrosion allowance shall not be less than 8 mm.

(d.) The flash tanks and manifolds shall be designed to take care of the impact forces due to incoming drains and possible erosion that may arising out of flashing.

(e.) In case the spray is in manifold, the material for the flash tank manifolds shall conform to ASTM A335 Gr. P22 or better and its thickness shall not be less than SCH 100 of ANSI B36.10 irrespective of temperature of the fluid handled

(f.) The temperature in the flash tanks shall be maintained by using condensate/Feed water spray, as the case may be and in whichever case applicable. The spray shall be automatically controlled. However, for flash tanks open to atmosphere continuous spray through an orifice shall also be acceptable.

SPECI IC RE UIREMENTS PIPES AND ITTIN S

2.01.00 Manufacturing tolerances on pipe diameter (for both ID and OD controlled pipes) and thickness shall be as per ASTM A-530/ A999M, as applicable.

2.02.00 Bend thinning allowance shall be provided for all bends as per the recommendations of ASME B 31.1. The finished bends wall thickness at any point of the bend shall not be less than the calculated minimum straight pipe wall thickness.

2.03.00 Steel pipes, fittings & valves shall in general be provided with butt welding ends as per ANSI B 16.25. for sizes 65NB & above and socket welding ends as per ANSI B 16.11 for 50 NB & below. However, butt weld joints in 25 NB / 40 NB / 50 NB piping is also acceptable provided root run (with TIG welding) is followed for the butt joints. However, in certain cases edge preparations on pipe welding end may be required to be done to match equipment terminals, valves, specialties, connection to flanges etc.

2.04.00 All stubs welded to the pipe including welded thermo wells and instrument source tapings shall be installed on the pipe prior to stress relieving.

2.05.00 Instrument tubing up to and including the root valves and all line drains & vents shall be generally of the same pipe material as that of the main pipe on which they are located unless & until specified otherwise elsewhere.

2.06.00 Wherever ASTMA 106 Gr. B/Gr. C or A - 105 material are used the maximum carbon content shall be limited to 0.30% (Max.).

2.07.00 Wherever mitered bends are used the thickness of pipe from which they are fabricated shall conform to the requirements of Regulations 361 (C) of IBR. The angle between axes of adjoining pipe sections shall not exceed 22.5 deg.

2.08.00 Non-destructive examinations for butt welds of NPS over 50 mm and for welded branch connections of branch size over 100 mm NPS shall be as specified elsewhere. For smaller sizes the mandatory minimum requirements shall be as per Table 136.4 of ANSI B 31.1 for non IBR piping and for piping under the purview of IBR, the mandatory minimum requirements shall be as per Regulation 360 of IBR or table 136.4 of ANSI B 31.1, whichever is more stringent.

SPECI IC RE UIREMENTS AL ES AND SPECIALITIES

3.01.00 For all globe and check valves, the direction of flow shall be clearly stamped on the body of the valve.

3.02.00 All globe valves shall be capable of being closed against the design pressure.

3.03.00 Where globe valve has been specified for regulation purpose, the disc shall be tapered plug type and suitable for controlling throughout its lift.

3.04.00 All gate and globe valves shall have bonnet-back seating arrangement.

3.05.00 Check valves shall have full floating and accurately guided discs.

3.06.00 All gate, globe and check valves shall be designed for reconditioning seating surfaces and replacement of stem and disc without removing the valve body from the line.

3.07.00 Hand wheels for all the valves shall close the valve in clockwise direction when viewing from the top. All hand wheels shall be clearly marked indicating the direction of opening/closing.

3.08.00 Manual gear operators shall be provided to open/close the valve against the maximum differential pressure across the valve such that the effort required to operate the valve does not exceed 35 kgf.

3.09.00 Valves of 65 mm NB & above with rising stem shall be provided with position indicator/ visual indication either through plastic stem covers or through metallic stem covers. All gate, and globe valves of size 50 mm and below in vacuum service shall have extra deep gland packing without requiring water gland sealing. All gate and globe valves of size 65 mm NB and above in vacuum services shall have adequately deep gland packing and shall be equipped with lantern rings to admit pressurized water for gland sealing.

3.10.00 Where floors and extension spindle arrangements is required for valves, the height of floor stand shall be about one meter from the floor/platform. The floor stand shall be sturdy construction with column, nut plate and hand wheel made of the cast iron conforming to material ASTM-A-126 Grade B. Suitable thrust bearing shall be provided/between the hand wheel and floor stand. The connection of the extension spindle to the valve stem shall be through a flexible coupling and shall be designed to permit valve thermal movements. Necessary nuts, bolts etc. for mounting the floor stand on platform shall be provided.

3.11.00 All valves shall be provided with proper name plates indicating complete information about the valves.

INTE RAL BY PASS AL ES

(a.) The requirement of integral bypass valves shown in P&IDs, is the minimum required. The final requirement shall be worked out, as per process requirement, during detailed engineering.

(b.) If integral bypass valve selected is of size 50 mm NB and below, then gate or globe type of forged construction with socket weld end as per ANSI B-16.11 shall be provided. For integral bypass valves of size 65 mm NB and above, both forged and cast steel gate valves with butt weld ends as per ANSI B 16.25 are acceptable.

(c.) Bypass pipe shall be of seamless construction and thickness corresponding to minimum of schedule 80 and shall be of the same material class as the main pipe.

(d.) Integral bypass shall be motor operated if main valve is motor operated.

SPECI IC RE UIREMENTS ABRICATION

5.01.00 Piping system fabrication shall be in accordance with the requirement of ANSI B 31.1. However for system under purview of IBR, the requirements of IBR, shall also be complied with. All dissimilar material piping connections shall be subjected to the acceptance and approval of the Employer. Complete document shall be submitted by the contractor in addition to the fulfillment of IBR requirement.

5.02.00 Where welded pipe and fittings are used the longitudinal weld seams of adjoining sections shall be staggered by 90 deg.

5.03.00 Access holes for radiography at shop for piping requiring 100% radiography shall be provided only if the area to be radio graphed is not accessible from pipe ends. Access holes for field radiography shall be provided.

5.04.00 **B d d E**

(a.) Elbows shall be generally of long radius type.

(b.) Bends for piping 65 mm NB and above shall be made hot and for piping 50 mm NB and smaller may be made cold.

(c.) Bends shall be made in accordance with PFI-ES-24/ ISO/ Other international standards. Bends shall be supplied with the minimum tangents except where the piping layout necessitates shorter lengths in which case the tangents shall be suitably reduced after the bending operation to suit the requirements of the piping layout. Heat treatment of bends shall be done as per material specification.

(d.) All bends 65 mm NB and larger shall be ultrasonically examined as per PFI-ES-20.

(e.) Where examination of bends indicates that wall thinning has resulted in thickness less than the minimum specified, repair by weld deposition shall be allowed only where the length of the affected area is 150 mm or less as measured along the outside arc of the bend. Repairs in excess of this amount shall not be allowed. All repairs shall be carried out only after approval of the Employer.

(f.) Circumferential butt welds shall not be used in the area of the bend. Longitudinal welds, where bends are formed from welded pipe shall be located on the bend's neutral axis.

5.05.00 Branch connections shall conform to the requirements of ASME B 31.1. All branch connection welds shall be full penetration welds, except as permitted by ASME B31.1/IBR.

5.06.00 All materials that are bent, forged or formed shall be subject to heat treatment after the forming operations as required by the original material specification. For alloy steel materials the preferred heat treatment process is full annealing.

5.07.00 **C d Pr**

(a.) All fabricated piping shall be cleaned as per relevant SSPC cleaning technique/practice such that both inside and outside surfaces of the piping are free of sand, loosely adhering scale, dirt and other foreign matters.

(b.) After cleaning outside surface shall be coated with enamel or other protective paint. The weld end preparation shall be coated with Deoxyaluminate paint and protected adequately. Use of grease or oil, other than light grade mineral oil is not allowed.

(c.) After descaling, the pipe shall be protected by applying internally with a water-soluble preservative.

(d.) Following cleaning and preservation, the fabricated sections shall be covered, boxed, capped, or others shielded from further contamination or corrosion.

5.08.00 **MARKIN**

5.08.01 All piping shall be marked clearly and legibly at the shop with its identifying pipeline description and piece no. as per the appropriate component or spool piece fabrication drawing.

5.08.02 Marking shall be by any method which does not produce sharp discontinuities and the marking does not get erased until the piping is erected. Piping 6 mm and thicker may be marked by stamping using round nose or dot interrupted die stamps with minimum nose radius of 0.8 mm.

5.08.03 Items too small to be marked shall have metal tags securely attached to each bundle or container of such items such that it does not get erased until the item has been erected.

SPECI IC RE UIREMENTS ERECTION

6.01.00	Where control valves, flow nozzles, orifices and other piping appurtenances are to be installed, they shall be installed only after steam blowing and chemical cleaning operation. After the completion of the steam blowing/chemical cleaning the contractor shall cut spool pieces of required length and install the components
6.02.00	Field run piping shall be erected only after completion of erection of all other piping system, structures and equipment unless otherwise approved/directed by the Employer.
6.03.00	When 'C' clamps are tack welded to the pipe for the purpose of alignments of a joint, preheating for the tack welding shall be performed if the main joint adjacent to it to be preheated as per the requirements of this specification, otherwise preheating for the tack weld may be omitted. After the joint is completed, all tack welds shall be removed, flushed with the adjacent surface of pipe by chipping and/or grinding. The areas where 'c' clamps were attached shall be subjected to stress relieving as required.
6.04.00	The hydrostatic testing of the piping system shall be done after proper installation of all permanent hangers/supports. Spring hangers shall be locked during hydrostatic test. Prior to steam blowing all hangers which had been locked for the hydrostatic testing shall be unlocked.
6.05.00	The setting and logging of all supports, restraints/limit stop, spring hangers, etc. is the responsibility of the contractor. The initial setting on all hangers and supports and clearance on restraints and limit stops shall correspond to the design cold values. The Contractor shall check all readings after completion of erection of piping system and application of insulation and carry out readjustment as necessary to be in line with the design cold values. After satisfactory setting of all hangers/restraints, hanger readings/clearances shall be logged by the contractor in proper format and a joint protocol be made.
6.06.00	The contractor shall monitor the behavior of all hangers, supports, restraints etc. during the initial stages of plant operation. When the piping system(s) have attained their rated temperature the contractor shall log, hanger readings, snubber deflections, restraints/limits stop clearances, as specified elsewhere.
6.07.00	All gaskets shall be asbestos free material and suitable for the service application.

SPECI ICATION OR PIPIN AND ITTIN S

	A S	C r S
A PIPES		
Material	ASTM A335Gr.P-92 or equivalent (See Note-1 below) ASTM A335 Gr.P-91 ASTM A335 Gr.P22 OR ASTM A335 Gr.P11 (*See Note below)*	ASTM 106 Gr. B / ASTM 106 Gr. C [A 106 Gr. C for BFD design parameters, CRH design parameters and above. Alternate material for BFD design parameters- 15NiCuMoNb5 (EN 1.6368) / ASTM A335 Grade P36 (See Note below)
Construction	Seamless (See Note below)	Seamless (See Note below)
B		
a) Material for 65 NB & Above	ASTM A182 Gr. F92 or Equivalent ASTM A234 GR. WP91 ASTM A234GR. WP22 OR ASTM A234GR. WP11 [See Note below]	ASTM A234 Gr. WPB with A 106 Gr. B piping and ASTM A234 Gr. WPC for A106 Gr. C piping And 15NiCuMoNb5 (EN 1.6368) / ASTM A335 Grade P36/ ASTM A234 Gr. WPC for alternate BFD pipe material [See Note below]
b) Material for 50 NB and Below	ASTM A182 Gr. F92 or equivalent ASTM A182 Gr. F91 ASTM A182 Gr. F22 or ASTM A182 Gr. F11	ASTM A105
	See note below	See note below
c) Basic standards	ANSI B16.9, ANSI B16.11 ANSI B 16.25 & ANSI B 16.28	ANSI B16.9, ANSI B16.11 ANSI B 16.25 & ANSI B 16.28
d) Construction	Seamless (Forged for 50 NB & below)	Seamless (Forged for 50 NB & below) See note below
e) Rating/Wall/ Thickness	To match with that of pipe	To match with that of pipe
C ELDIN		
Backing Rings	Not permitted	Not permitted
D MATERIAL ANALYSIS		

	A S	C r S
Mandatory Requirements and supplementary requirements:	**M d r r r** All tests, as given in respective material code (other than supplementary requirements), shall be carried out as minimum. This includes the tests wherein it is specified in the respective material code that "the test is to be carried out when specified by the purchaser" or any such indication, in the code. **O S r r r A r** **N C M N EN ASTM A r d P** **O r N C M N EN** Product Analysis (Option 3), Wall thickness measurement away from tube end (Option 15), NDT for the detection of transverse imperfection (option 8) and laminar imperfection (option 9) as indicated in EN 10216-2 and tensile test at room temperature to be done per heat as an additional test. **S r r ASTM A r d P** S1, S2, S3, S4 & S5 as indicated in ASTM A335. **S r Add R r r ASTM A P r E** **r ASTM A r d P** 1. Supplementary tests S1, S2, S3 and S4 as per ASTM A 335 will be done. However quantum of tests shall be at least 5% of the pipes per heat or Minimum 2 pipes per heat from one end / both end of the pipe as specified in ASTM A335. 2. Supplementary requirement S5: Certificate of conformity "COC" from pipe supplier for microstructure and delta ferrite (to be maintained within 3%max. when measured as per VD TUV 1272). 3. Chemical Composition: For ASTM A335 P92 Nickel and Copper shall be limited to Ni – 0.3% max. and Cu – 0.25% max., respectively, while complying the percentage of other elements in P-92 within the prescribed limits as indicated in the applicable codes/standards for piping (pipes/fittings/components/valves etc.). **r r ASTM A r d P** 1. All supplementary tests as per the applicable material standard /code 2. Certificate of conformity "COC" from pipe supplier for microstructure and delta ferrite (to be maintained within 3%max. when measured as per VD TUV 1272). 3. Additional tests (not covered above), if any, required as per IBR/ ASME.	

E YDROSTATIC TEST PRESSURE

(1) Piping system under IBR purview:

At Shop	All piping including fabricated piping shall be hydro tested at 1.5 times the design pressure subject to regulation 374 of IBR. However, non-destructive testing in lieu of hydro test is also acceptable subject to regulation 343 (3) of IBR
After Erection	All piping systems shall be hydro tested at 1.5 times the design pressure subject to regulation of 374 IBR. However, for such systems where it is practically not possible to do hydro tests, the tests as called for in ANSI B31.1& IBR in lieu of hydro test shall also be acceptable.

dr T B r d P Since, isolating valve is not provided at economizer inlet/ terminal point, contractor is to make all necessary arrangement of Hydro-Testing of BFD piping

beyond HP heater downstream isolating valves up to TP either by blanking or providing a temporary valve. NDT as per the provision of IBR & ASME B31.1 can be carried out for the joint at TP between SG & TG contractor.

(2) Non-IBR Piping Systems:-

At Shop	All piping including fabricated piping shall be hydro tested at 1.5 times the design pressure subject to regulation 374 of IBR. However, non-destructive testing in lieu of hydro test is also acceptable subject to regulation 343 (3) of IBR
After Erection	All piping systems shall be hydro tested at 1.5 times the design pressure subject to regulation of 374 IBR. However, for such systems where it is practically not possible to do hydro tests, the tests as called for in ANSI B31.1& IBR in lieu of hydro test shall also be acceptable.

Notes:

1. a) The materials used for main steam / hot reheat and other alloy steel piping systems shall be equal to or better than the following specified materials unless indicated otherwise

	M P r D T r r r r r r r	**M r**
	Upto & including 510 degree Celsius	Alloy steel ASTM A-335 Gr.P-11.
	Upto & including 545 degree Celsius	Alloy steel ASTM A -335 Gr.P-22.
	Upto & including 601 degree Celsius.* **Consequent to above design temperature limitation of 601 Deg.C for usage of ASTM-A-335-P-91 or its equivalent material, this material (i.e. ASTM-A-335-P91 or its equivalent) shall not be used or offered in Main Steam and / or Hot Reheat Piping System when rated steam temperature at turbine inlet as offered by the Bidder exceeds 593 deg.C for either mainsteam or Hot reheat piping or for both)*	Alloy steel ASTM A -335 Gr.P-91 or equivalent.
	Upto & including 610 degree Celsius.	Alloy steel ASTM A 335 Gr. P-92 or equivalent.

(b) In case it is proposed by the bidder to use piping material equivalent to ASTM-A-335 P-92 for Main Steam and / or Hot Reheat Piping, Bidder shall be required to furnish a certificate of provenness of the material certifying the usage & satisfactory performance of the proposed material in Main Steam and/or Hot Reheat Piping/components for a reference plant (or applicable unit of reference plant) having rated main steam and/or Hot Reheat steam temperature at turbine inlet at least equal to or higher than the rated Main Steam and/or Hot Reheat steam temperature at turbine inlet offered by the bidder. Such reference plant(s) (or unit) should have been executed by the bidder himself or by others and should have been under operation for at least 50,000 hours or 6 years from date of commissioning of the applicable unit (of the reference plant).

c) If ASTM A335 P92 is offered/ used by the bidder/ contractor for piping (pipes, fittings, components, valves, etc.), maximum allowable stress values to be considered for calculating the thickness of piping (pipe, fittings, components, valve etc.) will be reduced by 10% w.r.t allowable stress value indicated in code case (ASME-B-31.1) for P-92. Similarly, if any proven material equivalent to ASTM-A-335-P92 is used, the maximum allowable stress to be considered for calculating the thickness of piping (pipe, fittings, components, valves etc.) will be reduced by 10% w.r.t allowable stress value indicated in the standard/code of that equivalent material.

2. LP Bypass downstream piping shall be of ASTM A335 P91/ ASTM A691 Gr.91 or ASTM A335 P22 /ASTM A691 Gr. 2¼Cr. CL-21/22 and fittings shall be ASTM A234 Gr. WP22/WP91, depending on design temperature. The fittings shall correspond to ASTM A234 with Grade corresponding to the pipe material. Single seam welded construction fittings are also acceptable with A691 piping. However all requirements as per ASME B31.1 including the requirements given in mandatory appendix-D, IBR & respective material code shall be fully complied with, in respect of welded fittings.

3. Bends in BFP-T Exhaust Piping to condenser shall be of alloy steel of A691-2¼Cr.CL-21/22 or A691-1¼Cr. CL-21/22.

4. EFW Pipes as per ASTM A672 Gr.B60 CL-12/21/22 are acceptable for carbon steel piping of sizes 500Nb & above if the design pressure and design temperature are such that it calls for pressure rating of ASME 300 class or below except CEP discharge Piping. However, in such cases where the main piping is of seamless construction, all branch/tap-off from it shall also be of seamless construction irrespective of the pipe size. The fittings of A672 piping shall correspond to ASTM A234 with Grade corresponding to the pipe material. Single seam welded construction fittings are also acceptable with A672 piping. However all requirements as per ASME B31.1 including the requirements given in mandatory appendix-D, IBR & respective material code shall be fully complied with, in respect of welded fittings.

5. EFW pipes as per ASTM A691 Gr.2¼ Cr. CL-21/22 are acceptable for alloy steel piping (upto design temperature 545 degree) of sizes 500NB & above if the design pressure and design temperature are such that it calls for pressure rating of ASME 300 class or below. However, in such cases where the main piping is of seamless construction, all branch/tap-off from it shall also be of seamless construction irrespective of the pipe size. The fittings of A691 shall correspond to ASTM A234 with Grade corresponding to the pipe material. Single seam welded construction fittings are also acceptable with A691 piping. However all requirements as per ASME B31.1 including the requirements given in mandatory appendix-D, IBR & respective material code shall be fully complied with, in respect of welded fittings.

6. Materials used for pipe fittings, specialties and valves shall be corresponding to pipe material, unless specified otherwise.

7. Spherical WYE-piece (made of seamless forged components) as per TRD-303 / EN 13480-3 for high temperature applications is also acceptable.

8. For Boiler Feed Discharge piping or Re-heater attemperation, material conforms to 15NiCuMoNb5 (EN 1.6368)/ASTM A335 Grade P36 are acceptable as an alternate material to the specified material ASTM A106 Grade C. subject to meeting the following conditions:

   a) Material for stubs, laterals, Boss etc. which are to be welded on to the main pipe (15NiCuMoNb5 (EN 1.6368)/ ASTM A335 Grade P36) shall corresponds to either the pipe material or ASTM A105.

   b) Valves body shall be of forged construction and material shall corresponds to 15NiCuMoNb5 (EN 1.6368)/ ASTM A335 Grade P36 or A105.

   c) Maximum permissible operating temperature for the material shall not exceed 310 deg. C.

   d) The contractor / sub-contractor should have experience in fabrication & welding of feed water piping / re-heater attemperation with 15NiCuMoNb5/ASTM A335 P36.

e) If use of P36 piping by TG contractor calls for dissimilar material connection at terminal points (TP), supply of matching pieces required and dissimilar material welding at TP shall be in the scope of TG package contractor.

SPECI ICATION OR AL ES

8.01.00 **C r d S C NB**

Sl. No.	Description	Carbon Steel		Alloy Steel		Stainless Steel
		600 Lbs& below	Above 600 Lbs	600 Lbs& below	Above 600 Lbs	400 Lbs& below
1.0	Basic Standard	ANSI B16.34				
2.0	Construction					
A	Bonnet/Cover	Bolted type	Pressure Seal	Bolted type	Pressure seal	Bolted Type
B	Disc					
	Globe valves	Throttling type plug				
	Check valves	Twilting/swing type				
	Gate valves	Solid/flexible wedge below 100 NB				
		Flexible wedge for 100 NB & above				
C	Seat	Integral type / Welded Type				
	M r					
A	Body & Bonnet Cover	ASTM 216 Gr. WCB (Refer note below)	ASTM 216 Gr. WCC (Refer note below)	ASTM A217Gr. WC6 ASTM A217Gr. WC9 ASTM A217Gr. C12A ASTM A-182 Gr.F92 or equivalent (Refer Note-3)		ASTM A351 CF8/CF8M
B	Stem	13% chrome steel ASTM-A-182 Gr.F6a / ASTM A 564 Type 630 H 1150 D / ASTM A 565 GR 616 / ASTM A 565 GR 660 / A479 Type 410 / A479 Type 431/ A479 Type XM-19 / 16Cr-Ni-Mo (Ohtaron) or better				ASTM 182 F316/F304
C	Hinge pin(for check valves)	13% chrome steel ASTM A-182 Gr F6a or better				ASTM 182 F316/F304
D	Disc and seat ring (heat treated & hardened)	ASTM A216 Gr. WCB Minimum Hardness 250 BHN Refer note below)	ASTM A216 Gr. WCC Refer note below)	ASTM A-217 WC6 ASTM A-217 WC9 ASTM A-217 C12A ASTM A182 F92 or equivalent. (Refer Note-3)		ASTM 182 F316/F304
			Seating surface hard faced with stellite 350 BHN			
E	Back seat/ stem guide Bushing	ASTM A 182, Gr. F6a 13% Cr. SS with stellite hard facing				ASTM 182 F316/F304

8.02.00 **r d S NB C**

S N	D r	C r S	A S	S S
	D S d rd ASME B			
	C r			
A	Bonnet/cover	Bolted type for 600/800 lbs Seal welded type for 900 lbs and above		Seal welded/ Bolted type for 600/800Lbs. Sealed welded above 800lb
B	**D**			
	Gate	Solid wedge type		
	Globe	As per manufacturing std.		
	Check	Piston lift		
C	Seat	Integral type		
	M r			
A	Body & Bonnet Cover	ASTM A-105	ASTM A-182 Gr.F11/ ASTM A-182 Gr.F22/ ASTM A-182 Gr.F91/ ASTM A-182 Gr.F92 or equivalent / (Refer Note-3)	ASTM 182 F316/304
B	Stem	13% chrome steel ASTM-A-182 Gr.F6a/ ASTM A 564 Type 630 H 1150 D/ ASTM A 565 GR 616/ ASTM A 565 GR 660/ A479 Type 410 / A479 Type 431/ A479 Type XM-19 or better.		ASTM 182 F316/304
C	Disc and seat ring	ASTM A105 hard faced with stellite minimum hardness 350 HB	ASTM A182 Gr.F22 ASTM A 182 Gr F91/F92 or equivalent ASTM A 182 Gr F11 /hard faced with stellite minimum hard ness 350 HB	ASTM 182 F316/304 hard faced with stellite Minimum hardness 350 HB

8.03.00 **A** s

	A S	C r
D S d rd	ASME B16.34	ASME B16.34
M r		
Body & Bonnet	A182 Gr.F11/F22/F91/F92 or equivalent. (Refer Note-3)	A105 or better
Spindle/Disc	17% Chrome steel or better	17% Chrome steel or better
Disc Seat	Stellited	Stellited
Body Seat &back seat	Stellited	Stellited
Gland Packing	Graphite	Graphite
C r		
Valve type	Outside Screw & Yoke Type	

Body &Bonnet	Forged body with integral /welded bonnet construction for size 50Nb & below and Cast body with integral /welded bonnet construction for sizes above 50NB.
Disc type	Taper plug or Parabolic type to suit system requirement
End Connection	Socket weld end (ANSI B16.11) for sizes 50 NB & below and Butt weld end (ANSI B16.25) for sizes above 50 NB. However, butt weld end (as per ANSI B 16.25) is also acceptable for valves sizes 25 NB / 40 NB / 50 NB on corresponding size of piping having thickness schedule 80 & above.
Pressure rating	To suit the service condition. However, minimum pressure rating shall be corresponding to ANSI Class 1500

8.04.00 **O r d**

S NO	DESCRIPTION	SA ETY AL E		RELIE AL E	B AL E
		ALLOY STEEL	CARBON STEEL		
1.0	Basic standard	ANSI B16.34			AWWA C-504 / C-516
2.0	Pressure Class	400 lbs& below			75 B and above
3.0	Accumulation	10% (max.)			
4.0	Blow down	5% (max.)		10% to 15%	
5.0	Construction				
5.1	General	Spring loaded with weld end / flanged End inlet, pop up type # Refer Note below		Spring loaded with flanged inlet & outlet	Long body, butt Welded
5.2	Bonnet	Bolted type			
5.3	Seat bushing	Renewable type screwed on and held in position by pin / WELDED-IN TYPE BUSHING.			
5.4	Shaft seat				'O' ring type
6.0	Materials				
6.1	Body & Bonnet/ cover	ASTM A-217 WC6/WC9/C12 A/A182 Gr.F92 or equivalent. (Refer Note-3)	ASTM A216 Gr. WCB / WCC		ASTM A216 Gr. WCB
6.2	Spindle/Shaft	Stainless steel			ASTM A182 Gr.304
6.3	Disc, nozzle, seat ring	DISC : A 565-616T / ASTM A182 F316 F316L / ASTM A276 Type 316L or equivalent SEAT RING : ASTM A182 F316 / F316L **NO LE** ASTM A182 F316 / F316L	A105 with 17% Cr (hard faced) or better		ASTM A 216 Gr. WCB **S O R** -EPT/BUNA-N/ Neoprene for water service -EPT/EPDM for steam service
6.4	Spindle guide	17% chrome steel or monel, heat treated and hardened to minimum hardness 250 HB			

S NO	DESCRIPTION	SA ETY AL E		RELIE AL E	B AL E
		ALLOY STEEL	CARBON STEEL		
6.5	Spring	Stainless steel or Tungsten steel/ Chromium alloy	Carbon steel		
6.6	Retainer Rings and internal bolts Etc				SS 304
6.7	Bearing				Sleeve type, self-lubricated

NOTE:

1. For Pressure Class 400 LBS and below: Spring loaded with weld end / flanged End inlet, pop up type.
2. For Pressure Class above 400 LBS: Spring loaded with weld end inlet, pop up type.
3. For valves (all sizes) coming on A335 P92 or equivalent pipe line, valve body material shall be ASTM A182 F92 or equivalent and of forged construction.
4. Materials of valve trim shall be suitable for the design parameters.
5. Forged valve body construction in lieu of Cast valve body construction is also acceptable. However, material (ASME forged grade) shall correspond to the specified valve material/pipe material.

S R r

1. Valves of size 65 NB and above shall have butt welded ends as per ANSI B16.25 and Valves 50 NB and below shall have socket weld ends as per ANSI B16.11. However, butt weld end (as per ANSI B 16.25) is also acceptable for valves sizes 25 NB / 40 NB / 50 NB on corresponding size of piping having thickness schedule 80 & above.
2. Locking arrangement, wherever specified shall be of non-detachable type.
3. Valves shall be tested in accordance to ANSI B 16.34. However, for butterfly valves, the requirements of AWWA C-504, C516 shall also be met including POD test (where POD test results of representative valve is not available).
4. All gate and globe valves shall be with outside screw and yoke with rising stem. However for Valves sizes 2”and below Bidder may provide rising wheel design valve also.
5. Gate valves below 100 NB shall be solid wedge/flexible wedge type, valves of size 100 NB and above shall be of flexible wedge type. However, for sizes 100 mm NB and above and with class above 600, parallel slide valves are also acceptable.
6. Specification for valve actuators shall be as indicated in C&I Subsection
7. Stem for all valves shall be heat treated and hardened - minimum, hardness 200 HB and surface finish of 16 RMS or better in area of stem packing.
8. Gland packing for gate and globe valves shall be alloy steel/SS wire reinforced graphite with stem corrosion inhibitor.
9. All bolts and nuts shall be ASTM A-193 Gr. B 7 and ASTM A-194 Gr. 2H respectively.
10. Hand wheels for valves shall be of malleable iron / Carbon steel.
11. Minimum differential hardness between seat and other disc material shall be 50 HB in case of 13% chrome hardened with heat treatment of steel.
12. Valve closure test shall be as per ASME B16.34 and MSS-SP-61
13. Safety and Relief valves shall be supplied complete with discharge elbow and drip pan along with drain.
14. For valves of size 65 NB and above in vacuum service, water gland-sealing arrangement shall be provided. For valves of size 50 NB and below, deep gland

packing shall be provided. Butterfly valves, subjected to vacuum, shall be tested for vacuum as per relevant code

15. Valves 50NB and below shall be globe type unless otherwise specified elsewhere.
16. All globe valves shall be equipped with throttling cones with parabolic characteristic.
17. Unless otherwise agreed, all valves shall be fitted with the spindle in upright position.
18. The minimum inside diameter for valves shall be as per requirements of ASME B16.34. For valves beyond the listed sizes & rating in Table-A of non-mandatory Appendix-A of ASME B16.34, the minimum diameter of valve flow passage shall not be less than 90% of pipe inside diameter. However, reduced port valves are also acceptable for sizes 65NB and below.

SPECI ICATION OR AN ERS SUPPORTS

9.01.00 Design and Manufacture of Hangers/Supports shall conform to ANSI B 31.1, MSS-SP-58 and MSS-SP-89.

9.02.00 Where hanger rod angularity exceeds 4 degrees from cold to hot position (at rated parameters), the hanger and structural attachments shall be offset in the cold position in such a manner that the hanger rod shall be within 4 degree in hot position unless otherwise specified.

9.03.00 The Contractor shall furnish detailed arrangement sketches for each support, restraints, anchor, etc. The sketches shall include the key plan identification no., bill of quantities, design load, operating load, spring stiffness, amount of pre-compression, center line elevation of pipe, spring box position/orientation, etc.

9.04.00 Hangers support tag no. shall be marked on all pipe hangers/supports, restraints and anchor assemblies. The design loads, hot and/or cold loads shall be stamped on respective constant and variable springs.

9.05.00 **TEC NICAL RE UIREMENTS**

(a.) Each threaded connection and adjustable rod shall be provided with lock nuts.

(b.) Each rod of a double rod hanger support shall be designed for the full hydro test load coming on the double rod hanger assembly.

(c.) Hanger support rods of less than 10 mm diameter for supporting pipes of 50 Nb and smaller and less than 12 mm diameter for supporting pipes of 65 mm Nb and larger, shall not be used.

(d.) Parts of the hanger or support which move relative to the pipes during operation, shall be connected to the pipe attachments in such a manner that they lie entirely outside the pipe thermal insulation.

(e.) Attachments to piping shall be as far as possible by clamps. Material for all attachments welded to pipe shall be of material corresponding to pipe material or approved equivalent. Further, material of pipe clamps used shall be suitable for the design temperature of the piping concerned.

(f.) Where axial movement is to be restricted or riser clamps are used, suitable lug stops to prevent pipe movement shall be designed for welding on to pipe.

(g.) Bolted pipe clamps shall have a minimum thickness of 5 mm for weather protected locations and 6 mm for locations exposed to weather.

(h.) Beam clamps shall be forged steel equipped with a rod to fix a nut.

(i.) All sliding surfaces of supports and restraints shall have Teflon lining on one surface coming in contact with stainless steel lining on the other surface.

(j.) All pipes hangers and supports shall be designed to carry the weight of the piping fitting, thermal insulation, self-weight of the hanger assembly and medium transported or test medium whichever is heavier. In addition, all rigid rod hangers and variable spring shall be designed to carry the operation load in hot condition.

9.06.00 **S r r**

(a.) Constant load hangers shall generally be used when vertical displacement exceeds 40 mm or where the supporting effort variation of available variable spring exceeds 25%.

(b.) Constant load hanger shall be of moment-coil-spring counter balanced design or cam & spring type. Variable spring hangers shall be of helical spring design. Spring hanger/ assembly shall be constructed such that complete release of piping load is impossible in case of spring misalignment or failure.

(c.) Constant load hanger shall have a minimum field adjustment range of 15% of the load. The total travel for constant load hangers shall be design travel plus 20% but in no case shall the difference between total travel and design travel be less than 25 mm. The supporting effort variation throughout the travel range of constant load hangers shall not exceed 6%.

(d.) Variable spring hangers shall have supporting effort variation of not more than 25% throughout the total travel range.

(e.) All springs shall remain under compression throughout their operating regime and never under tension.

(f.) Spring hangers shall have provision for locking the hangers in any position of the travel.

(g.) Spring hangers shall be adjusted to the cold position before shipment and locked in that position. The cold and hot position shall be clearly marked on the travel indicator scales.

(h.) All spring hangers shall be locked before performing the hydro test. The locking shall be removed before the line is placed under operation.

9.07.00 **SNUBBERS**

a Snubbers shall be designed to allow normal movement of pipe due to thermal expansion and shall require minimal maintenance.

b The rated load/nominal load of selected snubber shall not be less than 1.25 times of the maximum calculated load on the Snubber.

c Snubber shall have convenient means for determining rod extension.

d Axes of snubbers/ restraints shall be parallel to the direction of the expected reaction force in operating condition.

e Construction of snubbers: At least piston & Cylinder (which is in contact with fluid) shall be made of stainless steel material (SS 304 or better). Non – stainless steel parts of snubbers exposed to atmosphere shall be provided with proper corrosion protection.

f Supporting Structure of the Snubbers shall be designed to withstand twice the rated load of the snubber.

9.08.00 **R r A r**

(a.) All anchors shall be designed for direct rigid fastening to the structural steel member.

(b.) Anchors, guides and restraints shall be capable of withstanding the forces and moments due to thermal expansion and dynamic effects.

9.09.00 **T d l**

(a.) All shop tests shall be conducted in accordance with ANSI standards and other applicable codes/standards.

(b.) Each Constant load hanger shall be tested before delivery to ensure that the variation in supporting capacity provided through specified range does not exceed 6%.

(c.) Each variable load spring hangers shall be tested before delivery for its spring stiffness.

(d.) Material test and analysis:

All materials shall be furnished in strict accordance with the applicable codes. All sources of materials shall be disclosed and relevant test certificates giving precise details of identification of material for the physical and chemical properties shall be submitted to the Employer/Project Manager.

(e.) All hangers\supports\restraints etc. on piping shall be inspected for the conditions mentioned elsewhere in the specification and log reports to be submitted to employer for their review.

STEAM TRAPS AND STRAINERS

10.01.00 Steam traps shall be of inverted bucket/thermo static type with integral or separate Y-type strainers.

10.02.00 Traps shall have stainless steel internals.

10.03.00 All Y-type strainers shall have stainless steel screen of not more than 20 mesh size. Screen open area shall be at least four (4) times the pipe cross sectional area.

10.04.00 Strainers shall have screwed blow off connection with removable plug.

10.05.00 All traps and strainers shall have socket weld ends as per ANSI B 16.11 for size 50 mm Nb and smaller and butt weld ends as per ANSI B 16.25 for sizes 65 mm Nb and larger.

10.06.00 Y-type strainers shall be provided along with each steam trap in case the strainer does not form an integral part of the trap.

SPECI ICATION OR T ERMAL INSULATION

11.01.00 **I M r C dd d A r**

(a.) The insulating material and cladding material shall be as per the tables of material given in the subsequent clauses.

(b.) All insulating materials, accessories and protective covering shall be non-sulphurous, incombustible, low chloride content, chemically rot proof, non-hygroscopic and shall be guaranteed to withstand continuously and without deterioration the maximum temperature to which they will be subjected under the specification conditions.

(c.) The use of insulation of finishing materials containing asbestos in any form is not permitted.

(d.) Insulation mattress/section shall be supplied in thickness of 25, 40, 50 and 75 mm. Insulation of higher thickness shall be made up in multiple layers using mattress/slabs of thickness specified above. However, if the required thickness is not achieved, the mattress/slabs in increment of 5mm shall be acceptable. The min. thickness shall not be less than 25 mm & number of layers shall be min. & the innermost layer shall be thickest.

11.02.00 **I M r**

(a.) Rock/glass wool insulation mattress shall be of long fibered rock or glass processed into fibrous form bonded with a binder. No Kind of slag wool inclusion is acceptable.

(b.) Calcium silicate pipe insulation shall be composed principally of hydrous calcium silicate reinforced with mineral fiber, it should be asbestos free.

(c.) All insulation shall conform to the quality requirements laid down below and test certificates on samples from the lot to be supplied shall be furnished to employer for approval.

(d.) Ceramic Fiber insulation shall be of high purity Alumina-silicate materials. Ceramic Fiber is produced by melting these products in an electric arc furnace, a stream is poured and cooled to form the fiber strands.

11.03.00 **O r A r**

The Contractor shall also provide other accessories such as ceramic boards, sealants and washers as required.

11.04.00 **I**

(a.) All surface to be insulated shall be cleaned of all foreign materials such as dirt, grease, rust etc. and shall be dry before the application of insulation.

(b.) Before applying the insulation the contractor shall check that all instrument tapings, clamps, lugs and other connections on the surface to be insulated have been properly installed as per the relevant erection drawing.

(c.) All flanged joints shall be insulated only after the final tightening and testing.

(d.) The insulation shall be applied to all surfaces when they are at ambient temp. Ample provision shall be made for the maximum possible thermal movement and the insulation shall be applied so as to avoid breaking/telescoping due to alternate periods of expansion and contraction.

(e.) All cracks, voids and depressions shall be filled with finishing cement, suitable for the equipment operating temp. so as to form a smooth base for the application of cladding.

	T	T	T	T	T	T
Type	Lightly resin Bonded mineral (rock) wool	Lightly resin bonded mineral (rock) wool	Resin bonded mineral (rock) wool preformed pipe section	Resin bonded glass wool preformed pipe section	Calcium silicate preformed block type	Ceramic Fiber
Apparent Density	120-150 Kg/M³	100 Kg/M³	140-150 kg/M³	60-80Kg/M³	200-250Kg/m³	128 Kg / m3
Mtl. Standard	IS:8183	IS:8183	IS:9842	IS:9842	IS:8154	IS : 15402
Applicable Service	Piping system & equipment with operating temp. in range of 400-500 deg. C	Piping system & equipment with operating temp. in range of 60-400 deg. C	Piping system of 350 NB and below with temp. in range of 60 – 500 deg. C	Piping system of 350 NB and below with operating temp. in range of 60-400 deg. C	Piping system & equipment with operating temp. in range of 400 – 500 deg. C	Refer Note #1 below
Testing Requireme nt	As per IS:8183	8183	IS:9842	IS:9842	IS:8154	IS : 15402

Note # 1: For piping system & equipment with operating temp 500 deg. C and above (except Vent and drain Lines). However, for drains & vent lines of operating temperature 500 Deg. C and above either Lightly resin Bonded mineral (rock) wool or ceramic fiber or combination of ceramic fiber & LRBM of suitable thickness as per approved calculation can be provided.

11.06.00 **C dd M r A r d r d r**

S N	**I**	**B S**	**D r**
1.	Cladding	Aluminium ASTM B-209-1060 temper H14 or IS:737 Gr.19000/H2	Thickness of sheathing (a) 18SWG (1.219mm) for diameter for insulated surface 450 mm and above and for flat surfaces (b) 20 SWG (0.91 mm) for diameter of insulated surface 150 mm and above upto 450 mm. (c) 22 SWG (0.71 mm) for diameter of insulated surface 150 mm and below.
2.	Binding & lacing wire	Galvanised Steel wire to IS: 280 for temp. below 400°C and stainless to IS:6528 for temp above 400°C	20 SWG for all insulation interface temperature
3.	Straps & Bands	(i) Aluminium where interface temperature are below 400 deg.C (ii) Stainless steel where temperatures are above 400 deg.C	Band shall be 20 mm wide and 0.6 mm thick for securing Aluminum Sheathing anodized aluminum bends shall be used.
4.	Screws	Stainless steel	Self-tapping, chese headed
5.	Hexagonal wire mesh	(i) (i) Galvanized steel wire to IS:280 mesh for interface temperature upto 400 deg.C. (ii) Stainless steel wire for temperature above 400 deg.C	Wire mesh netting shall be 10 to 13 mm aperture at least 0.56 mm diameter wire.

11.07.00 **I P**

(a.) All vertical pipes shall be provided with the suitable insulation supports to prevent collapsing/crushing of insulation due to its self-weight. Support rings shall be provided on all vertical piping with a difference in elevation of 4 meter or above, and there shall not be more than 3 meter straight length between support rings.

(b.) Longitudinal joints of insulation mattresses sections of horizontal piping shall be on the bottom or at the sides of the pipe.

(c.) When more than one layer of insulation mattress/section is required on piping the circumferential joints on adjacent layers shall be staggered by at least 150 mm and longitudinal joints shall be staggered by at least 50 mm.

(d.) The mattress type insulation shall be formed to fit the pipe and applied with the mattress edges drawn together at the longitudinal joints and secured by lacing wire. Pipe section insulation shall be fitted on pipe using binding wires.

(e.) Where insulation is applied in single layer or multi layers each layer of mattress shall be backed with hexagonal wire mesh. For pipe sections, the sections shall be held in place by binding wires without any wire mesh.

(f.) The ends of all wire loops shall be firmly twisted together with pliers, bent over and carefully pressed into the surface of the insulation. Any gap in the insulation shall be filled with loose mineral wool or finishing cement.

(g.) Insulation mattress/section ends shall be terminated at a sufficient distance from the flanges to facilitate removal of bolts.

(h.) The insulation shall be held in place by fastening over with binding wire for insulation surface with diameter upto and including 550 mm and with metal bends for insulation surfaces with diameter over 550 mm. The fastening shall be done at intervals of 250 mm except where specified otherwise. The ends of the binding wires shall be hooked and embedded in the insulation. The straps shall be mechanically stretched and fastened with metallic clamping seals of the same materials as the strap.

(i.) Insulation for application on bends and elbows shall be cut into mitered segments, sufficiently short to form a reasonably smooth internal surface. After the application of insulation material in place, insulating cement shall be applied as required to obtain a smooth surface.

(j.) Weather hoods shall be provided for insulated piping passing through floors/walls.

(k.) All pipe attachments coming on horizontal pipes, inclined pipes and bends shall be insulated along with pipe such that there will be no insulation applied to hanger rod and the component connecting hanger rod to pipe attachment. All pipe attachments exposed to weather shall be provided with weather proof.

(l.) Upstream of all drain lines and the lines connected to steam traps, shall be insulated upto and including first isolating valve for heat conservation. Rest of such lines such as downstream of the drain valves, traps etc. and other lines such as safety valve discharges, vents, etc. shall be insulated for personnel protection.

11.08.00 **I d**

(a.) All valves fittings and specialties shall be insulated with the same type and thickness of insulation as specified for the connected piping with the special provisions and or exceptions as given below.

(b.) All valves and flanges shall be provided with removable box type of insulation covered with box fabricated from aluminum sheets of thickness same as the connected pipe cladding. Adjoining pipe insulation shall be beveled back to permit removal bolts and nuts or bands. The portion of the valve which cannot be covered by box type insulation shall be filled by loose insulating material of packing density at least equal to that of the insulating material of adjoining pipe. The insulation for valves/flanges shall be applied

after the finishing has been applied over the connected piping. The cladding shall be applied in such a manner that the bonnet flange can be exposed easily without disturbing the complete insulation and cladding.

(c.) Expansion joints, metallic or rubber shall not be insulated unless otherwise specifically indicated.

11.09.00 **I E**

a	The insulation applied to the equipment shall be reinforced with hexagonal wire mesh. One layer of wire mesh shall be provided on the equipment surface prior to application of insulation.
b	Installation on horizontal cylindrical vessel/tanks (including heaters, deaerator, heat exchanger etc.).
c	All the surfaces of insulation layers, applied on horizontal cylindrical vessels shall be securely fastened by bands upto vessel/tank outer diameter of 150 mm and below. Where vessel/tank outer diameter exceeds 1500 mm, binding wire passing through insulation clips provided both longitudinally and circumferentially at 500 mm centers shall be used. Gaps in the insulation shall be filled with loose mineral wool and finished with finishing cement so as to obtain a smooth surface for the application of cladding. The contractor shall provide support ribs/lugs on the surface of the vessel/tank as necessary. The contractor shall obtain the approval of the 'Employer' and the equipment supplier's field engineering representative before performing any welding on equipment. Any heat treatment requirement as per recommendation of equipment supplier shall be performed by the contractor.
d	Installation on Vertical cylindrical Vessel/Tanks (including flash tanks etc.)
e	All vertical vessels/tanks shall be provided with support rings/ribs with other necessary frame work to take up the weight of the insulation prior to HT. The contractor shall obtain the approval of the 'Employer' and the equipment supplier's field engineering representative before performing any welding on equipment. Any heat treatment of vessel/equipment that is required after welding of rings/ribs on the vessel/equipment shall be as per recommendation of equipment supplier and shall be performed by the contractor.
f	The mattresses shall be held in position by means of 9 SWG steel wire nails, the nails being 25 mm longer than the thickness of insulation to be applied. After the mattresses have been placed over the nails, the nails shall be bent and embedded in the insulation. Alternatively, wire loops may be tack welded at 250 mm centers to hold the insulation in place

11.10.00 **I C dd**

(a.) All insulation shall be protected by means of an outer covering of aluminum sheathing. All insulation/cladding joints shall be sealed and made effectively weather and waterproof. All flat surfaces shall be given suitable slope to prevent collection of pools of water on the cladding surface.

(b.) All longitudinal joints shall have a minimum overlap of 50 mm and shall be located at 45 deg. or more below the horizontal for horizontal equipment. Joints shall be made with cheese headed self-tapping galvanized steel screws at 150 mm centers.

(c.) All circumferential joints shall have a minimum overlap of 100 mm and shall be held in position by stainless steel or anodized aluminum bands, stretched and clamped.

(d.) Removable box type cladding for valves and flanges shall be fitted on the connected pipe cladding, with bands.

(e.) Aluminum cladding shall not come directly into contact with either the equipment surface or with the supporting arrangement on the equipment surface. To this end, adequate layers of 3 mm thick ceramic board shall be provided between the cladding and any supporting arrangement equipment surface, and fitted with self-tapping screws/metal bands, as applicable.

(f.) For bends, fittings etc. the cladding shall be provided in segments as to ensure a smooth finish of the cladding.

(g.) For cladding on vertical pipes/equipment, provision for load take up shall be made at every 2 to 4 meters along pipe/equipment axis.

(h.) All joints shall be sealed with acrylic emulsion weather barrier.

(i.) Galvanic corrosion shall be prevented by carefully avoiding permanent contact of aluminum cladding with copper, copper alloys, tin, lead, nickel or nickel alloys including monel metal.

11.11.00 **T d r**

(a.) All tests, as per the applicable material standards and as specified shall be carried out in accordance with the methods prescribed. Employer shall have the right to witness any or all of the tests conducted by the contractor at the shop or laboratory.

(b.) The Contractor shall guarantee that if on actual measurement the specified maximum insulation surface temperatures are exceeded, the contractor shall either replace the insulation with a superior material or provide additional insulation thickness at no extra cost.

SPECI ICATION OR YDROSTATIC TEST O PIPIN SYSTEMS

12.01.0 On completion of installation/erection of the piping systems a hydraulic test in accordance with the requirements of the Indian Boiler Regulations/ASME B31.1, as applicable, shall be performed by the Contractor. The procedure adopted for hydraulic test shall have the prior approval of the Employer. The detailed schemes and procedure for carrying out hydraulic testing shall be prepared and furnished by the contractor and it shall be discussed and finalized during detailed engineering stage.

12.02.0 Cutting/welding/edge preparation and re-welding required for blanking, temporary piping connection and/or for replacements by spool pieces including reinstallation of components/piping systems after hydraulic testing shall be the responsibility of contractor.

12.03.0 The water for hydraulic test shall be made alkaline by addition of suitable chemicals. After the test, high pressure external piping shall be suitably drained and preserved.

12.04.0 All blank flanges/blanks, Caps, removable plugs, temporary valves, pipes & fittings, spools, blanking inserts/hydraulic kit for stop valves/control valves, other accessories & services etc. ,as applicable, for carrying out hydraulic testing of piping shall be furnished by the Contractor. The pressurization equipment including water piping as needed for the above test shall also be furnished by the Contractor. Any defect noticed during the testing shall be rectified and the unit shall be retested by the Contractor. However, if the hydro test of critical piping (MS, HRH, CRH) in SG Contractor / employer scope is to be carried out with HPT Stop valve & IPT Stop valve / CRV / OLV in the as installed position on critical piping, then the TG contractor / valve supplier to provide hydraulic kit / inserts / blanking plates / valve head, gaskets, bolts & nuts etc. for the valves to enable the SG contractor / employer to perform the hydro test of critical piping with these valve in circuit.

12.05.0 In case any piping (in other's scope) connection to/from the contractor's scope of piping are not ready or not erected at the time of hydro testing of contractor's scope of piping, then the contractor to provide necessary blanking arrangement as required at these branch connections / tap-off locations to complete the hydro testing of his scope of piping.

12.06.0 The hydraulic test shall be considered successful only on certification to that effect by the concerned inspecting authority as per the provision of the IBR and the Project Manager.

SPECI ICATION OR C EMICAL CLEANIN O PIPIN SYSTEMS AND E UIPMENTS

13.01.00 It is intended to chemically clean the following piping system

(a.) Boiler feed piping up to Economizer inlet NRV (i.e.including SG scope of FW piping)
(b.) Heater drains piping
(c.) Main condensate piping
(d.) Extraction steam piping
(e) Reheater spray piping
(f.) Any other piping system in contractor's scope to be cleaned through chemical cleaning as per the procedure prepared by contractor and approved by employer during detail engineering.
(g.) The following equipment which form a part of the above system shall also be included in the cleaning operation.
  (i.) H.P. Heaters
  (ii.) L.P. Heaters
  (iii.) Deaerator
  (iv.) Gland steam cooler
  (v.) Drain cooler
  (vi) Any other equipment in contractor's scope to be cleaned through chemical cleaning as per the procedure prepared by contractor and approved by employer during detail engineering.

  Note: In case chemical cleaning is not to be performed as per the standard practice of the bidder for any of the above-said equipment under bidder's scope, then suitable alternate measures are to be mutually discussed & agreed during detailed engineering after award.

13.02.00 Before introducing chemicals, all the piping systems and equipment listed above shall be water flushed. Water flushing will be followed by alkaline cleaning acid cleaning and passivation.

13.03.00 However, the Bidder shall submit along with the offer his usual procedures and practices for chemical cleaning of the piping and equipment specified. The Bidder shall submit all schematics, write up, details of chemicals to be used etc. and detailed procedures he intends to follow. These schematics and procedures shall be subject to the approval of the Employer.

13.04.00 **Pr C Pr d r**

Prior to starting any phase of cleaning operation the following procedures shall be ensured.

A Installation of all temporary piping, valves, pumps and equipments as required for the flushing and chemical cleaning operations.

B Temporary piping shall be routed at floor level as far as possible and secured in place to prevent movement/vibration beyond acceptable limits.

C Installation of the instruments as required to ensure satisfactory monitoring and control of the cleaning process. The Contractor shall also determine and arrange locations for sampling of the cleaning solution during cleaning.

D Bypassing all regulation/control valves coming in the cleaning circuit or installation of temporary spool pieces.

E Installation of special end covers and temporary suction strainers, for boiler feed pumps and condensate pumps. Pump internals shall not be installed.

F Installation of plastic seal in the condenser neck to protect the turbine from alkaline fumes.

G Blocking and securing of all spring hangers in the steam lines which may be flooded during the cleaning operation.

H Hand cleaning of the interiors of all vessels which are included in the cleaning operation.

13.05.00 **r C Pr d r**

(a.) Seal water lines to pump shall be broken and flushed.

(b.) Where pipeline terminate in spray headers, these headers shall be inspected after each phase of the cleaning operation and cleaned if necessary.

(c.) All strainers shall be observed closely during the cleaning operation by reading differential pressure gauges, and shall be cleaned when the differential pressure exceeds a predetermined value.

(d.) All high points, vents shall be opened periodically to ensure full system flow.

(e.) Upon completion of each stage of cleaning, the waste products shall be drained and transferred to the waste treatment basins (required waste water treatment basin/ neutralization pit shall be provided by bidder in consultation with project manager). The Contractor shall then supply and add the necessary chemicals to the basin to neutralize all waste solutions and rinses generated by the cleaning process, and arrange for its disposal to an area to be indicated by the Employer/Engineer.

(f.) Strictest safety precautions shall be exercised at all times during the chemical cleaning and during storage and handling of the chemicals. The Contractor shall ensure provision of all protective clothing, apparatus and equipment along with necessary first aid kits as required for handling the chemical and for carrying out the cleaning operation.

SPECI ICATION OR STEAM BLO IN O PIPIN SYSTEMS

14.01.00 Steam blowing of contractor's scope of piping systems shall be performed by the contractor. Contractor shall submit their recommended procedure for steam blowing operation of these piping systems along with scheme/ layout/ drawings giving step by step procedure for performing steam blowing of each these piping systems to the Employer for their approval. However, for purposes of bidding, the bidder shall make an estimate based on his experience for the piping system defined below, taking into consideration all temporary piping, consumables etc. required

14.02.00	Steam blowing shall include engineering, supply and installation of all temporary piping, valves, fittings including quick actuating valves (for puffing purposes), supports, blanking plates, blow tools, valve head/valve blanking cover plate, pipe spools, target plates, devices for protection of valves/equipment in steam blowing circuit, instruments, controls and all other accessories & services required to complete the cleaning process as specified herein.
14.03.00	Steam blowing shall also include reinstatement of cleaned piping systems and dismantling/removal of all temporary piping, equipment and other materials etc. from site. All temporary piping, valves, equipment and materials shall be taken back by the contractor upon satisfactory completion of cleaning/steam blowing and shall be removed from the Employer's premises.
14.04.00	Engineering involved regarding temporary piping shall include the following: a Selection of temporary piping. b Preparation of layout of temporary piping and performing stress analysis as per ASME B 31.1. c Selection of temporary hangers and supports as required.
14.05.00	The following piping systems shall be cleaned through steam blowing operation. 1. Main Turbine gland sealing system 2. Boiler Feed Pump Drive Turbine gland sealing system 3. Steam lines feeding turbines of boiler feed pump. 4. Steam lines to Deaerator 5. MS/ CRH/ HRH/ LP Bypass piping in TG bidder's scope 6. Any other piping systems in contractor's scope to be cleaned through steam blowing (as finalized during detailed engineering). Note: In case steam blowing is not performed for cleaning as per standard practice of the bidder for any of the above-said piping system under bidder's scope, then TG contractor shall submit, their recommended cleaning procedure for these piping systems for employer's review and approval which are to be mutually discussed & agreed upon during detailed engineering.
14.06.00	Steam blowing shall be carried out for removal of particles (rust, scales, weld splatter etc.) from various piping systems to avoid damage to turbine. Cleanliness of system shall be checked by means of test plates made of steel or as recommended by Turbine / Equipment OEM (As per Turbine / Equipment OEM proven practice) which will be installed in the center line of the piping system.
14.07.00	Cleaning shall be achieved by steam purging i.e. by blowing of steam through the piping such that the momentum of flow is greater than that of steam flow during normal operation of unit (at MCR). The disturbance factor during steam blowing (ratio of momentum of flow during purge to that during MCR) shall be more than 1.0.
14.08.00	The blow off shall be done with steam which is exhausted through adequately sized, open ended temporary piping. Temporary piping and motor operated valves shall be installed for steam blowing operation. Piping shall be warmed before release of steam by quick opening of motor operated valve located on temporary piping. The cycle shall be repeated until steam from the blow out pipe is determined to be clean. If erected already flow nozzles and control valves etc. shall be removed and replaced by spool pieces before steam blowing. The removed flow nozzle and control valves etc. shall be put back after steam blowing. Installation of thermo wells prior to steam blowing shall be as per recommendations of respective thermo well supplier or employer. The motor operated valves used for steam blowing shall have special characteristics like minimum loss of pressure, resistance to wear during grave working conditions (high velocity

and carryover of water and solid particles), quick opening time, minimum effort on electric actuator etc.

14.09.00 The steam blowing termination criteria will be :

(i)	Acceptable target plate condition
(ii)	Measured D.F. (disturbance factor) as specified in commissioning / Pre-commissioning chapter of this technical specification or as mutually agreed during detail engineering *for Critical Piping System (i.e. Main Steam, Hot Reheat, Cold Reheat, and HP & LP Bypass system piping systems in bidder's scope).*
(iii)	For piping system other than *Main Steam, Hot Reheat, Cold Reheat, and HP & LP Bypass system piping. The acceptance criteria will be decided during detail engineering based on the proven practice of Turbine / Equipment OEM.*

SPECI ICATION OR LAS TANKS

15.01.00 The flash tanks and accessories shall be designed, manufactured and tested in accordance with ASME Boiler and pressure vessels (B&PV) codes (latest) and other applicable ANSI standards referenced in the above codes.

15.02.00 **N r d S**

Flash tanks shall be provided into which all recoverable drains from turbine casing, extraction lines, valves, strainers, main steam, CRH and HRH line drains, cascaded drains from heaters etc. shall be led. Number of flash tanks shall as per tender drg. Requirement /details of various flash tanks are given below :

a High pressure (HP) flash tank for accommodating high pressure (above and including hot reheat design pressure) steam drains and HP heater emergency drains, as indicated in the tender drawing.

b Low pressure (LP) flash tank for accommodating low pressure (below hot reheat design pressure) steam drains and LP heater emergency drains as indicated in the tender drawing.

c Atmospheric flash tank to accommodate alternate drains of steam lines, feed water safety valve discharge and aux. steam line drains, as indicated in the tender drawing.

d In lieu of the HP & LP flash tanks mentioned above at a) & b) above, bidder may also offer flash boxes attached to condenser, if it is a standard & proven practice of the bidder. However, number of flash boxes shall be as indicated in the tender P&ID.

15.03.00 **C r r**

a Flash tanks shall be vertical, cylindrical design and of welded construction with tori spherical or hemispherical heads.

b Drain/hot water inlet nozzles shall be tangential to the vessel periphery. Suitable vortex breaker arrangement shall be made at the liquid outlet to the vessel. In case the contractor finds better alternate arrangement, the same can be submitted for the Employer acceptance & approval.

c The drain and vent of the flash tanks shall be adequately sized and lead to the condenser. There shall not be any valve on the drain and vent lines. Loop seal shall be provided on drain if required.

d A manhole shall be provided on the flash tanks for inspection purpose. It shall be of diameter 500 mm minimum. The manhole shall be of devit type and shall be provided with grip.

e The flash tanks shall be located on the ground/mezzanine floor of the powerhouse. Necessary structural supports including anchor bolts shall be provided. Three (3) support

legs at 120 degree spacing shall be provided on each flash tank. Necessary lifting lugs for handling by the TG hall EOT crane shall be provided.

f The flash tanks shall be provided with a full length level indicating gauge glass complete with protective rods, isolation valves and drains. Temperature indicators and temperature switches shall be provided on the flash tanks.

g The flash tanks shall be provided with access ladders, if required for access to the instruments, valves, main holes etc.

15.04.00 **S d M r**

Shell and Head	ASTM A 285 Gr.C
Wear Plate/Baffle	ASTM A 285 Gr.C
Nozzle Neck	ASTM A 106 Gr.B
Manhole nozzle flange and cover	ASTM A 285 Gr.C
Couplings	ASTM A 105
Bolts and studs	ASTM A 193 Gr. B7
Nuts	ASTM A 194 Gr. 2 H
Gaskets	Spiral wound SS 316 with graphite

However the material as per ASTM A516 Gr. 60 or IS 2062 Gr. B shall also be acceptable subject to the relevant codes / standards permitting so for the design parameters of various flash tanks.

SPECI ICATION OR METALLIC E PANSION OINTS

16.01.00 The expansion joints shall be of metallic multi-bellows construction and shall be used to reduce the reactions (forces and moments) at the connected equipment terminals due to thermal expansion/connection and/or vibration of connected equipment and piping.

16.02.00 The design, material, construction, manufacture, inspection, testing and performance of the expansion joints shall comply with the currently applicable requirement of EJMA, Boiler and Pressure Vessel Code Section III, ANSI B-31.1 and all statutes, regulations and safety codes.

16.03.00 **C r D**

(a) **B**

i The bellow shall be hydraulically or roll formed from perfect cylinders of single ply / multi ply, 304 grade stainless steel.

ii The number of longitudinal weld seams shall be minimum and there shall be no circumferential weld seam.

iii Cold formed stainless steel bellows shall not be heat treated.

iv All bellow elements shall be pickled after forming.

v Equalizing rings, where required, shall be either from high quality castings of from fabricated metal.

vi Flanged expansion joints shall be provided with adequate pipe stubs.

vii Butt welded expansion joints shall have adequate length of pipe so that site welding does not impair or reduce the joints efficiency.

S

i Expansion joints will be furnished with internal sleeves of the same material as the bellows and installed with sufficient clearance to allow full rated deflection. The sleeves shall be welded on the flow inlet end of the joint only.

Ii Bellow shall have external sleeves with an arrow indicating the direction of flow on the outside. The external steel covers provided to protect bellows from physical damages, shall be suitable for supporting insulation where necessary and shall be detachable.

T B r

I Joints shall be shipped at neutral length. They shall be provided with suitable erection and knock-off type temporary tie bars to prevent damage and misalignment during transit and also with permanent tie bars along with necessary nuts, bolts etc.

Ii The rods on pressure balanced type expansion joints shall be adequately sized to prevent buckling in vacuum services or services with other external loads.

16.04.00 **T M E**

Following tests (Type tests) shall be carried out for metallic expansion joints as per the procedures given in EJMA.

a) Life Cycle Test
b) Meridional yield-rupture testing
c) Squirm testing

16.04.01 For the purpose of carrying out type tests; metallic bellows shall be grouped based on the parameters as given below. The bellows conforming to same combination of these parameters shall constitute one group. Type test shall be carried out on one or more bellows (as required) for the successful completion of all the type tests specified above.

M r : Based on material of bellow, bellows shall be categorized into three category namely Carbon steel, stainless steel (E.g. SS304, 316, 321etc.) & High alloy steel (E.g. Inconel).

Pr : Each profile shall be considered as separate category (e.g. U profile, V profile & Lyra profile etc.).

iii. **D** Based on the size, the categories shall be as under:

- Nominal diameter of metallic expansion joint up to and including 800mm NB.
- Nominal diameter of metallic expansion joint greater than 800mm NB up to & including 1600 NB.
- Nominal diameter of metallic expansion joint greater than 1600mm NB up to & including 2400 NB.
- Each size above 2400mm NB shall be a separate category.

iv. **D r r** Based on the design pressure, bellows shall be categorized as under:

- Design pressure from full vacuum up to 5 kg / sq.cm (g).

- Design pressure above 5 kg / sq.cm (g) and up to 10 kg / sq.cm (g) with or without vacuum.

N r

For the life cycle test, the number of test cycles shall be minimum 10,000 cycles.

Other tests for metallic expansion joints shall be carried out as per the approved QP / QA Section. Further, other terms and conditions for type test shall be as specified elsewhere in the specification.

TESTIN RE UIREMENTS

The detailed testing requirements for power cycle piping and its components are given in the subsection for quality assurance(QA) .the requirements pertaining to testing given in this subsection if in variance with that given in QA subsection, then the more stringent of the two shall be followed.

PAINTIN

Specification for surface preparation/primer/ painting shall be as per Subsection A-7 (surface preparation & painting).

Amendment No. 5 to Bidding Documents [Commercial (Section I, II, III, IV, V & VII)]

Sl. No.	Ref. Clause	Existing Provisions	Amended provisions
1.	**Clause 8.0 (ITB 39.0), Section-III (BDS)**	Time for Completion of Facilities from the date of Notification of Award shall be 46 & 52 months for Unit 1 & Unit 2 respectively.	Time for Completion of Facilities from the date of Notification of Award shall be **44 & 50** months for Unit 1 & Unit 2 respectively.
2.	**Clause 6.1 (ITB 16.1), Section-III (BDS)**	ITB 16.1 Address to which physical documents shall be submitted : AGM (Corporate Contracts) THDC India Ltd., Pragati Bhawan, By-Pass Road, Pragatipuram, Rishikesh - 249 201 Ph. No. 0135-2431461/2473229/2473469	ITB 16.1 Address to which physical documents shall be submitted : GM (Corporate Contracts) THDC India Ltd., Pragati Bhawan, By-Pass Road, Pragatipuram, Rishikesh - 249 201 Ph. No. 0135-2431461/2473229/2473469
3.	**Clause 8.1.2 (f1), Section-II (IFB)**	New clause	**(f1) Attachment 8A: Functional Guarantees** The declaration on the guaranteed values of parameters as per Employer's format.
4.	**Clause 8.2.2.1 (iv), Section-II (IFB)**	**Attachment 6(P) : Functional Guarantees** The declaration on the guaranteed values of parameters as per Employer's format.	Attachment 6(P) is deleted.
5.	**Clause 10.4, Section-III (BDS)**	Bidders are required to quote Guaranteed Values as sought in Attachment-6(P) while submitting their Stage-II (Price) Bid and the same shall only be considered for the purpose of evaluation.	Clause 10.4 is deleted.

6.	**Clause 1 (Definitions), Section-V (SCC)**	**Time for Completion:** "Completion of the Facilities" for Unit-1 & Common System for the project shall be attained within 46 months from the date of Notification of Award. There will be a phase gap of 6 months in completion of facilities for subsequent Units.	**Time for Completion:** "Completion of the Facilities" for Unit-1 & Common System for the project shall be attained within **44** months from the date of Notification of Award. There will be a phase gap of 6 months in completion of facilities for subsequent Units.
7.	**Clause 5 (Scope of Facilities), Section-V (SCC)**	**GCC 7.3.1.8** The Contractor ....or by SG manufacturer .....The Contractor/SG manufacturer.....by the Contractor / SG manufacturer, ...of such items.	**GCC 7.3.1.8** The Contractor ....or by **STG** manufacturer .....The Contractor/**STG** manufacturer.....by the Contractor / **STG** manufacturer, ...of such items.
8.	**Clause 5 (Scope of Facilities), Section-V (SCC)**	**GCC 7.3.1.9** The prices of all future requirements of item of spares manufactured by contractor / SG manufacturer..... the equipment.	**GCC 7.3.1.9** The prices of all future requirements of item of spares manufactured by contractor / **STG** manufacturer..... the equipment.
9.	**Clause 6 (Time for Commencement and Completion), Section-V (SCC)**	"Completion of Facilities" for Unit-1 & Common System for the Project shall be attained within 46 months from the date of Notification of Award. There will be a gap of 6 months in completion of facilities for subsequent Units.	"Completion of Facilities" for Unit-1 & Common System for the Project shall be attained within **44** months from the date of Notification of Award. There will be a gap of 6 months in completion of facilities for subsequent Units.
10.	**Defect Liability (GCC Clause 27), Clause 21, Section-V (SCC)**	The critical components..... as detailed in the Technical Specification.	**Deleted**

11.	**Phased Manufacturing Programme (PMP) (GCC Clause 45), Clause 30.1(a), Section-V (SCC)**	Subsidiary Company The subsidiary company.....Qualified Steam Generator Manufacturer or Indian Subsidiary company of Qualified Steam Turbine Generator Manufacturer.	Subsidiary Company The subsidiary company.....Qualified Steam **Turbine** Generator Manufacturer or Indian Subsidiary company of Qualified Steam Turbine Generator Manufacturer.
12.	**BID FORM: Stage-I (Techno-Commercial) Bid**	New clause	2.0 **Attachments to the Bid Form Stage-I (Techno-Commercial) Bid :** (h1) Attachment 8A: Declaration on Guaranteed value of parameters as per your format furnished by us in this Attachment for bid evaluation.
13.	**BID FORM STAGE-II (PRICE) BID**	Clause 2.1 (h) Attachment-6(P) Declaration on Guaranteed value of parameters as per your format furnished by us in this Attachment for bid evaluation.	clause 2.1 (h) is deleted.
14.	**BID FORM STAGE-II (PRICE) BID**	Clause 15.0 We confirm that we have quoted the mandatory spares price.....quoted by us in Schedule-1/Schedule-2.	Clause 15.0 is deleted.
15.	**Attachment 3C**	Existing Attachment-3C	Replace the existing Attachment-3C with the revised Attachment-3C (Rev.01) which is enclosed herewith.
16.	**Attachment-3H (Manpower Loading Data), Section-VII (Part 1 of 3)**	Existing Attachment-3H	Replace the existing Attachment-3H with the revised Attachment-3H (Rev.01) which is enclosed herewith.

SL. NO.	SPECIFICATION REFERENCE	Existing	Read as
17.	**Attachment-14 (Milestone Schedule), Section-VII (Part 1 of 3)**	Existing Attachment-14	Replace the existing Attachment-14 with the revised Attachment-14 (Rev.01) which is enclosed herewith.
18.	**Schedule – 7A, Section-VII (Part 2 of 3)**	Existing **Schedule – 7A**	Replace the existing **Schedule – 7A** with the revised **Schedule – 7A** (Rev.01) which is enclosed herewith.
19.	**Schedule - 12 (Schedule Of Optional Items/Services), Section-VII (Part 2 of 3)**	Existing **Schedule - 12**	Replace the existing **Schedule – 12** with the revised **Schedule - 12** (Rev.01) which is enclosed herewith.
20.	**Form 13C2 (Form Of Deed Of Joint Undertaking), Section-VII (Book 3 of 3) (Part 2)**	Existing Form 13C2	Replace the existing Form 13C2 with the revised Form 13C2 (Rev.01) which is enclosed herewith.
21.	**Attachment-3H (Manpower Loading Data), Section-VII (Part 1 of 3)**	Existing Attachment-3H	Replace the existing Attachment-3H with the revised Attachment-3H (Rev.01) which is enclosed herewith.

	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
22.	Section-Vii Book 2/3	Schedule 10	3 of 9	22 (a)	(a) Price implication due to increase in rated discharge pressure over 355Kg/cm2 (g) (as specified in Cl. no. 6.01.00 (f) (iv), Section-VI, Part-B, Sub-section A-3) at terminal point by (i) (+) 5 Kg/cm2 (ii) (+) 10 Kg/cm2 (iii) (+) 15 Kg/cm2 — For all Units	a) Price implication due to increase in rated discharge pressure over **370** Kg/cm2 (g) (as specified in Cl. no. 6.01.00 (f) (iv), Section-VI, Part-B, Sub-section A-3) at terminal point by (i) (+) 5 Kg/cm2 (ii) (+) 10 Kg/cm2 (iii) (+) 15 Kg/cm2 — For all Units
23.	Section-Vii Book 2/3	Schedule 10	3 of 9	22 (b)	(b) Price implication due to decrease in rated discharge pressure over 315Kg/cm2 (g) (as specified in Cl. no. 6.01.00 (f) (iv) Section-VI, Part-B, Sub-section A-3) at termainal point by (i) (-) 5 Kg/cm2 (ii) (-) 10 Kg/cm2 (iii) (-) 15 Kg/cm2 — For all Units	b) Price implication due to decrease in rated discharge pressure over **330** Kg/cm2 (g) (as specified in Cl. no. 6.01.00 (f) (iv) Section-VI, Part-B, Sub-section A-3) at termainal point by (i) (-) 5 Kg/cm2 (ii) (-) 10 Kg/cm2 (iii) (-) 15 Kg/cm2 — For all Units
24.	Section-Vii Book 2/3	Schedule 10	3 of 9	23	Reduction in cost due to reduction in BMCR flow in steps of 5T/hr below 2580 T/hr up to 102% of VWO flow.(Applicable if BMCR i.e 102% of VWO is comming below 2580 T/hr.) — Per 800 MW Unit	Reduction in cost due to reduction in BMCR flow in steps of 5T/hr below **2100** T/hr up to 102% of VWO flow.(Applicable if BMCR i.e 102% of VWO is coming below **2100** T/hr.) — Per **660 MW** Unit

25.	Section-Vii Book 2/3	SCHEDULE - 9	2 of 4	SCHEDULE OF TAKE OUT PRICE S.No. (iii)	iii) Condenser on load lube cleaning system per 660 MW unit 1 Set	iii) Condenser on load **tube** cleaning system per 660 MW unit 1 Set

TURBINE GENERATOR AND ASSOCIATED PACKAGES FOR
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC-9915-371
(Manpower Loading Data)

Bidder's Name and Address:

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

We declare that our manpower loading during execution of the Contract will be as follows :

No. of months from the date of Notification of Award	1	2	3	4	5	6	7	8	9	10.....44.....50
Labour (Category)										

Date :
Place :

(Signature).....
(Printed Name)..... .....
(Designation).....
(Common Seal).....

Note :
1. The above Attachment shall be filled up by the bidder separately for himself and Qualified Steam Turbine Generator Manufacturer, Promoters of Indian Subsidiary Company/Promoters of Indian Joint Venture (JV) Company, as applicable, in his bid.
2. Continuation sheets of like size & format may be used if required and annexed to this Attachment
3. List of Category of Labour will be given by the Bidder.

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371

(Details of Design, Engineering, Manufacturing and Testing Capabilities of Bidder and/or wherever applicable, Qualified Steam ***Turbine*** Generator Manufacturer, Promoters of Indian Subsidiary Company/Promoters of Indian Joint Venture (JV) Company, as applicable)

Bidder's Name and Address:

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

(1) We hereby confirm that we do not anticipate any change in ownership during the proposed period of execution of work (if such a change is anticipated, the scope and effect thereof shall be defined). The relevant document for same is enclosed at Annexure ---------- to the Attachment-3C.

It is clearly understood that the bid is submitted for consideration of award on the strength of the credential / experience of the Bidder and executants of Deeds of Joint Undertakings and Letter of Undertakings as specified in the Qualifying Requirements of the subject Tender.

We confirm that in case of any change in our ownership the new / successor entity shall honor all our obligations under the Contract for the subject Package.

Note :

*The above shall be filled up and signed separately by the bidder **itself** and each of the executants of the Deeds of Joint Undertakings and Letter of Undertakings.*

(2) Furnish adequate detailed write up on

(i)	Design and Engineering Organisation and Facilities/ Capabilities.	:	Enclosed at Annexure ..... to this Attachment-3C
(ii)	Manufacturing & Testing Organization and Facilities available.	:	Enclosed at Annexure ..... to this Attachment-3C

(iii)	Field Organisation and resources for Erection, Civil and Structural works, Testing & Commissioning, etc.	:	Enclosed at Annexure ..... to this Attachment-3C
(iv)	Quality Assurance Organisation and Capabilities for Construction, Engg., Manufacturing & Field Installation	:	Enclosed at Annexure ..... to this Attachment-3C
(v)	Established Project Management	:	Enclosed at Annexure ..... to this Attachment-3C
(vi)	Details of Man power / Division of Company	:	Enclosed at Annexure ..... to this Attachment-3C

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

Note : 1 The above Attachment shall be filled up and signed by the bidder separately for **himself** and Qualified Steam Turbine Generator Manufacturer, Promoters of Indian Subsidiary Company/Promoters of Indian Joint Venture (JV) Company, as applicable, in his bid.

2. Continuation sheets of same size and format shall be added by the Bidder.

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)
BIDDING DOCUMENT NO. THDC/RKSH/CC-9915-371
(Guarantee Declaration)

Bidder's Name and Address :

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

Dear Sir,

We declare that the ratings, capacities and performance figures of the equipment furnished by us under the package are guaranteed. We further declare that in the event of any deficiencies in meeting the guaranteed figures indicated below as established after conducting the guarantee tests, you may at your discretion accept the equipment/system after assessing the liquidated damages as specified in Clause No. 1.01.02 (Category-I) of "FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES", Part-A, Section-VI (Technical Specifications) of the Bidding Documents, or reject the equipment/system and recover payments already made.

S.No.	Guaranteed Parameters	Guaranteed Figures
(i)	Turbine Cycle Heat Rate in kcal/kwhr under rated steam conditions at 77 mm Hg (abs) condenser pressure with zero (0%) make-up at 660 MW Unit Load (i.e. 100% of rated load) shall not be more than 1795 kcal/kwhr	**Yes / No**
(ii)	Turbine Cycle Heat rate in Kcal/Kwhr under turbine throttle main steam pressure of 150 Kg/cm2(abs) and rated main steam and reheat steam temperature at 77 mmHg(abs) condenser pressure with zero make up at 363 MW load (i.e 55 % of rated load) with one TDBFP in operation shall not be more than 1905 kcal/kwhr.	**Yes / No**
(iii)	Continuous TG output of Unit load (i.e. 105% of rated load) under rated steam conditions at 77mm Hg (abs) condenser pressure with 0% makeup shall not be less than 693 MW.	**Yes / No**

S.No.	Guaranteed Parameters	Guaranteed Figures
(iv)	Condenser pressure in mmHg (abs) (abs) measured at 300mm above top row of Condensor Tubes with 693 MW output, 0% make up design CW temperature and CW flow shall not be more than 65 mmHg (abs).	**Yes / No**
(v)	The total Auxiliary Power Consumption (in KW) for all the Turbine Generator Auxiliaries and Turbine cycle equipments and other common auxiliaries, required for continuous unit operation at 660 MW (i.e. 100% of rated load) under rated steam conditions and at condenser pressure of 77 mmHg (abs) with zero make-up shall not be more than 6550 KW.	**Yes/ No**

Note :

1. Bidder opting/ticking 'No' for any of the above guarantees from sl. no. i) to v) shall not be considered and their bids shall be liable for rejection.

Date :

Place :

(Signature) .....

(Printed Name) .....

(Designation) .....

(Common Seal).....

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371
(Milestone Schedule)

Bidder's Name and Address :

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

Dear Sirs,

1.0 We declare that the program of furnishing, erecting, testing, commissioning and completion of facilities identifying the key phases in various areas of work like design, procurement, manufacture, field activites including civil construction works as per requirement of Item No. 9 of BDS shall be as per master network (PERT network - L1 Schedule) enclosed as Annexure-I to this Attachment-14.

We, further declare that the completion schedule as per this Master Network shall be followed by us in furnishing and installating the equipments and in furnishing the spares under the Package. As per this Master Network the key milestone dates are as under. The period is commencing from the date of Notification of Award.

Major Activity / Milestone Chart

1.0 Milestone Schedule for Steam Turbine & Auxiliaries:

Sl. No.	Milestones	Schedule (Month from NOA)	
		Start	Finish
1.	Basic Engineering	-	06
2.	Completion of Detailed Engineering	-	24
3.	Commencement of Manufacturing	10	-
4.	Supply of CW Puddle flange	-	12
5.	Supply of TG embedment	14	
6.	Completion of Ordering of Major BOI (Bought out items)		12
7.	Completion of Ordering Balance BOI (Bought out items)		16

Sl. No.	Milestones	Schedule (Month from NOA)	
		Start	Finish
8.	Establishment of Storage facilities, lay down area etc	08	17
9.	Supply of Condenser, TG and other auxiliaries	19	32
10.	Erection and commissioning of EOT crane	19	21
11.	Start of Condenser Erection	21	
12.	Start of TG Erection	22	
13.	Supply of Power Cycle Piping	22	30
14.	Pre-assembly & erection of Power Cycle Piping	26	36
15.	Completion of Major Supplies		30
16.	Completion of Balance Supplies		34
17.	TG Box up		33
18.	Completion of TG Oil Flushing		35
19.	TG on Barring Gear		36
20.	Completion of site delivery of all Mandatory spares		36
21.	Unit Synchronization		40
22.	Full Load operation		42
23.	Completion of Trial Operation		43
24.	Completion of facilities		44

1.1 The above schedule is for Unit#1 only. The phase gap between various activities of subsequent unit (Unit #2) shall be 6 (Six) months, except for engineering activities which shall remain same.

1.2 The term "Supply" denotes receipt of material at site.

1.3 Since the gap between erection & commissioning of two units is six months, unit-wise erection agency deployment shall be discussed during the post-bid discussion based on the construction methodology and erection strategy to be submitted by the bidder in the bid documents. The erection strategy shall include unit-wise deployment schedule and utilization of major Tools & Plants (T&Ps). A suggestive list of T&Ps is annexed herewith. Based on the proposed erection strategy of the Bidder, the details of T&Ps and their deployment schedule shall be finalized during L2 schedule finalization with THDC. However, bidder will have to ensure the deployment of T&Ps as per actual requirement at site to meet the project milestones and implementation schedule.

1.4 The bidder shall deploy 1 no. rack & pinion construction lift in TG hall before commencement of TG erection of Unit#1.

2.0 Milestone Schedule for Other Systems /packages

2.1 The Bidder shall have the overall responsibility for readiness and commissioning of other systems viz AC & ventilation system, Inert Gas system for Control Tower area, C&I works, Electrical systems, associated civil works etc as detailed in specifications to meet the unit-wise milestones and commissioning schedules for achievement of critical milestones of Main plant. The Bidder shall submit detailed work program in the bid inter-alia taking into consideration the milestones to be considered for progressive payment. The broad milestones for other systems are indicated hereunder.

2.2 Schedule for Award of Other Systems/ Packages: As infrastructures like construction power, construction lighting, construction water etc (as specified in the scope) and TG & aux civil works including fabrication & installation of Main Power Structure, Pipe Cable Galleries etc are included in the scope of bidder.

2.3 Civil Packages: The following civil works packages have been envisaged in the scope of bidder: Civil Works for TG & aux.; Service Building; CPU & regeneration; cable trestles etc.

The successful bidder have to ensure timely award of the civil works package i.e., within 02nd month of award and suitable mobilization at site for work progress in such a manner that civil inputs are ready for commencement of works as specified in the work schedule of TG & Auxiliaries and other packages. The bidders have to submit a detail work schedule in line with this work schedule in their bids capturing the readiness of civil inputs/foundation for all majors works, under the scope of contract. The same shall be discussed along with suggestive list of major T&Ps during finalization of L2 schedule.

Milestones for Civil Works of TG & other areas:

The Bidder shall ensure the completion of various equipment foundations, structures, buildings and facilities etc to achieve the milestones for TG & Auxiliaries and other systems as per the schedules.

2.4 Milestone Schedule for AC & Ventilation and Inert Gas System for Control Tower:

Sl. No.	Milestone	Schedule (Month from NOA)
1.	Inert Gas system & Fire detection & alarm system for Control Room, CER, UPS & Battery Charger Room etc	32
2.	AC & Ventilation works completion for buildings required for Boiler light up viz Unit Control room, CER etc	32
3.	AC & Ventilation, Inert Gas and Fire detection & alarm system works completion for unit synchronization & full load commissioning	37

Note: The above milestones are for Unit#1 and common facilities. The respective milestones for subsequent unit shall have phase gap of 6 months.

2.5 Milestone schedule for Electrical and C&I items:

The bidder shall furnish detailed work program including important milestones like NIT, OBD, Award, Mobilization and commencement of work and readiness of systems for Generator Bus Duct & associated equipments, Power transformers, HT Switchgears for complete plant facilities, LT indoor transformers, Battery chargers, DC Batteries, DG sets, LT switchegars & Bus ducts, Lighting, cabling etc (Covered in scope of bidder's work). Further, the readiness of each system shall be linked with unit-wise readiness of drives/ systems required for Boiler Light up, Unit Synchronization and Commissioning etc. Detailed program submitted by the bidder shall be discussed and finalized during L2 schedule finalization.

3.0 THDC Inputs:

Sl. No.	Input	Schedule (Month from NOA)	
		Unit #1	Unit #2
1.	Land for site office of agency	3	
2.	Construction Power*	First Month at one point to feed ring main to be constructed by Bidder*	
3.	Availability of Steam for Steam Blowing & subsequently Turbine rolling	38	44

** Advance action is to be taken by bidder so that Ring main works start matching with construction activities. It is intended to provide power by THDC at one point of suitable capacity. However, Bidder to deploy sufficient DG sets for piling/ foundations, batching plant, fabrication, erection and Construction activities to meet the construction schedule.*

4.0 Integrated Network:

The bidder shall be required to submit a brief integrated network in line with the major milestone chart given above. The network shall be prepared and submitted in MS Project format showing all inter activity relationships. A soft copy of the same also may be furnished. Further, the integrated network shall, inter-alia, include at least following activities for each systems showing their inter-relationships between engineering, supply and site execution:

1. Basic Engineering & Drawings
2. Ordering on sub-vendor (wherever applicable)
3. Detailed Engineering & Drawings required to complete the entire package
4. Raw material procurement, fabrication/ manufacturing
5. Testing, Inspection and commencement of sequential dispatch
6. Transportation and receipt at site
7. Completion of dispatch
8. Intermediate milestones/ activities for readiness of Civil fronts.
9. Release of civil foundations/ fronts for equipment erection
10. Completion / achievement of milestones considered for progressive payment (as per bid documents)
11. Trestle / Gallery readiness

12. Progressive readiness of various buildings and other civil structures.
13. Start of erection (area-wise)
14. Intermediate milestones and completion of erection/ installation.
15. Commissioning of the system

5.0 Project Management Plan:

The bidder shall be required to submit his Project Management Plan along with the bid. The main objective of this document is to indicate how various elements of the contract like Engineering, Procurement, Transportation and Site Execution are planned and integrated. This document should be in line with aforesaid integrated network, which inter-alia shall contain following:

a) **Project Management Organization Structure:** Identifying responsibility centers with manpower identified for Engineering, Procurement and Construction supported by write up on methodology for integration of activities.

b) **Site Organization Structure:** Indicating manpower planned for various site functions like Material Management, Erection Management (Discipline wise) including planning, billing, quality, safety etc.

c) **Transportation Logistics:** Identification of ODC consignments and its transportation strategy.

d) **Construction Methodology, Erection Strategy and deployment of T&Ps:**

   i) A detailed erection strategy showing sequential erection activities supported by T&P deployment plan indicating quantity and time schedule for deployment, time schedule for finalization of erection agencies etc. T&P list should also include for storage handling of material and its movement at site.

   ii) The deployment of T&Ps shall be ensured by the contractor as per actual requirement to meet the project implementation schedule. Based on the proposed erection strategy of the Bidder, the details of T&Ps and their deployment schedule shall be firmed up with the bidder during L2 sch finalization in association with THDC site.

   iii) The suggestive lists of major T&Ps for TG & Auxiliaries and Civil Works are enclosed herewith in Annexure.

6.0 Agency for Erection:

Considering the phase gap of six (06) months between the units, the bidder may consider deploying separate construction and erection agency for consecutive units. However the bidder shall submit overall Erection strategy and implementation methodology in terms of Agency deployment unit-wise for Mechanical and civil works. The same shall be deliberated during post-bid discussions & L2 schedule finalization for final acceptance by THDC.

7.0 Detailed (L2) Schedule:

Successful bidder is required to submit a work program within one month of award of contract in the form of Detailed Integrated Network (L2 Schedule) covering details of Engineering, BOI ordering, Procurement, Manufacturing, Shipment / Delivery, Inland Transportation, Erection, Testing and Commissioning activities including inter dependency of activities in line with brief integrated network (submitted in the bids). The L2 Schedule will specify completion / attainment dates of milestones considered for progressive payment (as per bid documents). The same is to be submitted in hard copy as well as soft copy preferably in Primavera/ Microsoft Project format to THDC for approval.

8.0 Monthly Progress Report:

Successful bidder shall be required to submit Monthly Progress Report by 1st week of every month for all the activities with respect to L2 schedule and the data shall be furnished to THDC.

II. We confirm that we have enclosed project management plan alongwith this attachment as per requirement of Item 9 of BDS.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC-9915-371

Bidder's Name and Address:

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

Schedule No. 7A: Import Duty and Goods and Services Tax (GST)

The details of Import duty and Goods and Services Tax (as on seven (07) days prior to the last date for submission of price bids) applicable on the price of goods and services quoted in Schedule-1, not included in the Bid Price and which may be payable by the Employer in accordance with the provisions of Bidding Documents are as under:

A. Import duty

Bid Price Component	**Rate of Import duty (%)**	**Amount on which Import duty applicable (in Bid Currency)**	**Total Import duty payable (in Bid Currency)**
CIF-Main Equipment (**Schedule-1**)			
CIF-Mandatory Spares (**Schedule-1**)			
Any other Price Component (not covered above)			
TOTAL (Import duty)			

B. GST

Bid Price Component	**Rate of GST (%)**	**Amount on which GST applicable (in Bid Currency)**	**Total GST payable (in Bid Currency)**
CIF-Main Equipment (**Schedule-1**)			
CIF-Mandatory Spares (**Schedule-1**)			
Any other Price Component (not covered above)			
TOTAL (GST)			

Note: In case rate of Import duty/GST is different for various items, such different rates of Import duty/GST along with the amount on which such Import duty/GST is applicable shall be suitably indicated by the bidders in this schedule."

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TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC-9915-371

Bidder's Name and Address:

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

SCHEDULE NO. 12 : SCHEDULE OF OPTIONAL ITEMS/SERVICES

Sl. No.	Item Description (Set/No.)	*CIF Price	Qty.	*Ex-works / & Insurance Charges	Local Transportion Services	Installation

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

Note : * Please state the currency and fill in the amount in figures and words.
@ Bidders to quote their prices on Ex-works/CIF basis in line with price quoted in Schedule-1 and/or Schedule-2.

FORM OF DEED OF JOINT UNDERTAKING AS PER CLAUSE 1.3.2 & *1.3.3 AND NOTE 4 TO CLAUSE 1.0.0, ITEM 4.0 OF BID DATA SHEETS

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

DEED OF JOINT UNDERTAKING TO BE EXECUTED BY THE BIDDER/CONTRACTOR (INDIAN SUBSIDIARY COMPANY), THE QUALIFIED STEAM TURBINE GENERATOR MANUFACTURER (HOLDING COMPANY MEETING THE REQUIREMENTS AS PER CLAUSES 1.1.1 OF ITEM 4.0 OF BID DATA SHEETS ALONGWITH ITS SUBSIDIARIES) AND THE OTHER PROMOTER AND THE *QUALIFIED GENERATOR MANUFACTURER MEETING THE REQUIREMENTS AS PER CLAUSES 1.3.3 OF ITEM 4.0 OF BID DATA SHEETS FOR SUCCESSFUL PERFORMANCE OF THE STEAM TURBINE GENERATOR AND AUXILIARIES

The DEED OF JOINT UNDERTAKING executed on this ..... day of .....Two thousand ..... by M/s ..... a Company incorporated under ..... having its Registered Office at.....(hereinafter called the "Bidder/ Contractor/ *Indian Manufacturing Company", which expression shall include its successors, administrators, executors and permitted assigns) and

M/s..... a Company incorporated under ..... having its Registered Office at..... (hereinafter called the "Qualified Steam Turbine Generator Manufacturer"/"Holding Company", which expression shall include its successors, administrators, executors and permitted assigns) and

*M/s ..... a Company, other than the Qualified Steam Turbine Generator Manufacturer, registered under ..... having its Registered Office at ..... and having 25% or higher equity participation in the Indian *Subsidiary Company/ *JV Company (hereinafter jointly called the "OTHER PROMOTER", which expression shall include its successors, administrators, executors and permitted assigns) and

*M/s....., a Company incorporated under ..... having its Registered Office at..... (hereinafter called the "Qualified Generator Manufacturer", which expression shall include its successors, administrators, executors and permitted assigns), in favour of THDC India Limited, A Joint Venture of Govt. of India & Govt. of U.P., incorporated under the Companies Act, 1956, having its Registered Office at Bhagirathi Bhawan, (Top Terrace), Bhagirathipuram, Tehri Garhwal-249001 India (hereinafter called "THDCIL" or "Employer" which expression shall include its successors, administrators, executors and assigns)..

WHEREAS, the Employer invited Bids for the **Turbine Generator and Associated Packages for Khurja STPP (2X660MW)** (hereinafter referred to as "Plant") vide its Bidding Document No.: **THDC/RKSH/CC-9915-371.**

*AND WHEREAS clause 1.3.2 and *1.3.3 of item 4.0 of Bid Data Sheet of Bidding Documents(BDS), stipulate that the bidder shall furnish a Deed of Joint Undertaking executed by him, the Qualified Steam Turbine Generator Manufacturer, *OTHER PROMOTER (if any) having 25% or higher equity participation in the Subsidiary Company and *Qualified Generator Manufacturer who meets the requirement of Clause 1.3.3 of item 4.0 of BDS. Further as per note 4 iii) of clause 1.0.0, Item 4.0 of BDS, the Holding Company, as a Qualified Steam Turbine Generator Manufacturer, shall necessarily be part of the DJU being submitted by the Bidder.

AND WHEREAS clause 1.3.3 item 4.0 of BDS of Bidding Documents, stipulate that if the Qualified Steam Turbine Generator Manufacturer meets the requirement of Clause 1.1.1 of item 4.0 of BDS (except for Generator), then the *Subsidiary Company / *Joint Venture Company shall associate and have a technology transfer agreement with a Qualified Generator Manufacturer who meets the requirement of Clause 1.1.1item 4.0 of BDS fully in respect of Generator and Qualified Generator Manufacturer shall necessarily be one of the executants of Deed of Joint Undertaking.

WHEREAS M/s ..... (Bidder) is submitting its proposal in response to the Invitation for Bid by the Employer for **Turbine Generator and Associated Packages for Khurja STPP (2X660MW)**, against the Employer's Bidding Document No. **THDC/RKSH/CC-9915-371.**

AND WHEREAS the Bidder, the Qualified Steam Turbine Generator Manufacturer and OTHER PROMOTER are required to jointly execute and furnish along with the bid an irrevocable Deed of Joint Undertaking and be jointly and severally liable and bound unto the Employer for the successful performance of the **contract for the scope related to** Steam Turbine Generator and Auxiliaries including turbine cycle, regenerative feed heating & pumping system for **Khurja STPP (2X660MW)**, fully meeting the stipulated technical requirements, and guaranteed parameters and characteristics as per bidding documents, in the event, the Bid is accepted by the Employer resulting into a Contract/ Contracts.

*AND WHEREAS the Qualified Generator Manufacturer who meets the requirement of item no. 1.3.3 of item 4.0 BDS shall also be required to be one of the executants of the above Deed of Joint Undertaking and be liable to the Employer for successful performance of the Generator & its auxiliaries.

AND WHEREAS the Bidder, the Qualified Steam Turbine Generator Manufacturer and OTHER PROMOTER and *Qualified Generator Manufacturer are required to jointly execute and furnish along with the bid an irrevocable Deed of Joint Undertaking and be jointly and severally liable and bound unto the Employer for the successful implementation of the Phased Manufacturing Program and transfer of technology for supercritical Steam Turbine Generator sets in accordance with the bidding documents, in the event, the Bid is accepted by the Employer resulting into a Contract/ Contracts.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1 That in consideration of the award of the Contract(s) by the Employer to the Contractor, we the Contractor, Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer and OTHER PROMOTER do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful implementation of the Phased Manufacturing Program as specified in the said Contract(s).

2 We, the Contractor, Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer and the OTHER PROMOTER do jointly hereby undertake, declare and confirm that we shall be fully responsible for ensuring a valid technology transfer agreement including license to manufacture and supply in India between the *Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer, the *technology provider (if any) and the Indian Manufacturing Company covering the type, size and rating of the Steam Turbine Generator sets specified, valid minimum up to the end of the defect liability period of the contract. The technology transfer agreement necessarily covers transfer of technological know-how for super critical Steam Turbine Generator sets in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel

training to the Indian Manufacturing Company. Further technology transfer agreement have provision that the transfer of technology to the Indian Manufacturing Company shall be complete by the time last supercritical unit is supplied by the Contractor under this Tender.

3 We, the Qualified Steam Turbine Generator Manufacturer and the Qualified Generator Manufacturer do further undertake, declare and confirm that we shall be fully responsible for imparting relevant training to the personnel of the Indian Manufacturing Company as part of the technology transfer agreement.

4 That in consideration of the award of the Contract by the Employer to the Contractor, we the Qualified Steam Turbine Generator Manufacturer, Qualified Generator Manufacturer, OTHER PROMOTER and the Contractor, do hereby declare and undertake that we shall be jointly and severally liable to the Employer for the successful performance of the **contract for the scope related to** Steam Turbine Generator and Auxiliaries including turbine cycle, regenerative feed heating & pumping system, as specified under the said contract to the satisfaction of Employer. (Defined at **Annexure-I**)

5 That in consideration of the award of the Contract by the Employer to the Contractor, we, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTERS, the *Qualified Generator Manufacturer and the Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the execution and successful performance of the Generator and its auxiliary equipments as per **Annexure-I**.

6 In case of any breach of the Contract committed by the Contractor, we the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, and the *Qualified Generator Manufacturer, do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the **contract for the scope related to** Steam Turbine Generator and Auxiliaries including turbine cycle, regenerative feed heating & pumping system for **Khurja STPP (2X660MW)** and undertake to carryout all the obligations and responsibilities under this Deed of Joint Undertaking in order to discharge the Contractor's obligations and responsibilities stipulated under the Contracts. Further, if the Employer sustains any loss or damage on account of any breach of the Contract related to any of the Steam Turbine Generator Sets & their auxiliaries including turbine cycle, regenerative feed heating & pumping system HP/LP bypass system for **Khurja STPP (2X660MW)** , we, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, and the *Qualified Generator Manufacturer and the Contractor, jointly and severally undertake to promptly indemnify and pay such losses/ damages caused to the Employer on its written demand without any demur, reservation, contest or protest in any manner whatsoever. Determination of losses/ damages shall be in line with provisions on Limitation of Liability of the said contract (s).

The aggregate liability of the Bidder/Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to any obligation of the Contractor to indemnify the Employer with respect to patent infringement as per provisions of bidding documents (Clause 30 of GCC and relevant clause of SCC).

The liability of the Qualified Steam Turbine Generator Manufacturer, *Indian Subsidiary Company/ *JV Company and OTHER PROMOTER shall be limited to an amount equivalent to **US$ 87 Million** for each Turbine Generator Set to be supplied by the Bidder / Contractor. *The liability of the Qualified Generator Manufacturer, hereunder shall, however be limited to an amount equivalent to **US$ 13 Million** for each Generator Set to be supplied by the Bidder / Contractor. This is without prejudice to any right of Employer against the Contractor under the Contract and all guarantees.

7 Without prejudice to the generally of the undertaking in above paragraphs, the manner of achieving the objectives set forth above shall be as follows :

a) We, the Qualified Steam Turbine Generator Manufacturer, shall be fully responsible for design, engineering, supply, erection, performance including all guarantees for all the supercritical steam turbine generator sets & their auxiliaries.

b) We, the Qualified Steam Turbine Generator Manufacturer, shall be fully responsible for engineering preparation of all design, design calculations and manufacturing drawings for all the Steam Turbine Generator Sets & their auxiliaries and Condensers including Interfacing and integrating the complete turbine cycle including Boiler Feed Pump, Condensate Extraction Pump, Heaters, Deaerators, etc. so as to ensure satisfactory, reliable and trouble free performance of Steam Turbine Generators Sets and their Auxiliaries, Condensers as well as thermal performance of turbine cycle as per guaranteed parameters specified in the Contract.

c) We, the Qualified Steam Turbine Generator Manufacturer, shall be fully responsible for calculation of Heat Balance Diagrams, integration of all turbine cycle equipments, regenerative feed heating & pumping system:

Further, we, the Qualified Steam Turbine Generator Manufacturer, shall extend our quality surveillance/ supervision/quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at works and/or at Employer's project site. Without prejudice to the overall responsibilities of the Qualified Steam Turbine Generator Manufacturer as to the successful commissioning and the performance of the Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system, the Qualified Steam Turbine Generator Manufacturer shall depute its technical experts from time to time in the works/Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the Contracts.

d) We, the Qualified Steam Turbine Generator Manufacturer, will supply equipment/components manufactured at our works or at our vendor's works as per requirements/schedule specified in the Contracts.

e) We, the Qualified Steam Turbine Generator Manufacturer, will be fully responsible for the quality of manufacture of all equipment/main assembly/components for incorporation in the Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system. For the items to be manufactured by the Contractor's design, the Qualified Steam Turbine Generator Manufacturer shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Indian *subsidiary/*Joint Venture Company, which would result in the same quality of equipment as if manufactured at the Qualified Steam Turbine Generator Manufacturer's works and shall meet Qualified Steam Turbine Generator Manufacturer's approval/acceptance.

f) The Qualified Steam Turbine Generator Manufacturer shall be responsible to manufacture portion of the equipment which are to be manufactured at its works or its Indian *subsidiary's/*Joint Venture Company's works as per the Qualified Steam Turbine Generator Manufacturer's design and quality acceptance level (to be finalized during award of Contract). Further, the Contractor shall erect, commission

and carry out the performance tests of all the Steam Turbine Generator Sets & their auxiliaries and Condensers heaters, deaerators, BFP, CEP, HP/LP bypass system as per the Contract in accordance with the Qualified Steam Turbine Generator Manufacturer's advice, procedure and guidance. In case there is any need to modify the design/drawings/procedure in certain areas, the Contractor shall seek specific approval of Qualified Steam Turbine Generator Manufacturer before proceeding further.

g) In the event any problem is encountered during design, manufacture, erection, testing and commissioning or if the Contractor fails to demonstrate during the Guarantee tests that Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system meet the guarantee parameters and demonstration parameters and demonstration parameters as specified in the Contract, including the thermal performance of turbine cycle, the Qualified Steam Turbine Generator Manufacturer shall promptly provide all technical assistance/services/ support to analyse and suggest corrective measures/modifications to the equipment/systems of all the Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system directly to the Employer and the Contractor & the Qualified Steam Turbine Generator Manufacturer shall promptly carry out all corrective measures and modifications (as suggested by the Qualified Steam Turbine Generator Manufacturer and agreed by the Employer) for each of their own expense. Thereafter, the Contractor and the Qualified Steam Turbine Generator Manufacturer shall demonstrate the successful performance meeting the guaranteed parameters and demonstration parameters.

8 Without prejudice to the joint and several obligations of the Contractor, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER and the *Qualified Generator Manufacturer hereunder, the analysis/investigations of the non-performance of the equipment manufactured by the Contractor, the Qualified Steam Turbine Generator Manufacturer, may initially be carried out by the Contractor, within a period of 15 days from the date of reference of the problem by the Employer before the Employer approaches the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, *Qualified Generator Manufacturer for any such analysis/ investigation. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor before proceeding against the Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer (with respect to obligations and responsibilities of the Qualified Generator Manufacturer covered under this Deed of Joint Undertaking), nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any right of Employer under this Deed of Joint Undertaking to proceed against the *Qualified Generator Manufacturer, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER and Contractor.

9 * Without prejudice to the generality of the undertaking in above paragraphs, the responsibilities of Qualified Generator Manufacturer shall be as follows:

a) We, the Qualified Generator Manufacturer, shall be fully responsible for engineering, preparation of all design, design calculations and manufacturing drawings for all the Generators and their auxiliaries **(defined at Annexure-I)** so as to ensure satisfactory, reliable and trouble free performance of Steam Turbine Generator Sets and their auxiliaries as per guaranteed parameters specified in the Contract.

b) We, the Qualified Generator Manufacturer shall provide all additional necessary technical assistance to the Contractor for the portion of work pertaining to Generators and their auxiliaries. This shall also include providing all design data required by the Contractor for proper integration and interfacing of Steam Turbine and Generator.

Further, we, the Qualified Generator Manufacturer shall extend our quality surveillance/ supervision/quality control to the Contractor during manufacture, erection, commissioning and performance testing of all Generators and their auxiliaries, both at Contractor's works and/or at Employer's project site. Without prejudice to the overall responsibilities of the *Subsidiary Company/*JV Company and *Qualified Generator Manufacturer as to the successful commissioning and the performance of the Steam Turbine Generator Sets and their auxiliaries, the Qualified Generator Manufacturer shall depute its technical experts from time to time to the Contractor's works/ Employer's project site for jobs pertaining to Generators and their auxiliaries, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulations of the Contracts.

c) We, the Qualified Generator Manufacturer will supply equipment/components manufactured at our works or at our vendor's works as per requirements/ schedule specified in the Contracts.

d) We, the Qualified Generator Manufacturer will be fully responsible for the quality of manufacture of all equipment/main assembly/components for incorporation in all the Generators & their auxiliaries. For the items to be manufactured by the Contractor at his or his vendor's works as per the Qualified Generator Manufacturer's design, the Qualified Generator Manufacturer shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Qualified Generator Manufacturer's works and shall meet Qualified Generator Manufacturer's approval/ acceptance.

e) The Contractor shall be responsible to manufacture portion of the equipment which are to be manufactured at its works or its vendor's works as per the Qualified Generator Manufacturer's design and to the Qualified Generator Manufacturer's quality acceptance level (to be finalised during award of Contract). Further, the Contractor shall erect commission and carry out the performance tests of all the Generators and their auxiliaries as per the Contract in accordance with the Qualified Generator Manufacturer's advice, procedure and guidance. In case there is any need to modify the design/ drawings/ procedure in certain areas, the Contractor shall seek specific approval of Qualified Generator Manufacturer before proceeding further.

f) In the event any problem is encountered during design, manufacture, shop testing, erection, testing and commissioning of Generators and their auxiliaries or if the Contractor fails to demonstrate during the performance tests that the Generators and its auxiliaries meet the guaranteed parameters and demonstration parameters as specified in the Contract, the Qualified Generator Manufacturer shall promptly provide all technical assistance/ services/ support to analyse and suggest corrective measures/ modifications to the equipment/ systems of all the Generators & their auxiliaries directly to the Employer and the Contractor & the Qualified Generator Manufacturer shall promptly carry out all corrective measures and modifications (as suggested by the Qualified Generator Manufacturer and agreed by the Employer) for each of their respective equipment/systems supplied

by them at their own expense. Thereafter, the Contractor and the Qualified Generator Manufacturer shall demonstrate the successful performance meeting the guaranteed parameters and demonstration parameters.

10 The Contractor, the Qualified Steam Turbine Generator Manufacturer, and the *Qualified Generator Manufacturer will be fully responsible for the quality of all the equipments/ main assemblies/ components manufactured at their works or at their Vendors works or constructed at site, and their repair or replacement, if necessary, for incorporation in the plant and timely delivery thereof to meet the Completion Schedule under the Contracts.

11 We, the Contractor, the Qualified Steam Turbine Generator Manufacturer, the OTHER PROMOTER and the *Qualified Generator Manufacturer, do hereby undertake and confirm that this Deed of Joint Undertaking shall be initially valid till ninety (90) days beyond the scheduled end of defect liability period of all the equipment/ component covered under the Contract(s) or ninety (90) days beyond the completion of the Phased Manufacturing Program under the Contract(s), whichever occurs later. In case of delay in completion of the defect liability period under the Contract(s) or delay in completion of the Phased Manufacturing Program beyond the aforesaid period, the validity of this Deed of Joint Undertaking shall be extended by such period of delay. However, this deed of Joint Undertaking shall terminate at the latest 24 months from the scheduled end of defect liability period of the last unit of the project under the contract or completion of Phased Manufacturing Programme, whichever occurs later. We, the Contractor, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER and *Qualified Generator Manufacturer do further undertake and confirm that this Deed of Joint Undertaking shall be irrevocable and shall not be revoked till its validity. We further agree that this Deed of Joint Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract(s).

12 In case of award, in addition to the Contract Performance Securities to be furnished by the bidder/Contractor, the on demand Bank Guarantees in favour of the Employer as specified in Qualifying Requirements stipulated at Item 4.0 of BDS shall be furnished.

The aforesaid Bank Guarantees shall be guarantee towards the faithful performance/ compliance of this Deed of Joint Undertaking in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and initially valid till ninety (90) days beyond the scheduled date of completion of defect liability period of all the equipment/ component covered under the Contract(s) or ninety (90) days beyond the scheduled completion of the Phased Manufacturing Program under the Contract(s), whichever occurs later. In case of delay in completion of the defect liability period under the Contract(s) or delay in completion of the Phased Manufacturing Program beyond the aforesaid period, the validity of this Bank Guarantee shall be extended by such period of delay. However, this Bank Guarantee shall terminate at the latest 27 months from the scheduled end of defect liability period of the last unit of the project under the contract or completion of Phased Manufacturing Programme, whichever occurs later. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.

13 Any dispute that may arise in connection with this Deed of Joint Undertaking shall be settled as per arbitration procedure/rules mentioned in the Contract documents.

This deed of undertaking shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.

14 We, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, *Qualified Generator Manufacturer and the Contractor, agree that this Deed of Joint Undertaking shall form an integral part of the Contracts for this package. We further agree that this Deed of Joint Undertaking shall continue to be enforceable till its validity.

15 That this Deed of joint undertaking shall be operative from the effective date of the Contract.

IN WITNESS WHEREOF, the Contractor, the Qualified Steam Turbine Generator Manufacturer, the OTHER PROMOTER and the *Qualified Generator Manufacturer through their authorised representatives, have executed these presents and affixed common seal of their respective companies on the day, month and year first mentioned above.

For M/s.....
(Bidder / Contractor)

WITNESS :
1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name .....
Designation.....
Common Seal of the Company.....

For M/s .....
(Qualified Steam Turbine Generator Manufacturer / Holding Company)

WITNESS :

1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name.....

Designation.....
Common Seal of the Company .....

For M/s .....
(OTHER PROMOTER)

WITNESS :
1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name.....
Designation.....
Common Seal of the Company .....

*For M/s .....

(Qualified Generator Manufacturer)

WITNESS :
1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name.....

Designation.....
Common Seal of the Company .....

Note:

(i) *** Bidder to strike out, whichever is not applicable.**

(ii) ***In case the Holding Company anticipates change of management control of any of its subsidiaries lending strength/ experience for fulfillment of requirement of clause 1.1.1, item 4.0 of BDS, the Holding Company shall arrange for signing of DJU and bank guarantees from all such subsidiaries lending strength / experience to the Holding Company for fulfillment of requirement of clause 1.1.1, before the change in management control actually occurs, in addition to the bank guarantee already furnished by the Holding Company. Such bank guarantees to be furnished by all the entities lending support to the Holding Company for fulfillment of requirement of clause 1.1.1, item 4.0 of Bid Data Sheet, shall be equally divided among them and shall aggregate to 1.0% of the total contract price .***

(iii) **Power of Attorney of the persons signing on behalf of each of the executants is to be furnished by bidder and to be attached along with the signed Deed of Joint Undertaking.**

ANNEXURE-I

Indicative list of equipment / systems

A) Turbine

1. Turbine and its auxiliaries i.e. control fluid system, gland steam sealing system, governing system, lube oil system, exhaust hood spray system, stop /control valves, turbine drain system, turbine protection system, turbine control system (Analog & sequence) and turbine supervisory instruments.
2. Generator and auxiliaries i.e. generator seal oil system, generator water cooling system, hydrogen, carbon dioxide & nitrogen system, generator excitation system.
3. Condensate, feed water and extraction system.
4. Control and instrumentation.
5. Condenser, condenser air evacuation system and COLTCS.
6. CEPs & BFPs.
7. LPHs, HPHs and Deaerator.
8. HPLP bypass system.
9. Integration of turbine cycle equipment.
10. Any other auxiliary of steam turbine generator set not covered above.

B) Generator

1. Generator Seal oil system
2. Generator water cooling system
3. Hydrogen, carbon dioxide & Nitrogen system
4. Generator Excitation system
5. Any other auxiliary of Generator not covered above

THDC INDIA LIMITED

(A Joint Venture of Govt. of India & Govt. of U.P.)
Pragati Bhawan, Pragatipuram, Bypass Road, Rishikesh

UTTARAKHAND, INDIA

Amendment No.7

dated 04th Feb'2019
to

Turbine Generator and Associated Packages for Khurja Super Thermal Power Project (2x660 MW)

AMENDMENT NO. THDC/RKSH/CC-9915-371-AMDT-07

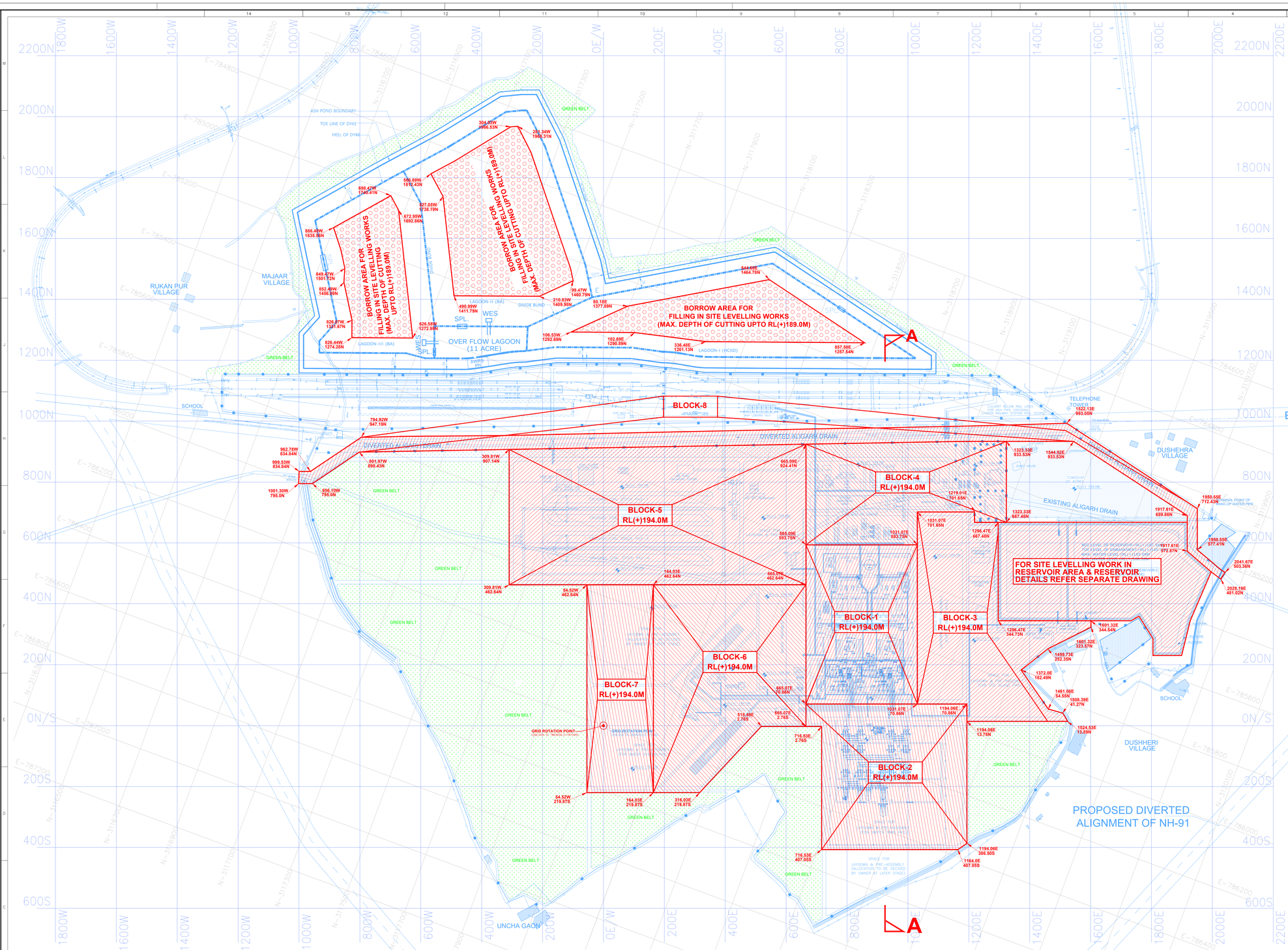
Tender No. THDC/RKSH/CC-9915-371

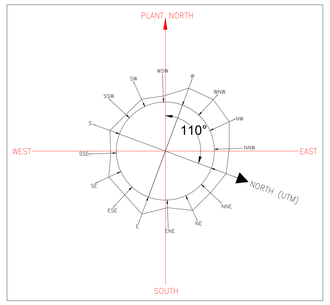
Khurja Super Thermal Power Project (2x660 MW)
Turbine Generator and Associated Packages :: Tender No. THDC/RKSH/CC-9915-371
Amendment No. 07 To Bidding Documents (Technical Specification)

Sl. No.	Specification Reference				Existing	Read as
	Sec / Part	Sub Sec.	Page No.	Clause No.		
1	VI / E	Tender Drawing	-	-	Drawing no. 9915-999-POC-F-001 **(REV.1)** titled "GENERAL LAYOUT PLAN "	Drawing no. 9915-999-POC-F-001 **(REV.1)** titled "GENERAL LAYOUT PLAN " is attached herewith. This supersedes Sl.No 164 of Amendment No.04
2.	VI / E	Tender Drawing	-	-	Drawing Nos. 9915-371-POC-A-001 titled "Site Levelling Plan", 9915-371-POC-A-002 titled "Layout of Roads" and 9915-371-POC-A-003 titled "Layout of Drains" added for information purpose only	Drawing Nos. 9915-371-POC-A-001 titled "Site Levelling Plan", 9915-371-POC-A-002 titled "Layout of Roads" and 9915-371-POC-A-003 titled "Layout of Drains" added for information purpose only . These drawings are attached herewith. This supersedes Sl.No 165 of Amendment No.04
3	VI / D	ECC	15/58	28.07.00	The Contractor shall provide two nos. multi-utility vehicles (8 to 10 seater) for facilitating movement of Employer's official of the Project, within as well as outside the plant premises. All expenses towards operation and maintenance including provision of drivers, fuel etc. associated with the vehicles shall be borne by thebidder from the date of site office opening till the completion of trial operation of the last unit.	Clause deleted.
4	VI / A	Sub Section A-0	-	-	Sub Section-A-0 : Project Information	Chapter revised and attached herewith
5	V	SCC	5/31	8.0	Values of the Contract Performance Securities furnished by Main Contractor and its Assignee (if applicable) shall be reduced to 67% and 34% of their original values on expiry of ninety (90) days after actual completion of defect liability period of all facilities relating to Unit-I and Unit-II respectively. In case defect liability period……Bank Guarantee(s) shall be in line with provision of SCC clause 8 (GCC 13.5).	Values of the Contract Performance Securities furnished by Main Contractor and its Assignee (if applicable) shall be reduced to **50%** of their original values on expiry of ninety (90) days after actual completion of defect liability period of all facilities relating to **Unit-I.** In case defect liability period……Bank Guarantee(s) shall be in line with provision of SCC clause 8 (GCC 13.5).
6	VII	Book 3 of 3 Part-2		Form 13C2	Existing Form 13C2 (Rev.01)	Replace the existing Form 13C2 (Rev.01) with the revised Form 13C2 **(Rev.02**) which is enclosed herewith.

Sec /Part -VI / E

Tender Drawings





WIND ROSE

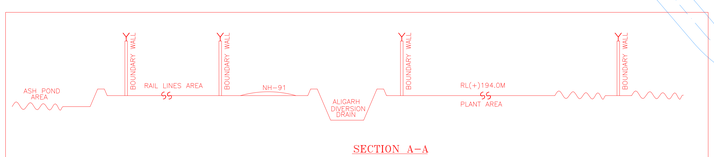
NOTES:–

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METERS.
2. GRIDS ARE MARKED AT 200M INTERVALS IN BOTH DIRECTIONS.
3. AREAS PROPOSED TO BE LEVELLED ARE AS SHOWN IN THE DRAWING. TOTAL AREA PROPOSED FOR LEVELLING BY BIDDER IS APPROX. 525 ACRES.
4. FILLING WITH EARTH SHALL BE DONE IN LAYERS AND COMPACTED TO 95% OR MORE OF STANDARD PROCTOR'S MAXIMUM DRY DENSITY AS PER TECHNICAL SPECIFICATION.
5. SLOPES IN CUTTING/FILLING FOR CHANGE OF LEVEL SHALL BE 1(V):2(H) UNLESS SPECIFICALLY NOTED OTHERWISE.
6. SURPLUS EARTH AVAILABLE FROM RAW WATER RESERVOIR MAY BE USED FOR FILLING IN SITE LEVELLING WORKS IN OTHER BLOCKS. HOWEVER, BALANCE EARTH AS REQUIRED FOR FILLING IN SITE LEVELLING SHALL BE FROM THE BORROW AREAS AS IDENTIFIED IN THIS DRAWING, AS PER TECHNICAL SPECIFICATION.
7. ALL CO–ORDINATES ARE SPECIFIED FOR THE TOP EDGE OF THE SLOPE OF FILLING/CUTTING. UNLESS SPECIFICALLY NOTED OTHERWISE.
8. WHEREVER COORDINATES ARE SPECIFIED AT THE COMMON BOUNDARY OF TWO BLOCKS, THEY REFER TO THE LIMIT OF BLOCK AT HIGHER LEVEL UNLESS NOTED OTHERWISE. THE COORDINATE OF THE LOWER BLOCK'S LIMIT SHALL BE CALCULATED AFTER ACCOUNTING FOR THE SLOPE OF FILLING.
9. BIDDER IS EXPECTED TO THOROUGHLY FAMILIARISE HIMSELF WITH THE CONDITIONS PREVAILING AT SITE INCLUDING NATURE OF SOIL, TOPOGRAPHY OF THE AREA, NATURAL GROUND LEVELS, EXISTING FACILITIES/BUILDINGS/STRUCTURES ETC, & ACCESS TO SITE. IN NO CASE ANY CLAIM OF THE CONTRACTOR ON ACCOUNT OF ACTUAL SITE CONDITIONS BEING DIFFERENT FROM WHAT HE HAS ASSUMED IN HIS TENDER SHALL BE ENTERTAINED BY THE OWNER AT LATER STAGE.
10. THE EXTENT OF VARIOUS BLOCKS AS SHOWN IN THIS DRAWING IS BASED ON THE GENERAL LAYOUT PLAN (DRAWING NO. 9915–999–POC–F–001) AND MAY SLIGHTLY CHANGE BASED ON REVISION IN GLP AT DETAILED ENGG. STAGE.
11. FINISHED GROUND LEVELS (FGL) FOR THE VARIOUS BLOCKS IS AS INDICATED IN THIS DRAWING. MINIMUM FORMATION LEVEL FOR ANY BLOCK SHALL NOT BE LESS THAN RL(+)194.0M.
12. BLOCK–8 REPRESENTS ALIGARH DRAIN DIVERSION CORRIDOR. FOR DETAILS OF DIVERSION DRAIN REFER DRAWING NO.–9915–370–POC–A–007.

LEGEND :–

1. AREA FOR SITE LEVELLING . . . . . .
2. LAND ACQUISTION BOUNDARY . . . . . .
3. GREEN BELT AREA . . . . . .

FOR INFORMATION PURPOSE ONLY



SECTION A–A

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ES	APPD	DATE
B	FOR INFORMATION PURPOSE ONLY	MANOJ									10.08.18
A	FOR TENDER PURPOSE ONLY	MANOJ									08.06.18

CLEARED BY

OWNER: THDC INDIA LIMITED (A JV of GOVT. OF INDIA & GOVT. OF UP)

CONSULTANT: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)

TITLE: TG ISLAND PACKAGE SITE LEVELLING PLAN

SIZE	SCALE	DRG. NO.	REV. NO.
A0	1 : 6000	9915–371–POC–A–001	B

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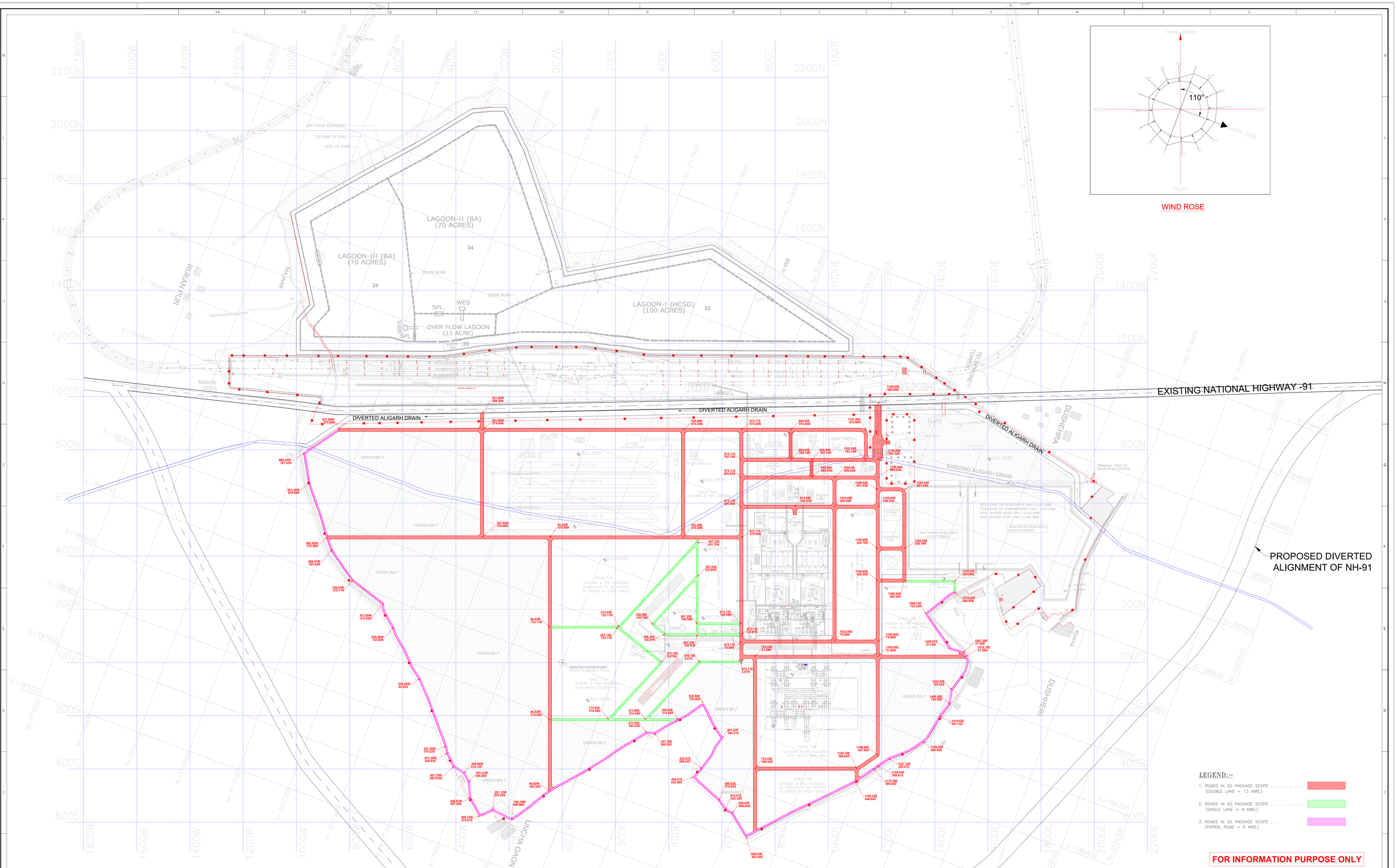

WIND ROSE

LEGEND:–

1. ROADS IN SG PACKAGE SCOPE . . . . . (DOUBLE LANE = 13 KMS.)
2. ROADS IN SG PACKAGE SCOPE . . . . . (SINGLE LANE = 4 KMS.)
3. ROADS IN SG PACKAGE SCOPE . . . (PATROL ROAD = 5 KMS.)

FOR INFORMATION PURPOSE ONLY

NOTES:–

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METRES.
2. TOP OF ROAD CREST LEVEL SHALL BE 350MM ABOVE THE FINISHED GROUND LEVEL(FGL).
3. THE CREST LEVEL OF THE ROAD SHALL CORRESPOND TO THE LEVEL AT THE TOP OF CONCRETE PAVEMENT AT THE CENTRE OF ROAD.
4. CAMBER SHALL BE PROVIDED AT SUBGRADE LEVEL.
5. APPROACH ROADS TO INDIVIDUAL BUILDINGS IN SG. PACKAGE IS ALSO IN THE SCOPE OF SG. PACKAGE WHICH IN NOT SHOWN IN THIS DRAWING.

REFERENCE DRAWINGS/DOCUMENTS:–

1. "GENERAL LAYOUT PLAN" DRAWING
2. "LAYOUT OF DRAIN" DRAWING
3. "SITE LEVELLING PLAN" DRAWING

SCALE 40 0 40 80 120 160M

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ES	APPD	DATE
A	FOR INFORMATION PURPOSE ONLY										10.08.18

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OWNER: THDC INDIA LIMITED (A JV of GOVT. OF INDIA & GOVT. OF UP)

CONSULTANT: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)

TITLE: TG ISLAND PACKAGE LAYOUT OF ROADS

SIZE	SCALE	DRG. NO.	REV. NO.
A0	1 : 6000	9915-371-POC-A-002	A

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TYPICAL CROSS SECTION OF RANDOM RUBBLE MASONRY DIVERTED ALIGARH DRAIN/ TRUNK DRAIN WORKS

TABLE-1 (DIVERSION ALIGARH DRAIN IN THE SCOPE OF SG PACKAGE)

DRAIN NO.	WIDTH B (IN M)		Z		DEPTH D (IN M)		START IL	END IL	START COORDINATES	END COORDINATES	APPROX. LENGTH	TYPE
	START	END	SIDE SLOPE		START	END						
DD-1	6	6	1.5:1		3	4	191.0	190.0	1944.53E 575.81N	991.19W 820.01N	3.2 KM	RRM

TABLE-2 (TRUNK DRAINS IN THE SCOPE OF SG PACKAGE)

DRAIN NO.	B	Z (H:V)	D	START COORDINATES	END COORDINATES	APPROX. LENGTH	TYPE
TD-1	2.0	1.5:1	2.4	1733.33E 220.41N	2016.36E 505.02N	500 M	RRM
TD-2	2.9	1.5:1	2.8	1470.56E 276.54N	531.43E 147.32S	2100 M	RRM
TD-3	3.0	1.5:1	2.8	531.43E 147.32S	191.65W 573.56S	850 M	RRM
TD-4	3.0	1.5:1	3.0	191.65W 573.56S	660.60W 217.52S	990 M	RRM
TD-5	4.0	1.5:1	3.0	660.60W 217.52S	959.10W 959.10N	685 M	RRM
TD-6	0.5	RECTANGULAR	1.2	769.98E 996.13N	1101.98E 1002.00N	332 M	RCC
TD-7	0.5	RECTANGULAR	1.1	769.98E 996.13N	104.11E 981.75N	666 M	RCC
TD-8	1.0	RECTANGULAR	1.4	219.22W 975.01N	104.11E 981.75N	325 M	RCC
TD-9	1.0	RECTANGULAR	1.6	219.22W 975.01N	791.43W 967.16N	575 M	RCC

B-BED WIDTH (m)
Z-SIDE SLOPE (H:V)
D-DEPTH WITH FREE BOARD (m)
RRM-RANDOM RUBBLE MASONRY
RCC-REINFORCED CEMENT CONCRETE

SPL. NOTE-1:-

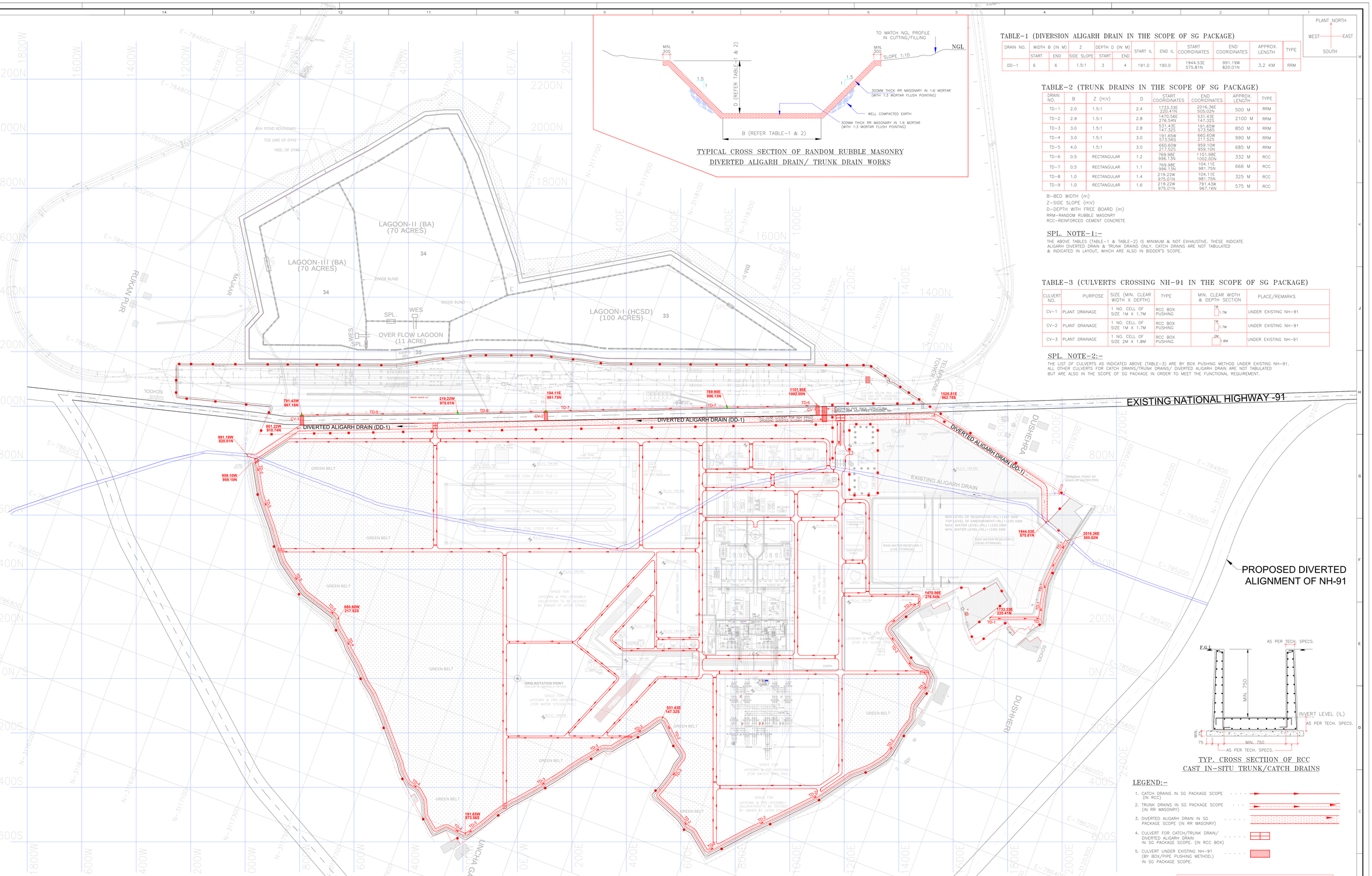
THE ABOVE TABLES (TABLE-1 & TABLE-2) IS MINIMUM & NOT EXHAUSTIVE. THESE INDICATE ALIGARH DIVERTED DRAIN & TRUNK DRAINS ONLY. CATCH DRAINS ARE NOT TABULATED & INDICATED IN LAYOUT, WHICH ARE ALSO IN BIDDER'S SCOPE.

TABLE-3 (CULVERTS CROSSING NH-91 IN THE SCOPE OF SG PACKAGE)

CULVERT NO.	PURPOSE	SIZE (MIN. CLEAR WIDTH X DEPTH)	TYPE	MIN. CLEAR WIDTH & DEPTH SECTION	PLACE/REMARKS
CV-1	PLANT DRAINAGE	1 NO. CELL OF SIZE 1M X 1.7M	RCC BOX PUSHING	1M 1.7M	UNDER EXISTING NH-91
CV-2	PLANT DRAINAGE	1 NO. CELL OF SIZE 1M X 1.7M	RCC BOX PUSHING	1M 1.7M	UNDER EXISTING NH-91
CV-3	PLANT DRAINAGE	1 NO. CELL OF SIZE 2M X 1.8M	RCC BOX PUSHING	2M 1.8M	UNDER EXISTING NH-91

SPL. NOTE-2:-

THE LIST OF CULVERTS AS INDICATED ABOVE (TABLE-3) ARE BY BOX PUSHING METHOD UNDER EXISTING NH-91. ALL OTHER CULVERTS FOR CATCH DRAINS/TRUNK DRAINS/ DIVERTED ALIGARH DRAIN ARE NOT TABULATED BUT ARE ALSO IN THE SCOPE OF SG PACKAGE IN ORDER TO MEET THE FUNCTIONAL REQUIREMENT.



TYP. CROSS SECTION OF RCC CAST IN-SITU TRUNK/CATCH DRAINS

LEGEND:-

1. CATCH DRAINS IN SG PACKAGE SCOPE (IN RCC)
2. TRUNK DRAINS IN SG PACKAGE SCOPE (IN RR MASONRY)
3. DIVERTED ALIGARH DRAIN IN SG PACKAGE SCOPE (IN RR MASONRY)
4. CULVERT FOR CATCH/TRUNK DRAIN/ DIVERTED ALIGARH DRAIN IN SG PACKAGE SCOPE. (IN RCC BOX)
5. CULVERT UNDER EXISTING NH-91 (BY BOX/PIPE PUSHING METHOD.) IN SG PACKAGE SCOPE.

FOR INFORMATION PURPOSE ONLY

NOTES:-

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. THE DESIGN (INVERT LEVELS, DEPTH, WIDTH, THICKNESS ETC.) OF DRAINS SHALL BE CARRIED OUT AS PER TECHNICAL SPECIFICATION AND CONTRACT TERMS & CONDITIONS. HOWEVER, MINIUMUM DIMENSIONS SHALL BE MAINTAINED BY THE CONTRACTOR AS SPECIFIED IN THIS DRAWING.
3. REINFORCED CEMENT CONCRETE (RCC) SHALL BE OF GRADE M25 FOR DRAINS AND CULVERTS AS PER IS: 456-2000.
4. MINIMUM CLEAR COVER TO MAIN REINFORCEMENT OF TOP SLAB, WALL AND BASE SLAB SHALL BE 40 MM.
5. ALL CIVIL AND STRUCTURAL WORKS SHALL BE CARRIED OUT IN CONJUNCTION WITH THE CONTRACT TERMS AND CONDITIONS AND TECHNICAL SPECIFICATION.
6. PCC BELOW FOUNDATIONS SHALL BE LAID IMMEDIATELY AFTER EXCAVATIONS. IN CASE OF ANY LOOSE MATERIAL BELOW FOUNDING LEVEL THE SAME SHALL BE REMOVED AND FILLED BY PCC. WATER TABLE SHALL BE MAINTAINED AT 0.5M BELOW FOUNDING LEVEL.
7. REINFORCEMENT STEEL SHALL BE HIGH YIELD DEFORMED TMT BARS OF GRADE FE-500 CONFIRMING TO IS:1786 (LATEST)
8. WEEP HOLES AT EVERY ONE METRE DISTANCE SHAL BE PROVIDED FOR DEPTH OF DRAIN MORE THAN 1M.
9. SLOPE OF THE DRAIN SHALL BE 1 VERTICAL : 1000 HORIZONTAL UNLESS OTHERWISE NOTED. DIRECTION OF SLOPE AS SHOWN IS SUGGESTIVE ONLY AND SHALL BE SUITABLY DECIDED AT DETAILED ENGG. STAGE IN CONSULTATION WITH THE OWNER.
10. DRAINS ARE TO BE PROVIDED ON BOTH SIDES OF THE ROAD AND CULVERTS SHALL BE PROVIDED AT REQUIRED LOCATIONS.
11. THE DRAIN LAYOUT AND DETAILS AS SHOWN IN THIS DRAWING ARE WITH REFERENCE TO "HYDROGRAPHICAL AREA DRAINAGE STUDY" REPORT. HOWEVER, ALL DRAINS & DETAILS AS SHOWN THIS DRAWING ARE IN THE SCOPE OF BIDDER.
12. ADDITIONAL DRAINS/CULEVRTS NOT SHOWN IN THE DRAWING BUT REQUIRED TO MEET THE FUNCTIONAL REQUIREMENT SHALL ALSO BE PROVIDED BY THE BIDDER.

REFERENCE DRAWINGS/DOCUMENTS:-

1. 'GENERAL LAYOUT PLAN' DRAWING
2. 'LAYOUT OF ROAD' DRAWING
3. 'SITE LEVELLING PLAN' DRAWING
4. 'HYDROGRAPHICAL AREA DRAINAGE STUDY' REPORT

SCALE 40 0 40 80 120 160M

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ES	APPD	DATE
A	FOR INFORMATION PURPOSE ONLY										23.08.18

CLEARED BY

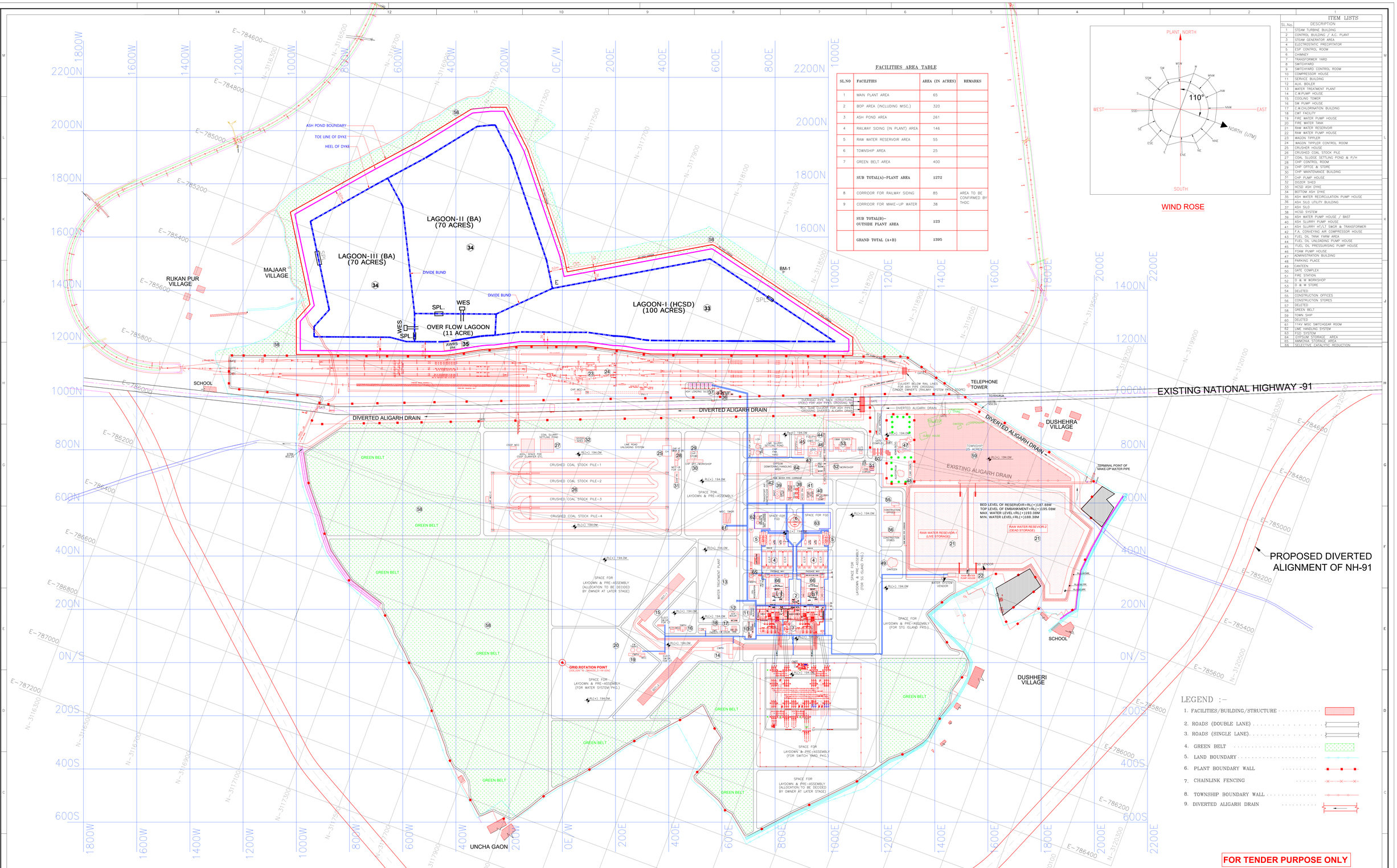
OWNER: THDC INDIA LIMITED (A JV of GOVT. OF INDIA & GOVT. OF UP)

CONSULTANT: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: KHURJA SUPER THERMAL POWER PROJECT (2x660 MW)

TITLE: TG ISLAND PACKAGE LAYOUT OF DRAINS

SIZE	SCALE	DRG. NO.	REV. NO.
A0	1 : 6000	9915-371-POC-A-003	A



FACILITIES AREA TABLE

SL.NO	FACILITIES	AREA (IN ACRES)	REMARKS
1	MAIN PLANT AREA	65	
2	BOP AREA (INCLUDING MISC.)	320	
3	ASH POND AREA	261	
4	RAILWAY SIDING (IN PLANT) AREA	146	
5	RAW WATER RESERVOIR AREA	55	
6	TOWNSHIP AREA	25	
7	GREEN BELT AREA	400	
	SUB TOTAL(A)-PLANT AREA	1272	
8	CORRIDOR FOR RAILWAY SIDING	85	AREA TO BE CONFIRMED BY THDC
9	CORRIDOR FOR MAKE-UP WATER	38	
	SUB TOTAL(B)- OUTSIDE PLANT AREA	123	
	GRAND TOTAL (A+B)	1395	

ITEM LISTS

SL.No.	DESCRIPTION
1	STEAM TURBINE BUILDING
2	CONTROL BUILDING / A.C. PLANT
3	STEAM GENERATOR AREA
4	ELECTROSTATIC PRECIPITATOR
5	ESP CONTROL ROOM
6	CHIMNEY
7	TRANSFORMER YARD
8	SWITCHYARD
9	SWITCHYARD CONTROL ROOM
10	COMPRESSOR HOUSE
11	SERVICE BUILDING
12	AUX. BOILER
13	WATER TREATMENT PLANT
14	C.W.PUMP HOUSE
15	COOLING TOWER
16	SW PUMP HOUSE
17	C.W.CHLORINATION BUILDING
18	CWT FACILITY
19	FIRE WATER PUMP HOUSE
20	FIRE WATER TANK
21	RAW WATER RESERVOIR
22	RAW WATER PUMP HOUSE
23	WAGON TIPPLER
24	WAGON TIPPLER CONTROL ROOM
25	CRUSHER HOUSE
26	CRUSHED COAL STOCK PILE
27	COAL SLUDGE SETTLING POND & P/H
28	CHP CONTROL ROOM
29	CHP OFFCE & STORE
30	CHP MAINTENANCE BUILDING
31	CHP PUMP HOUSE
32	DOZER SHED
33	HCSD ASH DYKE
34	BOTTOM ASH DYKE
35	ASH WATER RECIRCULATION PUMP HOUSE
36	ASH SILO UTILITY BUILDING
37	ASH SILO
38	HCSD SYSTEM
39	ASH WATER PUMP HOUSE / BAST
40	ASH SLURRY PUMP HOUSE
41	ASH SLURRY HT/LT SWGR & TRANSFORMER
42	F.A. CONVEYING AIR COMPRESSOR HOUSE
43	FUEL OIL TANK FARM AREA
44	FUEL OIL UNLOADING PUMP HOUSE
45	FUEL OIL PRESURISING PUMP HOUSE
46	FOAM PUMP HOUSE
47	ADMINISTRATION BUILDING
48	PARKING PLACE
49	CANTEEN
50	GATE COMPLEX
51	FIRE STATION
52	O & M WORKSHOP
53	O & M STORE
54	DELETED
55	CONSTRUCTION OFFICES
56	CONSTRUCTION STORES
57	DELETED
58	GREEN BELT
59	TOWN SHIP
60	DELETED
61	11KV MISC SWITCHGEAR ROOM
62	LIME HANDLING SYSTEM
63	FGD SYSTEM
64	GYPSUM STORAGE AREA
65	AMMONIA STORAGE AREA
66	SELECTIVE CATALYTIC REDUCTION

LEGEND :-

1. FACILITIES/BUILDING/STRUCTURE
2. ROADS (DOUBLE LANE)
3. ROADS (SINGLE LANE)
4. GREEN BELT
5. LAND BOUNDARY
6. PLANT BOUNDARY WALL
7. CHAINLINK FENCING
8. TOWNSHIP BOUNDARY WALL
9. DIVERTED ALIGARH DRAIN

NOTES:

1. ALL CO-ORDINATES ARE IN METRES.
2. FOR DETAILS IN MAIN PLANT BLOCK REFER EQUIPMENT LAYOUT PLAN DRAWING
3. FOR SCOPE AND DETAILS OF PIPE & CABLE TRESTLE REFER "DRAWING NO. 9915-999-POM-F-006" TITLED "PIPE & CABLE TRESTLE LAYOUT"
4. FORMATION LEVEL OF THE PROJECT SITE IS AT RL(+)194.0M
5. EL(±)0.00M CORRESPONDS TO RL(+)194.5M, WHICH IS FINISHED FLOOR LEVEL (FFL) OF MAIN POWER HOUSE (MPH) GROUND FLOOR.
6. THE AREA FOR CONSTRUCTION/ERECTION FACILITIES LIKE LAY-DOWN, PRE-ASSEMBLY,OFFICES AND STORES IS TO BE MANAGED BY BIDDER WITHIN THE ALLOCATED AREA FOR RESPECTIVE PACKAGES WITHIN THE PLANT BOUNDARY AS SHOWN IN GENERAL LAYOUT PLAN. IN CASE BIDDER REQUIRES ADDITIONAL AREA, HE SHALL MAKE HIS OWN ARRANGEMENT AT HIS COST OUTSIDE THE PLANT BOUNDARY. DEVELOPMENT OF THE SAME INCLUDING SECURITY ETC. FOR THE INTENDED USE WILL ALSO BE HIS RESPONSIBILITY.

SPECIAL NOTE:

PLANT GRIDS ARE ROTATED AT AN ANGLE OF 110° COUNTER CLOCKWISE AND COMMON POINT OF ROTATION IS 0.0E,0.0N AS PER NEW GRID SYSTEM AND 786400E,3118100N AS PER OLD GRID SYSTEM (SURVEY GRID) AS SHOWN IN THE DRAWING.

SCALE: 40 0 40 80 120 160M

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ES	APPD	DATE
1	GENERALLY UPDATED	MANOJ.									23.08.16
0	FOR TENDER PURPOSE	MANOJ.	AA		JS/SKD MT/AVK	PR/SU	RB	RS		RB	08.06.16

CLEARED BY

OWNER: THDC INDIA LIMITED (A JV of GOVT. OF INDIA & GOVT. OF UP)

CUNSALTANT: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: KHURJA SUPER THERMAL POWER PROJECT (2X660 MW)

TITLE: GENERAL LAYOUT PLAN

SIZE	SCALE	DRG. NO.	REV. NO.
A0	1 : 4000	9915-999-POC-F-001	1

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Sec /Part -VI / A
Sub Section-A-0

Project Information

KHURJA STPP (2X660 MW)

1.00.00 BACKGROUND

THDC India Limited (Formerly Tehri Hydro Development Corporation), is a joint venture of Govt. of India & Govt. of Uttar Pradesh. THDC India Limited has been entrusted to execute a Thermal Power Project in Khurja at district Bulandshahar, Uttar Pradesh (UP) along with various other hydro projects.

THDC has placed a Consultancy order to NTPC Ltd for Pre-award to Commissioning activities (consultancy) of Khurja Coal based power project (2x660 MW).

The present proposal is to establish 2X660 MW coal based Khurja Super Thermal Power Project for the benefit of Uttar Pradesh, Rajasthan, Uttarakhand, Himachal Pradesh & Delhi.

2.00.00 CAPACITY

PRESENT PROPOSAL **:** 2 x 660 MW

3.00.00 MODE OF OPERATION

Base Load

4.00.00 LOCATION AND APPROACH

Khurja Super Thermal Power Project is located in Bulandshahar district of Uttar Pradesh, between 28°08'35" to 28°10'25" Northern latitude and 77°53'47" to 77°55'22" Eastern longitude. The site is situated near villages Dushhara-kherli, Jahanpur, Naiphal (Unchagaon) and Rukunpur. The district Headquarters Buland Shahar is about 32 kms. The nearest railway station Danwar on Delhi-Kolkata Section (via Aligarh) is approximately 5 km away from the project site. The nearest major railway station is Khurja at a distance of about 11 kms.

Vicinity Plan of the proposed project is placed at **Annexure-I**.

Distance of the project site from nearest cities

Khurja	11 kms
Aligarh	36 kms
Delhi	90 kms
Bulandshaher	32 kms

For further information, bidders are also advised to visit the project site and collect data regarding local site conditions.

4.03.00 **AIRPORT**

The nearest commercial airport at Delhi is located at a distance of approximately 120 kms from the project site.

5.00.00 **LAND**

The land requirement for the project has been estimated as 1400 Acres for Main Plant, Balance of Plant including Coal Handling Plant, Ash Disposal Area, Ash Disposal Pipeline Corridors, Construction Stores & Offices, Laydown & Fabrication Yard, and Labor Colony etc. Land has already been acquired through UPSIDC. Additional patches of required land shall be acquired.

6.00.00 **WATER**

The Upper Ganga Canal passes near by the Khurja STPP. The makeup water for the project is proposed to be drawn from Upper Ganga Canal at a distance of about 13 kms.

Quantity of make-up water required for 2X660MW would be about 3265 Cum/hr with ash water recirculation system and 4415 Cum/hr with once through ash water system. Make-up water is proposed to be used for condenser cooling, ash sluicing, coal dust suppression and other plant processes. Make up water shall be drawn from the canal by constructing suitable intake structures. A Raw Water Reservoir is envisaged.

Govt. of UP has conveyed commitment for supply of required quantity of water for the project.

7.00.00 **COAL**

7.01.00 **Coal Requirement, Availability and Linkage**

The daily coal requirement for 2x660 MW units shall be about 15261 tonnes based on Gross Calorific Value of 4200 Kcal/kg and 2248 Kcal/KWh unit heat rate, considering 90% plant load factor.

Annual coal requirement for the plant shall be about 5.57 MTPA considering PLF of 90% and the same is proposed to be met from Amelia Coal Mine in District Singrauli, Madhya Pradesh, allotted to THDCIL by Ministry of Coal, Govt. of India. THDCIL has entered into an agreement with Nominated Authority, Ministry of Coal for the development of Amelia Coal Mine in Synchronization with the implementation of Khurja STPP. The distance between Khurja STPP plant site and Allotted Amelia Mine at Singrauli, Madhya Pradesh is around 900 Kms.

7.02.00 **Coal Transportation**

The envisaged mode of coal transportation from the coal mines to the power plant is through Indian Railways**.**

7.03.00 **Coal Quality**

The primary fuel for the main steam generator shall be coal. The coal quality parameters indicated in **Annexure-II** are to be considered for steam generator design.

8.00.00 **Fuel Oil**

The fuel oils to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel Oils having the characteristics & and High Speed Diesel Oil having the characteristics given at **Annexure-III & Annexure-IV** respectively.

9.00.00 **STEAM GENERATOR TECHNOLOGY**

The steam generators shall be based on super critical technology, once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.

10.00.00 **FLUE GAS DESULPHURIZATION SYSTEM (FGD) & SCR:**

The project is envisaged with Flue Gas Desulfurization (FGD) system and Selective Catalytic Reduction (SCR) in compliance to the notification dated 07.12.2015 by Ministry of Environment, Forest & Climate Change. The Tentative Limestone characteristic to be used for design of FGD system shall be as per the characteristic given at **Annexure-V.**

11.00.0 **POWER EVACUATION SYSTEM**

Power Generated from each 660 MW unit would be stepped up to the evacuation voltage level through suitably rated Generator Transformer and will be evacuated through 400kV transmission systems. Associated Transmission System (ATS) of the project has already taken-up with PGCIL/CEA/UPPTCL and will be finalized soon.

12.00.00 **METEOROLOGICAL DATA**

The meteorological data from nearest observatory (Aligarh) is placed at **Annexure - VI.**

13.00.00 **PLANT WATER SCHEME**

The Plant water scheme is described below.

13.01.00 **Condenser Cooling (CW) Water System**

It is proposed to adopt a recirculating type cooling water system with cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.

13.02.00 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a secondary circuit. The station auxiliaries such as Air compressors, Compressors of ash handling plant, compressor of mill reject system, FGD & SCR system etc. shall also be cooled by Demineralized (DM) water in a closed circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.

13.03.00 **Other Miscellaneous Water Systems**

CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, ash slurry pumps sealing, sealing of Vacuum

pumps (if applicable) of Ash Handling plant, FGD system, make-up to fire water system. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused.

FGD waste water shall be diverted to ash system after neutralization.

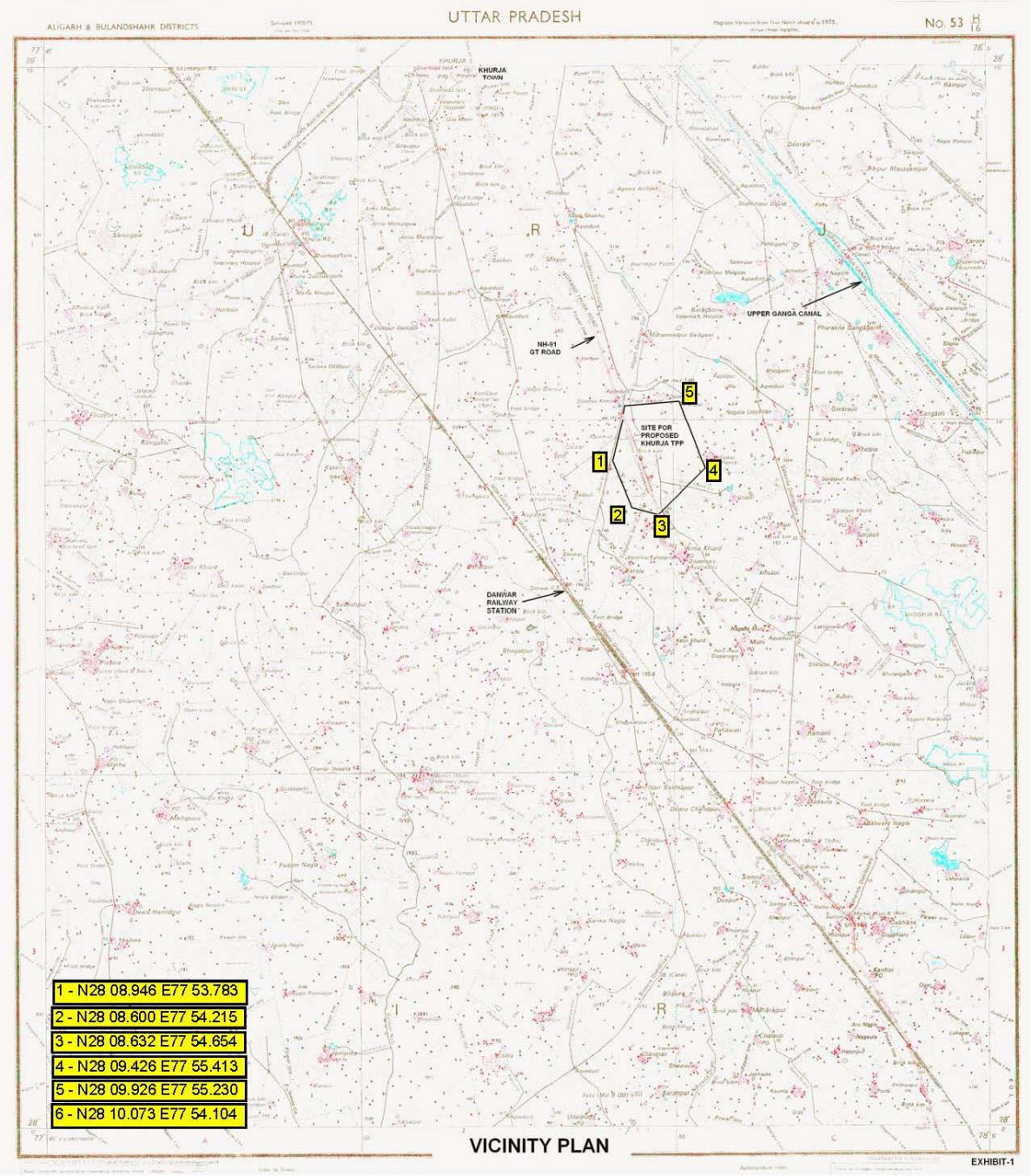
The quality of clarified water & DM water is given in this sub-section at **Annexure-VII-1 & VII-2.**

The Salient data for design and sizing of equipment at BMCR Condition is given in this sub-section at **Annexure-VII-3.**

Salient data for design and sizing of equipment at Pure Sliding Pressure Condition is given in this sub-section at **Annexure-VII-4.**

ANNEXURE-I

VICINITY PLAN



ANNEXURE-II

COAL & ASH CHARACTERISTICS

PROPOSED COAL CHARACTERISTICS FOR KHURJA (2X660 MW)

S.No.	Characteristics (as received basis)	Range of 95 % coal supplies Column - 1	Column - 2	Column - 3	Range of 5 % coal supplies	
1.0	PROXIMATE ANALYSIS	Design	Worst	Best		
1.1	Total Moisture (%)	12	14	11.0	11-15	
1.2	Ash (%)	32	35	28	28-36	
1.3	Volatile Matter (%)	24	23	25	22-26	
1.4	Fixed Carbon (%)	32	28	36.0	28-36	
1.5	Total (%)	100	100	100		
2.0	ULTIMATE ANALYSIS					
2.1	Carbon (%)	42.9	37.81	48.01	35.21-45.4	
2.2	Hydrogen (%)	3.2	2.8	3.3	2.9-4.2	
2.3	Sulphur (%)	0.4	0.6	0.3	0.52	
2.4	Nitrogen(%)	1	0.58	1.2	6.86	
2.5	Oxygen(%)(By difference)	8.17	8.77	7.7	0.28	
2.6	Carbonates (%)	0.27	0.38	0.45	0.3	
2.7	Phosphorous(%)	0.06	0.06	0.04	0.04	
2.8	Total Moisture (%)	12	14	11.0	22	
2.9	Ash (%)	32	35	28	39	
	Total	100	100	100		
2.10	GCV (Kcal/Kg)	4200	3650	4700	3600-4800	
2.11	Hard Grove Index	60	52	65	50-65	
2.12	YGP (mg/kg)	70	75	70	85-70	
3.0	ASH ANALYSIS					
3.1	Silica (%)	58.2	59.54	58.00	58.1-63	
3.2	Alumina(%)	28	26.3	27.20	22.2-26.1	
3.3	Iron Oxide (%)	6.1	6.4	7.60	8.3-11.5	
3.4	Titania	1.85	1.72	1.80	0.82-1.2	
3.5	Phosphoric Anhydride (%)	1.91	1.57	0.48	0.48-191	
3.6	Lime (%)	1.7	3.2	3.30	1.78-3.5	
3.7	Magnesia (%)	0.7	0.6	0.50	0.5-0.9	
3.8	Sulphuric Anhydride (%)	0.29	0.25	0.40	0.12-0.43	
3.9	Sodium Oxide (%)	0.3	0.1	0.30	0.1-0.32	
3.10	Potassium oxide	0.95	0.32	0.42	0.1-0.43	
	Total	100	100.00	100.00		
4.0	ASH FUSION RANGE					
	REDUCING ATMOSPHERE					
4.1	Initial Deformation Temp.(oC)	1200	1100	1150	1100	1200
4.2	Hemispherical Temp. (oC)	1400	1300	1350	1200	1400
4.3	Fusion Temperature (oC)	1400	1400	1350	1400	1450

ANNEXURE-III

LIGHT DIESEL OIL CHARACTERISTICS

AS PER IS 15770-2008

	Characteristics	LDO
1.	Pour Point (max)	21 °C & 12°C for Summer and Winter respectively
2.	Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0
3.	Sediment percent by mass (max)	0.10
4.	Total sulphur percent by mass (max)	1.5
5.	Ash percentage by mass (max)	0.02
6.	Carbon residue (Rams bottom) percent by pass (max.)	1.50
7.	Acidity inorganic	Nil
8.	Flash point (Min.) - Pensky Martens	66 deg.C
9.	Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2
10.	Water content, % by volume (max)	0.25
11.	GCV(kcal/kg)	10,000

ANNEXURE-IV

HIGH SPEED DIESEL OIL CHARACTERISTICS

[AS PER IS **1460-2005 (BS-II)**]

S. No.	Particulars	Unit	Value
1.	PHYSICAL PROPERTIES		
	a. Distillation volume recovery @ 350^0C	% vol. (min)	85
	b. Distillation volume recovery @ 370^0C	% vol. (min)	95
	c. Kinematic Viscosity @ 40 Degree C	cSt	2.0 – 5.0
	d. Density @ 15 Degree C	kg/m^3	820 – 860
	e. Pour Point		
	- Summer	Degree C (max)	15
	- Winter	Degree C (max)	03
	f. Cold Filter Plugging Point		
	- Summer	Degree C (max)	18
	- Winter	Degree C (max)	06
	g. Flash Point (Abal)	Degree C (max)	35
	h. Lubricity WSD 1.4 @ 60 Degree C	Microns (max)	460
2.	HEATING VALUE		
	a. Higher Heating Value (HHV)	Kcal/Kg	11,000
	b. Lower Heating Value (LHV)	Kcal/Kg	10,300
3.	ACIDITY		
	a. Inorganic	mg KOH/g	Nil
	b. Total	mg KOH/g	0.2 (max.)
4.	Copper Strip Corrosion 3 hours @100^0C	No.	1 (max)
5.	RCR on 10% residue	% wt.	0.3 (max)
6.	CONTAMINANTS		
	a. Ash	ppm (wt.)	100 (max)
	b. Sediments	% wt	0.05 (max)
	c. Total Sulphur	% wt	0.05 (max)
	d. Water Content	% volume	0.05 (max)
	e. Trace Metals		
	- Na + K	ppm (wt)	0.30 (max)
	- Vanadium	ppm (wt)	0.50 (max)
	- Lead	ppm (wt)	0.50 (max)
	- Calcium	ppm (wt)	2.0
	- Ni + Zn	ppm (wt)	Nil
7.	Nitrogen content (FBN)	% wt.	0.015

ANNEXURE-V

LIMESTONE CHARACTERISTICS

Chemical Analysis(% by mass)			
1.	CaO	%	47-51.0*
2.	MgO	%	0.9-3.8
3.	Fe_2O_3	%	0.45-1.0
4.	Al_2O_3	%	1.19-2.1
5.	Si_2O_3	%	2.1-4.5
6.	Mn_2O_3	%	<0.12
7.	P_2O_5,	%	Traces
8.	Cl_2	%	<0.015
9.	Na_2O	%	<0.16
10.	K_2O	%	<0.01
11.	TiO_2	%	<0.02
12.	Total Sulphur	%	<0.1
13.	LOI	%	39.0-41.3
Physical properties			
1	Bond Index	kWh/t	13
2	Granule size		Medium

METEOROLOGICAL DATA

ANNEXURE-VI

BACK

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : अलीगढ
STATION : Aligarh

अक्षांश LAT. 27°53' देशांतर LONG. 78°04'

समुद्री तल माध्य से ऊंचाई HEIGHT ABOVE M.S.L. 187 मीटर METRES

प्रेक्षणों पर आधारित BASED ON OBSERVATIONS 1971-2000

माह / MONTH		स्टेशन का सतह दाब / STATION LEVEL PRESSURE (एच.पी.ए / hPa)	वायु तापमान माध्य: शुष्क बल्ब / DRY BULB (डि. से / °C)	नम बल्ब / WET BULB (डि. से / °C)	दैनिक अधिकतम / DAILY MAX (डि. से / °C)	दैनिक न्यूनतम / DAILY MIN (डि. से / °C)	माह में उच्चतम / HIGHEST IN THE MONTH (डि. से / °C)	माह में निम्नतम / LOWEST IN THE MONTH (डि. से / °C)	चरम: उच्चतम / HIGHEST (डि. से / °C)	दिनांक और वर्ष / DATE AND YEAR	निम्नतम / LOWEST (डि. से / °C)	दिनांक और वर्ष / DATE AND YEAR	आर्द्रता: सापेक्ष आर्द्रता / RELATIVE HUMIDITY (प्रतिशत / %)	वाष्प दाब / VAPOUR PRESSURE (एच.पी.ए / hPa)	मेघ की मात्रा: समस्त मेघ / ALL CLOUDS (आकाश के अष्टमाश / Oktas of sky)	निम्न मेघ / LOW CLOUDS (आकाश के अष्टमाश / Oktas of sky)	मासिक योग / MONTHLY TOTAL (मि.मि. / mm)	वर्षा के दिनों की संख्या / NO. OF RAINY DAYS	वर्षा: वर्षसहित सबसे नम महीने का योग / TOTAL IN WETTEST MONTH WITH YEAR (मि.मि. / mm)	वर्षसहित शुष्कतम महीने का योग / TOTAL IN DRIEST MONTH WITH YEAR (मि.मि. / mm)	24 घंटों की सबसे भारी वर्षा / HEAVIEST FALL IN 24 HOURS (मि.मि. / mm)	दिनांक और वर्ष / DATE AND YEAR	माध्य पवन गति / MEAN WIND SPEED (कि.मी. प्र. घं. / Kmph)
जनवरी / JAN	I	996.0	10.8	9.2	20.6	7.4	25.1	3.8	30.7	28	0.6	16	80	10.5	2.5	2.3	15.2	1.5	71.9	0.0	53.8	12	3.1
	II	993.3	18.2	13.8						1991		1935	60	12.4	2.3	2.0			1883			1994	
फरवरी / FEB	I	993.7	13.3	11.1	23.6	9.5	28.8	5.0	33.3	26	1.7	11	75	11.6	2.5	2.2	13.9	1.4	141.0	0.0	71.1	2	3.5
	II	991.0	21.2	15.4						1989		1950	52	13.0	2.3	2.1			1928			1928	
मार्च / MAR	I	990.9	19.3	15.2	30.0	14.1	35.5	8.9	41.7	31	3.9	6	63	14.1	2.3	1.9	8.5	1.0	106.7	0.0	63.5	18	4.2
	II	988.1	27.2	18.7						1945		1945	41	14.8	2.6	2.1			1870			1870	
अप्रैल / APR	I	986.6	26.8	18.9	36.8	20.1	41.5	14.3	44.5	29	10.9	9	45	15.5	1.5	1.2	8.8	0.9	68.1	0.0	30.6	29	4.8
	II	982.9	34.3	21.3						1999		1957	28	14.7	2.0	1.6			1909			1997	
मई / MAY	I	982.5	30.6	21.9	40.1	24.5	43.9	19.9	47.2	28	15.5	3	45	19.2	1.5	1.3	21.0	2.2	75.7	0.0	41.1	20	4.9
	II	979.1	37.6	24.0						1988		1987	30	18.8	1.6	1.4			1913			1913	
जून / JUN	I	978.7	31.2	24.8	39.3	26.6	44.4	22.3	46.7	7	18.6	2	59	26.1	2.8	2.6	68.5	4.1	544.8	0.0	327.2	30	5.6
	II	975.3	36.5	26.0						1995		1957	44	25.1	3.0	2.8			1933			1981	
जुलाई / JUL	I	978.4	29.2	26.3	34.6	26.0	39.4	23.0	44.5	2	19.9	12	79	31.9	6.1	5.9	217.7	10.2	576.1	1.5	164.6	3	4.7
	II	975.4	32.2	27.3						1987		1988	69	32.0	6.1	5.8			1958	1941		1942	
अगस्त / AUG	I	980.0	28.3	26.1	33.2	25.4	36.9	22.9	42.1	11	20.1	13	84	32.1	6.1	5.7	247.4	11.6	529.8	0.0	183.6	15	4.3
	II	977.3	30.7	27.0						1987		1957	75	32.7	6.1	5.9			1940			1964	
सितम्बर / SEP	I	984.6	27.4	24.5	33.8	23.8	36.9	20.7	40.2	1	14.8	16	78	28.6	3.2	2.9	104.1	5.2	590.5	0.0	220.6	26	3.7
	II	981.5	31.0	25.6						1979		1994	65	28.6	3.2	3.0			1884			1964	
अक्तूबर / OCT	I	990.4	23.5	19.8	33.0	18.8	36.2	14.4	41.7	4	11.0	9	69	20.2	1.0	0.9	31.4	1.4	231.1	0.0	138.7	13	2.2
	II	987.2	29.1	21.8						1952		1983	51	20.4	1.0	0.8			1955			1955	
नवम्बर / NOV	I	994.5	17.5	14.4	28.3	12.9	32.1	9.4	36.1	3	5.0	30	69	14.0	0.8	0.7	4.2	0.5	34.8	0.0	26.2	14	2.1
	II	991.5	24.0	18.2						1944		1937	55	16.4	0.9	0.8			1904			1966	
दिसम्बर / DEC	I	996.7	12.3	10.4	22.5	8.5	26.7	5.3	32.8	2	1.2	30	77	11.2	1.7	1.4	11.0	0.8	87.6	0.0	56.2	28	2.7
	II	993.6	19.5	15.0						1948		1973	59	13.5	1.8	1.5			1909			1977	
वार्षिक योग या माध्य / ANNUAL TOTAL OR MEAN	I	987.7	22.5	18.6	31.3	18.1	44.1	3.4	47.2	28	0.6	16	69	19.6	2.6	2.4	751.8	40.7	1342.9	204.5	327.2	30	3.8
	II	984.7	28.5	21.2					5	1988	1	1935	52	20.2	2.7	2.4			1933	1918	6	1981	
वर्षों की संख्या / NUMBER OF YEARS	I / II	29	29	29	29	29	29	29	68		68		29	29	29	29	28	28	64	64	66		15

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : अलीगढ
STAION : Aligarh

		मौसम परिघटना						पवन													मेघ											दृश्यता				
		के साथ दिनों की संख्या						पवन की गती के साथ दिनों की संख्या (कि. मी. प्र. घं.)				पवन की दिशा के दिनों की संख्या का प्रतिशत									मेघ मात्रा (सभी मेघ) सहित दिनों की संख्या - अष्ठमांश					निम्न स्तरी मेघ मात्रा सहित दिनों की संख्या - अष्ठमांश						दृश्यता सहित दिनों की संख्या				
माह		वर्षण 0.3 मि.मि.या अधिक	ओले	गर्जन	कुहरा	धूल भरी आंधी	चंड वात	62 या अधिक	20-61	1-19	0	उ	उपू	पू	दपू	द	दप	प	उप	शांत	0	ले-2	3-5	6-7	8	0	ले-2	3-5	6-7	8	कुहरा 8	1 कि.मी. तक	1-4 कि.मी.	4-10 कि.मी.	10-20 कि.मी.	20 कि.मी. से अधिक
		WEATHER PHENOMENA						WIND													CLOUD										VISIBILITY				
		No. OF DAYS WITH						No. OF DAYS WITH WIND SPEED (Km. p. h.)				PERCENTAGE No. OF DAYS WIND FROM									No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS					No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS						No. OF DAYS WITH VISIBILITY				
MONTH		PPT 0.3 mm Or more	HAIL	THUN DER	FOG	DUST STORM	SQU ALL	62 Or more	20-61	1-19	0	N	NE	E	SE	S	SW	W	NW	CALM	0	T-2	3-5	6-7	8	0	T-2	3-5	6-7	8	FOG 8	UP TO 1 Km	1-4 Kms	4-10 Kms	10-20 Kms	OVER 20 Kms
जनवरी	I	2.1	0.1	0.2	3.0	0.0	0.0	0	0	25	6	2	14	10	16	2	11	15	9	21	20	1	2	3	5	20	1	2	3	5	0	3.3	6.2	16.9	4.6	0.0
JAN	II							0	0	23	8	4	9	6	13	4	5	19	13	27	19	2	2	4	4	20	2	2	3	4	0	1.1	11.5	6.3	12.1	0.0
फरवरी	I	2.4	0.1	0.5	1.2	0.0	0.0	0	0	23	5	3	14	8	14	2	12	15	14	18	16	2	3	3	4	18	1	2	3	4	0	1.9	4.8	14.5	6.8	0.0
FEB	II							0	0	23	5	5	8	5	13	1	9	24	15	20	17	2	3	3	3	18	2	2	3	3	0	0.0	8.4	4.8	14.8	0.0
मार्च	I	2.2	0.3	0.7	0.0	0.1	0.0	0	0	27	4	2	13	8	19	2	12	16	14	14	20	1	3	4	3	22	0	3	3	3	0	0.4	4.7	13.4	12.5	0.0
MAR	II							0	0	26	5	6	8	6	11	2	10	20	22	15	17	2	4	5	3	19	2	3	4	3	0	0.1	6.3	6.6	18.1	0.0
अप्रैल	I	1.9	0.1	0.9	0.0	0.8	0.0	0	0	26	4	3	15	9	18	2	12	13	15	13	21	1	3	3	2	24	0	2	2	2	0	0.0	3.6	14.0	12.4	0.0
APR	II							0	0	27	3	8	7	6	12	4	9	13	30	11	19	2	3	4	2	20	2	3	3	2	0	0.0	5.5	7.0	17.4	0.0
मई	I	3.2	0.1	0.9	0.0	2.3	0.0	0	0	27	4	3	12	11	13	3	12	15	16	15	23	1	2	2	3	25	0	2	1	3	0	0.0	5.6	15.4	9.9	0.0
MAY	II							0	0	27	4	7	9	8	12	3	9	16	25	11	22	3	2	2	2	23	2	2	2	2	0	0.0	5.9	9.2	15.9	0.0
जून	I	5.2	0.0	0.5	0.0	1.0	0.0	0	0	26	4	2	12	13	15	4	14	11	15	14	17	1	3	4	5	17	1	3	4	5	0	0.0	5.4	13.0	11.6	0.0
JUN	II							0	0	27	3	5	14	11	15	4	13	11	18	9	15	3	3	4	5	16	3	3	3	5	0	0.0	5.8	8.9	15.3	0.0
जुलाई	I	13.2	0.0	0.6	0.0	0.1	0.0	0	0	26	5	2	13	11	11	3	18	12	15	15	4	1	2	6	18	5	1	2	6	17	0	0.0	4.6	12.2	14.2	0.0
JUL	II							0	0	26	5	5	14	14	12	4	14	10	12	15	2	2	3	8	16	3	2	3	7	16	0	0.0	5.3	7.7	18.0	0.0
अगस्त	I	14.4	0.0	0.8	0.0	0.0	0.0	0	0	25	6	2	11	12	12	3	15	13	14	18	4	0	3	5	19	5	1	2	4	19	0	0.0	3.3	11.4	16.2	0.0
AUG	II							0	0	26	5	5	14	13	10	5	14	13	9	17	2	3	3	6	17	2	3	3	6	17	0	0.0	5.4	7.6	18.0	0.0
सितम्बर	I	7.4	0.0	0.4	0.0	0.0	0.0	0	0	24	6	2	11	13	15	3	14	13	11	18	16	1	4	3	6	17	1	3	3	6	0	0.0	1.4	10.2	18.4	0.0
SEP	II							0	0	23	7	7	12	10	11	2	11	13	12	22	13	5	3	4	5	15	4	3	3	5	0	0.0	4.6	6.7	18.7	0.0
अक्तूबर	I	1.9	0.0	0.5	0.1	0.1	0.0	0	0	20	11	4	8	10	11	3	5	11	10	38	26	1	1	1	2	27	0	1	1	2	0	0.1	1.6	11.7	17.7	0.0
OCT	II							0	0	17	14	8	6	8	9	2	5	8	10	44	25	2	1	1	2	26	1	1	1	2	0	0.0	7.5	6.1	17.4	0.0
नवम्बर	I	0.7	0.0	0.1	0.1	0.0	0.0	0	0	18	12	3	7	7	11	2	8	14	6	42	25	1	2	1	1	27	0	1	1	1	0	0.1	3.6	16.3	10.0	0.0
NOV	II							0	0	12	18	6	2	4	5	1	4	11	7	60	25	1	2	1	1	26	1	1	1	1	0	0.0	12.2	6.6	11.2	0.0
दिसम्बर	I	1.2	0.0	0.1	2.2	0.0	0.0	0	0	21	10	1	9	7	15	1	9	14	10	34	22	1	2	3	3	25	0	1	2	3	0	1.5	7.7	16.0	5.7	0.0
DEC	II							0	0	17	14	3	4	3	8	1	4	20	10	47	21	2	2	3	3	23	1	2	3	2	0	0.1	14.6	5.9	10.4	0.0
वार्षिक योग या माध्य	I	55.8	0.8	6.1	6.7	4.3	0.0	0	0	287	78	2	12	10	14	2	12	13	12	23	224	11	29	38	63	240	7	24	32	62	0	7.3	52.6	166.8	138.4	0.0
ANNUAL TOTAL OR MEAN	II							0	0	276	89	6	9	8	11	3	9	15	15	24	202	28	33	46	56	220	24	27	39	55	0	1.2	91.3	83.3	189.1	0.0
वर्षोंकी सं NUMBER OF YEARS	I II	29						30				30									30					30						30				

ANNEXURE-VII-1

ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER

S.No	Characteristics	Value
1.	Silica (Max.)	0.02 ppm as Sio2
2.	Iron as Fe	Nil
3.	Total hardness	Nil
4.	pH value	6.8 -7.2
5.	Conductivity	Not more than 0.1micro mho/cm excluding the effects of free CO2

ANNEXURE-VII-2

DESIGN CLARIFIED WATER ANALYSIS

S.No	PARAMETER	UNIT	Clarified Water Analysis
			Calculated
1	pH .	-	6.8-7.3
2	Sp. Cond.	µs/cm	325
3	TDS	mg/l	230
4	Turbidity	NTU	10
5	Total hardness	mg/l As CaCO3	155
6	Calcium	mg/l As CaCO3	148.8
7	Magnesium	mg/l As CaCO3	45
8	Sodium	mg/l CaCO3	45
9	Potassium		
10	P Alkalinity	mg/l As CaCO3	-
11	M Alkalinity	mg/l As CaCO3	125.3
12	Chlorides	mg/l As as CaCO3	42
13	Sulphate	mg/l As CaCO3	71.5
14	Silica (Total)	mg/l As SiO2	21
15	Silica (Reactive)	mg/l As SiO2	20
16	Silica (Collidal)	mg/l As SiO2	1
17	TOC	mg/l	6
18	COD	mg/l	45
19	BOD	mg/l	18
20	Fe	mg/lt	-

Note: Cooling water system is expected to operate at a design minimum cycle of concentration (C.O.C) of about 5 to 5.5.

ANNEXURE-VII-3

Salient data for design and sizing of equipment at BMCR Condition

Sl. No.	Description	BMCR condition, 3% MU, 77 mmHg
1	Steam flow at Superheater Outlet (T/hr)	2100
2	Pressure at SH outlet (kg/cm^2-abs)	279
3	Pressure at Turbine inlet (kg/cm^2-abs)	270
4	Temperature at Superheater outlet (° C)	603
5	Steam flow to Reheater (T/hr)	1670
6	Steam Pressure at HP Turbine Exhaust (Kg/cm^2-abs)	69.3
7	Steam temperature at HP Turbine exhaust (°C)	380.2
8	Steam Temperature at Reheater Outlet (°C)	603
9	Pressure drop through the Reheater including cold and hot Reheat piping (kg/cm^2)	10% of HPT Exhaust Pressure
10	Feed Water Temperature at Economizer inlet (°C)	303.7

Notes :

(1) The parameters given here are tentative and will be finalized after receiving from TG supplier.

(2) Feed Water Temperature at Economiser inlet specified in above table is at Bidder's Feed Water terminal point (Specified Elsewhere in the specification)

ANNEXURE-VII-4

Salient data for design and sizing of equipment at Pure Sliding Pressure Condition

Sl.No.	Description	100% TMCR	60% TMCR MSP condition	528 MW (80%) PSP condition	396 MW (60%) PSP condition	330 MW (50%) PSP condition	660 MW (Both stream of HPHs out of service)
1	Steam flow at Superheater Outlet (T/hr)	1898	1110	1489	1107.1	923.1	1628.4
2	Pressure at Turbine inlet (kg/cm2-abs)	270	166	210	158	132	270
3	Pressure at SH Outlet (kg/cm2-abs)	To be derived by the bidder based on the SH outlet Pressure of 279 kg/cm2 (abs) at BMCR condition					
4	Temperature at Superheater outlet (°C)	603	603	603	603	603	603
5	Steam flow to Reheater (T/hr)	1561.4	950	1248.4	948.3	800.1	1624.4
6	Steam Pressure at HP Turbine exhaust (Kg/cm2-abs)	65	40	52.3	40	33.9	69.3
7	Steam temperature at HP Turbine exhaust (°C)	373.9	385	380.8	387	390.8	390.4
8	Steam Temperature at Reheater Outlet (°C)	603	603	603	603	603	603
9	Pressure drop through the Reheater including Cold and Hot Reheater piping (kg/cm2)	10% of HPT Exhaust Pressure for BMCR condition and correspondingly lower for different conditions					
10	Feed Water Temperature at Economizer inlet (°C)	300	271.9	287.9	271.9	261.9	194

Notes :

(1) The parameters given here are tentative and will be finalized after receiving from TG supplier.
(2) The above parameters are at 0% Make-up with average condenser back pressure of 77 mm of Hg.
(3) The Final Feed Water Temperature during All HP heater out can go down till 176°C.
(4) Feed Water Temperature at Economiser inlet specified in above table is at Bidder's Feed Water terminal point (Specified Elsewhere in the specification)

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Book 3 of 3 Part-2

Form 13C2 (Rev-02)

FORM OF DEED OF JOINT UNDERTAKING
AS PER CLAUSE 1.3.2 & 1.3.3 AND NOTE 4 TO CLAUSE 1.0.0, ITEM 4.0 OF BID DATA SHEETS

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

DEED OF JOINT UNDERTAKING TO BE EXECUTED BY THE BIDDER/CONTRACTOR (INDIAN SUBSIDIARY COMPANY), THE QUALIFIED STEAM TURBINE GENERATOR MANUFACTURER (HOLDING COMPANY MEETING THE REQUIREMENTS AS PER CLAUSES 1.1.1 OF ITEM 4.0 OF BID DATA SHEETS ALONGWITH ITS SUBSIDIARIES) AND THE OTHER PROMOTER AND THE QUALIFIED GENERATOR MANUFACTURER MEETING THE REQUIREMENTS AS PER CLAUSES 1.3.3 OF ITEM 4.0 OF BID DATA SHEETS FOR SUCCESSFUL PERFORMANCE OF THE STEAM TURBINE GENERATOR AND AUXILIARIES

The DEED OF JOINT UNDERTAKING executed on this ..... day of .....Two thousand ..... by M/s ..... a Company incorporated under ..... having its Registered Office at.....(hereinafter called the "Bidder/ Contractor/ *Indian Manufacturing Company", which expression shall include its successors, administrators, executors and permitted assigns) and

M/s..... a Company incorporated under ..... having its Registered Office at..... (hereinafter called the “Qualified Steam Turbine Generator Manufacturer”/"Holding Company", which expression shall include its successors, administrators, executors and permitted assigns) and

*M/s ..... a Company, other than the Qualified Steam Turbine Generator Manufacturer, registered under ……. having its Registered Office at ..... and having 25% or higher equity participation in the Indian *Subsidiary Company/ JV Company (hereinafter jointly called the "OTHER PROMOTER", which expression shall include its successors, administrators, executors and permitted assigns) and

*M/s....., a Company incorporated under ..... having its Registered Office at..... (hereinafter called the “Qualified Generator Manufacturer”, which expression shall include its successors, administrators, executors and permitted assigns), in favour of THDC India Limited, A Joint Venture of Govt. of India & Govt. of U.P., incorporated under the Companies Act, 1956, having its Registered Office at Bhagirathi Bhawan, (Top Terrace), Bhagirathipuram, Tehri Garhwal-249001 India (hereinafter called "THDCIL" or "Employer" which expression shall include its successors, administrators, executors and assigns)..

WHEREAS, the Employer invited Bids for the **Turbine Generator and Associated Packages for Khurja STPP (2X660MW)** (hereinafter referred to as "Plant") vide its Bidding Document No.: **THDC/RKSH/CC-9915-371.**

*AND WHEREAS clause 1.3.2 and *1.3.3 of item 4.0 of Bid Data Sheet of Bidding Documents(BDS), stipulate that the bidder shall furnish a Deed of Joint Undertaking executed by him, the Qualified Steam Turbine Generator Manufacturer, *OTHER PROMOTER (if any) having 25% or higher equity participation in the Subsidiary Company and *Qualified Generator Manufacturer who meets the requirement of Clause 1.3.3 of item 4.0 of BDS. Further as per note 4 iii) of clause 1.0.0, Item 4.0 of BDS, the Holding Company, as a Qualified Steam Turbine Generator Manufacturer, shall necessarily be part of the DJU being submitted by the Bidder.

AND WHEREAS clause 1.3.3 item 4.0 of BDS of Bidding Documents, stipulate that if the Qualified Steam Turbine Generator Manufacturer meets the requirement of Clause 1.1.1 of item 4.0 of BDS (except for Generator), then the *Subsidiary Company / *Joint Venture Company shall associate and have a technology transfer agreement with a Qualified Generator Manufacturer who meets the requirement of Clause 1.1.1item 4.0 of BDS fully in respect of Generator and Qualified Generator Manufacturer shall necessarily be one of the executants of Deed of Joint Undertaking.

WHEREAS M/s ..... (Bidder) is submitting its proposal in response to the Invitation for Bid by the Employer for **Turbine Generator and Associated Packages for Khurja STPP (2X660MW)**, against the Employer's Bidding Document No. **THDC/RKSH/CC-9915-371.**

AND WHEREAS the Bidder, the Qualified Steam Turbine Generator Manufacturer and OTHER PROMOTER are required to jointly execute and furnish along with the bid an irrevocable Deed of Joint Undertaking and be jointly and severally liable and bound unto the Employer for the successful performance of the **contract for the scope related to** Steam Turbine Generator and Auxiliaries including turbine cycle, regenerative feed heating & pumping system for **Khurja STPP (2X660MW)**, fully meeting the stipulated technical requirements, and guaranteed parameters and characteristics as per bidding documents, in the event, the Bid is accepted by the Employer resulting into a Contract/ Contracts.

*AND WHEREAS the Qualified Generator Manufacturer who meets the requirement of item no. 1.3.3 of item 4.0 BDS shall also be required to be one of the executants of the above Deed of Joint Undertaking and be liable to the Employer for successful performance of the Generator & its auxiliaries.

AND WHEREAS the Bidder, the Qualified Steam Turbine Generator Manufacturer and OTHER PROMOTER and *Qualified Generator Manufacturer are required to jointly execute and furnish along with the bid an irrevocable Deed of Joint Undertaking and be jointly and severally liable and bound unto the Employer for the successful implementation of the Phased Manufacturing Program and transfer of technology for supercritical Steam Turbine Generator sets in accordance with the bidding documents, in the event, the Bid is accepted by the Employer resulting into a Contract/ Contracts.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1 That in consideration of the award of the Contract(s) by the Employer to the Contractor, we the Contractor, Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer and OTHER PROMOTER do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful implementation of the Phased Manufacturing Program as specified in the said Contract(s).

2 We, the Contractor, Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer and the OTHER PROMOTER do jointly hereby undertake, declare and confirm that we shall be fully responsible for ensuring a valid technology transfer agreement including license to manufacture and supply in India between the *Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer, the *technology provider (if any) and the Indian Manufacturing Company covering the type, size and rating of the Steam Turbine Generator sets specified, valid minimum up to the end of the defect liability period of the contract. The technology transfer agreement necessarily covers transfer of technological know-how for super critical Steam Turbine Generator sets in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel

training to the Indian Manufacturing Company. Further technology transfer agreement have provision that the transfer of technology to the Indian Manufacturing Company shall be complete by the time last supercritical unit is supplied by the Contractor under this Tender.

3 We, the Qualified Steam Turbine Generator Manufacturer and the *Qualified Generator Manufacturer do further undertake, declare and confirm that we shall be fully responsible for imparting relevant training to the personnel of the Indian Manufacturing Company as part of the technology transfer agreement.

4 That in consideration of the award of the Contract by the Employer to the Contractor, we the Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer, OTHER PROMOTER and the Contractor, do hereby declare and undertake that we shall be jointly and severally liable to the Employer for the successful performance of the **contract for the scope related to** Steam Turbine Generator and Auxiliaries including turbine cycle, regenerative feed heating & pumping system, as specified under the said contract to the satisfaction of Employer. (Defined at **Annexure-I**)

5 That in consideration of the award of the Contract by the Employer to the Contractor, we, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTERS, the *Qualified Generator Manufacturer and the Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the execution and successful performance of the Generator and its auxiliary equipments as per **Annexure-I**.

6 In case of any breach of the Contract committed by the Contractor, we the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, and the *Qualified Generator Manufacturer, do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the **contract for the scope related to** Steam Turbine Generator and Auxiliaries including turbine cycle, regenerative feed heating & pumping system for **Khurja STPP (2X660MW)** and undertake to carryout all the obligations and responsibilities under this Deed of Joint Undertaking in order to discharge the Contractor's obligations and responsibilities stipulated under the Contracts. Further, if the Employer sustains any loss or damage on account of any breach of the Contract related to any of the Steam Turbine Generator Sets & their auxiliaries including turbine cycle, regenerative feed heating & pumping system HP/LP bypass system for **Khurja STPP (2X660MW)** , we, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, and the *Qualified Generator Manufacturer and the Contractor, jointly and severally undertake to promptly indemnify and pay such losses/ damages caused to the Employer on its written demand without any demur, reservation, contest or protest in any manner whatsoever. Determination of losses/ damages shall be in line with provisions on Limitation of Liability of the said contract (s).

The aggregate liability of the Bidder/Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to any obligation of the Contractor to indemnify the Employer with respect to patent infringement as per provisions of bidding documents (Clause 30 of GCC and relevant clause of SCC).

The liability of the Qualified Steam Turbine Generator Manufacturer, *Indian Subsidiary Company/ *JV Company and OTHER PROMOTER shall be limited to an amount equivalent to **US 87 Million** for each Turbine Generator Set to be supplied by the Bidder / Contractor. *The liability of the Qualified Generator Manufacturer, hereunder shall, however be limited to an amount equivalent to **US 13 Million** for each Generator Set to be supplied by the Bidder / Contractor. This is without prejudice to any right of Employer against the Contractor under the Contract and all guarantees.

7 Without prejudice to the generally of the undertaking in above paragraphs, the manner of achieving the objectives set forth above shall be as follows :

a) We, the Qualified Steam Turbine Generator Manufacturer, shall be fully responsible for design, engineering, supply, erection, performance including all guarantees for all the supercritical steam turbine generator sets & their auxiliaries.

b) We, the Qualified Steam Turbine Generator Manufacturer, shall be fully responsible for engineering preparation of all design, design calculations and manufacturing drawings for all the Steam Turbine Generator Sets & their auxiliaries and Condensers including Interfacing and integrating the complete turbine cycle including Boiler Feed Pump, Condensate Extraction Pump, Heaters, Deaerators, etc. so as to ensure satisfactory, reliable and trouble free performance of Steam Turbine Generators Sets and their Auxiliaries, Condensers as well as thermal performance of turbine cycle as per guaranteed parameters specified in the Contract.

c) We, the Qualified Steam Turbine Generator Manufacturer, shall be fully responsible for calculation of Heat Balance Diagrams, integration of all turbine cycle equipments, regenerative feed heating & pumping system:

Further, we, the Qualified Steam Turbine Generator Manufacturer, shall extend our quality surveillance/ supervision/quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at works and/or at Employer's project site. Without prejudice to the overall responsibilities of the Qualified Steam Turbine Generator Manufacturer as to the successful commissioning and the performance of the Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system, the Qualified Steam Turbine Generator Manufacturer shall depute its technical experts from time to time in the works/Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the Contracts.

d) We, the Qualified Steam Turbine Generator Manufacturer, will supply equipment/components manufactured at our works or at our vendor's works as per requirements/schedule specified in the Contracts.

e) We, the Qualified Steam Turbine Generator Manufacturer, will be fully responsible for the quality of manufacture of all equipment/main assembly/components for incorporation in the Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system. For the items to be manufactured by the Contractor's design, the Qualified Steam Turbine Generator Manufacturer shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Indian *subsidiary/*Joint Venture Company, which would result in the same quality of equipment as if manufactured at the Qualified Steam Turbine Generator Manufacturer’s works and shall meet Qualified Steam Turbine Generator Manufacturer’s approval/acceptance.

f) The Qualified Steam Turbine Generator Manufacturer shall be responsible to manufacture portion of the equipment which are to be manufactured at its works or its Indian *subsidiary’s/*Joint Venture Company’s works as per the Qualified Steam Turbine Generator Manufacturer’s design and quality acceptance level (to be finalized during award of Contract). Further, the Contractor shall erect, commission

and carry out the performance tests of all the Steam Turbine Generator Sets & their auxiliaries and Condensers heaters, deaerators, BFP, CEP, HP/LP bypass system as per the Contract in accordance with the Qualified Steam Turbine Generator Manufacturer's advice, procedure and guidance. In case there is any need to modify the design/drawings/procedure in certain areas, the Contractor shall seek specific approval of Qualified Steam Turbine Generator Manufacturer before proceeding further.

g) In the event any problem is encountered during design, manufacture, erection, testing and commissioning or if the Contractor fails to demonstrate during the Guarantee tests that Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system meet the guarantee parameters and demonstration parameters and demonstration parameters as specified in the Contract, including the thermal performance of turbine cycle, the Qualified Steam Turbine Generator Manufacturer shall promptly provide all technical assistance/services/ support to analyse and suggest corrective measures/modifications to the equipment/systems of all the Steam Turbine Generator Sets & their auxiliaries and Condensers, heaters, deaerators, BFP, CEP, HP/LP bypass system directly to the Employer and the Contractor & the Qualified Steam Turbine Generator Manufacturer shall promptly carry out all corrective measures and modifications (as suggested by the Qualified Steam Turbine Generator Manufacturer and agreed by the Employer) for each of their own expense. Thereafter, the Contractor and the Qualified Steam Turbine Generator Manufacturer shall demonstrate the successful performance meeting the guaranteed parameters and demonstration parameters.

8 Without prejudice to the joint and several obligations of the Contractor, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER and the *Qualified Generator Manufacturer hereunder, the analysis/investigations of the non-performance of the equipment manufactured by the Contractor, the Qualified Steam Turbine Generator Manufacturer, may initially be carried out by the Contractor, within a period of 15 days from the date of reference of the problem by the Employer before the Employer approaches the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, *Qualified Generator Manufacturer for any such analysis/ investigation. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor before proceeding against the Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer (with respect to obligations and responsibilities of the Qualified Generator Manufacturer covered under this Deed of Joint Undertaking), nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any right of Employer under this Deed of Joint Undertaking to proceed against the *Qualified Generator Manufacturer, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER and Contractor.

9 * Without prejudice to the generality of the undertaking in above paragraphs, the responsibilities of Qualified Generator Manufacturer shall be as follows:

a) We, the Qualified Generator Manufacturer, shall be fully responsible for engineering, preparation of all design, design calculations and manufacturing drawings for all the Generators and their auxiliaries **(defined at Annexure-I)** so as to ensure satisfactory, reliable and trouble free performance of Steam Turbine Generator Sets and their auxiliaries as per guaranteed parameters specified in the Contract.

b) We, the Qualified Generator Manufacturer shall provide all additional necessary technical assistance to the Contractor for the portion of work pertaining to Generators and their auxiliaries. This shall also include providing all design data required by the Contractor for proper integration and interfacing of Steam Turbine and Generator.

Further, we, the Qualified Generator Manufacturer shall extend our quality surveillance/ supervision/quality control to the Contractor during manufacture, erection, commissioning and performance testing of all Generators and their auxiliaries, both at Contractor's works and/or at Employer's project site. Without prejudice to the overall responsibilities of the *Subsidiary Company/*JV Company and *Qualified Generator Manufacturer as to the successful commissioning and the performance of the Steam Turbine Generator Sets and their auxiliaries, the Qualified Generator Manufacturer shall depute its technical experts from time to time to the Contractor's works/ Employer's project site for jobs pertaining to Generators and their auxiliaries, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulations of the Contracts.

c) We, the Qualified Generator Manufacturer will supply equipment/components manufactured at our works or at our vendor's works as per requirements/ schedule specified in the Contracts.

d) We, the Qualified Generator Manufacturer will be fully responsible for the quality of manufacture of all equipment/main assembly/components for incorporation in all the Generators & their auxiliaries. For the items to be manufactured by the Contractor at his or his vendor's works as per the Qualified Generator Manufacturer's design, the Qualified Generator Manufacturer shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Qualified Generator Manufacturer's works and shall meet Qualified Generator Manufacturer's approval/ acceptance.

e) The Contractor shall be responsible to manufacture portion of the equipment which are to be manufactured at its works or its vendor's works as per the Qualified Generator Manufacturer's design and to the Qualified Generator Manufacturer's quality acceptance level (to be finalised during award of Contract). Further, the Contractor shall erect commission and carry out the performance tests of all the Generators and their auxiliaries as per the Contract in accordance with the Qualified Generator Manufacturer's advice, procedure and guidance. In case there is any need to modify the design/ drawings/ procedure in certain areas, the Contractor shall seek specific approval of Qualified Generator Manufacturer before proceeding further.

f) In the event any problem is encountered during design, manufacture, shop testing, erection, testing and commissioning of Generators and their auxiliaries or if the Contractor fails to demonstrate during the performance tests that the Generators and its auxiliaries meet the guaranteed parameters and demonstration parameters as specified in the Contract, the Qualified Generator Manufacturer shall promptly provide all technical assistance/ services/ support to analyse and suggest corrective measures/ modifications to the equipment/ systems of all the Generators & their auxiliaries directly to the Employer and the Contractor & the Qualified Generator Manufacturer shall promptly carry out all corrective measures and modifications (as suggested by the Qualified Generator Manufacturer and agreed by the Employer) for each of their respective equipment/systems supplied

by them at their own expense. Thereafter, the Contractor and the Qualified Generator Manufacturer shall demonstrate the successful performance meeting the guaranteed parameters and demonstration parameters.

10 The Contractor, the Qualified Steam Turbine Generator Manufacturer, and the *Qualified Generator Manufacturer will be fully responsible for the quality of all the equipments/ main assemblies/ components manufactured at their works or at their Vendors works or constructed at site, and their repair or replacement, if necessary, for incorporation in the plant and timely delivery thereof to meet the Completion Schedule under the Contracts.

11 We, the Contractor, the Qualified Steam Turbine Generator Manufacturer, the OTHER PROMOTER and the *Qualified Generator Manufacturer, do hereby undertake and confirm that this Deed of Joint Undertaking shall be initially valid till ninety (90) days beyond the scheduled end of defect liability period of all the equipment/ component covered under the Contract(s) or ninety (90) days beyond the completion of the Phased Manufacturing Program under the Contract(s), whichever occurs later. In case of delay in completion of the defect liability period under the Contract(s) or delay in completion of the Phased Manufacturing Program beyond the aforesaid period, the validity of this Deed of Joint Undertaking shall be extended by such period of delay. However, this deed of Joint Undertaking shall terminate at the latest 24 months from the scheduled end of defect liability period of the last unit of the project under the contract or completion of Phased Manufacturing Programme, whichever occurs later. We, the Contractor, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER and *Qualified Generator Manufacturer do further undertake and confirm that this Deed of Joint Undertaking shall be irrevocable and shall not be revoked till its validity. We further agree that this Deed of Joint Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract(s).

12 In case of award, in addition to the Contract Performance Securities to be furnished by the bidder/Contractor, the on demand Bank Guarantees in favour of the Employer as specified in Qualifying Requirements stipulated at Item 4.0 of BDS shall be furnished.

The aforesaid Bank Guarantees shall be guarantee towards the faithful performance/ compliance of this Deed of Joint Undertaking in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and initially valid till ninety (90) days beyond the scheduled date of completion of defect liability period of all the equipment/ component covered under the Contract(s) or ninety (90) days beyond the scheduled completion of the Phased Manufacturing Program under the Contract(s), whichever occurs later. In case of delay in completion of the defect liability period under the Contract(s) or delay in completion of the Phased Manufacturing Program beyond the aforesaid period, the validity of this Bank Guarantee shall be extended by such period of delay. However, this Bank Guarantee shall terminate at the latest 27 months from the scheduled end of defect liability period of the last unit of the project under the contract or completion of Phased Manufacturing Programme, whichever occurs later. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.

13 Any dispute that may arise in connection with this Deed of Joint Undertaking shall be settled as per arbitration procedure/rules mentioned in the Contract documents.

This deed of undertaking shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.

14 We, the Qualified Steam Turbine Generator Manufacturer, OTHER PROMOTER, *Qualified Generator Manufacturer and the Contractor, agree that this Deed of Joint Undertaking shall form an integral part of the Contracts for this package. We further agree that this Deed of Joint Undertaking shall continue to be enforceable till its validity.

15 That this Deed of joint undertaking shall be operative from the effective date of the Contract.

IN WITNESS WHEREOF, the Contractor, the Qualified Steam Turbine Generator Manufacturer, the OTHER PROMOTER and the *Qualified Generator Manufacturer through their authorised representatives, have executed these presents and affixed common seal of their respective companies on the day, month and year first mentioned above.

For M/s.....
(Bidder / Contractor)

WITNESS :
1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name .....
Designation.....
Common Seal of the Company.....

For M/s .....
(Qualified Steam Turbine Generator Manufacturer / Holding Company)

WITNESS :

1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name.....

Designation.....
Common Seal of the Company .....

For M/s .....
(OTHER PROMOTER)

WITNESS :
1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name.....
Designation.....
Common Seal of the Company .....

*For M/s .....

(Qualified Generator Manufacturer)

WITNESS :
1. .....

.....
(Official Address)

.....
(Signature of the Authorised Representative)
Name.....

Designation.....
Common Seal of the Company .....

Note:

(i) **Bidder to strike out, whichever is not applicable.**

(ii) ***In case the Holding Company anticipates change of management control of any of its subsidiaries lending strength/ experience for fulfillment of requirement of clause 1.1.1, item 4.0 of BDS, the Holding Company shall arrange for signing of DJU and bank guarantees from all such subsidiaries lending strength / experience to the Holding Company for fulfillment of requirement of clause 1.1.1, before the change in management control actually occurs, in addition to the bank guarantee already furnished by the Holding Company. Such bank guarantees to be furnished by all the entities lending support to the Holding Company for fulfillment of requirement of clause 1.1.1, item 4.0 of Bid Data Sheet, shall be equally divided among them and shall aggregate to 1.0% of the total contract price .***

(iii) **Power of Attorney of the persons signing on behalf of each of the executants is to be furnished by bidder and to be attached along with the signed Deed of Joint Undertaking.**

ANNEXURE-I

Indicative list of equipment / systems

A) Turbine

1. Turbine and its auxiliaries i.e. control fluid system, gland steam sealing system, governing system, lube oil system, exhaust hood spray system, stop /control valves, turbine drain system, turbine protection system, turbine control system (Analog & sequence) and turbine supervisory instruments.
2. Generator and auxiliaries i.e. generator seal oil system, generator water cooling system, hydrogen, carbon dioxide & nitrogen system, generator excitation system.
3. Condensate, feed water and extraction system.
4. Control and instrumentation.
5. Condenser, condenser air evacuation system and COLTCS.
6. CEPs & BFPs.
7. LPHs, HPHs and Deaerator.
8. HPLP bypass system.
9. Integration of turbine cycle equipment.
10. Any other auxiliary of steam turbine generator set not covered above.

B) Generator

1. Generator Seal oil system
2. Generator water cooling system
3. Hydrogen, carbon dioxide & Nitrogen system
4. Generator Excitation system
5. Any other auxiliary of Generator not covered above

THDC INDIA LIMITED

(A Joint Venture of Govt. of India & Govt. of U.P.)
Pragati Bhawan, Pragatipuram, Bypass Road, Rishikesh

UTTARAKHAND, INDIA

Amendment No.09

dated 25th Feb'2019
to

Turbine Generator and Associated Packages for Khurja Super Thermal Power Project (2x660 MW)

AMENDMENT NO. THDC/RKSH/CC-9915-371-AMDT-09

Tender No. THDC/RKSH/CC-9915-371

AMENDMENT NO. 09 TO BIDDING DOCUMENTS (TECHNICAL SPECIFICATION)

SL. NO.	SPECIFICATION REFERENCE				Existing	Read as
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
1	VI/ PART-A	TERMINAL POINTS & EXCLUSIONS	PAGE 4 OF 6	8.00.00	**8.00.00 ELECTRICAL** 8.01.00 Terminal point for Construction power – construction power at two points at 11Kvnear TG area.	8.00.00 ELECTRICAL 8.01.00 Terminal point for Construction power – construction power at one point at 11kV near TG area.
2	VI/ PART-A	B1	PAGE 8 OF 15	1.15.00	The Bidder shall extend construction power supply from owners 11 kV Construction power ring main from maximum two locations.	The Bidder shall extend construction power supply from owners 11 kV Construction power ring main from one location.
3	VI/ PART-A	D1	PAGE 3 OF 4	2.02.00	CONSTRUCTION FACILITIES 2. Construction Power Scope of supply of construction power is specified in SECTION – VI, PART-B, SUB SECTION B-9 of Technical specification.	CONSTRUCTION FACILITIES 2. Construction Power Scope of supply of construction power is specified in SECTION – VI, PART-A, SUB SECTION B-1 of Technical specification.
4	VI/ PART-B	B-9	PAGE 1 OF 2	1.01.00	GENERAL Power shall be made available to the bidder, at 11kV level from owners construction power ring mains. Bidder shall be fully responsible to make all his arrangement beyond these points for receiving & further distribution to meet all construction power requirements for the entire scope including the owner's construction power requirements indicated in Section-VI, Part-A Sub section –II B of the technical specification.	GENERAL Power shall be made available to the bidder, at 11kV level from owners construction power ring mains. Bidder shall be fully responsible to make all his arrangement beyond these points for receiving & further distribution to meet all construction power requirements for the entire scope including the owner's construction power requirements indicated in Section-VI, Part-A Sub section – B1 of the technical specification.
5	VI/ PART-D	B-9	PAGE 13 OF 58	27.02.00	Electricity Refer scope related to construction power, as envisaged at Sub Section-II-B, Part A, Sec VI of Technical specification. Power supply will not be provided for the use in labour and staff colony.	Electricity Refer scope related to construction power, as envisaged at Sub Section-B1, Part A, Sec VI of Technical specification. Power supply will not be provided for the use in labour and staff colony.

Sl. No.	Ref. Clause	Existing Provisions	Amended provisions
1.	Clause 8.1.1 (c1), Section-II (ITB)	Attachment 3I1: Technology Support Agreement	Clause 8.1.1 (c1) is deleted.
2.	Clause 1.6.0 of Item No. 4.0 (Qualifying Requirements for Bidders)(ITB 8.1.2(a)), Section-III (BDS)	1.6.0 Route 6: Indian Supercritical Steam Turbine Generator Manufacturer 1.6.1 The bidder should be an Indian manufacturing company which is a supercritical Steam turbine Generator manufacturer and meets the following criteria. Eight (8) Nos supercritical steam turbine generators …….shall be submitted along with the techno commercial bid. The bidder shall offer only the type of the steam turbine generator for which it is qualified.	1.6.0 Route 6: Indian Supercritical Steam Turbine Generator Manufacturer 1.6.1 The bidder should be an Indian manufacturing company which is a supercritical Steam turbine Generator manufacturer and meets the following criteria. Eight (8) Nos supercritical steam turbine generators manufactured/supplied in India by the Indian Subsidiary/JV Company / Indian manufacturing company should be in commercial operation (achieved COD) out of which four (4) such steam turbine generators should have been in commercial operation for at least one year and Performance Guarantee (PG) Test should have been successfully completed in any two (2) such steam turbine generators prior to the date of techno-commercial bid opening. In case any problem related to Steam Turbine Generator Sets & Auxiliaries is encountered during execution of the contract, bidder shall resolve the same within a reasonable time (in the opinion of the owner) by itself/through its collaborator/through firm having competency to resolve such issues. If the problem is not resolved within a reasonable period of

			time in the opinion of the owner, Owner shall have the option to approach directly to the collaborator/licensor/technology Provider or any other firm to resolve the issue. In such a case the financial expenditure(s) incurred by Owner for resolution of such issues will be to bidder's account. Accordingly, bidder shall submit a letter along with the techno commercial bid valid up to the end of defect liability period of the contract, as per the format enclosed in the bidding documents. The bidder shall offer only the type of the steam turbine generator for which it is qualified.
3.	Clause 1.0.0 of Item No. 4.0 (Qualifying Requirements for Bidders)(ITB 8.1.2(a)), Section-III (BDS)	-	A new note (11) is added under "Notes for clause 1.0.0" as under: (11) Bidders participating through any of the Routes 1.1.0 or 1.2.0 or 1.3.0 or 1.4.0 or 1.5.0 shall not be required to furnish deed of joint undertaking (DJU) and associated BG for the steam turbine generator, in case they meet the following criteria: Eight (8) Nos supercritical steam turbine generators manufactured/supplied in India by the Indian Subsidiary/JV Company / Indian manufacturing company should be in commercial operation (achieved COD) out of which four (4) such steam turbine generators should have been in commercial operation for at least one year and Performance Guarantee (PG) Test should have been successfully completed in any two (2) such steam turbine

			generators prior to the date of techno-commercial bid opening. In case any problem related to Steam Turbine Generator Sets & Auxiliaries is encountered during execution of the contract, bidder shall resolve the same within a reasonable time (in the opinion of the owner) by itself/through its collaborator/through firm having competency to resolve such issues. If the problem is not resolved within a reasonable period of time in the opinion of the owner, Owner shall have the option to approach directly to the collaborator/licensor/technology Provider or any other firm to resolve the issue. In such a case the financial expenditure(s) incurred by Owner for resolution of such issues will be to bidder's account. Accordingly, bidder shall submit a letter along with the techno commercial bid valid up to the end of defect liability period of the contract, as per the format enclosed in the bidding documents.
4.	Clause 3.0.0 ((Phased Manufacturing Program and Transfer of Technology) of Item No. 4.0 (Qualifying Requirements for Bidders)(ITB 8.1.2(a)), Section-III (BDS)	Existing Note to clause 3.0.0: (1) Bidders who have already given commitments for PMP and submitted bank guarantees for security for default against specified PMP for steam Turbine Generators to any Central / State sector power generating Company for supercritical projects shall not be required to furnish further bank guarantees for security for default against specified PMP. (2) In case the Indian Subsidiary Company/JV	Note to clause 3.0.0 (1) Bidders who have already given commitments for PMP and submitted bank guarantees for security for default against specified PMP for steam Turbine Generators to any Central / State sector power generating Company for supercritical projects or if such bank guarantees have already been released shall not be required to furnish further bank guarantees for security for default against specified PMP. (2) In case the Indian Subsidiary Company/JV

		Company/Indian manufacturing company have already completed PMP, for supercritical steam turbine then such Indian Subsidiary Company/JV Company/Indian manufacturing company need not submit the undertakings/documents for PMP again. However, certificate in support of completion of such PMP duly issued by the competent authority shall be submitted along with the techno-commercial bid.	Company/Indian manufacturing company have already completed PMP, for supercritical steam turbine then such Indian Subsidiary Company/JV Company/Indian manufacturing company need not submit the undertakings/documents for PMP again. However, certificate in support of completion of such PMP duly issued by the competent authority or proof of release of the bank guarantee by any Central / State power generating company shall be submitted along with the techno-commercial bid.
5.	Item No. 4.0 (Qualifying Requirements for Bidders) (ITB 8.1.2(a)), Section-III (BDS)	Existing Item No. 4.0 (Qualifying Requirements for Bidders)	Wherever the words“Steam Turbine Generator Island Package” are appearing in the Qualifying Requirements, the same may be read as “Turbine Generator and Associated Packages”.
6.	Attachments 3A1 to 3A6	Existing Attachments 3A1 to 3A6	Replace the existing Attachments 3A1 to 3A6 with the revised Attachments 3A1(Rev.01)to 3A6(Rev.01) which are enclosed herewith.
7.	Attachment-18 (Form Of Letter Of Undertaking For Super Critical Steam Turbine Generator Sets Towards Phased Manufacturing Programme), Section-VII (Part 1 of 3)	Existing Attachment-18	Replace the existing Attachment-18 with the revised Attachment-18 (Rev.01) which is enclosed herewith.
8.	Form 13F (Form of Technology Support Agreement)	Existing Form 13F(Form of Technology Support Agreement)	Replace the existingForm 13F(Form of Technology Support Agreement)with the revisedForm 13F(Format of Letter to ensure satisfactory performance of Steam Turbine Generator & Auxiliaries)(Rev.01)which is enclosed herewith.

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371

(Experience details of Qualified Steam Turbine Generator Manufacturer as per clause 1.1.0 of Item No. 4.0 of BDS)

Bidder's Name and Address:

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

1.0.0 We M/s.....,Qualified Steam Turbine Generator Manufacturer are seeking Qualification as per clause 1.1.0 of Item No. 4.0 of BDS as per following details.

1.1.0 We have designed, engineered, *manufactured / *got manufactured, *erected / *supervised erection, *commissioned / *supervised commissioning of (i) at least one (1) number supercritical steam turbine of tandem compound, condensing, reheat type of 500 MW or above capacity with main steam pressure of 225 Kg/cm2 (gauge) or higher and main steam / reheat temperature of 565^0 C / 565^0 C or higher and (ii) at least one (1) number of generator of two pole, Thermal class 155 (F) winding insulation, hydrogen/ water cooled stator and hydrogen / water cooled rotor of 500 MW or above capacity. These steam turbine and generator are in successful operation for a period of not less than one (1) year prior to the date of techno-commercial bid opening. The details are as follows:-

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)

1.00.00 Name of the station and its location

1.01.00 Name, address, Fax No., e-mail and Tel. No. of Owner of station

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
1.01.01	Name, address, Fax No., e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Steam Turbine Generator Manufacturer from intermediary organization.						
1.02.00	Name and Designation of the responsible person in Owner's organization						
1.02.01	Name and Designation of the responsible person in intermediary organization.						
1.03.00	No. of Steam Turbine Generator Sets supplied by us for the station						
1.04.00	Contract No. and Date						
1.05.00	Capacity in MW of Unit						
1.06.00	Starting date of project						
1.07.00	Scheduled date of commissioning						
1.08.00	Actual date of commissioning						
1.09.00	Date of commencement of successful operation						

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Gene-rator (if separate station)	For Steam Turbine	For Gene-rator (if separate station)	For Steam Turbine	For Gene-rator (if separate station)
1.10.00	Scope of work executed by us for the aforesaid Steam Turbine Generator Set includes the following :						
	(a) Designed	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(b) Engineered	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(c) *Manufactured / *Got Manufactured	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(d) *Erected/*Supervised Erection/**Acted as an Advisor for Erection	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(e) *Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No

** Necessary Documents / certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.00.00	Details of Turbine			
2.01.00	Steam Turbine make			
2.02.00	Tandem compound	*Yes/No	*Yes/No	*Yes/No
2.03.00	No. of Reheat			
2.04.00	(i) No. of Cylinders:			
	(a) HP			
	(b) IP			
	(c) Combined HP-IP			
	(d) LP			
	(ii) Whether HP and IP cylinders are combined or separate			
2.05.00	Module Number			
	(a) HP Turbine			
	(b) IP Turbine			
	(c) Combined HP-IP turbine (if applicable)			
	(d) LP Turbine			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.06.00	Main steam pressure (ata)			
2.07.00	Main steam temperature (deg.C)			
2.08.00	Reheat Steam temperature (deg.C)			
2.09.00	Condensing type	*Yes/No	*Yes/No	*Yes/No
2.10.00	Rated speed (RPM) and operating frequency range (Hz)			
2.11.00	No. of Steam Extractions			
2.12.00	Steam Turbine and Generator Directly coupled	*Yes/No	*Yes/No	*Yes/No
2.13.00	Steam Turbine Generator Set Installation	*Indoor/*Outdoor	*Indoor/*Outdoor	*Indoor/*Outdoor
3.00.00	Generator Details			
3.01.00	Generator make and model No.			
3.02.00	Rated MVA			
3.03.00	Rated Power Factor			
3.04.00	MW rating			
3.05.00	Rated voltage (kV)			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.06.00	No. of phases			
3.07.00	No. of poles			
3.08.00	Mounting	* Horizontally/ Vertical	* Horizontally/ Vertical	* Horizontally/ Vertical
3.09.00	Installation	* Indoort/Outdoor	* Indoort/Outdoor	* Indoort/Outdoor
3.10.00	Cylindrical rotor type	* Yes/No * Yes/No	* Yes/No	
3.11.00	Cooling medium			
	(a) Stator			
	(b) Rotor			
3.12.00	Thermal Class of insulation			
	(a) Stator			
	(b) Rotor			
3.13.00	Schedule date of Commissioning			
3.14.00	Actual date of commissioning			
3.15.00	Date of commencement of successful operation			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
4.00.00	Certificate(s) from the Owner that the aforesaid Steam Turbine Generator Set / Steam Turbine / Generator (as applicable) is in successful operation for a period of not less than one (1) year prior to the date of Techno-commercial Bid Opening is furnished at Annexure..... to this Attachment			
4.01.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.2.0 *(a) We have registered an Indian Subsidiary Company M/s....., as per Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. The Subsidiary Company has obtained certificate for Commencement of Business in India (Applicable in case the Indian Subsidiary Company is registered as a public limited Company).

We confirm that we have minimum 51% equity and shall continue to maintain equity participation of minimum 51% in the Indian Subsidiary Company for a lock in period of 7 years from the date of incorporation of this Indian Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

*We meet the requirement of clause 1.1.1 of Item No. 4.0 of BDS except for Generator and accordingly the Subsidiary Company have associated and have a technology transfer agreement with M/s.....(Qualified Generator Manufacturer) who meets the requirement in respect of generator as per clause 1.1.4 of Item No. 4.0 of BDS. M/s..... (Qualified Generator Manufacturer) have minimum 10% equity participation and shall continue to maintain equity participation of minimum 10% in the said Indian Subsidiary Company for a lock in period of 7 years from the date of incorporation of this Indian Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

The details of Indian Subsidiary Company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of Indian Subsidiary Company	
1.01.00	Equity participation of qualified Steam Turbine Generator manufacturer in the subsidiary company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian subsidiary company or up to the end of defect liability period of the contract whichever is later? (Bidder to furnish documentary evidence for their equity participation in the Indian Subsidiary Company along with lock in period of such equity in compliance to clause 1.1.2(a) of Item No. 4.0 of BDS supported by Board Resolution of the Bidder)	Yes/No
2.00.00	*Equity participation of other Promoter having Equity equal to or more than 25% in Indian Subsidiary Company	
2.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian subsidiary company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description	
3.00.00	*Equity participation of Qualified Generator manufacturer, in the Indian Subsidiary company.	
3.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian subsidiary company or upto the end of defect liability period of the contract whichever is later? (Qualified Generator manufacturer to furnish documentary evidence for their equity participation in the Indian Subsidiary Company along with lock in period of such equity in compliance to clause 1.1.4 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Generator manufacturer)	Yes/No
4.01.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment	
4.02.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of Indian subsidiary company is enclosed at Annexure_____ of this Attachment	

1.2.0 *(b) We have registered a Joint Venture (JV) Company M/s....., as per Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets covering the type, size and rating specified.

The Joint Venture (JV) Company is promoted by (i) M/s....., an Indian Company registered in India under the Companies Act 1956 of India and (ii) M/s ....., a Qualified Steam Turbine Generator Manufacturer (iii) *M/s ....., a Qualified Generator Manufacturer.

The JV Company have obtained certificate for commencement of Business in India as on the date of techno-commercial bid opening, (Applicable in case, the JV Company is incorporated as a public limited Company).

We confirm that we have minimum 26% equity participation and shall continue to maintain equity participation of minimum 26% in the JV Company for a lock-in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

Further M/s....., one of the promoters shall be a majority stakeholder who have minimum 51% equity participation and shall continue to maintain a minimum equity participation of 51% in the JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

*We meet the requirement of clause 1.1.1 of Item No. 4.0 of BDS except for Generator and accordingly the JV Company have associated and have a technology transfer agreement with M/s.....(Qualified Generator Manufacturer) who meets the requirement in respect of generator as per clause 1.1.4 of Item No. 4.0 of BDS. M/s..... (Qualified Generator Manufacturer) have minimum 10% equity participation and shall continue to maintain equity participation of minimum 10% in the JV Company for a lock in period of 7 years from the date of incorporation of this JV Company or up to the end of the defect liability period of the contract whichever is later.

The details of the Joint Venture (JV) company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of JV Company	
1.01.00	Equity participation of Qualified Steam Turbine Generator manufacturer in the JV company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later? (Bidder to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.1.2(b) of Item No. 4.0 of BDS supported by Board Resolution of the Bidder)	Yes/No
2.00.00	Equity participation of the Majority Stake Holder having Equity equal to or more than 51% in JV Company	
2.01.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description	
	(Majority Stake Holder to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.1.2(b) of Item No. 4.0 of BDS supported by Board Resolution of the Majority Stake Holder)	
3.00.00	*Equity participation of Qualified Generator manufacturer, in the JV Company	
3.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later? (Qualified Generator manufacturer to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.1.4 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Generator Manufacturer)	Yes/No
4.01.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment	
4.02.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of JV company is enclosed at Annexure _____ of this Attachment	

1.2.0 *(c) Our *Indian subsidiary/*JV Company M/s..... whose details are indicated at *1.2.0(a)/ *1.2.0(b) above have registered another Indian manufacturing Subsidiary Company M/s....., as per Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. This manufacturing Subsidiary Company has obtained certificate for Commencement of Business in India (Applicable in case the Indian manufacturing Subsidiary Company is registered as a public limited Company).

We confirm that this Indian manufacturing subsidiary Company shall continue to remain a subsidiary of the *Indian subsidiary/*Indian JV Company with a lock in period of 7 years from the date of incorporation of this Indian manufacturing Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

The details of Indian manufacturing Subsidiary Company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of Indian manufacturing Subsidiary Company	
1.01.00	Equity participation of the *Indian subsidiary / *JV company of qualified Steam Turbine Generator manufacturer in the manufacturing subsidiary company (in percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian manufacturing subsidiary company or upto the end of defect liability period of the contract whichever is later ? (Bidder to furnish documentary evidence for the above equity participation in the Indian manufacturing Subsidiary Company along with lock in period of such equity in compliance to note 7 for clause 1.0.0 of Item No. 4.0 of BDS supported by Board Resolution of the Bidder's *Indian subsidiary/*JV company)	Yes/No

S.No.	Item Description
2.00.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment
2.01.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of Indian manufacturing subsidiary company is enclosed at Annexure_____ of this Attachment

1.3.0 *We M/s....., a super critical steam turbine manufacturer, meet the requirements of clause 1.1.1 except for generator. Hence as per clause 1.1.4 of item no. 4.0 of BDS, the Subsidiary Company / JV Company (as the case may be) have associated with and have a Technology Transfer agreement with M/s....., (qualified Generator Manufacturer) meeting the requirements of clause 1.1.4 of item no. 4.0 of BDS fully in respect of generator. The details are as follows :-

The Qualified Generator Manufacturer have minimum 10% equity participation and shall continue to maintain a minimum equity participation of 10% in the Indian Subsidiary Company or the JV Company (as the case may be), for a lock-in period of 7 years from the date of incorporation of the Indian Subsidiary Company or JV Company (as the case may be) or up to the end of defect liability period of the contract whichever is later.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.00.00	Name of the station and its location			
1.01.00	Name, address, Fax No. and Tel. No. of Owner of Plant			
1.01.01	Name, address, Fax No. and Tel. No. of intermediary organization in case the award has been received by Qualified Generator Manufacturer from intermediary organization.			
1.02.00	Name and Designation of the responsible person in Owner's organization.			
1.02.01	Name and Designation of the responsible person in intermediary organization			
1.03.00	No. of Generator Sets supplied			
1.04.00	Contract No. and Date			
1.05.00	Capacity in MW of Unit			
1.06.00	Starting date of project			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.07.00	Scheduled date of completion			
1.08.00	Actual date of completion			
1.09.00	Date of commencement of successful operation			
1.10.00	Scope of work for the aforesaid Generator Set includes the following:			
	(a) Designed	*Yes/No	*Yes/No	*Yes/No
	(b) Engineered	*Yes/No	*Yes/No	*Yes/No
	(c) *Manufactured / *Got Manufactured	**Yes/No	*Yes/No	*Yes/No
	(d) *Erected/*Supervised Erection/**Acted **Acted as an Advisor for Erection	*Yes/No	*Yes/No	*Yes/No
	(e) *Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/No	*Yes/No	*Yes/No

** Necessary Documents/ certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

1.02.00 Details of Generator

1.02.01 Generator make and model No.

1.02.02 Rated MVA

1.02.03 Rated Power Factor

S. No.	Item Description		Installation#1	Installation#2	Installation#3
1.02.04	MW rating				
1.02.05	Rated voltage (kV)				
1.02.06	No. of phases				
1.02.07	No. of poles				
1.02.08	Mounting	*Horizontal/Vertical	*Horizontal/Vertical	*Horizontal/Vertical	*Horizontal/Vertical
1.02.09	Installation	*Indoor/Outdoor	*Indoor/Outdoor	*Indoor/Outdoor	*Indoor/Outdoor
1.02.10	Cylindrical rotor Type		* Yes/No	*Yes/No	*Yes/No
1.02.11	Cooling medium				
	(a) Stator				
	(b) Rotor				
1.02.12	Thermal class of Insulation				
	(a) Stator				
	(b) Rotor				
1.02.13	Date of Commissioning				
1.02.14	Date of Commencement of successful operation				

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.00.00	Certificate(s) from the Owner that the aforesaid Generator Set is in successful operation for a period of not less than one (1) year as on date of Techno-Commercial Bid Opening is furnished at Annexure..... to this Attachment			
3.00.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.4.0 *We M/s....., (Name of Bidder) are seeking qualification as holding company (singularly or collectively) with our subsidiaries (held directly or indirectly) as per notes No.4 for clause no. 1.0.0 of Item No. 4.0 of BDS. The details of our subsidiaries meeting the QR are as follows :

1.4.1 *Name, Address, Tele No. of the Subsidiary meeting the QR for Steam Turbine Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.4.2 *Name, Address, Tele No. of the Subsidiary meeting the QR for Generator Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.4.3 *Name, address & Telephone No. of subsidiary company owning the technology for supercritical steam turbine and generators

*We have submitted the experience details in support of Qualifying Requirement at 1.1.0 above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship with our above subsidiaries

*1.5.0 Deed of Joint Undertaking (DJU) executed by us, Indian Subsidiary Company / JV Company (as the case may be), Other Promoter having 25% or higher Equity Participation in the Indian Subsidiary Company/JV Company (as the case may be), *Qualified Generator Manufacturer, *subsidiaries of Holding Company (Bidder) and *the manufacturing subsidiary Company as per clause 1.1.3 and/or 1.1.4 and/or Note No. 4 & 7 for clause no. 1.0.0 of Item No. 4 of BDS is enclosed at Annexure _____ to this Attachment.

1.6.0** ***Letter to ensure satisfactory performance of Steam Turbine Generator & Auxiliariesas per Note No. 11 for clause no. 1.0.0 of Item No. 4 of BDS as per the format enclosed in the bidding documents is enclosed at Annexure ---------- to this Attachment.

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* Bidder to strike out whichever is not applicable.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371

(Experience details of Indian Steam Turbine Generator
Manufacturer as per clause 1.2.0 of Item No. 4.0 of BDS)

Bidder's Name & Address :

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

1.0.0 We M/s....., Indian Steam Turbine Generator Manufacturer are seeking Qualification as per clause 1.2.0 of Item No. 4.0 of BDS as per following details.

1.1.0 We are an Indian Steam Turbine Generator Manufacturing Company who have designed, engineered, *manufactured/*got manufactured, *erected/ *supervised erection, *commissioned/ *supervised commissioning ofat least one (1) number of reheat type of steam turbine and generator set of 500 MW or above capacity and which is in successful operation for at least one (1) year prior to the date of techno-commercialbid opening. The details are as follows :-

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.00.00	Name of the Station and its location			
1.01.00	Name, address, Fax No. e-mail and Tel. No. of Owner of Station			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.01.01	Name, address, Fax No. e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Steam Turbine Generator Manufacturer from intermediary organization.			
1.02.00	Name and Designation of the responsible person in Owner's organization.			
1.02.01	Name and Designation of the responsible person in intermediary organization.			
1.03.00	No. of Units in the Station			
1.04.00	Contract No. and Date			
1.05.00	Unit Capacity in MW			
1.06.00	Starting Date of the Project			
1.07.00	Schedule Date of Commissioning			
1.08.00	Actual Date of Commissioning			
1.09.00	Date of Commencement of Successful Operation			

S. No.	Item Description		Installation#1	Installation#2	Installation#3
1.10.00	Scope of work executed for the aforesaid Steam Turbine and Generator includes the following:				
	(i)	Designed	Yes/No	Yes/No	Yes/No
	(ii)	Engineered	Yes/No	Yes/No	Yes/No
	(iii)	Manufactured/got manufactured	Yes/No	Yes/No	Yes/No
	(iv)	*Erected / *Supervised Erection / **acted as adviser for Erection	Yes/No	Yes/No	Yes/No
	(v)	*Commissioned / *Supervised Commissioning / **acted as adviser for Commissioning	Yes/No	Yes/No	Yes/No

** Necessary Documents / certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

2.00.00 Details of Steam Turbine

2.01.01 Steam Turbine make

2.01.02 Tandem Compound / Cross Compound

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.01.03	No. of Reheat			
2.01.04	No. of Cylinders:			
	(i) HP			
	(ii) IP			
	(iii) Combined HP & IP			
	(iv) LP			
2.01.05	Module Number			
	(i) HP Turbine			
	(ii) IP Turbine			
	(iii) LP Turbine			
	(iv) Combined HP & IP turbine (if applicable)			
2.01.06	Main Steam Pressure (ata)			
2.01.07	Main Steam Temperature (deg.C)			
2.01.08	Reheat Steam Temperature (deg.C)			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.01.09	Exhaust Pressure (ata)			
2.01.10	Type of Turbine	*Condensing/ Non Condensing	*Condensing/ Non Condensing	*Condensing/ Non Condensing
2.01.11	Rated speed (RPM) and operating frequency range (Hz)			
2.01.12	No. of Steam Extractions for regeneration			
3.00.00	Details of Generator			
3.01.01	Generator make and model No.			
3.01.02	Generator MVA Rating			
3.01.03	Generator MW Rating			
3.01.04	Rated Power Factor			
3.01.05	Rated voltage (kV)			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
4.00.00	Certificate(s) from the Owner that the aforesaid Steam Turbine Generator Set is in successful operation for a period of not less than one (1) year prior to date of Techno-Commercial Bid Opening is furnished at Annexure..... to this Attachment			
4.01.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.2.0 We Indian Steam Turbine Generator Manufacturing Company have a valid ongoing collaboration and technology transfer agreement including license to manufacture and supply supercritical steam turbine generator sets covering the type, size and rating specified, in India with M/s....., a Qualified Steam Turbine Generator Manufacturer meeting requirements of clause 1.1.1 of Item No. 4.0 of BDS, valid minimum up to the end of the defect liability period of the contract. The details of Qualified Steam Turbine Generator Manufacturer are as under :

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
1.00.00	Name of the station and its location						
1.01.00	Name, address, Fax No., e-mail and Tel. No. of Owner of station						
1.01.01	Name, address, Fax No., e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Steam Turbine Generator Manufacturer from intermediary organization						
1.02.00	Name and Designation of the responsible person in Owner's organization						
1.02.01	Name and Designation of the responsible person in intermediary organization						
1.03.00	No. of Steam Turbine Generator Sets supplied by us for the station						
1.04.00	Contract No. and Date						

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate
1.05.00	Capacity in MW of Unit						
1.06.00	Starting date of project						
1.07.00	Scheduled date of commissioning						
1.08.00	Actual date of commissioning						
1.09.00	Date of commencement of successful operation						
1.10.00	Scope of work executed by us for the aforesaid Steam Turbine Generator Set includes the following :						
	(a) Designed	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(b) Engineered	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(c) *Manufactured / *Got Manufactured	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate
(d)	*Erected/*Supervised Erection/**Acted as an Advisor for Erection	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(e)	*Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ NoNo

** Necessary Documents /certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.00.00	Details of Turbine			
2.01.00	Steam Turbine make			
2.02.00	Tandem compound	*Yes/*No	*Yes/*No	*Yes/*No
2.03.00	No. of Reheat			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.04.00	(i) No. of Cylinders:			
	(a) HP			
	(b) IP			
	(c) Combined HP-IP			
	(d) LP			
	(ii) Whether HP and IP cylinders are combined or separate			
2.05.00	Module Number			
	(a) HP Turbine			
	(b) IP Turbine			
	(c) Combined HP-IP turbine (if applicable)			
	(d) LP Turbine			
2.06.00	Main steam pressure (ata)			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.07.00	Main steam temperature (deg.C)			
2.08.00	Reheat Steam temperature (deg.C)			
2.09.00	Condensing type	*Yes/No	*Yes/No	*Yes/No
2.10.00	Rated speed (RPM) and operating frequency range (Hz)			
2.11.00	No. of Steam Extractions			
2.12.00	Steam Turbine and Generator Directly coupled	*Yes/*No	*Yes/No	*Yes/No
2.13.00	Steam Turbine Generator Set Installation	*Indoor/*Outdoor	*Indoor/*Outdoor	*Indoor/*Outdoor
3.00.00	Generator Details			
3.01.00	Generator make and model No.			
3.02.00	Rated MVA			
3.03.00	Rated Power Factor			
3.04.00	MW rating			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.05.00	Rated voltage (kV)			
3.06.00	No. of phases			
3.07.00	No. of poles			
3.08.00	Mounting	* Horizontally/ Vertical	* Horizontally Vertical	* Horizontally /Vertical
3.09.00	Installation	* Indoor/Outdoor		
3.10.00	Cylindrical rotor type	* Yes/No		
3.11.00	Cooling medium			
	(a) Stator			
	(b) Rotor			
3.12.00	Thermal Class of insulation			
	(a) Stator			
	(b) Rotor			
3.13.00	Schedule date of Commissioning			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.14.00	Actual date of commissioning			
3.15.00	Date of commencement of successful operation			
4.00.00	Certificate(s) from the Owner that the aforesaid Steam Turbine Generator Set / Steam Turbine / Generator (as applicable) is in successful operation for a period of not less than one (1) year prior to the date of Techno-commercial Bid Opening is furnished at Annexure..... to this Attachment			
4.01.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.3.0 *M/s....., a super critical steam turbine manufacturer meets the requirements of clause 1.1.1 of Item No. 4.0 of BDS except for generator. Hence as per clause 1.2.3 of Item No. 4.0 of BDS, we have associated and have a Technology Transfer agreement with M/s....., (Qualified Generator Manufacturer) who meets requirements of clause 1.1.1of Item No. 4.0 of BDS fully in respect of generator. The details are as follows :-

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.00.00	Name of the station and its location			
1.01.00	Name, address, Fax No. e-mail and Tel. No. of Owner of Station			
1.01.01	Name, address, Fax No. e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Generator Manufacturer from intermediary organization			
1.02.00	Name and Designation of the responsible person in Owner's organization			
1.02.01	Name and Designation of the responsible person in intermediary organization.			
1.03.00	No. of Generator Sets supplied			
1.04.00	Contract No. and Date			
1.05.00	Capacity in MW of Unit			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.06.00	Starting date of project			
1.07.00	Scheduled date of Commissioning			
1.08.00	Actual date of Commissioning			
1.09.00	Date of commencement of successful operation			
1.10.00	Scope of work for the aforesaid Generator Set includes the following:			
	(a) Designed	*Yes/No	Yes/No	Yes/No
	(b) Engineered	Yes/No	Yes/No	Yes/No
	(c) *Manufactured / *Got Manufactured	Yes/No	Yes/No	Yes/No
	(d) *Erected/*Supervised/Erection/ **Acted as an Advisor for Erection	Yes/No	Yes/No	Yes/No
	(e) *Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	Yes/No	Yes/No	Yes/No

** Necessary Documents / certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.02.00	Details of Generator			
1.02.01	Generator make and model No.			
1.02.02	Rated MVA			
1.02.03	Rated Power Factor			
1.02.04	MW rating			
1.02.05	Rated voltage (kV)			
1.02.06	No. of phases			
1.02.07	No. of poles			
1.02.08	Mounting	* Horizontal/ Vertical	* Horizontal/ Vertical	* Horizontal/ Vertical
1.02.09	Installation	* Indoor/Outdoor	* Indoor/Outdoor	* Indoor/Outdoor
1.02.10	Cylindrical rotor Type	Yes/No	Yes/No	Yes/No
1.02.11	Cooling medium			
	(a) Stator			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
	(b) Rotor			
1.02.12	Thermal class of Insulation			
	(a) Stator			
	(b) Rotor			
1.02.13	Date of Commissioning			
1.02.14	Date of Commencement of successful operation			
2.00.00	Certificate(s) from the Owner that the aforesaid Generator Set is in successful operation for a period of not less than one (1) year prior to the date of Techno-Commercial Bid Opening is furnished at Annexure..... to this Attachment			
3.00.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.4.0 *M/s....., (Qualified Steam Turbine Generator Manufacturer) are seeking qualification as holding company (singularly or collectively) with subsidiaries (held directly or indirectly) as per note No.4 for clause no. 1.0.0 of Item No. 4.0 of BDS. The details of subsidiaries meeting the QR are as follows :

1.4.1 *Name, Address, Tele No. of the Subsidiary meeting the QR for Steam Turbine Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.4.2 *Name, Address, Tele No. of the Subsidiary meeting the QR for Generator Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.4.3 *Name, address & Telephone No. of subsidiary company owning the technology for supercritical steam turbine and generators

*We have submitted the experience details in support of Qualifying Requirement at 1.2.0 above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Steam Turbine Generator Manufacturer) with above subsidiaries.

*1.5.0 Deed of Joint Undertaking (DJU) executed by us, Qualified Steam Turbine Generator Manufacturer, *Qualified Generator Manufacturer and *subsidiaries of Holding Company (Qualified Steam Turbine Generator Manufacturer) as per clause 1.2.2 and/or 1.2.3 and/or Note No 4 for clause no. 1.0.0 of Item No. 4.0 of BDS is enclosed at Annexure _____ to this Attachment.

**1.6.0 Letter to ensure satisfactory performance of Steam Turbine Generator & Auxiliaries as per Note No. 11 for clause no. 1.0.0 of Item No. 4 of BDS as per the format enclosed in the bidding documents is enclosed at Annexure ---------- to this Attachment.*

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* Bidder to strike out whichever is not applicable.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371

(Experience details of Indian Subsidiary Company of a Qualified Steam Turbine Generator Manufacturer as per clause 1.3.0 of Item No. 4.0 of BDS)

Bidder's Name & Address :

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

1.0.0 We M/s....., Indian Subsidiary Company of a Qualified Steam Turbine Generator Manufacturer are seeking Qualification as per clause 1.3.0 of Item No. 4.0 of BDS as per following details.

1.1.0 We are an Indian Subsidiary Company of M/s....., Qualified Steam Turbine Generator manufacturer registered in India under Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets covering the type, size and rating specified.

Further, we have obtained certificate for Commencement of Business in India (Applicable in case the Indian Subsidiary Company is registered as a public limited Company).

We confirm that Qualified Steam Turbine Generator manufacturer have minimum 51% equity participation and shall continue to maintain equity participation of minimum 51% in the Indian Subsidiary Company for a lock in period of 7 years from the date of incorporation of this Indian Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

*We have registered another Indian manufacturing subsidiary company M/s ..... in India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. Further, our manufacturing subsidiary company have obtained certificate for Commencement of Business in India (Applicable in case the Indian manufacturing Subsidiary Company is registered as a Public Limited Company). We confirm that this Indian manufacturing Subsidiary Company shall continue to remain our

subsidiary with a lock in period of 7 years from the date of incorporation of this Indian manufacturing Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

*The Qualified Steam Turbine Generator manufacturer meets the requirement of clause 1.1.1 of Item No. 4.0 of BDS except for Generator and accordingly we have associated and have a technology transfer agreement with M/s..... (Qualified Generator Manufacturer) who meets the requirement in respect of generator as per clause 1.3.3 of Item No. 4.0 of BDS. M/s..... (Qualified Generator Manufacturer) have minimum 10% equity and shall continue to maintain equity participation of minimum 10% in the Indian Subsidiary Company for a lock in period of 7 years from the date of incorporation of this Indian Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

The details of Indian Subsidiary Company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of Indian Subsidiary Company	
1.01.00	Equity participation of Qualified Steam Turbine Generator manufacturer in the subsidiary company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian subsidiary company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description	
	(Qualified Steam Turbine Generator Manufacturer to furnish documentary evidence for their equity participation in the Indian Subsidiary Company along with lock in period of such equity in compliance to clause 1.3.1 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Steam Turbine Generator Manufacturer)	
2.00.00	*Equity participation of other Promoter having Equity equal to or more than 25% in Indian Subsidiary Company	
2.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian subsidiary company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description	
3.00.00	*Equity participation of Qualified Generator manufacturer, in the Indian Subsidiary company.	
3.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian subsidiary company or upto the end of defect liability period of the contract whichever is later? (Qualified Generator manufacturer to furnish documentary evidence for their equity participation in the Indian Subsidiary Company along with lock in period of such equity in compliance to clause 1.3.3 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Generator manufacturer)	Yes/No
4.01.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment	

S.No.	Item Description
4.02.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of Indian subsidiary company is enclosed at Annexure_____ of this Attachment

1.2.0 M/s....., Qualified Steam Turbine Generator manufacturer, have designed, engineered, *manufactured / *got manufactured, *erected / *supervised erection, *commissioned / *supervised commissioning of (i) at least one (1) number supercritical steam turbine of tandem compound, condensing, reheat type of 500 MW or above capacity with main steam pressure of 225 Kg/cm2 (gauge) or higher and main steam / reheat temperature of 565^0 C / 565^0 C or higher and (ii) at least one (1) number of generator of two pole, Thermal class 155 (F) winding insulation, hydrogen/ water cooled stator and hydrogen / water cooled rotor of 500 MW or above capacity. These steam turbine and generator are in successful operation for a period of not less than one (1) year prior to the date of techno-commercial bid opening. The details are as follows :-

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
1.00.00	Name of the station and its location						
1.01.00	Name, address, Fax No., e-mail and Tel. No. of Owner of station						
1.01.01	Name, address, Fax No., e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Steam Turbine Generator Manufacturer from intermediary organization						

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
1.02.00	Name and Designation of the responsible person in Owner's organization						
1.02.01	Name and Designation of the responsible person in intermediary organization.						
1.03.00	No. of Steam Turbine Generator Sets supplied by us for the station						
1.04.00	Contract No. and Date						
1.05.00	Capacity in MW of Unit						
1.06.00	Starting date of project						
1.07.00	Scheduled date of commissioning						
1.08.00	Actual date of commissioning						
1.09.00	Date of commencement of successful operation						

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate
1.10.00	Scope of work executed by us for the aforesaid Steam Turbine Generator Set includes the following :						
(a)	Designed	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(b)	Engineered	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(c)	*Manufactured / *Got Manufactured	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(d)	*Erected/*Supervised Erection/ **Acted as an Advisor for Erection	*Yes	*Yes	*Yes	*Yes	*Yes	*Yes
(e)	*Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes No	*Yes No	*Yes No	*Yes No	*Yes No	*Yes No

** Necessary Documents/ certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

S.No.	Item Description	Installation No.1	Installation No.2	Installation No.3
2.00.00	Details of Turbine			
2.01.00	Steam Turbine make			
2.02.00	Tandem compound	*Yes/*No	*Yes/*No	*Yes/*No
2.03.00	No. of Reheat			
2.04.00	(i) No. of Cylinders:			
	(a) HP			
	(b) IP			
	(c) Combined HP-IP			
	(d) LP			
	(ii) Whether HP and IP cylinders are combined or separate			
2.05.00	Module Number			
	(a) HP Turbine			
	(b) IP Turbine			

S.No.	Item Description	Installation No.1	Installation No.2	Installation No.3
	(c) Combined HP-IP turbine (if applicable)			
	(d) LP Turbine			
2.06.00	Main steam pressure (ata)			
2.07.00	Main steam temperature (deg.C)			
2.08.00	Reheat Steam temperature (deg.C)			
2.09.00	Condensing type	*Yes/No	*Yes/No	*Yes/No
2.10.00	Rated speed (RPM) and operating frequency range (Hz)			
2.11.00	No. of Steam Extractions			
2.12.00	Steam Turbine and Generator Directly coupled	*Yes/No	*Yes/No	*Yes/No
2.13.00	Steam Turbine Generator Set Installation	*Indoor/*Outdoor	*Indoor/*Outdoor	*Indoor/*Outdoor

S.No.	Item Description	Installation No.1	Installation No.2	Installation No.3
3.00.00	Generator Details			
3.01.00	Generator make and model No.			
3.02.00	Rated MVA			
3.03.00	Rated Power Factor			
3.04.00	MW rating			
3.05.00	Rated voltage (kV)			
3.06.00	No. of phases			
3.07.00	No. of poles			
3.08.00	Mounting	*Horizontally/ Vertical	*Horizontally/ Vertical	*Horizontall/ Vertical
3.09.00	Installation	* Indoort/Outdoor	* Indoort/Outdoor	* Indoort/Outdoor
3.10.00	Cylindrical rotor type	* Yes/No	* Yes/No	* Yes/No
3.11.00	Cooling medium			
	(a) Stator			
	(b) Rotor			

S.No.	Item Description	Installation No.1	Installation No.2	Installation No.3
3.12.00	Thermal Class of insulation			
	(a) Stator			
	(b) Rotor			
3.13.00	Schedule date of Commissioning			
3.14.00	Actual date of commissioning			
3.15.00	Date of commencement of successful operation			
4.00.00	Certificate(s) from the Owner that the aforesaid Steam Turbine Generator Set / Steam Turbine / Generator (as applicable) is in successful operation for a period of not less than one (1) year prior to the date of Techno-commercial Bid Opening is furnished at Annexure..... to this Attachment			
4.01.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.3.0 *We have registered another Indian manufacturing Subsidiary Company M/s....., as per Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. The manufacturing Subsidiary Company has obtained certificate for Commencement of Business in India (Applicable in case the Indian manufacturing Subsidiary Company is registered as a public limited Company).

We confirm that this Indian manufacturing Subsidiary Company shall continue to remain our subsidiary with a lock in period of 7 years from the date of incorporation of this Indian manufacturing Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

The details of Indian manufacturing Subsidiary Company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of Indian manufacturing Subsidiary Company	
1.01.00	Our equity participation in the Indian manufacturing subsidiary company (in percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian manufacturing subsidiary company or upto the end of defect liability period of the contract whichever is later ?	Yes/No

S.No.	Item Description
	(Bidder to furnish documentary evidence for the above equity participation in the Indian manufacturing Subsidiary Company along with lock in period of such equity in compliance to note 7 for clause 1.0.0 of Item No. 4.0 of BDS supported by Board Resolution of the Bidder and *Indian subsidiary/*JV company)
2.00.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment
2.01.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of Indian manufacturing subsidiary company is enclosed at Annexure_____ of this Attachment

1.4.0 *M/s....., a super critical steam turbine manufacturer as a promotor of Indian Subsidiary company meets the requirements of clause 1.1.1 of Item No. 4.0 of BDS except for generator. Hence, as per clause 1.3.3 of Item No. 4.0 of BDS, we have associated and have a Technology Transfer agreement with M/s....., (Qualified Generator Manufacturer) who meetsthe requirements of clause 1.1.1 of Item No. 4.0 of BDS fully in respect of generator. The details are as follows :-

The Qualified Generator Manufacturer have minimum 10% equity participation and shall continue to maintain a minimum equity participation of 10% in the Indian Subsidiary Company, for a lock-in period of 7 years from the date of incorporation of the Indian Subsidiary Company or up to the end of defect liability period of the contract whichever is later.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.00.00	Name of the station and its location			
1.01.00	Name, address, Fax No. and Tel. No. of Owner of Plant			
1.01.01	Name, address, Fax No. and Tel. No. of intermediary organization in case the award has been received by Qualified Generator Manufacturer from intermediary organization.			
1.02.00	Name and Designation of the responsible person in Owner's organization.			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.02.01	Name and Designation of the responsible person in intermediary organization.			
1.03.00	No. of Generator Sets supplied			
1.04.00	Contract No. and Date			
1.05.00	Capacity in MW of Unit			
1.06.00	Starting date of project			
1.07.00	Scheduled date of completion			
1.08.00	Actual date of completion			
1.09.00	Date of commencement of successful operation			
1.10.00	Scope of work for the aforesaid Generator Set includes the following:			
	(a) Designed	*Yes/No	*Yes/No	*Yes/No
	(b) Engineered	*Yes/No	*Yes/No	*Yes/No

S. No.	Item Description	Installation#1	Installation#2	Installation#3
(c)	*Manufactured / *Got Manufactured	*Yes/No	*Yes/No	*Yes/No
(d)	*Erected/*Supervised Erection/**Acted as an Advisor for Erection	*Yes/No	*Yes/No	*Yes/No
(e)	*Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/No	*Yes/No	*Yes/No

** Necessary Documents / certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

1.02.00 Details of Generator

1.02.01 Generator make and model No.

1.02.02 Rated MVA

1.02.03 Rated Power Factor

1.02.04 MW rating

1.02.05 Rated voltage (kV)

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.02.06	No. of phases			
1.02.07	No. of poles			
1.02.08	Mounting	* Horizontal/ Vertical	* Horizontal/ Vertical	* Horizontal/ Vertical
1.02.09	Installation	* Indoor/Outdoor	* Indoor/Outdoor	* Indoor/Outdoor
1.02.10	Cylindrical rotor Type	* Yes/No	* Yes/No	* Yes/No
1.02.11	Cooling medium			
	(a) Stator			
	(b) Rotor			
1.02.12	Thermal class of Insulation			
	(a) Stator			
	(b) Rotor			
1.02.13	Date of Commissioning			
1.02.14	Date of Commencement of successful operation			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.00.00	Certificate(s) from the Owner that the aforesaid Generator Set is in successful operation for a period of not less than one (1) year prior to the date of Techno-Commercial Bid Opening is furnished at Annexure..... to this Attachment			
3.00.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.5.0 *M/s....., (Qualified Steam Turbine Generator Manufacturer) are seeking qualification as holding company (singularly or collectively) with subsidiaries (held directly or indirectly) as per note No. 4 for clause no. 1.0.0 of Item No. 4.0 of BDS. The details of subsidiaries meeting the QR are as follows :

1.5.1 *Name, Address, Tele No. of the Subsidiary meeting the QR for Steam Turbine Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.5.2 *Name, Address, Tele No. of the Subsidiary meeting the QR for Generator Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.5.3 *Name, address & Telephone No. of subsidiary company owning the technology for supercritical steam turbine and generators

*We have submitted the experience details in support of Qualifying Requirement at 1.2.0 above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Steam Turbine Generator Manufacturer) and above subsidiaries.

*1.6.0 Deed of Joint Undertaking (DJU) executed by us, Qualified Steam Turbine Generator manufacturer, Other Promoter having 25% or higher Equity Participation in the Indian Subsidiary Company, *Qualified Generator Manufacturer, *Subsidiaries of Holding Company (Qualified Steam Turbine Generator manufacturer and Indian manufacturing subsidiary company) as per clause 1.3.2 and/or 1.3.3 and/or Note No 4 & 7 for clause no. 1.0.0 of Item No. 4 of BDS is enclosed at Annexure _____ to this Attachment.

1.7.0 Letter to ensure satisfactory performance of Steam Turbine Generator & Auxiliaries as per Note No. 11 for clause no. 1.0.0 of Item No. 4 of BDS as per the format enclosed in the bidding documents is enclosed at Annexure ---------- to this Attachment.

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* Bidder to strike out whichever is not applicable.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT(2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371

(Experience details of Indian Joint Venture (JV) Company for manufacturing of Super Critical Steam Turbine Generator in India between an Indian Company and a Qualified Steam Turbine Generator Manufacturer as per clause 1.4.0 of Item No. 4.0 of BDS)

Bidder's Name & Address :

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

1.0.0 We M/s.....,Indian Joint Venture (JV), Company for manufacturing of Super Critical Steam Turbine Generator in India between an Indian Company and a Qualified Steam Turbine Generator Manufacturer are seeking Qualification as per clause 1.4.0 of Item No. 4.0 of BDS as per following details.

1.1.0 We M/s....., are a Joint Venture (JV) Company registered in India under the Companies Act 1956 of India for the purpose of manufacturing in India supercritical steam turbine generator sets covering the type, size and rating specified.

The Joint Venture (JV) Company is promoted by (i) M/s....., an Indian Company registered in India under the Companies Act 1956 of India, (ii) M/s ....., a Qualified Steam Turbine Generator Manufacturer meeting requirement of clause 1.1.1 of Item No. 4.0 of BDS and/or (iii) *M/s ....., a Qualified Generator Manufacturer.

The above said JV Company have obtained certificate for commencement of Business in India as on the date of techno-commercial bid opening, (Applicable in case, the JV Company is incorporated as a public limited Company).

We confirm that Qualified Steam Turbine Generator Manufacturer have minimum 26% equity participation and shall continue to maintain equity participation of minimum 26% in the JV Company for a lock-in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

Further M/s....., one of the promoters shall be a majority stakeholder who have minimum 51% equity participation and shall continue to maintain a minimum equity participation of 51% in the said JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

*We have registered another Indian manufacturing subsidiary company M/s ..... in India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. Further, our manufacturing subsidiary company have obtained certificate for Commencement of Business in India (Applicable in case the Indian manufacturing Subsidiary Company is registered as a Public Limited Company). We confirm that this Indian manufacturing Subsidiary Company shall continue to remain our subsidiary with a lock in period of 7 years from the date of incorporation of this Indian manufacturing Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

*Further, the Qualified Steam Turbine Generator Manufacturer meets the requirement of clause 1.1.1 of Item No. 4.0 of BDS except for Generator and accordingly we have associated and have a technology transfer agreement with M/s..... (Qualified Generator Manufacturer) who meets the requirement in respect of Generator as per clause 1.4.3 of Item No. 4.0 of BDS. M/s..... (Qualified Generator Manufacturer) have minimum 10% equity participation and shall continue to maintain equity participation of minimum 10% in the JV Company for a lock in period of 7 years from the date of incorporation of this JV Company or up to the end of the defect liability period of the contract whichever is later.

The details of the Joint Venture (JV) company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of JV Company	
1.01.00	Equity participation of qualified Steam Turbine Generator manufacturer in the JV company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later? (Qualified Steam Turbine Generator Manufacturer to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.4.1 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Steam Turbine Generator Manufacturer)	Yes/No

S.No.	Item Description	
2.00.00	Equity participation of the Majority Stake Holder having Equity equal to or more than 51% in JV Company	
2.01.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later? (Majority Stake Holder to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.4.1 of Item No. 4.0 of BDS supported by Board Resolution of the Majority Stake Holder)	Yes/No
3.00.00	*Equity participation of Qualified Generator manufacturer, in the JV Company	
3.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description
	(Qualified Generator manufacturer to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.4.3 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Generator Manufacturer)
4.01.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment
4.02.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of JV company is enclosed at Annexure _____ of this Attachment

1.2.0 M/s....., the Qualified Steam Turbine Generator Manufacturer have designed, engineered, *manufactured / *got manufactured, *erected / *supervised erection, *commissioned / *supervised commissioning of (i) at least one (1) number supercritical steam turbine of tandem compound, condensing, reheat type of 500 MW or above capacity with main steam pressure of 225 Kg/cm2 (gauge) or higher and main steam / reheat temperature of 565^0 C / 565^0 C or higher and (ii) at least one (1) number of generator of two pole, Thermal class 155 (F) winding insulation, hydrogen/ water cooled stator and hydrogen / water cooled rotor of 500 MW or above capacity. These steam turbine and generator are in successful operation for a period of not less than one (1) year prior to the date of techno-commercial bid opening. The details are as follows :-

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
1.00.00	Name of the station and its location						
1.01.00	Name, address, Fax No., e-mail and Tel. No. of Owner of station						
1.01.01	Name, address, Fax No., e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Steam Turbine Generator Manufacturer from intermediary organization						
1.02.00	Name and Designation of the responsible person in Owner's organization						
1.02.01	Name and Designation of the responsible person in intermediary organization.						
1.03.00	No. of Steam Turbine Generator Sets supplied by us for the station						

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate
1.04.00	Contract No. and Date						
1.05.00	Capacity in MW of Unit						
1.06.00	Starting date of project						
1.07.00	Scheduled date of commissioning						
1.08.00	Actual date of commissioning						
1.09.00	Date of commencement of successful operation						
1.10.00	Scope of work executed by us for the aforesaid Steam Turbine Generator Set includes the following :						
	(a) Designed	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(b) Engineered	*Yes/ No	*Yes/ No	*Yes/No No	*Yes/ No	*Yes/ No	*Yes/ No

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
(c)	*Manufactured / *Got Manufactured	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(d)	*Erected/*Supervised Erection/**Acted as an Advisor for Erection	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(e)	*Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No

** Necessary Documents / certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.00.00	Details of Turbine			
2.01.00	Steam Turbine make			
2.02.00	Tandem compound	*Yes/*No	*Yes/*No	*Yes/*No

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.03.00	No. of Reheat			
2.04.00	(i) No. of Cylinders:			
	(a) HP			
	(b) IP			
	(c) Combined HP-IP			
	(d) LP			
	(ii) Whether HP and IP cylinders are combined or separate			
2.05.00	Module Number			
	(a) HP Turbine			
	(b) IP Turbine			
	(c) Combined HP-IP turbine (if applicable)			
	(d) LP Turbine			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.06.00	Main steam pressure (ata)			
2.07.00	Main steam temperature (deg.C)			
2.08.00	Reheat Steam temperature (deg.C)			
2.09.00	Condensing type	*Yes/No	*Yes/No	*Yes/No
2.10.00	Rated speed (RPM) and operating frequency range (Hz)			
2.11.00	No. of Steam Extractions			
2.12.00	Steam Turbine and Generator Directly coupled	*Yes/No	*Yes/No	*Yes/No
2.13.00	Steam Turbine Generator Set Installation	*Indoor/ *Outdoor	*Indoor/ *Outdoor	*Indoor/ *Outdoor
3.00.00	Generator Details			
3.01.00	Generator make and model No.			
3.02.00	Rated MVA			
3.03.00	Rated Power Factor			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.04.00	MW rating			
3.05.00	Rated voltage (kV)			
3.06.00	No. of phases			
3.07.00	No. of poles			
3.08.00	Mounting	*Horizontal/ Vertical	*Horizontal/ Vertical	*Horizontal/ Vertical
3.09.00	Installation	*Indoor/ Outdoor	*Indoor/ Outdoor	*Indoor/ Outdoor
3.10.00	Cylindrical rotor type	*Yes/No	*Yes/No	*Yes/No
3.11.00	Cooling medium			
	(a) Stator			
	(b) Rotor			
3.12.00	Thermal Class of insulation			
	(a) Stator			
	(b) Rotor			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.13.00	Schedule date of Commissioning			
3.14.00	Actual date of commissioning			
3.15.00	Date of commencement of successful operation			
4.00.00	Certificate(s) from the Owner that the aforesaid Steam Turbine Generator Set / Steam Turbine / Generator (as applicable) is in successful operation for a period of not less than one (1) year prior to the date of Techno-commercial Bid Opening is furnished at Annexure..... to this Attachment			
4.01.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.3.0(a) *We, M/s....., the majority stake holder in the said JV Company and an entity other than the Qualified Steam Turbine Generator Manufacturer, are an Indian Company and have executed, in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer and / or any other process industry with the total value of such projects being Rs. 10000 million or more. At least one of such projects have a contract value of Rs. 4000 million or more. These projects are in successful operation for a period of not less than one year as on the date of techno-commercial bid opening. The details are as follows :

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.00	Name of the station & its Location			
1.01	Owner's Name and its address, Fax No. Tel. No.			
1.02	Name of the responsible person in Owner's organization			
1.03	Contract No. & date			
1.04	Nature/area of EPC Project			
1.05	Starting date of Project			
1.06	Scheduled date of Commissioning			
1.07	Actual date of Commissioning			
1.08	Date of Commencement of Scheduled Operation			
1.09	Value of above projects			

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.10	Certificate from the Owner(s) that the aforesaid plants are in successful operation for a period not less than one (1) year as on date of Techno-Commercial Bid opening			
1.11	Necessary documentary evidence is support of above are attached at Annexure..... of this Attachment			

1.3.0 (b) *We, M/s....., the majority stake holder in the said JV Company an entity other than the Qualified Steam Turbine Generator Manufacturer are an Indian Company. Our Parent Company M/s ..... have executed, in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer and / or any other process industry with the total value of such projects being Rs. 10000 million or more. At least one of such projects have a contract value of Rs. 4000 million or more. These projects are in successful operation for a period of not less than one year as on the date of techno-commercial bid opening.

We confirm that we are a wholly owned subsidiary of our parent company M/s..... who have 100% equity and shall continue to maintain equity participation of 100% in us (wholly owned subsidiary company) for a lock in period of 7 years from the date of incorporation of the JV company or upto the end of defect liability period of the contract whichever is later.

The details are as follows :

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.00	Name of the station & its Location			
1.01	Owner's Name and its address, Fax No. Tel. No.			
1.02	Name of the responsible person in Owner's organization			
1.03	Contract No. & date			
1.04	Nature/area of EPC Project			
1.05	Starting date of Project			
1.06	Scheduled date of Commissioning			

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.07	Actual date of Commissioning			
1.08	Date of Commencement of Scheduled Operation			
1.09	Value of above projects			
1.10	Certificate from the Owner(s) that the aforesaid plants are in successful operation for a period not less than one (1) year prior to the date of Techno-Commercial Bid opening			
1.11	Necessary documentary evidence is support of above are attached at Annexure..... of this Attachment			
1.12	Date of Incorporation of JV Company			
1.13	Equity participation of Parent Company in the wholly owned subsidiary company (in percentage of the total equity)			

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.14	Whether Lock-in period for above equity participation is seven years from the date of incorporation of JV company or upto the end of defect liability period of the contract whichever is later? (Bidder to furnish documentary evidence for equality participation of parent company in the wholly owned subsidiary company along with lock in period of such equity in compliance to note 5 for clause 1.0.0 of Item No. 4.0 of BDS supported by Board Resolution of the Parent Company)			

1.4.0 *We have registered another Indian manufacturing Subsidiary Company M/s....., as per Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. The manufacturing Subsidiary Company has obtained certificate for Commencement of Business in India (Applicable in case the Indian manufacturing Subsidiary Company is registered as a public limited Company).

We confirm that this Indian manufacturing Subsidiary Company shall continue to remain our subsidiary with a lock in period of 7 years from the date of incorporation of this Indian manufacturing Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

The details of Indian manufacturing Subsidiary Company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of Indian manufacturing Subsidiary Company	
1.01.00	Our equity participation in the Indian manufacturing subsidiary company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian manufacturing subsidiary company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description
	(Bidder to furnish documentary evidence for their equity participation in the Indian manufacturing Subsidiary Company along with lock in period of such equity in compliance to Note 7 for clause 1.0.0 of Item No. 4.0 of BDS supported by Board Resolution of the Bidder)
2.00.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment
2.01.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of Indian manufacturing subsidiary company is enclosed at Annexure_____ of this Attachment

1.5.0 *M/s....., a super critical steam turbine manufacturer meets the requirements of clause 1.1.1 of Item No. 4.0 of BDS except for generator. Hence as per clause 1.4.3 of Item No. 4.0 of BDS, we have associated and have a Technology Transfer agreement with M/s....., (Qualified Generator Manufacturer) who meetsthe requirements of clause 1.1.1 of Item No. 4.0 of BDS fully in respect of Generator.

The Qualified Generator Manufacturer have minimum 10% equity participation and shall continue to maintain a minimum equity participation of 10% in the JV Company for a lock-in period of 7 years from the date of incorporation of the JV Company or up to the end of defect liability period of the contract whichever is later. The details of work as per QR are as follows:-

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.00.00	Name of the station and its location			
1.01.00	Name, address, Fax No. e-mail and Tel. No. of Owner of Plant			
1.01.01	Name, address, Fax No. e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Generator Manufacturer from intermediary organization			
1.02.00	Name and Designation of the responsible person in Owner's organization			
1.02.01	Name and Designation of the responsible person in intermediary organization			
1.03.00	No. of Generator Sets supplied			

S. No.	Item Description		Installation#1	Installation#2	Installation#3
1.04.00	Contract No. and Date				
1.05.00	Capacity in MW of Unit				
1.06.00	Starting date of project				
1.07.00	Scheduled date of completion				
1.08.00	Actual date of completion				
1.09.00	Date of commencement of successful operation				
1.10.00	Scope of work for the aforesaid Generator Set includes the following:				
	(a)	Designed	*Yes/No	*Yes/No	*Yes/No
	(b)	Engineered	*Yes/No	*Yes/No	*Yes/No
	(c)	*Manufactured / *Got Manufactured	*Yes/No	*Yes/No	*Yes/No
	(d)	*Erected/*Supervised Erection/**Acted as an Advisor for Erection	*Yes/No	*Yes/No	*Yes/No

S. No.	Item Description	Installation#1	Installation#2	Installation#3
	(e) *Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/No	*Yes/No	*Yes/No

** Necessary Documents / certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

1.02.00	Details of Generator			
1.02.01	Generator make and model No.			
1.02.02	Rated MVA			
1.02.03	Rated Power Factor			
1.02.04	MW rating			
1.02.05	Rated voltage (kV)			
1.02.06	No. of phases			
1.02.07	No. of poles			
1.02.08	Mounting	* Horizontal/ Vertical	* Horizontal/ Vertical	* Horizontal/ Vertical

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.02.09	Installation	*Indoor/Outdoor	*Indoor/Outdoor	*Indoor/Outdoor
1.02.10	Cylindrical rotor Type	*Yes/No	*Yes/No	*Yes/No
1.02.11	Cooling medium			
	(a) Stator			
	(b) Rotor			
1.02.12	Thermal class of Insulation			
	(a) Stator			
	(b) Rotor			
1.02.13	Date of Commissioning			
1.02.14	Date of Commencement of successful operation			
2.00.00	Certificate(s) from the Owner that the aforesaid Generator Set is in successful operation for a period of not less than one (1) year prior to date of Techno-Commercial Bid Opening is furnished at Annexure..... to this Attachment			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.00.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.6.0 *M/s....., (Qualified Steam Turbine Generator Manufacturer) are seeking qualification as holding company (singularly or collectively) with subsidiaries (held directly or indirectly) as per notes No.4 for clause no. 1.0.0 of Item No. 4.0 of BDS. The details of subsidiaries meeting the QR are as follows :

1.6.1 *Name, Address, Tele No. of the Subsidiary meeting the QR for Steam Turbine Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.6.2 *Name, Address, Tele No. of the Subsidiary meeting the QR for Generator Manufacture as per clause 1.1.0 of Item No. 4.0 of BDS

1.6.3 *Name, address & Telephone No. of subsidiary company owning the technology for supercritical steam turbine and generators

*We have submitted the experience details in support of Qualifying Requirement at 1.2.0 above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Steam Turbine Generator Manufacturer) and above subsidiaries.

*1.7.0 Deed of Joint Undertaking (DJU) executed by us, Qualified Steam Turbine Generator Manufacturer, Other Promoter having 25% or higher Equity Participation in the JV Company, *Qualified Generator Manufacturer, *subsidiaries of Holding Company (Qualified Steam Turbine Generator Manufacturer), *Parent company of Indian majority stake holder and * subsidiary company of the Indian JV company as per clause 1.4.2 and/or 1.4.3 and/or Note No, 4, 5 & 7 for clause no. 1.0.0 of Item No. 4.0 of BDS is enclosed at Annexure _____ to this Attachment.

**1.8.0 Letter to ensure satisfactory performance of Steam Turbine Generator & Auxiliaries as per Note No. 11 for clause no. 1.0.0 of Item No. 4 of BDS as per the format enclosed in the bidding documents is enclosed at Annexure ---------- to this Attachment.*

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* Bidder to strike out whichever is not applicable.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

TURBINE GENERATOR AND ASSOCIATED PACKAGES
FOR
KHURJA SUPER THERMAL POWER PROJECT (2 X 660 MW)
BIDDING DOCUMENT NO. : THDC/RKSH/CC- 9915-371

(Experience details of Indian JV Promoter holding at least 51% equity in a Joint Venture Company for manufacturing Super Critical Steam Turbine Generator sets in India between an Indian Company and a Qualified Steam Turbine Manufacturer as per clause 1.5.0 of Item No. 4.0 of BDS)

Bidder's Name & Address :

To
Corporate Contracts,
THDC India Ltd.,
Pragati Bhawan, By-Pass Road,
Pragatipuram, Rishikesh - 249 201

1.0.0 *We M/s....., an Indian Promotor with majority stakeholding in M/s....., an Indian Joint Venture (JV) Company, are seeking Qualification as per clause 1.5.0 of Item No. 4.0 of BDS as per following details.

* We M/s..... the parent company of our wholly owned subsidiary M/s....., the Indian Promotor with majority stake holding in M/s..... an Indian Joint Venture (JV) Company, are seeking Qualification as per clause 1.5.0 and Note 6 for clause 1.0.0 of Item No. 4.0 of BDS as per following details.

1.1.0 M/s....., the Joint Venture (JV) Company has been incorporated in India under the Companies Act 1956 of India for the purpose of manufacturing in India supercritical steam turbine generator sets covering the type, size and rating specified.

The above Joint Venture (JV) Company is promoted by (i) M/s....., a Company registered in India under the Companies Act 1956 of India and (ii) M/s ....., a Qualified Steam Turbine Generator Manufacturer (iii) *M/s ....., a Qualified Generator Manufacturer.

The above said JV Company have obtained certificate for commencement of Business in India as on the date of techno-commercial bid opening, (Applicable in case, the JV Company is incorporated as a public limited Company).

We confirm that M/s....., the Qualified Steam Turbine Generator Manufacturer have minimum 26% equity participation and shall continue to maintain equity participation of minimum 26% in the JV Company for a lock-in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

* Further, we, the Bidder, have minimum 51% equity participation and shall continue to maintain a minimum equity participation of 51% in the said JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

* Further, our wholly owned subsidiary,the majority stakeholder, have minimum 51% equity participation and shall continue to maintain a minimum equity participation of 51% in the said JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the end of the defect liability period of the contract whichever is later.

*Further, M/s....., the Qualified Steam Turbine Generator Manufacturer meets the requirement of clause 1.1.1 of Item No. 4.0 of BDS except for Generator and accordingly we have associated and have a technology transfer agreement with M/s..... (Qualified Generator Manufacturer) who meets the requirement in respect of generator as per clause 1.5.3 of Item No. 4.0 of BDS. M/s..... (Qualified Generator Manufacturer) have minimum 10% equity participation and shall continue to maintain equity participation of minimum 10% in the JV Company for a lock in period of 7 years from the date of incorporation of this JV Company or up to the end of the defect liability period of the contract whichever is later.

The details of the Joint Venture (JV) company are as follows :

S.No.	Item Description
1.00.00	Date of Incorporation of JV Company

S.No.	Item Description	
1.01.00	Equity participation of Qualified Steam Turbine Generator manufacturer in the JV company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later? (Qualified Steam Turbine Generator Manufacturer to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.5.1 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Steam Turbine Generator Manufacturer)	Yes/No
2.00.00	Equity participation of the Majority Stake Holder having Equity equal to or more than 51% in JV Company	

S.No.	Item Description	
2.01.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later? (Majority Stake Holder to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.5.1 of Item No. 4.0 of BDS supported by Board Resolution of the Majority Stake Holder)	Yes/No
3.00.00	*Equity participation of Qualified Generator manufacturer, in the JV Company	
3.01.00	*Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian JV company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description
	(Qualified Generator manufacturer to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 1.5.3 of Item No. 4.0 of BDS supported by Board Resolution of the Qualified Generator Manufacturer)
4.01.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment
4.02.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of JV company is enclosed at Annexure _____ of this Attachment

1.2.0 M/s....., the Qualified Steam Turbine Generator Manufacturerhave designed, engineered, *manufactured / *got manufactured, *erected / *supervised erection, *commissioned / *supervised commissioning of (i) at least one (1) number supercritical steam turbine of tandem compound, condensing, reheat type of 500 MW or above capacity with main steam pressure of 225 Kg/cm2 (gauge) or higher and main steam / reheat temperature of 565^0 C / 565^0 C or higher and (ii) at least one (1) number of generator of two pole, Thermal class 155 (F) winding insulation, hydrogen/ water cooled stator and hydrogen / water cooled rotor of 500 MW or above capacity. These steam turbine and generator are in successful operation for a period of not less than one (1) year prior to the date of techno-commercial bid opening. The details are as follows :-

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)	For Steam Turbine	For Generator (if separate station)
1.00.00	Name of the station and its location						
1.01.00	Name, address, Fax No., e-mail and Tel. No. of Owner of station						
1.01.01	Name, address, Fax No., e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Steam Turbine Generator Manufacturer from intermediary organisation.						
1.02.00	Name and Designation of the responsible person in Owner's organization						
1.02.01	Name and Designation of the responsible person in intermediary organization.						
1.03.00	No. of Steam Turbine Generator Sets supplied by us for the station						

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate
1.04.00	Contract No. and Date						
1.05.00	Capacity in MW of Unit						
1.06.00	Starting date of project						
1.07.00	Scheduled date of commissioning						
1.08.00	Actual date of commissioning						
1.09.00	Date of commencement of successful operation						
1.10.00	Scope of work executed by us for the aforesaid Steam Turbine Generator Set includes the following :						
	(a) Designed	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
	(b) Engineered	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No

S. No.	Item Description	Installation#1		Installation#2		Installation#3	
		For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate	For Steam Turbine station)	For Gene-rator (if separate
(c)	*Manufactured / *Got Manufactured	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(d)	*Erected/*Supervised Erection/**Acted as an Advisor for Erection	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No
(e)	*Commissioned/*Supervised Commissioning/**Acted as an Advisor for Commissioning	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No	*Yes/ No

** Necessary Documents/ certificates from the client, in support of Note No. 2 for Clause no. 1.0.0 of Item No. 4.0 of BDS are Attached at Annexure..... of this Attachment.

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.00.00	Details of Turbine			
2.01.00	Steam Turbine make			
2.02.00	Tandem compound	*Yes/*No	*Yes/*No	*Yes/*No

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.03.00	No. of Reheat			
2.04.00	(i) No. of Cylinders:			
	(a) HP			
	(b) IP			
	(c) Combined HP-IP			
	(d) LP			
	(ii) Whether HP and IP cylinders are combined or separate			
2.05.00	Module Number			
	(a) HP Turbine			
	(b) IP Turbine			
	(c) Combined HP-IP turbine (if applicable)			
	(d) LP Turbine			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
2.06.00	Main steam pressure (ata)			
2.07.00	Main steam temperature (deg.C)			
2.08.00	Reheat Steam temperature (deg.C)			
2.09.00	Condensing type	*Yes/No	*Yes/*No	*Yes/*No
2.10.00	Rated speed (RPM) and operating frequency range (Hz)			
2.11.00	No. of Steam Extractions			
2.12.00	Steam Turbine and Generator Directly coupled	*Yes/*No	*Yes/*No	*Yes/*No
2.13.00	Steam Turbine Generator Set Installation	*Indoor/*Outdoor	*Indoor/*Outdoor	*Indoor/*Outdoor
3.00.00	Generator Details			
3.01.00	Generator make and model no.			
3.02.00	Rated MVA			
3.03.00	Rated Power Factor			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.04.00	MW rating			
3.05.00	Rated voltage (kV)			
3.06.00	No. of phases			
3.07.00	No. of poles			
3.08.00	Mounting	*Horizontally/ Vertical	*Horizontally/ Vertical	*Horizontally/ Vertical
3.09.00	Installation	*Indoor/ Outdoor	*Indoor/ Outdoor	*Indoor/ Outdoor
3.10.00	Cylindrical rotor type	*Yes/No	*Yes/No	*Yes/No
3.11.00	Cooling medium			
	(a) Stator			
	(b) Rotor			
3.12.00	Thermal Class of insulation			
	(a) Stator			
	(b) Rotor			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
3.13.00	Schedule date of Commissioning			
3.14.00	Actual date of commissioning			
3.15.00	Date of commencement of successful operation			
4.00.00	Certificate(s) from the Owner that the aforesaid Steam Turbine Generator Set / Steam Turbine / Generator (as applicable) is in successful operation for a period of not less than one (1) year prior to date of Techno-commercial Bid Opening is furnished at Annexure..... to this Attachment			
4.01.00	Documentary evidence in support of QR data is enclosed at Annexure..... to this Attachment			

1.3.0 *(a) We, M/s....., the Bidder, have executed in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer and / or any other process industry with the total value of such projects being Rs. 10000 million or more. At least one of such projects have a contract value of Rs. 4000 million or more. These projects are in successful operation for a period of not less than one year as on the date of techno-commercial bid opening. The details are as follows :

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.00	Name of the station & its Location			
1.01	Owner's Name and its address, Fax No. Tel. No.			
1.02	Name of the responsible person in Owner's organisation			
1.03	Contract No. & date			
1.04	Nature/area of EPC Project			
1.05	Starting date of Project			
1.06	Scheduled date of Commissioning			
1.07	Actual date of Commissioning			
1.08	Date of Commencement of Scheduled Operation			
1.09	Value of above projects			
1.10	Certificate from the Owner(s) that the aforesaid plants are in successful operation for a period not less than one (1) year prior to date of Techno-Commecial Bid opening			

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.11	Necessary documentary evidence is support of above are attached at Annexure..... of this Attachment			

1.3.0 *(b) We, M/s....., the parent company of our wholly owned subsidiary M/s..... have executed in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer and / or any other process industry with the total value of such projects being Rs. 10000 million or more. At least one of such projects have a contract value of Rs. 4000 million or more. These projects are in successful operation for a period of not less than one year as on the date of techno-commercial bid opening.

We confirm that we have 100% equity and shall continue to maintain equity participation of 100% in our wholly owned subsidiary company which is the majority stake holder in JV company for a lock in period of 7 years from the date of incorporation of JV company or up to the end of the defect liability period of the contract whichever is later.

The details are as follows :

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.00	Name of the station & its Location			
1.01	Owner's Name and its address, Fax No. Tel. No.			

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.02	Name of the responsible person in Owner's organisation			
1.03	Contract No. & date			
1.04	Nature/area of EPC Project			
1.05	Starting date of Project			
1.06	Scheduled date of Commissioning			
1.07	Actual date of Commissioning			
1.08	Date of Commencement of Scheduled Operation			
1.09	Value of above projects			
1.10	Certificate from the Owner(s) that the aforesaid plants are in successful operation for a period not less than one (1) year prior to date of Techno-Commercial Bid opening			
1.11	Necessary documentary evidence is support of above are attached at Annexure..... of this Attachment			

S.No.	Item Description	Plant#1	Plant#2	Plant#3
1.12	Date of Incorporation of JV Company			
1.13	Equity participation of Bidder in the wholly owned subsidiary company (In percentage of the total equity)			
1.14	Whether Lock-in period for above equity participation is seven years from the date of incorporation of JV company or upto the end of defect liability period of the contract whichever is later? (Bidder to furnish documentary evidence for their equality participation in the wholly owned subsidiary company along with lock in period of such equity in compliance to Note 6 for clause 1.0.0 of Item No. 4.0 of BDS supported by Board Resolution of the Parent Company)			

1.4.0 *The JV company have registered another Indian manufacturing Subsidiary Company M/s....., as per Companies Act 1956 of India for manufacturing supercritical steam turbine generator sets in India covering the type, size and rating specified. The manufacturing Subsidiary Company has obtained certificate for Commencement of Business in India (Applicable in case the Indian manufacturing Subsidiary Company is registered as a public limited Company).

We confirm that this Indian manufacturing Subsidiary Company shall continue to remain a subsidiary of the Indian JV Company with a lock in period of 7 years from the date of incorporation of this Indian manufacturing Subsidiary Company or up to the end of the defect liability period of the contract whichever is later.

The details of Indian manufacturingSubsidiary Company are as follows :

S.No.	Item Description	
1.00.00	Date of Incorporation of Indian manufacturing Subsidiary Company	
1.01.00	Equity participation of JV Company in the Indian manufacturing subsidiary company (In percentage of the total equity)	
1.02.00	Whether Lock-in period for above equity participation is seven years from the date of incorporation of Indian manufacturing subsidiary company or upto the end of defect liability period of the contract whichever is later?	Yes/No

S.No.	Item Description
	(Bidder to furnish documentary evidence for JV company's equity participation in the Indian manufacturing Subsidiary Company along with lock in period of such equity in compliance to Note 7 for clause 1.0.0 of of Item No. 4.0 of BDS supported by Board Resolution of the JV company)
2.00.00	Certificate for commencement of Business in India (if applicable) is enclosed at Annexure_____ of this Attachment
2.01.00	Copy of Certificate of Incorporation and Article of Association and Memorandum of Association of Indian manufacturing subsidiary company is enclosed at Annexure_____ of this Attachment

1.5.0 *M/s....., a super critical steam turbine manufacturer meets the requirements of clause 1.1.1 of Item No. 4.0 of BDS except for generator. Hence as per clause 1.5.3 of Item No. 4.0 of BDS, the JV Company have associated and have a Technology Transfer agreement with M/s....., (qualified Generator Manufacturer) who meetsthe requirements of clause 1.1.1 of Item No. 4.0 of BDS fully in respect of generator.

The Qualified Generator Manufacturer have minimum 10% equity participation and shall continue to maintain a minimum equity participation of 10% in the JV Company for a lock-in period of 7 years from the date of incorporation of the JV Company or up to the end of defect liability period of the contract whichever is later. The details in support of QR are as follows:-

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.00.00	Name of the station and its location			
1.01.00	Name, address, Fax No. e-mail and Tel. No. of Owner of Plant			
1.01.01	Name, address, Fax No. e-mail and Tel. No. of intermediary organization in case the award has been received by Qualified Generator Manufacturer from intermediary organization.			
1.02.00	Name and Designation of the responsible person in Owner's organization.			

S. No.	Item Description	Installation#1	Installation#2	Installation#3
1.02.01	Name and Designation of the responsible person in intermediary organisation			
1.03.00	No. of Generator Sets supplied			
1.04.00	Contract No. and Date			
1.05.00	Capacity in MW of Unit			
1.06.00	Starting date of project			
1.07.00	Scheduled date of completion			
1.08.00	Actual date of completion			
1.09.00	Date of commencement of successful operation			
1.10.00	Scope of work for the aforesaid Generator Set includes the following:			
	(a) Designed	*Yes/No	*Yes/No	*Yes/No
	(b) Engineered	*Yes/No	*Yes/No	*Yes/No