TELANGANA STATE POWER GENERATION CORPORATION LIMITED

1X800 MW KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT#12

TECHNICAL SPECIFICATION FOR CHAIN PULLEY BLOCKS

SPECIFICATION NO.: PE-TS-410-563-A101

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA (U.P.)
INDIA

VOLUME – IIB

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SECTION – A

SCOPE OF ENQUIRY

1.0 SCOPE OF INQUIRY

1.1 This specification includes, but not limited to design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site as required on FOR site basis, performance and guarantee testing at vendor's works (as mentioned elsewhere in the specification) of **CHAIN PULLEY BLOCK** as per details in different sections / volumes of this specification for **1X800 MW KOTHAGUDEM TPP STAGE-VII, UNIT#12.**

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. **Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the supply of CHAIN PULLEY BLOCK & its accessories**

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.

1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information , ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents.** In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed deviation schedule along with cost of withdrawal; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification. If no cost of withdrawal is given against the deviation, it will be presumed that deviation can be withdrawn without any cost to BHEL/its customer

1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, Section - C shall prevail over section – D, however more stringent requirement as per the interpretation of the owner shall apply.

1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.11 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or TELANGANA STATE POWER GENERATION CORPORATION LIMITED including their consultant as interpreted by BHEL in the relevant context. For details refer the relevant clause in GCC

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SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	INTRODUCTION
2.00.00	APPROACH TO SITE
3.00.00	LAND
4.00.00	SOURCE OF COAL
5.00.00	SOURCE OF WATER
6.00.00	ASH DISPOSAL AREA
7.00.00	SALIENT DESIGN DATA

VOLUME : IIA

SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed 1x800 MW Kothagudem Thermal Power Station (KTPS), Stage-VII, Unit-12 would be set up by Telangana State Power Corporation Ltd. (TSGENCO) at Kothagudem, Telangana. The proposed Power Plant will be installed adjacent to the existing D colony of Kothagudem Thermal Power Station, at Kothagudem.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

2.00.00 APPROACH TO SITE

Site is located in the existing D Colony of Kothagudem Thermal Power Station, which is at a distance 30 km from temple town of Bhadrachalam and 300 km from Hyderabad by road. The Nearest railway station is Bhadrachalam Road (Known as Kothagudem) at a distance of 12 km. Kothagudem- Bhadrachalam National Highway branches off to the power station site near village Paloncha.

3.00.00 LAND

Land is primarily required for the main plant & auxiliaries (BTG) and balance of plant (BOP) like ash handling, coal storage, cooling tower, switchyard etc., which is available within the existing plant boundary.

The existing colony is to be dismantled, and the land of about 137 acres will be used for the main plant building, water facilities, switchyard, coal handling etc. The raw water reservoir will be located adjacent to the existing raw water reservoirs.

230 acres of land required for Ash Dyke will be procured. Land is available for staff colony, which is to be constructed by the EPC contractor.

4.00.00 SOURCE OF COAL

100% Imported and Blended coal (50% imported + 50% indigenous) will be used. Indigenous coal shall be sourced from Suliyari coal mines, Madhya Pradesh.

5.00.00 SOURCE OF WATER

Source of water (total quantity of water is 2192 m^3/hr) is Godavari River near Burgampahad & water will be pumped through existing GRP pipe line (of length approx. 26 km).

6.00.00 ASH DISPOSAL AREA

Ash shall be dumped in the ash dump area which will be about 9 km from plant. The ash dyke area of 230 acres is adequate for 1x800 MW unit as per MOEF norms.

7.00.00 SALIENT DESIGN DATA

7.01.00 Meteorological data of site is given below:-

Elevation above MSL		:	89 m
Monthly highest temperature		:	44.9 ºC
Monthly lowest temperature.		:	12.9 ºC
Rainfall			
	Average.	:	1031 mm
	Max.	:	100 mm/ hr
Mean Wind speed		:	44M/s
Relative Humidity			
	Max	:	82%
	Min	:	35%
Seismic Zone		:	Zone-III as per IS- 1893 (Part-IV)

[Climatological data of Khammam is attached for reference].

TABLE - VII

STATION : Khammam 43137 LAT: 17 15 N LONG: 80 09 E HT. ABOVE M.S.L. 112 METERS DATA 1951 TO 1980

		Mean Temperature						Extremes				Cloud		Rainfall					
MN	SLP	DB	WB	MAX	MIN	HIGH	LOW	MAX DT	MIN DT	RH	VP	TOT	LOW	TOT	RAINY	WET	DRY	HEAVY	DAY	WS
1	1003.4	21.2	19.0	30.8	17.9	32.8	14.0	35.0 31	9.4 08	80	20.3	2.1	1.2	4.6	0.2	84.5	0.0	84.5	13	4.3
	999.1	29.2	20.7					1950	1946	44	17.5	2.3	1.1			1966			1966	
2	1001.5	23.7	20.9	33.7	20.4	36.9	16.9	39.4 21	11.7 03	77	22.6	2.6	2.0	6.0	0.5	45.0	0.0	39.6	18	5.6
	997.3	32.3	21.9					1969	1943	38	17.9	1.9	0.9			1971			1946	
3	999.7	26.1	23.2	36.8	23.1	39.8	19.8	43.3 28	16.1 01	76	26.0	3.0	2.4	9.8	0.7	129.4	0.0	66.0	18	6.8
	995.1	35.3	23.5					1953	1952	35	19.5	1.8	0.9			1967			1967	
4	997.2	28.9	25.2	39.0	25.9	42.3	22.5	45.5 30	18.0 17	73	29.1	3.4	2.3	20.7	1.6	125.5	0.0	63.0	20	7.6
	992.2	37.3	25.1					1973	1972	36	22.2	2.8	1.3			1945			1945	
5	993.2	31.5	26.0	40.9	27.9	44.7	23.4	47.2 25	20.1 14	64	29.2	3.7	1.9	43.6	2.4	465.2	0.0	227.2	20	7.8
	988.1	38.7	26.2					1947	1971	36	23.8	3.9	2.0			1969			1969	
6	991.2	29.8	25.3	37.0	26.9	42.8	22.8	46.7 03	21.6 19	70	28.6	5.6	2.4	153.3	8.0	351.0	12.5	92.7	17	9.0
	987.0	34.9	26.3					1953	1961	52	27.2	5.9	3.4			1978	1948		1953	
7	991.4	27.2	24.7	32.6	25.0	36.3	22.6	40.6 07	20.5 21	81	29.1	6.5	3.4	260.2	12.9	494.0	47.6	299.7	10	7.6
	988.3	30.9	25.8					1966	1959	67	29.0	6.5	4.0			1956	1964		1954	
8	992.2	26.9	24.6	32.0	24.7	35.1	22.6	41.2 16	20.2 23	83	29.1	6.2	3.5	200.4	11.5	483.5	29.2	143.2	15	6.5
	988.9	30.1	25.7					1972	1961	70	29.4	6.4	4.0			1970	1941		1978	
9	994.4	27.1	24.8	32.7	24.5	35.9	22.3	37.6 22 *	20.6 30	82	29.5	5.3	2.6	184.7	9.0	413.9	34.9	177.4	07	4.5
	990.7	30.1	25.5					1977	1942	69	29.0	6.0	3.6			1975	1973		1968	
10	998.0	26.6	24.2	32.5	23.3	35.5	19.7	39.6 30	16.0 31	81	28.2	3.9	2.2	114.3	6.9	264.3	14.0	130.8	08	3.1
	994.4	29.8	24.3					1978	1974	63	26.0	4.9	2.8			1974	1957		1941	
11	1001.6	23.7	21.0	30.9	19.9	33.3	15.8	35.4 04	11.7 30	77	22.8	3.2	1.4	29.1	1.6	166.9	0.0	86.4	09	3.3
	998.0	28.6	21.7					1965	1941	54	20.6	3.6	1.9			1946			1946	
12	1003.6	20.8	18.4	29.9	17.1	32.0	13.5	34.6 01	9.7 13	78	19.3	2.5	0.9	4.9	0.4	57.0	0.0	33.0	13	3.0
	999.6	27.8	20.1					1972	1966	46	17.3	2.6	1.2			1969			1969	
YR	997.3	26.1	23.1	34.1	23.1	44.9	12.9	47.2	9.4	77	26.2	4.0	2.2	1031.6	55.7	1832.3	530.8	299.7		5.8
LY	993.2	32.1	23.9							51	23.3	4.1	2.3			1969	1952			
YRS	30	30	30	30	30	30	30	39	39	30	30	30	23	30	30	39	39	39		28
	30	30	30							30	30	30	23							

* Occurred More Than Once

STATION : Khammam 43137 .. contd

	Weather						Wind speed				% Wind Direction								Total Cloud					Low cloud						Visibility				
MN	PPT	HAIL	THUN	FOG	D.STM	SQUA	62	61	19	0	N	NE	E	SE	S	SW	W	NW	0	0	T-2	3-5	6-7	8	0	T-2	3-5	6-7	8	F8	<1	1-4	4-10	10-20	>20
1	0.5	0.0	0.1	1.7	0.0	0.0	0	0	15	16	6	3	29	10	3	1	0	1	47	17	4	4	4	2	23	3	2	2	1	0	1.4	5.2	5.5	18.1	0.8
							0	0	18	13	4	2	33	12	7	2	1	1	38	13	7	6	4	1	19	7	4	1	0	0	0.0	0.1	5.8	24.1	1.0
2	0.7	0.0	0.2	0.8	0.0	0.0	0	0	21	7	2	2	30	33	9	1	0	1	22	11	5	4	6	2	16	4	3	4	1	0	0.2	3.5	6.5	17.2	0.6
							0	0	19	9	5	2	27	17	11	3	5	2	28	13	7	5	3	0	18	6	3	1	0	0	0.0	0.0	4.1	23.2	0.7
3	0.8	0.0	0.3	0.1	0.0	0.0	0	0	28	3	1	2	29	39	18	1	0	0	10	11	4	6	8	2	15	4	5	6	1	0	0.0	3.4	5.9	21.6	0.1
							0	0	22	9	3	1	17	19	22	6	5	1	26	16	6	5	3	1	20	7	3	1	0	0	0.0	1.1	5.5	23.5	0.9
4	1.9	0.0	1.4	0.0	0.6	0.0	0	0	27	3	2	1	21	37	25	3	1	0	10	7	6	8	8	1	12	6	6	5	1	0	0.0	2.0	6.5	20.7	0.8
							0	0	21	9	3	1	17	20	22	5	4	1	27	10	6	8	5	1	15	9	4	2	0	0	0.0	0.7	4.3	22.8	2.2
5	3.4	0.0	2.5	0.0	1.2	0.0	0	0	26	5	6	1	13	22	18	8	13	5	14	7	5	7	8	4	16	5	5	3	2	0	0.0	1.8	5.7	22.0	1.5
							0	0	23	8	12	2	15	12	12	5	13	5	24	6	6	9	8	2	11	10	7	2	1	0	0.0	0.6	5.3	22.6	2.5
6	10.6	0.0	2.6	0.0	0.2	0.0	0	1	25	4	5	1	3	2	4	13	45	14	13	3	2	5	10	10	15	4	4	2	5	0	0.0	1.8	6.6	19.5	2.1
							0	0	24	6	10	0	7	2	8	12	37	7	17	1	2	7	11	9	7	8	8	3	4	0	0.0	1.1	5.5	21.4	2.0
7	16.2	0.0	1.0	0.0	0.0	0.0	0	0	26	5	2	0	1	2	5	20	47	9	14	1	1	4	10	15	11	3	7	3	7	0	0.0	3.1	7.7	18.1	2.1
							0	1	24	6	7	0	2	2	4	10	45	9	21	0	1	5	11	14	5	6	10	4	6	0	0.0	2.2	5.4	21.6	1.8
8	15.8	0.0	0.8	0.0	0.0	0.0	0	0	25	6	3	0	1	2	3	15	49	11	16	2	1	5	12	11	10	4	7	4	6	0	0.0	2.6	5.7	20.4	2.3
							0	0	22	9	10	1	2	2	2	8	39	10	26	1	1	6	12	11	6	6	10	4	5	0	0.0	2.6	4.7	21.9	1.8
9	11.8	0.0	1.7	0.0	0.0	0.0	0	0	20	10	9	1	4	1	6	10	29	8	32	3	3	7	10	7	12	6	6	3	3	0	0.1	1.8	5.8	20.4	1.9
							0	0	20	10	16	2	9	3	4	5	24	8	29	0	2	7	12	9	4	8	10	4	4	0	0.0	2.1	4.0	22.2	1.7
10	9.0	0.0	0.9	0.0	0.0	0.0	0	0	15	16	14	4	13	4	3	2	5	5	50	8	5	6	7	5	15	5	5	3	3	0	0.0	2.7	5.8	20.6	1.9
							0	0	17	14	14	6	23	4	3	2	3	2	43	5	3	8	10	5	9	8	8	3	3	0	0.0	1.8	5.5	22.4	1.3
11	2.3	0.0	0.4	0.1	0.0	0.0	0	0	14	16	17	5	20	3	1	1	1	3	49	8	6	6	7	3	20	4	3	2	1	0	0.0	4.5	5.3	19.6	0.6
							0	0	16	14	11	8	32	4	2	0	1	1	41	8	5	7	6	4	14	7	5	2	2	0	0.0	1.3	4.8	22.7	1.2
12	0.8	0.0	0.0	0.6	0.0	0.0	0	0	13	18	18	4	15	5	1	0	0	2	55	14	5	4	6	2	26	1	2	1	1	0	0.5	4.8	5.7	20.0	0.0
							0	0	15	16	6	6	34	3	2	0	1	1	47	13	6	6	5	1	21	5	3	1	1	0	0.0	0.4	5.8	24.5	0.3
YR	73.8	0.0	11.9	3.3	2.0	0.0	0	1	255	109	7	2	15	13	8	6	16	5	28	92	47	66	96	64	191	49	55	38	32	0	2.2	37.2	72.7	238.2	14.7
LY							0	1	241	123	8	3	18	8	8	5	15	4	31	86	52	79	90	58	149	87	75	28	26	0	0.0	14.0	60.7	272.9	17.4
YRS				26					25					27								25					25				25			
									24					26								25					25				25			

VOLUME - IIB

SECTION – C1

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF WORK

1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's / sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site as required on FOR site basis, demonstration test at vendor's works (as mentioned elsewhere in the specification) of **CHAIN PULLEY BLOCK** as per details in different sections / volumes of this specification for **1X800 MW KOTHAGUDEM TPS**

1.2 The equipment to be furnished by the bidder for the chain pulley blocks of different capacity and lift as specified in Annexure-I along with all accessories including mandatory spares and tools and tackles.

1.3 The chain pulley blocks offered shall have technical parameters as per the Data Sheet A enclosed herewith in section –C1 of Vol IIB

1.4 Any equipment/accessories not specified herein but required to make the equipment complete and efficient shall also be under bidder's scope of work.

The following shall be in the bidder's scope of work.

a. Chain pulley blocks with/without traveling trolleys as per the Annexure-I.
b. Maintenance Tools and Tackles as given at 4.0
c. Mandatory spares
d. Packaging.
e. O&M manuals, drawings and documents etc.
f. Inspection & testing of Chain Pulley Blocks as per QAP approved by BHEL /Customer during detail engineering. Prime inspection agency shall be BHEL / End Customer. Equipment being supplied shall be strictly in accordance with nomenclature & technical specification. Any additional testing requirement at any stage of inspection deemed necessary by Customer/BHEL shall be carried out without any commercial or technical or delivery implication.

2.0 TESTING AND INSPECTION

2.1 As per standard quality plan enclosed. Any additional inspection & testing requirement / CHP (customer's hold point) deemed necessary by customer/BHEL during detailed engineering shall also be complied with without any commercial or delivery implication.

2.2 Chain pulley block shall be completely assembled at manufacturer's works and minimum following tests shall be conducted at works

a. Over load test
b. Rated load test
c. Other tests as per IS-3832.

2.3 The scope of inspection shall include but not limited to the following:

i. Material identification / co-relation for important items like hook, load chain, hand chain, wheels, ratchet and pawl etc.
ii. Hardness for pawl and ratchet
iii. Dye penetration test/ UT test for hooks
iv. Operational test including operational effort, velocity ratio etc.
v. Proof load test upto 1.5 times of working load limit.
vi. Dimensional check of hook
vii. Marking

3.0 WORKS EXCLUDED

3.1 Supply of monorail for traveling trolley of chain pulley blocks.

4.0 MAINTENANCE TOOLS AND TACKLES

A complete unused one set of special maintenance tools & tackles and accessories along with detailed instructions for maintenance and manual operation shall be supplied. Tools shall be of suitable sizes for maintenance of Chain Pulley Block of each type and capacity. Each tool and wrench shall be stamped so as to be identified easy for its use and size. The tools shall be supplied in steel toolbox and with a copy of instruction manual. The items supplied shall be of the best quality, specially protected against rusting. The following shall be provided as minimum requirement.

i.	Adjustable spanner	One (1)
ii.	Wrench spanner	One (1)
iii.	Oil gun	One (1)
iv.	Set of Screw driver	Min 6 nos. (of different sizes suiting various types and capacities of Chain Pulley Blocks)
v.	2 lb hammer with wooden handle	One (1)
vi..	Grease Gun	One (1)

Note: All maintenance tools & tackles are to be supplied in a tool box.

Any other item required for maintenance shall also be provided.

5.0 **MANDATORY SPARES**: A complete unused and new set of mandatory spare parts shall be supplied. Each part shall be stamped so as to be identified, easy for it use. The items supplied shall be of the best quality and specially protected against rusting in tropical climate. The minimum requirement of mandatory spare parts is listed in Annexure –V, volume II-B of this specification.

6.0 DRAWINGS/DESIGN DOCUMENTS FOR SUBMISSION (during detailed engineering)

A. For Approval

a. G.A. drawing showing clearances, assembly, cross section details, materials of construction, lifts & approaches etc.
b. Quality plan
c. Test certificates & reports on various shop tests.

For details refer Volume IIB, Annexure IV

7.0 NO.OF DRAWINGS/DOCUMENTS FOR SUBMISSION DURING BID.

Refer Volume III.

8.0 DEVIATIONS

8.1 If the offer submitted has got any deviations from technical specification in the tender document. Bidder shall tabulate the same in the 'Deviation sheet (cost of withdrawal)" format furnishing full particulars of such deviations. Deviations are to be furnished with mention to specific clause numbers notes/ comments e.g. "Refer to forwarding letter" etc. is not acceptable. Cost of withdrawal of deviations to be put against each deviation.

8.2 Reasons/Explanations for such deviations shall be furnished.

9.0 FUNCTIONAL TESTS

9.1 The chain pulley blocks along with other accessories shall be guaranteed for the rated capacity. The minimum following tests shall be conducted at works – Overload test, rated load test and other tests as per IS-3832. Pull on the hoist and trolley shall not increase during full load operation.

9.2 The bidder shall have full responsibility for the safe and efficient operation of the chain pulley blocks and traveling trolley with associated accessories as a single unit.

9.3 If the shop performance tests indicate the failure of any of the components to achieve the functional performance, the deficiency shall be made good at bidder's cost.

9.4 Performance tests shall be carried out each time after the rectification modification is carried out.

10.0 MAKE OF SUB-VENDOR ITEMS

Refer annexure-III section C-3, Vol. IIB

11.0 PAINTING SPECIFICATION

As per attached painting specification in Annexure-II section C3, vol.-IIB of this volume.

12.0 PACKING

Refer general technical requirement.

13.0 DATA SHEET-A

1.00.0	Type	:	Hand operated chain pulley blocks
2.00.00	Capacity & Lift	:	As per Annexure I in Volume II B, Section C3
3.00.00	Design	:	IS: 3832
4.00.00	Duty Class as per IS: 3832	:	Class -II
5.00.00	Hoisting Mechanism		
a)	Type	:	Hand operated gear transmission
b)	Load Chain	:	
i)	Type	:	Link type
ii)	Material	:	T (8) as per IS: 6216
iii)	Conforms to (Std./Code):		IS: 6216
c)	Hand Chain	:	
i)	Type	:	Link type
ii)	Material	:	Mild steel (grade –L3) as per IS 2429 Part I
d)	Load Hook & Hook Block	:	
i)	Type of load hook	:	Plain shank- Trapezoidal section
ii)	Load hooks conforms to/Material:		IS: 1556o.

iii) Type of hook suspension : Swiveling

iv) Type of make of bearing : Thrust ball bearing of hook suspension

e) Gears / pinion :

i) Type : Spur / Helical

ii) Material : Alloy steel / carbon steel

iii) Type of bearing used : Antifriction ball bearing / Roller

f) Sprockets

i) Type of bearings used : Antifriction ball bearing / Roller

g) Method of lubrications Used

i) Bearings : Grease

ii) Gearing & Pinions : Grease

iii) Sprockets : Grease

h) Brakes :

i) Type : Screw and friction disc type

j) Effort on hand wheel : Shall not exceed 25 kgf.

6.00.0 Trolley & Bridge Drive

a) Trolley

i) Type : Geared (Manually operated)

ii) Material of frame : Rolled structural steel (IS:2062 Grade A or B)

b) Drive Chain

i) Type : Link type

ii) Material : Steel Gr.30

c) Trolley Wheel

i) Number of pairs of wheel in each trolley/bridge : Two/four

ii) Flange : Single flanged

iii) Wheel material : As per IS 3832

iv) Type of bearings need : Antifriction

d) Gears/ Pinions

i) Type : Spur / helical

ii) Material : Alloy/ Carbon steel

iii) Type of bearings used : Antifriction

e) Method of lubrication for

i) Bearings : Grease

ii) Sprockets : Grease

f) Load chain wheel

i) Material : As per IS 3832

g) Hand chain wheel

i) Material : As per IS 3832

	MANUFACTURER'S NAME & ADDRESS :	**MANUFACTURING QUALITY PLAN** **ITEM :** Chain Pulley Block **QP No.:** PE-TS-410-563-A101 **REV**.:0, **Date.: 20.07.15, PAGE**: 1 OF 4	**PROJECT :** **1X800 MW KOTHAGUDEM TPS,** **PACKAGE : chain pulley blocks** **VOL IIB, SEC C-1**

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY M	AGENCY C	AGENCY N	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.		10.			11.
1	**RAW MATERIAL & B/OUT ITEMS:**												
1.1	HOOKS	DIMENSIONS, CHEMICAL COMPOSITION. IDENTIFICATION & COMPLIANCE WITH TC. MECHANICAL, PHYSICAL PROPERTIES	MA MA MA	LAB ANALYSIS HARDNESS MECHANICAL PROPERTIES	One sample PER LOT	IS: 15560 Gr. M OR APPD. DRAWING	IS: 15560 Gr. M or APPD. DRG.	MFR's T.C.	✓	P	V	V	
1.2	LOAD CHAIN	- DIMENSIONS - BREAKING STRENGTH - PROOF LOAD	MA MA MA	MEASUREMENT -TENSILE TEST -TENSILE TEST	100 % 100% 100%	IS: 6216 OR APPD. DRAWINGS	IS: 6216 & APPD. DRGS.	MFR'S TC	✓	P	V	V	
1.3	RAW MATL. FOR GEAR/ RATCHET PAWL / RATCHET WHEEL	CHEMICAL COMPOSITION MECHANICAL	MA MA	LAB ANALYSIS HARDNESS	ONE SAMPLE PER LOT	BS 970/ DIN 17210/SAE/ IS	En 9 / En 3A 16MnCr5 /16Mn5Cr4	TC TC	✓ ✓	P P	V V	V V	TC or inspection report for components shall be given.

	LEGEND:	FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR SUB-CONTRACTOR	** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION		
SIGNATURE		REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL

	MANUFACTURER'S NAME & ADDRESS :	**MANUFACTURING QUALITY PLAN** **ITEM :** Chain Pulley Block **QP No.:** PE-TS-410-563-A101 **REV**.:0, **Date.: 20.07.15, PAGE**: 2 OF 4	**PROJECT :** **1X800 MW KOTHAGUDEM TPS,** **PACKAGE : chain pulley blocks** **VOL IIB, SEC C-1**

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										M	C	N	
1.	2.	3.	4.	5.	6.	7.	8.	9.		10.			11.
1.4.	LOAD CHAIN WHEELS	- CHEMICAL COMPOSITION PHYSICAL PROPERTIES	MA MA	CHEMICAL MECHANICAL PROPERTIES	ONE SAMPLE PER LOT	IS 1865 OR APPD. DRG.	Gr 500/7 OR APPD. DRG.	MFR'S TC	✓	P	V	V	
1.5	BEARINGS	MAKE, TYPE, CATALOUGE NO.	MA	VISUAL	RANDOM	APP DRG / MFR"S CATALOGUE	APP DRG / MFR"S CATALOGUE	IR	✓	P	V	V	
1.6	HAND CHAIN WHEEL	CHEMICAL PHYSICAL PROPERTIES	MA	CHEMICAL MECHANICAL PROPERTIES	ONE SAMPLE PER LOT	AS PER DRAWING	AS PER DRAWING	IR/TC	✓	P	V	V	
1.7	HAND CHAIN	GRADE/ DIMENSION	MA	GRADE DIMENSION	ONE SAMPLE PER LOT	AS PER DRAWING	AS PER DRAWING	IR/TC	✓	P	V	V	
1.8	TROLLEY GEARS, PINION,WHEELS, AXLE	CHEMICAL & MECHANICAL	MA	LAB ANALYSIS,	100%	APPVD DRGS	APPVD DRGS	IR/TC	✓	P	V	V	
2	**IN PROCESS**												
2.1	HOOKS	-PROOF LOAD, -DPT /MPI AFTER P / LOAD	MA MA MA	LOAD TEST DPT/MPI UT	100 % 100 % 100%	IS:15560 ASTM E165 ASTM A388	IS:15560 NO DEFECT 20% DF Max., 80% BWE Min.	IR IR IR	✓ ✓ ✓	P P P	V V V	V V V	-UT FOR SHANK IF DIA. > 50 MM)

	LEGEND: ** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION	FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR SUB-CONTRACTOR SIGNATURE		REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL

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Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										M	C	N	
1.	2.	3.	4.	5.	6.	7.	8.	9.		10.			11.
2.2	RATCHET PAWL / RATCHET WHEEL	-HARDNESS -SURFACE CRACK	MA MA	HARDNESS DPT	100% 100 %	IS:3832/ APPD DRG. ASTM E165	IS:3832/ APPD. DRG. NO DEFECT	IR IR	✓	P P	V V	V V	
2.3	GEARS AND PINIONS	SURFACE HARDNESS HEAT TREATMENT, SURFACE CRACK, CASE DEPTH	MA	HARDNESS HT CHART, DPT FOR SURFACE CRACK	RANDOM ASTM E 165 FOR DPT	MFG STANDARD NO DEFECT	MFG STANDARD	IR IR	✓ ✓	P P	V V	V V	HT Chart to be provided
3.0	**FINAL INSPECTION**												
3.1	COMPLETE ASSEMBLY	OVERALL DIMENSION PROOF LOAD TEST LIGHT LOAD TEST HEIGHT OF LIFT SWIVELING OF HOOK EFFORT	MA CR MA MA MA MA	MEASUREMENT LOAD TEST LOAD TEST MEASUREMENT VISUAL PULL ON CHAIN	100 % 100% 100% 100% 100 % 100%	IS:3832 /APPD DRG -DO- IS 3832 Cl NO 9.3.1 -DO- -DO- -DO-	IS:3832 /APPD DRG No cracks, flaws & other defects IS 3832 -DO – -DO- -DO-	IR IR IR IR IR IR	✓ ✓ ✓ ✓ ✓ ✓	P P P P P P	W W W W W W	V V V V V V	
3.2	PAINTING	-CLEANING - SHADE & DFT OF PAINT (Blue / Black)	MA MI	VISUAL VISUAL	AT RANDOM AT RANDOM	APPROVED DRAWING/ **SPECIFICATION**	APPROVED DRAWING/ **SPECIFICATION**	IR IR		P p	--- W	--- ---	

	LEGEND:	FOR CUSTOMER USE	
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SIGNATURE		REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL

	MANUFACTURER'S NAME & ADDRESS :	**MANUFACTURING QUALITY PLAN** **ITEM :** Chain Pulley Block **QP No.:** PE-TS-410-563-A101 **REV**.:0, **Date.: 20.07.15, PAGE**: 4 OF 4	**PROJECT :** **1X800 MW KOTHAGUDEM TPS,** **PACKAGE : chain pulley blocks** **VOL IIB, SEC C-1**

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									M	C	N	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.			11.
3.3	NAME PLATE	VERIFICATION	MA	VISUAL	100%			IR		P	V	---	
3.4	PACKING	-VERIFICATION	MI	VISUAL	100%	SPECS.	SPECS.	IR		P	---	---	
3.5	REVIEW OF QA DOCUMENTATION	VERIFICATION	MA	VISUAL	100%	APPD. QP	APPD. QP		✓	V	V	V	

CR – CRITICAL, MA – MAJOR , MI – MINOR

NOTE: BACK WALL ECHO SHALL BE ADJUSTED TO 100% OF FULL SCREEN HEIGHT IN SOUND (DEFECT FREE) AREA. DEFECT ECHO HEIGHT MORE THAN 20% OF SCREEN HEIGHT SHALL BE TREATED AS UNACCEPTABLE. BACK WALL ECHO SHALL NOT BE LESS THAN 80% OF SCREEN HEIGHT IN ANY CASE.

NOTE 2: RECORDS IDENTIFIED WITH TICK SHALL BE ESSENTIALLY INLCUDED IN QA DOCUMENTATION.

	LEGEND:	FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR SUB-CONTRACTOR	** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION		
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VOLUME - IIB

SECTION – C2

CUSTOMER SPECIFICATION – GENERAL REQUIREMENTS

MISCELLANEOUS HOISTS

1.00.00 GENERAL INFORMATION

1.01.00 The hoists will be used for erection and maintenance of various equipment in different buildings.

1.02.00 Hoists are divided into two separate groups - (a) Hand operated and (b) Electric operated.

2.00.00 CODES AND STANDARDS

The design, manufacture and testing of the equipment covered under this specification shall conform to the latest editions of the following Indian Standards:

2.01.00	IS : 3832	:	Specification for Hand Operated Chain Pulley-blocks.
2.02.00	IS : 807	:	Code of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of Cranes and Hoists.
2.03.00	IS : 6216	:	Short link Chain, Grade T(8) for Pulley-blocks & other Lifting Appliances.
2.04.00	IS : 4164	:	Lifting 'C' Hooks with Eye Capacity upto 25 tonnes.
2.05.00	IS : 2429 (part -I)	:	Non-calibrated Load Chain for Lifting Purposes.
2.06.00	IS : 3938	:	Specification for Electric Wire Rope Hoists. and other Indian Standards referred to in the above standards.

3.00.00 SCOPE OF WORK

3.01.00 Hoists shall be provided in all areas where any equipment/component weighing above 500 kg is installed and needs to be handled for maintenance purposes. Number of monorail beams shall be such that the centre line of the hoist and the centre line of equipment to be handled shall be not more than 500 mm.

3.01.01 The location and no. of hoists is to be finalised during detailed engineering. Final arrangement is subject to approval of Owner/Consultant.

3.01.02 Monorail hoists shall at least be provided in the areas mentioned in Annexure-I. The list is indicative only and not an exhaustive one.

3.02.00 All drive motors and driving gears as necessary.

3.03.00 Limit switches for electrical hoist as necessary.

3.04.00 Trailing cable with all supporting fixtures as necessary for electric hoists.

3.05.00 Pendent control station with all accessories for electric hoists.

3.06.00 Lifting lug, eye bolts etc., for handling hoist parts.

3.07.00 Protection guard as specified.

3.08.00 Lifting hook block assembly for hoists.

4.00.00 **SPECIFIC DESIGN REQUIREMENTS**

4.01.00 Lifting capacity

4.01.01 Capacity of each hoist shall be 1.2 times the maximum working load.

4.01.02 Hoists of capacity upto 5 tones shall be manual hoists.

Hoists of capacity above 5 tones shall be electric hoists.

4.02.00 **Effort for Mechanical Hoists**

4.02.01 Hoisting

Hoisting effort for hoists upto 3 tones capacity shall not be more than 20 kg.

Hoisting effort for hoists above 3 tones capacity shall not be more than 25 kg

4.02.02 Trolley Motion

Effort for trolley motion for hoists upto 3 tones capacity shall not be more than 15 kg.

Effort for trolley motion for hoists above 3 tones capacity shall not be more than 20 Kg.

4.02.03 For Electric operated hoist both hoisting and trolley motion shall be motor operated.

4.03.00 **Lift**

4.03.01 Lift above operating floor

Highest position of the hook shall be such that during operation of hoists, the vertical distance between bottom of any equipment handled and top of any permanent structure or equipment in the operating area shall be at least one metre.

4.03.02 Approach below operating floor

To be decided by the Bidder for safe and reliable handling of any equipment above half ton below the operating floor.

4.04.00 **Length of Monorail Hoist**

To be decided by the Bidder depending on the floor and machine layout. The horizontal distance between the centre line of the hoist and centre line of any installed equipment in its operating shall not be more than half metre.

5.00.00 **DESIGN AND CONSTRUCTION**

5.01.00 All parts requiring replacement or lubrication shall be easily accessible without the need for dismantling of other equipment and structures.

Robust construction and ample rating merging which experience has shown to be necessary shall be ensured throughout manufacture.

5.02.00 All components of hoists of identical capacity and duty shall be interchangeable. The hoists of identical capacity and duty shall be identical in all respects unless otherwise required. The hoist design shall be such that these can be quickly removed from one monorail beam and fixed on another beam without disassembling major components.

5.03.00 All machinery and equipment included under this specification must be equipped with safety devices and clearances to comply with recognized standards and specification requirements.

5.04.00 Cast iron parts wherever used, shall conform to IS:210 - FG 260. Also no wood or other combustible materials shall be used.

5.05.00 Defects in material like fractures, cracks, blowholes, laminations, pitting etc. are not allowed. Rectifications of any such flaw is permissible only with the approval of the Purchaser.

5.06.00 Each hoist shall be permanently and legibly stamped with the tag number, manufacturer's name, safe working load, grade of load chain (where applicable), range of lift etc.

5.07.00 Load chain (where applicable) shall be of grade T(8) as per IS:6216 and Hand chain shall be as per IS:2429 (Part-I) grade 30.

5.08.00 Wheels in trolley unit travel shall be single flanged with straight/tapper/barrel shaped tread to suit the monorail. Wheels should be preferably of forged steel construction. Material of construction for wheels of traversing block and hoist gear for hoist used in hazardous areas shall be of non-ferrous material to avoid spark during operation.

5.09.00 All gears shall be hardened and tempered steel with machine out teeth.

5.10.00 **Hoist (Manually Operated)**

5.10.01 Manually operated hoists shall be of spur gear chain pulley block type. It shall be suspended from the trolley by a hook. The design of the hoist shall conform to IS:3832 (Specification for hand operated chain pulley blocks). The hooks and brakes of hoist shall conform to the requirements stipulated in (a) and (b) below

a) Hooks shall conform to and IS:3832. The load hook shall be swievelling type fitted with a locking device.

b) The pulley blocks shall be fitted with an automatic mechanical load brake to prevent self lowering of load in all working positions. The load brake shall also allow smooth lowering of load without serious overheating.

c) All manually operated hoists, unless stated otherwise, shall be trolley suspended type.

5.10.02 The trolley of hoists shall be manually operated.

5.10.03 The hoists shall be of Mechanism class 2 as per IS:3832.

5.11.00 **Electric Hoist**

5.11.01 Electric hoist shall be electric wire rope trolley suspended type. The design, operation, testing of electric hoist shall conform to IS:3938 (Specification for electric wire rope hoist).

Minimum speed for hoisting shall be 3 m/min. and that of for trolley motion shall be 15 m/min.

5.11.02 Lifting hook shall conform to IS-4164 as applicable.

5.11.03 Wire rope for hoists shall conform to IS-2266.

5.11.04 Electro-mechanical brakes of fail to safety type shall be provided for hoist motion as well as per trolley motion for electrically driven trolley. Load brake shall allow smooth lowering of load and arrangement shall be such as it can not be released accidentally. Capacity of brake and other relevant data shall conform to IS:3938.

5.14.09 Transformers to step down the voltage and rectifiers as necessary shall be provided by the Bidder.

5.14.10 All external and internal power, control and auxiliary circuit wiring of the electrical drive and accessories and panels shall be provided. The wiring shall be done with 1100 V grade PVC insulated stranded aluminium conductor cable of suitable size not less than 2.5 sq.mm nominal equivalent copper area of cross-section. All control and auxiliary circuit wiring shall be done with 1100 V grade PVC insulated, 2.5 sq.mm stranded copper conductor. Control wire terminations to the panels shall be made with compression type connectors. Multiway terminal blocks shall be furnished for terminating panel wiring and outgoing cable.

5.14.11 The hoist structure, motor frame and metal cases of all electrical equipment including metal conduit shall be effectively connected to earth. All grounding materials shall be supplied under this specification to grounding risers.

5.14.12 Single speed control shall be used for both hoist and trolley travel in each direction of motion.

6.00.00 INSPECTION AND TESTING

6.01.00 The manufacturer shall conduct all tests required to ensure that the equipment furnished shall conform to the requirements of the specification and in compliance with the requirements of the latest edition of IS:3832 or equivalent standards for manually operated hoists and shall be as per IS:3938 for electrically operated hoist.

6.02.00 All the mono-rail hoists shall also be tested at site as per the stipulation of relevant Indian Standards.

7.00.00 DRAWINGS, DATA AND INFORMATION

7.01.00 General arrangement drawings incorporating all dimensions information on head rooms, lift, wheel loads, hook suspension arrangement and other relevant data for all the hoists.

7.02.00 For Mandatory Spares, Spares required for erection and commissioning, Recommended Spares, Special Tools And Tackles, fixtures etc., as required for regular operation and maintenance of the equipment offered and supply of first charge of lubricating oil, inhibitor oil and also adequate quantity of the consumables, please refer Technical Specification Volume-II A.

7.03.00 Design calculation for selection of electric motor capacities for electric hoist.

7.04.00 Complete list of location, number and capacity of hoists provided.

GENERAL TECHNICAL REQUIREMENTS (AS APPLICABLE)

1.00.00 **CODES AND STANDARDS**

1.01.00 Except where otherwise specified, the Plant shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as listed in the annexure to this Section and mentioned in detailed specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary; to enable the Owner to identify all of the Plant in the same detail as would be possible had there been a Standard Specification.

1.02.00 Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.

1.03.00 The plant will be designed in compliance with applicable National and International Codes and Standards such as ASME, ASTM, DIN, BS, IEC, IEEE, IS, etc. Wherever specified or required the Plant shall conform to various statutory regulations such as Indian Boiler Regulations, Indian Explosives Act, Indian Factories Act, Indian Electricity Act, Environmental Regulations, etc. Wherever required, approval for the plant supplied under the specification from statutory authorities shall be the responsibility of the Contractor.

1.04.00 In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements, which are more stringent, shall govern.

1.05.00 In case of any change of code, standards and regulations between the date of purchase order and the date the Contractor proceeds with manufacturing the Owner shall have the option to incorporate the changed requirements. It shall be the responsibility of the Contractor to advise Owner of the resulting effect.

1.06.00 Successful Bidder to furnish two (2) sets of latest of national/inter-national codes and standards to owner.

2.00.00 **RESPONSIBILITY FOR DESIGN**

2.01.00 The Contractor shall assume full responsibility for the design of the whole and every portion of the Plant, whether or not the design work was undertaken specifically in relation to the Contract and whether or not the Contractor was directly involved in the design work.

2.02.00 Notwithstanding the Owner's wish to receive the benefits of new, advanced and improved technologies, a prime requirement is that all the systems and components proposed shall have been already adequately developed and shall have demonstrated good reliability under similar, or more arduous conditions elsewhere, at least for continuous 2 years in two different power station.

2.03.00 The successful bidder shall have to carry out surge analysis, BFP transient analysis and other transient condition studies as may be necessary and as required by the Owner as per proven engineering practice.

2.04.00 The Bid shall include a detailed discussion on the development status of, and the reasons for any changes made in proposed systems or components for the Plant, as compared with similar items previously supplied in other installations cited by the bidder as reference plants.

2.05.00 The Bidder may also make alternate offers, provided such offers are superior in his opinion in which case adequate technical information, operating feed back, etc. are to be enclosed with the offer, to enable the Owner to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumptions, etc. shall be clearly brought out to the Owner to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications i.e. Base offer shall be as per the technical specifications and the same will be considered for techno-commercial evaluation.

3.00.00 NAME PLATES (RATING PLATES)

3.01.00 Instruction plates, name plates or labels shall be permanently attached to each main and auxiliary item of plant in a conspicuous position. These plates shall be engraved with the identifying name, type and manufacturers serial number, together with the loading conditions under which the item of plant has been designed to operate.

3.02.00 Items such as valves, etc. which are subject to hand operation, shall be provided with nameplates so constructed as to remain clearly legible throughout the life of the plant giving due consideration to the difficult climatic conditions to be encountered. Nameplates shall be securely mounted where they will not be obscured in service by insulation, cladding, actuators or other equipment. Direction of flow is also to be engraved.

3.03.00 All trade nameplates and labels shall be in English language. All measurements shall be in M.K.S. Units.

3.04.00 The size and location of nameplates shall be subject to Approval of the Engineer.

4.00.00 SAFETY AND SECURITY

4.01.00 The design shall incorporate every reasonable precaution and provision for the safety of all personnel and for the safety and security of all persons and

property. The design shall comply with all appropriate statutory regulations relating to safety. All structures and equipment shall be designed and constructed to withstand every foreseeable static and dynamic loading condition, including loading under earthquake conditions, with an adequate margin of safety.

4.02.00 Ready and safe access with clear head room shall be provided to all parts of the plant for operation, inspection, cleaning and maintenance.

4.03.00 Escape routes and clear ways shall be provided to allow speedy evacuation of the plant in the event of fire or explosion, and the plant layout shall allow for ease of access to all parts of the Works by rescue and fire fighting teams. The plant layout shall be designed to localise and minimise the effects of any fire or explosion. The recommendations of NFPA, OSHA, and TAC etc. as necessary shall be followed in all respects.

4.04.00 The use of corrosive, explosive, toxic or otherwise hazardous materials shall be kept to a minimum during construction and the design of the plant shall minimise the requirement for such materials during operation and maintenance. Where such materials must be used, all necessary precautions shall be taken in the design, manufacture and layout of equipment to minimise the resulting hazard, and all equipment necessary for the protection and first-aid treatment of personnel in the event of accidents shall be provided. Particular attention is drawn to avoid the use of materials containing asbestos in any form.

5.00.00 GUARDS

5.01.00 Effective guards and fences must be provided to prevent injury to operators through accident or malpractice.

5.02.00 Mesh guards which allow visual inspection of equipment with the guard in place are generally preferable. The guards shall be constructed of mesh attached to a rigid framework of mild steel rod, tube, or angle and the whole galvanised to prevent loss of strength by rusting or corrosion. The guards shall be designed to facilitate removal and replacement during maintenance.

5.03.00 All drive belts, couplings, gears, sharp metallic edges and chains must be safely guarded. Any lubricating nipple requiring attention during normal running must be positioned where they can be reached without moving the guards.

5.04.00 Guards for couplings and rotating shafts shall be in accordance with BS 5304-1975 or similar approved standard. All rotating shafts and parts of shafts must be covered.

5.05.00 Suitable fencing shall be provided to enclose all openings or doorways used for the hoisting and lowering of machinery etc. This fencing must be securely fixed but quickly detachable when required. A secure hand hold must be provided on each side of the opening or doorway.

6.00.00 LOCATION AND LAYOUT REQUIREMENTS

The majority of plant and equipment (excluding steam generator and some other auxiliaries) shall all be of indoor installation. A broad list of buildings housing such equipment is given elsewhere in this specification. Layout should facilitate access for operation-maintenance and inspection of any one or more equipment/components at a time without disturbing the operation or installation of rest of the plant. Further, Bidder should comply with the criteria given under the various equipment and system specifications as well as those stipulated in Annexure-II attached to this section.

Enclosed General Layout and other tender layout drawings show the location of major installations and auxiliary buildings. The Bidder shall try to retain these locations as far as practicable. The layout of equipment within the power house as shown in the tender drawings is indicative. The Bidder may, subject to Owner's approval alter the same to suit the space requirement of the equipment offered.

Bidder may give as an alternative his own preferred layout clearly indicating the advantages and other implications, if any. Such alternative will not be considered for evaluating the bid, but may be considered with the successful Bidder if Owner/Engineer finds the proposal more attractive in terms of techno-economic consideration.

While developing the layout of buildings the following criteria shall be given effect :

a) The minimum width of clear access corridors around equipment shall be 1.2 meter.

b) Each building shall have an identified vacant space for equipment unloading and maintenance and preferably a separate bay altogether in buildings housing heavy equipment. Provision for handling equipment by monorail hoist and/or overhead crane shall be made as specified.

c) The minimum clear height available between two consecutive floor slabs shall not be less than five (5) meters. A clear head room of 2.5m shall be maintained between the floor and any overhead piping/ cables or other obstruction. Adequate provision for natural ventilation and illumination shall be made as per good engineering practices.

d) There shall be at least two (2) nos. main access doors, one on either side of each building, of which one shall be minimum 3 meters wide with rolling shutters for equipment entry. For multistoried buildings, at least two (2) nos. regular staircases diagonally opposite to each other shall be provided connecting all the floors and roof. These minimum requirements shall be augmented as required depending on the floor area, statutory requirements and TAC recommendations.

e) All buildings shall have provision for toilet and associated effluent discharge system together with facility for drinking water. The criteria for ventilation, fire protection and illumination of building spaces specified

elsewhere in this specification shall be complied with.

f) All rail/road crossings for pipe/cable racks shall be done with minimum 8 meters headroom from top of rail/road to bottom of rack. Similarly top cover over underground pipes/cables shall be minimum one (1) meter. For other detail refer to Annexure-II.

g) Cubicle for operating personnel shall be located at safe place near the equipment.

h) Interplant cable routing will be on overhead cable trays on pipe cum cable trestle or on cable trestle except where approved by purchaser/consultant. In exceptional case, small stretch of outdoor run of interplant cable routing may be taken through cable trench only with the Employer's prior approval.

i) Concept of various mechanical and electrical equipment location and building dimensions (including column-row spacing) as shown in Plot Plan/Floor Plan drawing are to be adhered to. Any departure from this suggestive layout is primarily not recommended.

7.00.00 OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS

7.01.00 Equipment/works offered shall be designed for high availability, high reliability, low maintenance and ease of operation & maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability, availability, operability and ease of maintenance. He shall also furnish details of availability records in plants stated in his experience list.

7.02.00 Ample space for ease of operation and maintenance including equipment removal, tube bundle/cartridge/rotor pulling etc. shall be provided. All valves, gates, dampers and other devices shall be located and oriented in such a way that they are accessible from operating floor levels. Where this cannot be adhered to, platforms and walkways with access ladders shall be provided to facilitate operation and maintenance.

7.03.0 Motorised lifting devices, i.e. hoists, chain pulleys, jacks, etc. shall be provided for handling and carrying out maintenance of any equipment and/or part having weight in excess of 3000 Kg. Suitable beams, hooks etc. for this purpose shall be provided in the buildings.

No lifting arrangement is necessary for part having weight less than 500 Kg. Hoist shall be well protected by environment. Suitable painting and coating covering hoist at outdoor shall be provided.

Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist/crane shall be provided by the Bidder for lifting the equipment, accessories covered under this specification.

7.04.00 All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same material and workmanship as the corresponding parts of the equipment. Where feasible common

components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 MATERIALS

8.01.00 In selecting materials of construction of equipment, the Contractor shall pay particular attention to the atmospheric conditions existing at the Site and the nature of material/fluid handled. Wherever deviations are taken in respect of materials specified, the reasons shall be spelt out clearly in the proposal.

All materials shall be new, and shall be of the quality most suited to the proposed application.

8.02.00 In as far as is possible; materials shall be in accordance with Indian or international standard specifications and shall be used in accordance with Indian or international codes of practice. Where such standards or codes of practice are not available sufficient information shall be provided to allow the Owner to assess the suitability of the material for the particular application.

All materials used shall have performed lengthy satisfactory service in similar or more arduous conditions to those proposed by the Contractor.

8.03.00 All parts which could deteriorate or corrode under the influence of the atmospheric, meteorological or soil conditions at the Site, or under the influence of the working conditions shall be suitably and effectively protected so that such deterioration or corrosion is a minimum over the life of the plant.

9.00.00 LUBRICATION

9.01.00 Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.

9.02.00 Non ferrous capillary tubing shall be used throughout.

9.03.00 Gear boxes and oil baths shall be provided with filling and drain plugs, both of adequate size. An approved means of oil indication including level switches and temperature indication shall be provided.

9.04.00 All high speed gears shall be oil bath lubricated. Low speed gears shall be lubricated by means of soft grease. Removable and accessible drip pans shall be provided to collect lubricant which may drop from operating parts.

9.05.00 All lubrication points shall be conveniently situated for maintenance purposes. It must be possible to carry out lubrication from a gangway or landing and without the removal of guarding or having to insert the hand into it. Where accessibility to a bearing for oiling purposes would be difficult a method of remote lubrication shall be fitted.

9.06.00 The Contractor shall supply grease gun equipment suitable to service each type of nipple fitted.

10.00.00 **LUBRICANTS AND CONTROL FLUIDS**

10.01.00 The Contractor shall provide a detailed and comprehensive specification for all lubricating oils, greases and control fluids required for the entire plant. A sufficient supply of these shall be provided by the Contractor for initial commissioning, first fill and till COD of the unit.

10.02.00 The Contractor shall supply a detailed schedule giving the lubricant testing, cleaning and replacement procedures. All equipment and facilities necessary for the testing, cleaning and changing of lubricants and control fluids shall be provided. The Contractor shall endeavor to reduce the varieties and grades of required lubricants and control fluids to a minimum, matching them where possible to those already in use in the generating station in order to simplify procurement and minimise storage requirements. All lubricants and control fluids shall be of internationally recognised standards and shall be easily obtainable from a large number of Indian suppliers. Bidder shall also indicate the equivalent Indian Standard for the above for easy procurement in future.

10.03.00 No lubricant or control fluid shall have toxic or other harmful effects on personnel or on the environment.

11.00.00 **OPERATION AND MAINTENANCE**

11.01.00 The plant shall be designed and constructed so that operation and maintenance manpower requirements are minimised.

The design and layout shall facilitate inspection, cleaning, maintenance and repair. The importance of continuity of operation is second only to that of safety.

11.02.00 Spare parts for equipment shall be interchangeable with the original components and, so far as possible, be of common design and manufacture.

11.03.00 All similar standard components/parts of similar standard equipment provided shall be interchangeable with one another. Further identical equipments shall be provided for similar duties so that the same are interchangeable with one another in totality and component wise.

11.04.00 All heavy parts (500 Kg and above) must be provided with a convenient arrangement for slinging and handling during erection and overhaul. Any item of plant normally stripped or lifted during periods of maintenance and weighing one tonne or above, shall be clearly marked with its weight.

11.05.00 On completion of commissioning, a complete set of tools for the maintenance of the entire plant shall be provided by the Contractor. This shall include all necessary spanners, special wrenches, extraction equipment and any special tools reasonably required by the Engineer. Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

11.06.00 All equipment and major valves should be provided with adequate maintenance approach and facility.

12.00.00 PLANT LIFE AND MODE OF OPERATION

The complete plant including all the equipment and systems individually and collectively shall be designed for continuous operation for an economic service life of thirty (30) years under the prevailing site conditions and for the type of duty intended.

The critical components of the Steam Generator, Turbine-Generator and Auxiliary equipment, the life of which is limited by time and temperature dependent mechanisms such as thermal stress, creep and low cycle fatigue, are to be designed considering expected (hot, warm and cold) start-up, shut-down and cyclic load variations.

The allowable stresses shall be reduced so that life expectancy to minimum 2,00,000 hours of operation can be achieved. The Bidder shall discuss this aspect in his technical proposal.

The unit would be operated on base load with cyclic load variation. The load variation is expected to be as per schedule depending on power demand.

The expected start-ups should be considered as minimum
(Based on HPT metal temperature)

Cold start-up (>72 hrs. shutdown)	:	6 per year
Warm start-up (between 10 to 72 hrs. of shutdown)	:	40 per year
Hot start-up (less than 10 hrs. shutdown)	:	160 per year

13.00.00 PACKAGING & MARKING

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials, the limitations from the point of view of availability of railway wagon sizes in India should be taken account of. The details of various wagons normally available with Indian Railways for transportation of heavy equipment shall be considered by the Bidder. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

As per the information available, the dimensions of OD consignment for transportation of the equipment by rail (if any equipment to be handled through rail transportation) are as below :

a)	Width of the Package (from centre-line of rails - 1.6 metres on both sides)	:	3.2 Meters
b)	Height of the package from rail top	:	4.47 Meters

The above indicates the dimensions which can be normally transported on the

wagons without infringement of the "moving gauge". This is however not indicative of the consignment which can be carried out with infringement of "moving gauge" duly authorised and approved by the Indian Railways. There may be difference between the "moving gauge" and the "fixed structure gauge" and consignments infringing the "moving gauge" can be moved after investigation regarding possible infringement with the fixed structures. As the critical fixed structures in each route are different, consignments infringing moving dimensions have to be individually investigated to select a route and also determine the restrictions under which such movement is to be carried out. Such routes selected or other mode of transport envisaged is to be clearly brought out in the proposal wherever transport of over dimensional equipment is involved.

Bidder to consider unloading of material delivered through rail transportation, at near by railway station/ site unloading siding. The subsequent transportation up to project work place shall be considered by road only. All unloading and handling equipment both at railway station siding and at project site shall be arranged by the Bidder. Necessary arrangement to be organized with the railway authority for such purpose shall also be under the scope of services of the Bidder. Bidder may consider entire material delivered up to site through rail transportation only.

The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement. Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

For imported equipment and material, suitable port facilities may be used in which case material may be transported from the port by tractor-trailer. Bidder may consider this aspect.

14.00.00 PROTECTION

Equipment having antifriction or sleeve bearings shall be protected by weather-tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces that are damaged shall be repainted.

Electrical equipment, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound as specified above and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors.

All piping, tubing and conduit connections on equipment and other equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of

piping, tubing and conduit shall be sealed and taped.

Returnable containers and special shipping devices shall be returned by the manufacturer's field representative at the Contractor's expense.

15.00.00 ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT

15.01.00 Environment Protection

The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Bidder to restrict pollution from the liquid effluent and stack emission within the limits as given below with due consideration of Environment (Protection) Rules 1986 as amended till date.

In case the Ministry of Environment & Forest stipulate any other conditions not specified hereunder while clearing the project shall be complied with the plant by the contractor.

15.01.01 For Liquid Effluent

a) Provision laid down in schedule-I for Thermal Power Plants and also in Schedule-VI. General Standards for discharge of Environmental pollutants Part-A : Effects of Environmental (protection) Rules 1986, as amended till date.

b) Any specific requirement of State Pollution Authorities over and above the above stipulation.

15.01.02 For Air Emission

a) Suspended Particulate Matter i.e. dust burden at chimney outlet - Maximum 50 mg/Nm^3 (with worst coal and one field out at TMCR).

b) NO_x - 365 ppm Max. or 750 mg/Nm^3 (Equivalent NO_2).

c) SO_2 - Concentration based standard 2000 mg/Nm^3. Load based standard 0.2 metric tonne /MWe/day (for first 500 MW and 0.1 metric tonne/MWe/day for rest of the capacity above 500 MW)

In absence of Indian Standard for emission from power plants as on date, for certain gaseous effluents, the internationally accepted World Bank Standard is to be followed. Indian Standard for emission of power plants are under formulation. Should this standard is published before finalisation of the contract, the bidder has to comply the more stringent of the above norm or the new Indian Standard.

The bidder shall include in his scope all necessary equipment and measuring instruments to comply with above requirements. Location and accessibility of the instruments shall be properly coordinated.

15.02.00 **Noise Level Requirement**

The plant will be designed, constructed and provided with suitable acoustic measures to ensure the noise level criteria as per the following stipulations.

a) Maximum noise level shall not exceed 85 dB (A) when measured at 1.0M away from the noise emission source.

b) Maximum noise level from its source within the premises shall not exceed 70 dB (A) as per Environment (Protection) Rules 1986, Schedule-III, `Ambient Air Quality Standards' in respect of noise.

c) Any statutory changes in stipulations regarding noise limitation that may occur in future according to State Pollution Control Board or Central pollution Control Board or Ministry of Environment & Forest regulation during tenure of the contract, the contractor shall comply with the requirement.

An exception will be made for the plant at startup operations and other big pressure reducing devices operating during emergency periods and for the safety valves.

16.00.00 **INSPECTION AND TESTING**

16.01.00 **Inspection and Tests during Manufacture**

16.01.01 The method and techniques to be used by the Contractor for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner prior to the Award of Contract.

16.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.

16.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.

16.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Contractor may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.

The Contractor shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Distribution of six (6) copies of Test Certificates for approval will be two(2) copies to owner and four(4) copies to consultant. These four(4) copies will be further distributed by consultant after approval to owner, site and bidder. One copy will be retained with the

consultant for record purpose.

Further, nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere. Distribution of nine (9) copies of Shop Test Certificates for approval will be Two (2) copies to owner, Three (3) copies to site, Two (2) copies to consultant, Two (2) copies to owner's library / record.

16.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Owner's Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer along with Defect Map.

16.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.

Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Contractor shall allow for trial assembly prior to despatch from place of manufacture.

16.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material or any other test as required by approved QAP/ Material specification.

16.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure or as required by design code of that part, for a period not less than one hour.

16.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.

16.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnuflux and ultrasonic testing shall be employed wherever necessary/recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed.

16.01.11 Statutory payments in respect of IBR approvals including inspection for design and manufacturer of equipment shall be made by the Bidder. All payment for erection and testing at site (i.e. under IBR jurisdiction) shall also be made by the Bidder. In such case Contractor's scope shall also be extended to preparation of all necessary documents, co-ordination and follow-up with IBR authorities for above approval.

16.02.00 **Performance Tests at Site**

16.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Contractor on site under normal operating conditions. The Contractor shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.

16.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.

16.02.03 The Contractor shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.

16.03.00 For details of specific tests required on individual equipment refer to respective section of this specification.

17.00.00 TRAINING OF OWNER'S PERSONNEL

The Contractor shall extend all possible assistance and co-operation to the Purchaser regarding the transfer of technology and developing expertise in the area of engineering operation and maintenance of the Plant.

Number of man-days of training as mentioned below shall be included in his Tender.

17.01.00 Training at Contractor's Premises

The Contractor shall conduct training of sixty (60) engineers of the Owner on engineering, operation and maintenance of the Plant at the Contractor's or Associates or Sub-contractor's premises where adequate training facilities are available during the design and manufacturing stage of the Contractor.

The total man-months for training of engineers shall be maximum sixty (60), having following indicative break-up :

Discipline	No. of Engineers	No. of Man-month
Operation	20 heads	20
Maintenance Boiler, Turbine, Mechanical	20 heads	20
Electrical Maintenance	8 heads	4
Control & Instrumentation	8 heads	4
Maintenance Planning	4 heads	2
	---	---

	60 heads	60
	---	---

However, the details of the training programme will be discussed and finalised with the successful Bidder.

The training may also be arranged by the Contractor in any Plant where the equipment manufactured by the Contractor or his Associates is under installation, operation or testing to enable the trainees to become familiar with the equipment being furnished by the Contractor. All expenses inherently related to the training shall be borne by the Contractor and shall include but not limited to travel expenses (international and inland fares), lodging and per diem charges as well as medical insurance, instructors fee, programme and miscellaneous cost to be incurred during the training.

The training programme shall be adequate for the trainees to acquire the necessary expertise and competence in the area of engineering, operation and maintenance and as trainers for in-house technology transfer programme of the Purchaser.

The Contractor shall be responsible for the development of the Training Module and Programme Schedule which shall be submitted to the Purchaser for approval.

The components of the training modules shall include but not be limited to the training procedures/methodology, instructional materials such as audio visual materials, CDs and slides and manuals for each trainee.

Three (3) sets of the materials included in the training modules shall be handed over to the Purchaser upon completion of the training. An evaluation shall be jointly undertaken by the Contractor and the Purchaser's representative on the adequacy, appropriateness and relevance of the training and the programme effectiveness after the training. The training material shall be in English language only.

The content of the training programme shall include but not be limited to:

1. Coal fired thermal plant principles in management and practice for operators, technicians and maintenance personnel.

2. Plant operation and systems training for operators including simulator training as applicable.

3. Maintenance training programme covering electrical, mechanical and instrumentation and control.

Said training programme shall be submitted to the Purchaser for approval.

The timing of the training should be such that the participants will be conversant with sufficient know-how to participate in the pre-commissioning and commissioning tests of the Plant.

The Contractor shall provide qualified English speaking instructors and training

coordinator(s) during the tenure of the training programme.

17.02.00 **Operation and Maintenance Training at Site**

The Contractor shall provide a comprehensive training programme related to design application, plant management, operation and maintenance, including trouble shooting, of the Contractor's supplied system and equipment at the Site starting from Start of Commissioning and thereafter up to the Final Acceptance of the first Unit.

The following instructors shall be at the Site continuously during the training :

a) One (1) for Steam Generator and Auxiliaries ;

b) One (1) for Turbine Generator and Auxiliaries ;

c) One (1) for Electrical Works ;

d) One (1) for Instrumentation and Control (Boiler and Auxiliaries) ;

e) One (1) for Instrumentation and Control (Turbine and Auxiliaries).

17.03.00 **On-the-Job Training**

During the period of pre-commissioning, commissioning and trial operation, the Purchaser shall provide operation and maintenance personnel to assist the Contractor in the operation and maintenance of his supply and work under the direction of the Contractor for the purpose of on-the-job training.

The Purchaser shall have the right to send to the Site his employees later intended to operate and maintain the equipment supplied under this Contract. The Contractor shall, without additional cost, use his site staff to instruct these employees on the operation and maintenance of the equipment. All instructions shall be in the English language.

17.04.00 For detail C&I training refer to Volume-VI, Section-9.

18.00.00 **DEVIATIONS**

The Bidder is required to submit with his proposal in the relevant schedules a detail list of any and all deviations taken by him clearly without any ambiguity. In the absence of such a list it will be understood and agreed that the Bidder's proposal is based on strict conformance to this specification and no post-contract negotiations would be allowed in this regard.

Unless otherwise specifically indicated in the deviation list, it will be construed and agreed that details indicated in documents & drawings furnished by the Bidder along with the offer is in-line with the specification requirement.

ANNEXURE-I

LIST OF STANDARDS FOR REFERENCE

a) International Standards Organisation (ISO).

b) International Electro-technical Commission (IEC).

c) American Society of Mechanical Engineers (ASME).

d) American National Standards Institute (ANSI).

e) American Society for Testing and Materials (ASTM).

f) American Institute of Steel Construction (AISC).

g) American Welding Society (AWS).

h) Architecture Institute of Japan (AIJ).

i) National Fire Protection Association (NFPA).

j) National Electrical Manufacturer's Association (NEMA).

k) Japanese Electro-technical Committee (JEC).

l) Institute of Electrical and Electronics Engineers (IEEE).

m) Federal Occupational Safety and Health Regulations (OSHA).

n) Instrument Society of America (ISA).

o) National Electric Code (NEC).

p) Heat Exchanger Institute (HEI).

q) Tubular Exchanger Manufacturer's Association (TEMA).

r) Hydraulic Institute (HIS).

s) International Electro-Technical Commission (IEC) Publications.

t) Power Test Code for Steam Turbines (PTC).

u) Applicable German Standards (DIN).

v) Applicable British Standards (BS).

w) Applicable Japanese Standards (JIS).

x) Electric Power Research Institute (EPRI).

y) Standards of Manufacturer's Standardization Society (MSS).

z) Bureau of Indian Standards Institution (BIS).

aa) Indian Electricity Rules.

bb) Indian Boiler Regulations (IBR).

cc) Indian Explosives Act.

dd) Indian Factories Act.

ee) Tariff Advisory Committee (TAC) rules.

ff) Emission regulation of Central Pollution Control Board (CPCB).

gg) Pollution Control regulations of Dept. of Environment, Govt. of India

hh) Central Board of Irrigation and Power (CBIP) Publications.

ii) The Air Prevention and Control of Pollution Act.

jj) The Environmental Protection Act

kk) The Public Liability Insurance Act.

ll) The Forest Conservation Act

mm) The Wildlife protection Act.

nn) The EIA Notification, 1994.

oo) IS: 14665-Specification for Electric Traction Lift

pp) Any other statutory Codes/Standards/Regulations

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SECTION – C3

ANNEXURES

ANNEXURE I
SCOPE OF CHAIN PULLEY BLOCKS

S.No.	AREA / EQUIPMENT DESCRIPTION	Type	QTY (nos)	CAPACITY (T)	LIFT RANGE (M)	PATH
B	**Scope of Chain pulley blocks (CPB)**					
1	Fuel Oil Pump House	CPB with TT	1	2	6	Straight
2	GENERAL PURPOSE MAINTENANCE	CPB without TT	5	2	6	Straight
5	One (1) set of Maintenance Tools and Tackles		1 set			
6	One (1) sets of Mandatory Spares		2 sets			
	Note					
1	***CPB: Chain Pulley Block TT: Travelling Trolley***					

Annexure II

PAINTING SPECIFICATION

Surface preparation: De greasing and Mechanical cleaning with wire brush or hand tool. (SA 1/ ST 2 / ST 3 as applicable)

Primer : Red oxide Zinc chromate as per IS: 2074 (Alkyd medium) - 1 coat, DFT35 µ per coat.

Intermediate : Red oxide Zinc chromate as per IS: 2074 (Alkyd medium) - 1 coat, DFT35 µ per coat

Finish Coat : Synthetic enamel (Alkyd medium) as per IS: 2932- 2 coats, DFT 25 µ per coat.

Total DFT : 120µ

Electrical /Control Panel:

Surface preparation: Seven tank process

Primer : Zinc phosphate (Alkyd medium) - 2 coat Minimum DFT 25- 35 µ per coat.

Finish Coat : Synthetic enamel (Alkyd medium) as per IS: 2932- 3 coats, Minimum DFT 20-25 µ per coat.

Total DFT : 110 - 145µ

Color Shade:

SL. No	Item Description	Color Shade	Remarks
1	Chain Pulley Block	Smoke Gray shade 692 as per IS-5	
2	Hooks	Black	

		ANNEXURE-III
STANDARD LIST OF MAKES OF SUB-VENDOR ITEMS FOR CHAIN PULLEY BLOCKS		
S.NO.	**ITEM**	**STANDARD MAKES**
1	STEEL	SAIL /TISCO / JINDAL/ ESSAR
2	HOOKS	Steel Forging & Engg. Co., Kolkata/ SIMRITI FORGING/ Karachiwala (up to 25T)
3	GEAR COUPLINGS	ALLIANCE / FLEX-TRANS (formerly known as HICLIFF) / OEM / NUTECH/ SAHARA
4	BEARINGS	SKF/ FAG/ TATA / NBC
5	BRAKES	ELECTROMAG /SPEED-O- CONTROL / BCH (for DCEM Brakes only) / Kakku
Note: The sub-vendor list is indicative and will be subject to customer approval during detail engineering of the package without any commercial implication on account of the same.		

ANNEXURE-IV

Master drawing list and submission schedule

Sl. No.	BHEL DRG.NO	DRAWING TITLE	REMARKS	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF P.O
	PE-TS-392-563-A101	**REV 00**		
1	PE-V0-410-563-A102	Manufacturing Quality Plan	INFORMATION	2
2	PE-V0-410-563-A101	GA Drawing for Chain Pulley Block with detail BOM with painting details	INFORMATION	2
3	PE-V0-410-563-A103	O & M Manual	INFORMATION	4
4	PE-V0-410-563-A106	Mandatory spare parts list	APPROVAL	3
5	PE-V0-410-563-A104	Erection procedure	INFORMATION	4
NOTE:	1	VENDOR SHALL RESUBMIT THE REVISED DRAWINGS WITHIN 7 DAYS OF RECIEPT OF COMMENTS.		
	2	INCOMPLETE DRAWINGS/DOCUMENTS SHALL NOT BE TREATED AS SUBMITTED.		
	3	MANUFACTURING SHALL BE STARTED ON RECIEPT OF CAT II APPROVED DRAWINGS.		

Note:
Bidder to note that BHEL reserves the right for drawing/document submission through web based Document Management System. Bidder would be provided access to the DMS for drawing/ document approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7.
- Internet speed – 2 mbps (Minimum preferred).
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked.
- Vendor's internal proxy setting should not block DMS application's link (http://124.124.36.198/wrenchwebaccess/login.aspx).

List of Mandatory Spares – Annexure V

ONE LOT FOR EACH TYPE & CAPACITY

S. No.	Description	Total quantity required
1	Load chain wheel	1 No.
2	Load chain stripping fork	5 Nos.
3	Hand chain wheel	2 Nos.
4	Ratchet pawl	1 No.
5	Locking ratchet wheel	2 Nos.
6	Guide roller	2 Nos.
7	Brake disc	2 Nos.

ANNEXURE VI

DISTRIBUTION SCHEDULE

S. No	Description	TSGENCO								M/S DCPL, KOLKATA			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/ KTPS	SE/ Civil KTPS	SE/E&M / KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS		
A	**Letter Of Intent or Contract Documents**	1	1	1	S	1	2	2	1	1	1	1	2	
B	**Vendor Drawings**													
1.	Preliminary	1	1	1	2	1	1	2	2	12	1	-	S	
2.	Return preliminary with comments	-	-	1	2	1	1	1	1	S	1	-	1	
3.	Final and any revision thereof													
	a. Civil	1	1	6+1T	1	1	6+1T	1	-	2+1T	1	1	S	
	b. E&M	1	1	1	6+1T	1	1	6+1T	1	2+1T	1	1	S	
C.	**Design Drawings**													
1.	Preliminary													
	a. Civil	1	1	2	1	1	2	1	1	4	1	1	S	
	b. E&M	1	1	1	2	1	1	2	1	4	1	1	S	
2.	Released for construction													
	a. Civil	1	1	2	1	1	6	1	1	1	1	2	S	
	b. E&M	1	1	1	1	2	1	6	1	1	1	2	S	
3.	Return marked 'As built'													
	a. Civil	-	-	1	-	-	1	-	-	1	1	S	1	
	b. E&M	-	-	-	1	-	-	1	1	1	1	S	1	
4.	As built drawings													
	a. Civil	-	-	1+1T	-	2+1T	5+1T	-	1	1+1T	-	1	S	
	b. E&M	-	-	1	2+1T	2+1T	-	5+1T	1+1T	1+1T	-	1	S	

S. No	Description	TSGENCO								M/S DCPL, KOLKATA			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/ KTPS	SE/ Civil KTPS	SE/E&M / KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS		
D	Progress Report Monthly									-				
1.	Equipment vendor	1	1	1	2	1	1	2	1	1	1	1	S	
2.	M/s DCPL, Kolkata	1	1	2	2	1	1	2	1	S	1	1	Nil	
E	Test & Inspection Reports													
1.	Equipment manufacturer													
	a. Civil	1	1	1	2	1	1	1	-	11	1	1	S	
s	b. E&M	1	1	-	2	1	-	1	1	11	1	1	S	
2.	M/s DCPL, Kolkata	1	1	-	2	1	-	1	1	S	-	1	-	
F	Instruction Manuals/Data Books													
1.	Equipment manufacturer													
	a. Civil	1	1	1+1T	1	1	6+1T	1	1	2+1T	1	1	S	
	b. E&M	1	1	-	3+1T	1	-	6+1T	2	3+1T	1	1	S	
2.	M/s DCPL, Kolkata	1	1	-	10+1T	1	-	15+1T	-	S	1	1	Nil	
G	M/s DCPL, Kolkata Criteria	1	1	1	8+1T	1	1	2	1	1	1	1	S	
H	Design Calculations	1	1	1	8+1T	1	1	2	1	1	1	1	S	
I	Final consulting Engineering Report	1	1	1	10	1	1	2	1	S	1	1	Nil	

S – Source, T – Transparency & Soft Copy on CD,

TSGENCO : Telangana State Power Generation Corporation Limited

Director, Projects, Hyd : Director/ Projects, TSGENCO, Vidyut Soudha, Hyderabad – 500 082

SECTION - D

CHAIN PULLEY BLOCK

1. GENERAL

1.1 This specification covers the design, manufacture, assembly, painting, inspection and testing at manufacturer's works of hand operated chain pulley block.

2. CODES AND STANDARDS

2.1 The design, manufacture, inspection and testing and performance of hand operated chain pulley blocks shall confirm to latest editions of the following standards : -

2.1.1 IS: 3832 Specification for hand operated chain pulley block OR BS 3243

2.1.2 IS 807:1976 Codes of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of cranes and hoists.

2.1.3 IS: 3109(Part II) Calibrated load chain for pulley blocks and other lifting appliances

2.1.4 IS: 2429(Part II) Calibrated hand chain for pulley blocks and other lifting appliances

2.1.5 IS: 4460 Method for rating of machine cut spur and helical gears

2.1.6 IS 6216 : 1982 Short Link Chain, Grade T (8), Calibrated for Pulley Blocks and other Lifting Appliances

2.1.7 IS:15560: 2005 Point Hooks with Shank up to 160 Tonne - Specification

2.1.8 Material Specification IS or approved

3. EQUIPMENT

3.1 Chain Pulley Block – The block shall be so designed that all components shall withstand without failure, an application to the block of a load equal to at least four times the working load limit.

3.1.1 Frame

Frame shall be robust in design and of welded construction .The frame shall be selected in such a way that head room requirement is minimum. Frame shall maintain alignment under all expected conditions of services.

3.1.2 Chain

i. The load chain shall be electrically welded, accurately calibrated, and pitched arid polished conforming to IS: 6216 Grade 80(T8)/ IS 3109 (Part 2).

ii. The hand chain shall also be electrically welded, calibrated, pitched and polished and shall conform to IS: 2429 (Part II) Grade 30. The length of chain and link dimension shall be as per IS: 3832.

3.1.3 Hook

The forged hook shall be properly heat treated and so designed that in loaded condition, it is free to swivel without twisting the load chain. The hook shall conform to IS: 15560

3.1.4 Reduction Gear

The reduction gear shall be either spur or worm/ worm wheel type. The spur gear and worm shall be of high grade carbon steel and heat treated. The worm wheel shall be of bronze. A detachable steel cover shall be provided for total enclosure of the gear train and ample lubrication to be provided.

3.1.5 Brakes

Brakes shall be of screw friction disc type self-actuating or any other superior type. Brake capacity shall be ample and humid atmosphere shall not affect materials used. The brake shall prevent self lowering of load and arrest and sustain load in all working positions. The load brake shall also allow smooth lowering of the load without serious overheating which may impair working of block

3.1.6 Bearing

Bearing used shall be as per guidelines laid down in IS: 3832.

3.1.7 Chain Wheels

The load chain wheel shall be made of heavy duty malleable casting and shall be designed to ensure, effective operation of the chain. Load chain wheels shall be mounted on two ball bearings. Hand chain wheel shall be made from malleable casting/pressed sheet steel. The idler wheel shall be so shaped as to avoid the twisting of the chain during operation. The P.C.D of idler wheels shall be such that the bending action of the link is avoided. The hand chain wheel shall be provided with flanges and designed to ensure effective operation with hand chain.

3.1.8 Other components

All other components of chain pulley block such as anchorage, guide, pawl, stripper etc. shall be designed and provided as per IS: 3832.

3.1.9 Trolley

Monorail trolley frame shall be of heavy section rolled steel, held together by bolts. Wheels shall be of high grade cast iron/steel mounted on ball bearings. Axles and shafts shall be of carbon steel, accurately machined and suitably supported. The trolley shall be suitable for variations in I section beams. The trolley shall be geared travel type.

The hand chain required for trolley travel shall be as per clause 3.1.2 of this specification.

Hand chain wheel shall be as per clause 3.1.7 of this specification.

3.1.10 The effort required for hoisting and travel shall be as stipulated in IS 3832.

VOLUME - III

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under "exclusion and those resolved as per 'Schedule of Deviations', with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.

g) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions

h) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price and within purview of the tender specification even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities.

i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

j) As built drawings shall be submitted as and when required during the project execution.

k) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

l) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

m) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

n) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor’s account and shall not be used as a reason for extension in contract completion.

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

DEVIATION SHEET (COST OF WITHDRAWL)

PROJECT:- 1X800 MW DARLIPALI STPP

PACKAGE:- CHAIN PULLEY BLOCKS

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

DOCUMENTS TO BE FURNISHED WITH OFFER FOR TECHNICAL EVALUATION

1) Deviation schedule with reference to specific clauses of the specification along with reason for such deviation or No deviation in the format given under Vol.-III
2) SIGNED AND STAMPED COPY OF COMPLIANCE CUM CONFIRMATION CERTIFICATE.
3) Unpriced format, duly mentioned 'Quoted' against each Sl.no below each column.

NOTE:

i) NO OTHER DOCUMENTS OTHER THAN THOSE LISTED ABOVE ARE REQUIRED TO BE S UBMITTED FOR TECHNICAL EVALUATION. IN CASE ANY OTHER DOCUMENT IS FURNISHED, THE SAME WILL NOT BE TAKEN INTO CONSIDERATION FOR TECHNICAL EVALAUATION.

ii) BIDDER TO CLEARLY MENTION "QUOTED" AGAINST EACH ITEM. IN CASE ANY ITEM IS NOT APPLICABLE THEN "NA" SHOULD BE CLEARLY MENTIONED AGAINST THE SAME.