



# भारत हेवी इलेक्ट्रिकल्स लिमिटेड

( भारत सरकार का उपक्रम )

## BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

TCN – 12

Ref: PSER:SCT:NKP-M1673:TCN-12

Date: 13-08-2015

Sub	Tender change notice (TCN) 12	
Job	Design, engineering, manufacturing, supply, erection & commissioning, etc of one (1) No. IDCT cooling tower Pkg for 3x660 MW units at North Karanpura Super Thermal Power Project, Jharkhand.	
Ref	1.0	Tender No. PSER:SCT:NKP-M1673:15
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-M1673:4470, dated 20-05-2015
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:NKP-M1673:TCN-01, dated 09-06-2015.
	4.0	BHEL's TCN-02, vide reference no PSER:SCT:NKP-M1673:TCN-02, dated 09-06-2015.
	5.0	BHEL's TCN-03, vide reference no PSER:SCT:NKP-M1673:TCN-03, dated 15-06-2015.
	6.0	BHEL's TCN-04, vide reference no PSER:SCT:NKP-M1673:TCN-04, dated 22-06-2015.
	7.0	BHEL's TCN-05, vide reference no PSER:SCT:NKP-M1673:TCN-05, dated 04-07-2015.
	8.0	BHEL's TCN-06, vide reference no PSER:SCT:NKP-M1673:TCN-06, dated 08-07-2015.
	9.0	BHEL's TCN-07, vide reference no PSER:SCT:NKP-M1673:TCN-07, dated 13-07-2015.
	10.0	BHEL's TCN-08, vide reference no PSER:SCT:NKP-M1673:TCN-08, dated 21-07-2015.
	11.0	BHEL's TCN-09, vide reference no PSER:SCT:NKP-M1673:TCN-09, dated 24-07-2015.
	12.0	BHEL's TCN-10, vide reference no PSER:SCT:NKP-M1673:TCN-10, dated 29-07-2015.
	13.0	BHEL's TCN-11, vide reference no PSER:SCT:NKP-M1673:TCN-11, dated 06-08-2015.
	14.0	All other pertinent issues till date.

With reference to above, following points/ documents, relevant to tender, may please be noted and complied with while submitting offer.

SL NO	BIDDER'S QUERY	BHEL'S CLARIFICATION
1	Referring to PE-TS-405-165-N001 volume IIB, section C1 Rev 01 page 9 of 10, clause 16.01.00, compliance certificate format and Guarantee schedule format as indicated are not found in the tender.	Kindly refer Vol-II section –A (A.1 and A.3.), as attached.

- 1.0 Revised 'No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.
- 2.0 All other terms & conditions of the tender shall remain unchanged.

Thanking you,

Yours faithfully,  
for BHARAT HEAVY ELECTRICALS LTD

SR.ENGR (SCT)

Encl : As above.

पावर सेक्टर पूर्वी क्षेत्र ( मुख्यालय )

POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091

फैक्स/Fax : (033) 23211960

फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

**FORMAT FOR NO DEVIATION CERTIFICATE**  
**(To be submitted in the bidder's letter head)**

BHARAT HEAVY ELECTRICALS LIMITED,  
Power Sector - Eastern Region,  
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,  
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	Design, engineering, manufacturing, supply, erection & commissioning, etc of one (1) No. IDCT cooling tower Pkg for 3x660 MW units at North Karanpura Super Thermal Power Project, Jharkhand.	
Ref	1.0	Tender No. PSER:SCT:NKP-M1673:15
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	4.0	BHEL's TCN-02, vide reference no PSER:SCT:NKP-M1673:TCN-02, dated 09-06-2015.
	5.0	BHEL's TCN-03, vide reference no PSER:SCT:NKP-M1673:TCN-03, dated 15-06-2015.
	6.0	BHEL's TCN-04, vide reference no PSER:SCT:NKP-M1673:TCN-04, dated 22-06-2015.
	7.0	BHEL's TCN-05, vide reference no PSER:SCT:NKP-M1673:TCN-05, dated 04-07-2015.
	8.0	BHEL's TCN-06, vide reference no PSER:SCT:NKP-M1673:TCN-06, dated 08-07-2015.
	9.0	BHEL's TCN-07, vide reference no PSER:SCT:NKP-M1673:TCN-07, dated 13-07-2015.
	10.0	BHEL's TCN-08, vide reference no PSER:SCT:NKP-M1673:TCN-08, dated 21-07-2015.
	11.0	BHEL's TCN-09, vide reference no PSER:SCT:NKP-M1673:TCN-09, dated 24-07-2015.
	12.0	BHEL's TCN-10, vide reference no PSER:SCT:NKP-M1673:TCN-10, dated 29-07-2015.
	13.0	BHEL's TCN-11, vide reference no PSER:SCT:NKP-M1673:TCN-11, dated 06-08-2015.
	14.0	BHEL's TCN-12, vide reference no PSER:SCT:NKP-M1673:TCN-12, dated 13-08-2015.
	15.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)

POWER SECTOR EASTERN REGION DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091

फैक्स/Fax : (033) 23211960

फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

**NORTH KARANPURA SUPER THERMAL POWER  
PROJECT – NTPC Ltd.  
3X660MW, UNIT # 1, 2 & 3.**

**TECHNICAL SPECIFICATION  
FOR  
COOLING TOWERS**

**VOLUME -II**

**Specification No. : PE-TS-405-165-N001 (REV. 0)**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT  
NOIDA – 201301.**



**TITLE : TECHNICAL SPECIFICATION  
FOR  
COOLING TOWERS  
PREAMBLE**

SPEC. NO. **PE-TS- 405-165-N001**

**VOLUME : II**

**SECTION :**

REV. NO. 00

DATE : 12.12.2014

SHEET 1 OF 2

The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

**1.1 Volume -I CONDITIONS OF CONTRACT**

This consists of four parts as below :

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

**1.2 Volume - TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume II which comprises of :

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

**1.2.1 Volume - II B :**

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of technical specifications of equipments complete with data sheet A, B & C. Data sheet-A specifies data and other requirements pertaining to the equipment. Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).



**TITLE : TECHNICAL SPECIFICATION  
FOR  
COOLING TOWERS  
PREAMBLE**

SPEC. NO. **PE-TS- 405-165-N001**

**VOLUME : II**

**SECTION :**

REV. NO. 00

DATE : 12.12.2014

SHEET 2 OF 2

1.2.2 Volume - II TECHNICAL SCHEDULES

This volume contains technical schedules and Data Sheets – B (to be submitted at contract stage), which are to be duly filled by the bidder and the same shall be furnished with the technical bid.

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.



TITLE : TECHNICAL SPECIFICATION  
FOR

**COOLING TOWERS**

SPEC. NO. PE-TS-405-165-N001

VOLUME : II

SECTION :

REV. NO. 00

DATE : 12.12.14

SHEET 1 OF 1

## INDEX

### SECTION

### TITLE

- |          |  |
|----------|--|
| <b>A</b> | <b>DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER</b>  |
| A.1      | COMPLIANCE CERTIFICATE   |
| A.2      | SCHEDULE OF DEVIATIONS   |
| A.3      | SCHEDULE OF PERFORMANCE GUARANTEE  |
| A.4      | SCHEDULE OF PRICES   |
| A.5      | SCHEDULE OF UNIT PRICES  |
| A.6      | ELECTRICAL LOAD DATA   |
| A.7      | General arrangement drawing for cooling tower, incorporating all relevant dimensions, cold water channels / sludge chamber/ screens/ gates in the cold water channel, staircase etc. |
| A.8      | Pumping head calculations.   |
| A.9      | Thermal design calculations.   |
| A.10     | Tower performance curves.  |
| <b>B</b> | <b>DOCUMENTS TO BE SUBMITTED ON PLACEMENT OF LOI</b>   |
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TITLE : TECHNICAL SPECIFICATION  
FOR

**COOLING TOWERS**

SPEC. NO. PE-TS-405-165-N001

VOLUME : II

SECTION : A

REV. NO. 00

DATE : 12.12.14

SHEET 1 OF 1

**DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER**

- COMPLIANCE CERTIFICATE
- SCHEDULE OF DEVIATIONS
- SCHEDULE OF PERFORMANCE GUARANTEE
- SCHEDULE OF PRICES
- SCHEDULE OF UNIT PRICES
- ELECTRICAL LOAD DATA



TITLE:  
**TECHNICAL SPECIFICATION  
INDUCED DRAFT COOLING TOWERS  
COMPLIANCE CERTIFICATE  
3X660 MW NKSTPP,UNIT- 1.2 &3**

SPEC. NO.: **PE-TS-405-165-N001**

VOLUME: **II**

REV. NO. **0** DATE **12.12.14**

SHEET **1** OF **1**

### COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate 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 with regard to same.
- b) There are no other deviations w.r.t. specification 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.
- d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification.

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) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself. Prices for special tools & tackles, if any, shall also be included in the base price.
- g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.
- h) The Performance guarantees shall stand valid till at least eighteen (18) months after full load commissioning of CT or as per commercial terms and conditions, whichever is later.
- i) Specifically confirm compliance with Cl. Nos. 5.0 and 11.0 and their sub clauses of Sec. C1 of Technical Specification specification.
- j) The hydrostatic testing of piping shall be carried out as specified i.e. at 1.5 times the design pressure.
- k) Thermal design calculations and CT drawings for fill arrangements shall be got vetted and approved from any of the IIT's (Indian Institutes of Technology) in the event of order.
- l) Complete mechanical equipment handling arrangement shall be provided by bidder:
  - For lifting of complete equipments from ground to deck level.
  - For moving of equipment at the deck level to desired installation.

The complete handling arrangement shall be of adequate design for ease of handling by the operator effortlessly. The details shall be submitted in the event of order and shall be subject to purchaser's approval.



TITLE

**\* SCHEDULE OF DEVIATIONS**

( ) From Conditions of Contract (Volume - I)

( ) From General Technical Conditions (Volume - II A)

( ) From Technical Specifications (Volume - II B)

SPECIFICATION NUMBER

**PE-TS-405-165-N001**

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VOLUME III      PART - A

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SHEET ..... OF .....

\* Each type of deviation shall be listed on a separate sheet.  Tick the applicable

We the undersigned hereby certify that the above mentioned are the only deviations.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	<b>COMPANY SEAL</b>



TITLE: **TECHNICAL SPECIFICATION  
COOLING TOWERS  
GUARANTEE SCHEDULE  
3X660 MW NKSTPP, UNIT- 1,2 &3**

SPEC. NO.: **PE-TS-405-165-N001**  
VOLUME: **II**  
REV. NO. **0**      DATE **12.12.14**  
SHEET **1**      OF **1**

1.      Guaranteed Pumping head at design capacity (viz. static lift w.r.t. FGL up to top of topmost pipe without any siphon recovery & frictional losses from bidders terminal point onwards including 10% margin, etc) MWC
  
2.      Guaranteed Power Consumption at inlet to motor terminals of fans, at design capacity and design conditions  
  
         Per Fan motor KW  
         Total for the working Cells, per CT KW
  
3.      Guaranteed Cold water temperature at design capacity & parameters with the working cells Deg. C

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



TITLE : SCHEDULE OF  
PRICES  
3x660MW NKSTPP, UNIT -1,2&3

SPEC NO: PE-TS-405-165-N001

Vol. II Date-

SL. NO.	** Description of Works Or Equipment/ System	Prices (in Lakhs of Rs.)
1.	<p><b>A) Total Price for One (01) no. Induced Draft Cooling Tower</b> For Design, Manufacture, Inspection/ Testing, Supplies, Packing for transportation &amp; delivery complete with commissioning spares/ special tools and tackles/ including all accessories &amp; equipments, Civil Works (excluding Cement &amp; Reinforcement Steel), piling, Erection works, Commissioning and Performance testing including Mandatory Spares as specified and as necessary for completion for cooling tower in all aspect.</p> <p><b>B) TOTAL</b></p> <p><b>Note:</b> Bidder to Indicate all duties, taxes, etc. stating whether included/ excluded in above prices.</p>	<p>Rs</p> <p>Rs</p>

**Bidder shall furnish this price Schedule in his price offer only**

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**TITLE : SCHEDULE OF  
UNIT PRICES**

**3x660MW NKSTPP, UNIT -1,2&3**

**SPEC NO: PE-TS-405-165-N0001**

Vol. II

**SL. NO.                    \*\* Description of Works Or Equipment/ System                    Prices (in Lakhs of Rs.)**

**1.0 Break up of Cl. 1.0 of "Schedule of Prices" for design, manufacture supplies and site works:**

a) Design and engineering of one (1) no. CT

**Rs.**

b) Manufacture and supply of following for one (1) no. CT

**Rs.**

- Complete mechanical equipments
- Complete electrical and C&I equipments

c) Complete Civil works and piling (as required) of one (1) no. CT.

**Rs.**

- Civil Works

d) Cement & Reinforcement steel requirement( Free issue as per NIT).

(i) Cement ( Loading Rate @ Rs. 5500 per MT)

**Total Tonnes**

(ii) Reinforcement Steel ( Loading Rate @ Rs 42000 Per MT)

**Total Tonnes**

f) Erection & Commissioning of following for one (1) no. CT:

**Rs.**

- Complete mechanical equipments
- Complete electrical and C&I equipments

g) Performance Guarantee testing of one (1) no. CT.

**Rs.**

h) Mandatory Spares ( As per list enclosed in Sec-C1,Vol-IIB)

**Rs.**

**Note:**

1.0 Sum total of Cl. 1.0 should match Cl. 1.0 (Schedule of prices) for one(1) IDCT. In the event of discrepancy the least of two figures shall be considered for award of contract.

2.0 Prices of commissioning & erection spares shall be included in the price of cooling tower.

**Bidder shall furnish this price Schedule in his price offer only**

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL





TITLE : TECHNICAL SPECIFICATION  
FOR  
COOLING TOWERS

SPEC. NO. PE-TS-405-165-N001

VOLUME : II

SECTION :


REV. NO. 00


DATE : 12.12.2014


SHEET 1 OF 1

**DOCUMENTS TO BE SUBMITTED ON THE PLACEMENT OF ORDER**


- DATA SHEET-B COOLING TOWERS
- LIST OF SCHEDULES A OVERLEAF


	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001		
	<b>FOR</b> INDUCED DRAFT COOLING TOWER 3X660 MW NKSTPP,Unit- 1 , 2& 3.		<b>VOLUME :</b> II		
			<b>SECTION :</b> A		
			<b>DATE :</b> 12.12.14		
		<b>SHEET</b> 1 of 10			
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER		
1.0	Type Model No. (Single air inlet, Double air inlet)				
2.0	Quantity	Nos/Unit			
3.0	Rated Capacity	M <sup>3</sup> /Hr			
4.0	No. of Cells a) Working b) Standby	Nos./Tower			
5.1	Ambient Design Wet Bulb Temperature	°C			
5.2	Recirculation Allowance	°C			
5.3	Design Inlet Wet Bulb Temp (including recirculation allowance)	°C			
6.0	Cold Water Temperature	°C			
7.0	Cooling Tower Approach	°C			
8.0	Cooling Tower Range	°C			
9.0	Cooling Tower Loss  a. Evaporation Loss  b. Drift Loss  c. Blow Down Loss (Concentration Factor to be indicated)				
10.0	Basin Storage capacity	M <sup>3</sup> /hr			
11.0	Cell size (Length x Width x Height)	M x M x M			
12.0	Overall Size of Cooling Tower (Length x Width x Height)	MxMxM			
13.0	Required Pumping Head including all	M			


	TITLE : DATA SHEET - B		SPECIFICATION NO. PE-TS-405-165-N001	
	FOR		VOLUME : II	
	INDUCTED DRAFT COOLING TOWER		SECTION : A	
	3X660 MW NKSTPP, Unit- 1 , 2& 3.		DATE : 12.12.14	
		SHEET		2 of 10
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER	
	losses measured from basin, curb level			
14.1	Dia of fan stack	Metres		
15.0	Cooling Tower Levels			
	a. Graded Level	M		
	b. Maximum Water Level	M		
	c. Basin Curb Level	M		
	d. Minimum Water Level	M		
	e. Basin Bottom Level	M		
16.0	Overall Tower Height from Basin Floor	M		
17.0	Basin Dimensions			
	a. Length	M		
	b. Width	M		
	c. Depth (from basin curb)	M		
18.0	Free Board (Above Max. Water Level)	mm		
19.0	Heat Transfer Data	mm		
	a. Heat Transfer Coefficient (K)			
	b. Tower Coefficient © Ka V/L	M		
	c. Average Fill Height	M		
	d. Total Fill Volume	M <sup>3</sup>		
	e. Total Water wetted surface	Sq. M		
	e. Total Tower Wetted Surface	M <sup>2</sup>		
20.0	Hot Water Distribution Piping			
	a. Size (OD X Thk)	Mm X mm		
	b. Elevation of Center Line of Hot Water distribution Header	M		
	c. Design pressure for Hot Water Distribution System	Kg/cm <sup>2</sup> (g)		
21.0	Isolation Valves in Hot Water Risers			
	a. Size	mm		
	b. Quantity			

	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001		
	<b>FOR</b> INDUCED DRAFT COOLING TOWER 3X660 MW NKSTPP,Unit- 1 , 2& 3.		<b>VOLUME :</b> II		
			<b>SECTION :</b> A		
			<b>DATE :</b> 12.12.14		
		<b>SHEET</b> 3 of 10			
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER		
	<ul style="list-style-type: none"> <li>➤ For Counter flow towers</li> <li>➤ For cross flow tower</li> </ul>		Nos./ cell		
	c. Type/Code & Standard		Nos. /Cells		
	d. Make				
	e. Pressure drop across the valve in fully open position	MWC			
	f. Materials of Construction				
	i) Body				
	ii) Disc				
	iii) Drive Shaft/Stub Shaft				
	iv) Bearings				
	g. Test Pressure duration	kg/cm <sup>2</sup> (g)	Minutes		
22.0	Flow Control Valves (If Applicable)				
	a. Make				
	b. Size	Mm			
	c. No. of Cell	Nos.			
	d. Materials of Construction				
	i) Body				
	ii) Spindle				
	iii) Trim				
23.0	Isolating Valve in Sludge Pit				
	a. Size	Mm			
	b. Quantity	Nos./Tower			
	c. Type				
	d. Make				
	e. Conform to which code in respect of design/testing				
	f. Materials of Construction				
	i) Body				
	ii) Stem				
	iii) Trim				
24.0	Stationary Screen				
	a. Quantity	Nos. Tower			
	b. Size & Material of Bar				
	c. Clear Space between the bar				
	d. Lifting Arrangement				




	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001	
	FOR		<b>VOLUME :</b> II	
	<b>INDUCTED DRAFT COOLING TOWER</b>		<b>SECTION :</b> A	
	<b>3X660 MW NKSTPP,Unit- 1 , 2&amp; 3.</b>		<b>DATE :</b> 12.12.14	
		<b>SHEET</b>		5 of 10
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER	
	iv) Type and material of drain boards			
	e. Blade Support Spacers			
	i) Type			
	ii) Material			
27.2	FANS			
	a) Manufacturer			
	b) Type			
	c) Model Number			
	d) Number furnished	Nos./Tower		
	e) Diameter	Metre		
	f) Number of Blades/fan			
	g) Fan speed	RPM		
	h) Tip speed	Metre/Sec/		
	i) Blade tip clearance	mm		
	j) BHP per fan			
	k) Air delivery per fan			
	l) Fan static efficiency			
	m) Blade material			
	n) Hub material			
	o) Fasteners & Hardware material			
	p) Entire fan assembly statically balanced			
	q. Total differential pressure drop mm H2O (considering recovery_			
	i. Drop through louvers	mm of HFO		
	ii. Drop through fills	mm of HFO		
	iii. Drop though eliminators	mm of HFO		


	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001		
	FOR <b>INDUCTED DRAFT COOLING TOWER</b> <b>3X660 MW NKSTPP,Unit- 1 , 2&amp; 3.</b>		<b>VOLUME :</b> II		
			<b>SECTION :</b> A		
			<b>DATE :</b> 12.12.14		
		<b>SHEET</b> 6 of 10			
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER		
	iv. Velocity pressure	mm of HFO			
	v. Drop through plenum	mm of HFO			
	r. Noise level of fan at rated pitch and speed				
	s. Total guaranteed power consumption at motor inlet (to be supported by calculations)	KW/Fan			
	t. Fan motor rating	KW			
28.0	<b>GEAR REDUCER</b>				
	a) Manufacturer				
	b) Model Number				
	c) Reduction Ratio				
	d) Service factor at rated HP of drive				
	e) Bearing and material				
	f) Material of gear tooth and hardness.				
29.0	<b>DRIVE SHAFT</b>				
	a) Manufacturer				
	b) Number				
	c) Rated HP				
	d) Drive and shaft material				
	e) Coupling material				
	f) Number of couplings furnished per driving unit				
	g) Type of couplings and whether coupling guard provided.				
	h) Drive shaft statically dynamically balanced.				


	TITLE : DATA SHEET - B	SPECIFICATION NO. PE-TS-405-165-N001
	FOR	VOLUME : II
	INDUCTED DRAFT COOLING TOWER	SECTION : A
	3X660 MW NKSTPP,Unit- 1 , 2& 3.	DATE : 12.12.14
	SHEET	7 of 10

S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER
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30.0	<p><b>Gate in Cold Water Outlet Channel</b></p> <p>a. Number per cold water outlet channel</p> <p>b. Gate Type</p> <p>c. Name of Manufacturer</p> <p>d. Gate Size</p> <p>e. Weight of each gate</p> <p>f. Are elements of gate dismantling type?</p> <p>g. Weight of each Element</p> <p>h. Frame Type</p> <p>i. Fixing arrangement of frame with RCC channel</p> <p>j. Lifting Arrangement of Gate</p> <p>k. Type of treatment for the wood (in case of wooden gates)</p> <p>l. Expected Life</p>	Years	
31.0	<p><b>VERTICAL SLUDGE PUMP &amp; MOTOR (Optional Item)</b></p> <p>Vertical sludge pumps complete with electric motors, valves, piping and fittings at their discharge offered.</p> <p>a. Make &amp; Model No.</p> <p>b. Rated capacity</p> <p>c. TDH</p> <p>d. Pump speed</p> <p>e. Pump efficiency</p> <p>f. Power consumption at rated flow</p> <p>g. Motor HP provided</p>	<p>Yes/No.</p> <p>M<sup>3</sup>/Hr</p> <p>MWC</p> <p>RPM</p> <p>RPM</p> <p>KW</p> <p>HP/KW</p>	

	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001	
	FOR		<b>VOLUME :</b> II	
	<b>INDUCTED DRAFT COOLING TOWER</b>		<b>SECTION :</b> A	
	<b>3X660 MW NKSTPP, Unit- 1 , 2&amp; 3.</b>		<b>DATE :</b> 12.12.14	
		<b>SHEET</b>		8 of 10
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER	
	<ul style="list-style-type: none"> <li>h. Material of Construction               <ul style="list-style-type: none"> <li>i) Impeller</li> <li>ii) Casing</li> <li>iii) Pump &amp; Line Shaft</li> <li>iv) Bearings</li> <li>v) Impeller/Casing Wearing Rings</li> </ul> </li> </ul>			
32.	<ul style="list-style-type: none"> <li>a) Oil Level Indication in Gear Box provided</li> <li>b) Vertical Switch               <ul style="list-style-type: none"> <li>➤ Type &amp; Model No.</li> <li>➤ Manufacturer</li> <li>➤ Contact rating</li> </ul> </li> </ul>	Yes/No		
33.0	<b>Cooling Tower Materials of Construction</b> <ul style="list-style-type: none"> <li>a. Casing</li> <li>b. Louvers</li> <li>c. Cell Partition Walls</li> <li>d. Basin Partition Walls</li> <li>e. Stack</li> <li>f. Stair Case</li> <li>g. Hot Water piping</li> <li>h. Hot Water distribution basin</li> <li>i. Internal Walkways</li> <li>j. Supporting Structure</li> <li>k. Hand Rails</li> <li>l. Structure Connector</li> <li>m Bolts, nuts, washers and other hardware</li> <li>n. Nails</li> <li>o. Anchor Bolts</li> <li>p. Hot Water Distribution Nozzle</li> <li>q. Hot Water distribution Plates</li> <li>r. Spacers</li> </ul>			
34.0	<b>Weight of Equipments</b> <ul style="list-style-type: none"> <li>a. Weight of Heaviest part to be handled</li> </ul>	Kgs.		

	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001		
	FOR		<b>VOLUME :</b> II		
	INDUCED DRAFT COOLING TOWER		<b>SECTION :</b> A		
	3X660 MW NKSTPP, Unit- 1 , 2& 3.		<b>DATE :</b> 12.12.14		
			<b>SHEET</b> 9 of 10		
<b>S. NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>DATA/PARAMETER</b>		
	b. Size of largest part to be handled c. Weight of gear box d. Weight of fan drive motor	kg.			
35.0	<b>Inspection &amp; Testing</b> a. Hydro Test Pressure for Hot water piping i) Test Pressure ii) Duration b. Balancing test for the fan and the drive shafts shall be conducted. c. Field performance test for the tower shall be conducted.	 Kg/cm <sup>2</sup> (g) Minutes  Yest/No  yes/No			
36.0	<b>Painting Details</b>  a. <b>Externally painted Surfaces</b>				
		<b>External Surface</b>	<b>Surface Preparation</b>	<b>Primer</b>	<b>Final Paint</b>
	i. Piping (Under Ground)				
	ii. Piping (Over Ground)				
	iii. Stationary Screens				
	iv. Drive shaft				
	v. Fan gear box				
	vi. Fan hub				
	vii. Hoist Derric				
	viii. Other Items				
	b. <b>Internally painted Surfaces</b>				
		<b>Internal Surface</b>	<b>Surface Preparation</b>	<b>Primer</b>	<b>Final Paint</b>
	i. Piping and Valves				
	ii. Other Items				

	<b>TITLE :</b> DATA SHEET - B		<b>SPECIFICATION NO.</b> PE-TS-405-165-N001		
	<b>FOR</b> INDUCED DRAFT COOLING TOWER 3X660 MW NKSTPP, Unit- 1 , 2& 3.		<b>VOLUME :</b> II		
			<b>SECTION :</b> A		
			<b>DATE :</b> 12.12.14		
		<b>SHEET</b> 10 of 10			
S. NO.	DESCRIPTION	UNIT	DATA/PARAMETER		
37.0	Flow per cell at design condition	M <sup>3</sup> /Hr			
38.0	Maximum Water Handling capacity (per cell)	M <sup>3</sup> /Hr			
39.0	Cooling Water Flow Rate (L)	Kg/m <sup>2</sup> /Hr			
40.0	Dry Air Flow Rate (G)	Kg/m <sup>2</sup> /Hr			
41.0	Ratio of Water to Air	(L/G)			
42.0	Dry Air Flow	Kg/Hr			
43.0	Temperature of air leaving the Stack	°C			
44.0	Inlet air Enthalpy	KCal/Kg			
45.0	Exit air Enthalpy	KCal/Kg			
46.0	Total Heat Exchange/Kg of Inlet Dry air	KCal/Kg			
47.0	Losses in hot water piping in MWC	MWC			
48.0	Type of air inlet	MWC			
49.0	Pressure recovery from fan stack	mm			
50.0	Air inlet are per cell	Max.			
51.0	Splash surface of fill per cell in	M <sup>2</sup>			
52.0	Whether fan blades are adjustable degree of pitch adjustment	°C			
53.0	Max. possible discharge through fan (indicate angle of pitch)	M <sup>3</sup> /Hr			
54.0	Design value of discharge through fan (indicate angle pitch)	M <sup>3</sup> /Hr			
55.0	Weight of complete fan assembly	kg			

**CHECKLIST - LIST OF SCHEDULES**

Sl. No.	Form No.	Description	Tick Applicable Forms
1.	PEM-6024	Schedule of Drawings/Catalogues submitted with Bid.	✓
2.	PEM-6025@	Schedule of Occurrence of Key Events of Delivery, Erection & Commissioning	
3.	PEM-6026	Schedule of Equipment Manufacture. Despatch and Shipment to Site.	✓
4.	PEM-6027	Schedule of Weights & Dimensions.	
5.	PEM-6028@	Schedule of Performance Guarantee	
6.	PEM-6030	Inspection Schedule	✓
7.	PEM-6031	Schedule of Cement and Steel and Quarterly Cement Requirement.	
8.	PEM-6032	Schedule of Quarterly Requirement of Reinforcing Bars and Structural Steel.	
9.	PEM-6033@	Bill of Quantities (Civil Works)	
10.	PEM-6035	Schedule of Bidder's Proposed Construction/ Site Fabrication Facilities.	
11.	PEM-6036	Schedule of Deviations.	✓
12.	PEM-6040	Schedule of Declaration	✓
13.	PEM-6041	Quality Plan	✓
14.	PEM-6042	Vendor's Drawings/ Documents Schedule	✓
15.	PEM-6043@	Schedule of Occurrence of Key Events for Civil/Structural Works	
16.	PEM-6046	Inspection Request.	✓
17.	PEM-6051@	Schedule of Prices.	✓
18.	PEM-6052@	Schedule of Unit prices	✓
19.	PEM-6053	Schedule of Prices for Commissioning & Mandatory Spares.	✓
20.	PEM-6054	Schedule of Prices for Recommended Spares.	✓
21.	PEM-6055	Schedule Prices for Erection and Maintenance Tools & Tackles.	✓
22.	PEM-6057	Schedule of Daily & Overtime Rates.	
23.	PEM-6058	Schedule of Hire charges for Construction/ Site Fabrication Facilities.	

**For Forms marked with @ certain information to be filled by DEs before issuing to bidder.**

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**SCHEDULE OF DRAWINGS/CATALOGUES  
SUBMITTED WITH BID**

SPECIFICATION NO:

VOL III

SHEET..... OF.....

Section C/D enclosed with the specification indicate the drawings / catalogues to be furnished with the bid. The bidder in addition to furnishing the same, can also include any other drawings / catalogues which he may desire to submit with the bid. This schedule duly lists out such drawings as enclosed by the bidder with the bid.

DRAWING/ CATALOGUE NUMBER	DESCRIPTION	NUMBER OF SHEETS

**PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE**

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL
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**SCHEDULE OF EQUIPMENT,  
MANUFACTURE, DESPATCH AND  
SHIPMENT TO SITE**

SPECIFICATION NO:

VOL III

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Equipment/Major Bought-out items	Time for Manufacture/ Procurement from Date of issues of Letter of intent (Weeks)	Time for Test Dismantling Packing & Ready for Despatch (Weeks)	Time required fro Shipment to Site (Weeks)	Total Time from Date of Issue of Letter of intent to Shipment to Site (Weeks)

We, the undersigned hereby undertake to meet the schedule in weeks fro manufacture, dispatch and shipment of each equipment and procurement of major boughtout items as listed above.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**SCHEDULE OF  
WEIGHTS & DIMENSIONS**

SPECIFICATION NO:

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The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.

Description of Package(S)	Dimension (in meters)	Weight (in tones)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



**INSPECTION SCHEDULE**

SPECIFICATION NO


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S No.	ITEM/COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	SCHEDULE D DATE OF INSPECTION	DURATION OF TEST / INSPECTION (IN DAYS)

This schedule shall be in the line with specification and quality plan requirements. The information in this form shall be furnished after receipt of LOI/PO.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	<p><b>TITLE</b></p> <p style="text-align: center;"><b>* SCHEDULE OF DEVIATIONS</b></p> <p>( ) From Conditions of Contract (Volume – 1)</p> <p>( ) From General Technical Conditions (Volume – II A )</p> <p>( ) From Technical Specifications (Volume –II B)</p>	<p>SPECIFICATION NO</p> <hr/> <p>VOL III</p> <hr/> <p>SHEET..... OF.....</p>
<p>We the undersigned hereby certify that the above mentioned are the only deviations.</p>		

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	<b>TITLE</b> <b>* SCHEDULE OF DECLARATIONS</b>	SPECIFICATION NO
		VOL III
		SHEET..... OF.....

\* Bidder shall include this schedule both in technical and Price offers

**DECLARATION**

I .....certify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated ..... and there is no deviation to the specification.

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Biders Company Name .....

Authorised representative's Signature .....

Name .....

Bider's Name The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

6: ISO FORMS / P & M FORMS

Bid FORM No. PEM - 6041-0

S. NO.		QUALITY PLAN										SPECIFICATION NUMBER		
		COMPONENT / OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE / METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
		SHEET	OF	SYSTEM	ITEM	QUALITY PLAN NUMBER	PROJECT TITLE	CUSTOMER		SPECIFICATION TITLE		SECTION VOLUME III		
											P	W	V	
1		2	3	4	5	6	7	8	9	10				11
		BHEL												
		PARTICULARS										BIDDER / VENDOR		
		NAME												
		SIGNATURE												
		DATE												
													BIDDER'S / VENDOR'S COMPANY SEAL	

**INSTRUCTIONS FOR FILLING QUALITY PLAN**  
(Form No. PEM-6042 (7))

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

- Column 1- Serial Number
- Column 2- Component/Operation- The component and/or operation being checked shall be given here.
- Column 3- Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc.
- Column 4- Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel  
'MA' stands for major Characteristic - affecting safety of equipment and personnel  
'MI' stands for minor characteristic - affecting appearance etc.
- Column 5- Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
- Column 6- Extent of check, such as, 100, 10, 1 per heat etc.
- Column 7- Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
- Column 8- Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
- Column 9- Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
- Column 10- Agency - The agency which performs the test/instruction shall be written in sub-column 'W'  
The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'  
The agencies are codified as 1, 2 & 3  
'1' stands for (BHEL)  
'1' \* means the operation shall be cleared by BHEL before the start of the next operation.  
'2' Stands for Vendor  
'3' stands for sub-Vendor of the Vendor and so on.

**Example :**

- Entry '3' in column 'P' means test/inspection to be performed by sub-Vendor's QC
- Entry '2' in column 'W' means test/inspection to be witnessed by Vendor's QC
- Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
- Column II- Remarks - Any special remarks shall be given here.

**NOTES**

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless otherwise agreed.
3. For castings and forgings integral test specimens shall be provided. When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHEL's Purchaser/Third Party/Statutory authorities are mandatory, this shall be compiled with.
7. Inspection reports, log sheets, test reports/certificate, etc. shall be furnished to BHEL at the appropriate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in septuplicate (7 Copies).



**\*SCHEDULE OF PRICES FOR COMMISSIONING AND MANDATORY SPARES**

SPECIFICATION NO

VOL III

SHEET..... OF.....

**\*Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid**

The bidder shall indicate here the quantity required for erection / commissioning and mandatory spares for equipment as listed in Section C / Section – D. If the listed spares are not adequate then the bidder shall indicate those and additional spares considered necessary by him.

Type	Manufacturer's Drawing No / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Recommended	If Set, Nos. Per Set	Delivery Period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection & Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



	<b>TITLE</b> <b>* SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS &amp; TACKLES</b>	SPECIFICATION NO
		VOL III
		SHEET..... OF.....

**\*Unpriced schedule shall also be furnished along with Part A- Schedule in technical bid**  
 The bidder shall be given below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools. If specified in Section – C / Section - D

S. No	DESCRIPTION OF TOOLS & TACKLES	QUANTITY OFFERED	UNIT PRICE (Rs.)	TOTAL PRICE (Rs.)

**NOTE :** The hire charges for vendors equipment called for in this schedule shall include the cost of consumables, operation services, descriptions, wear and tear as well as vendor's over head and profit (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract).

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL