



भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

TCN - 01

Ref: PSER:SCT:NKP-M1987:TCN-01

Date: 04-10-2019

Sub	Tender Change Notice (TCN)- 01.	
Job	Erection, Testing and Commissioning of Air Cooled Condenser (ACC) with Associated Auxiliary System etc. for unit # 2 of 3x660 MW North Karanpura STPP, Jharkhand.	
Ref	1.0	Tender no PSER:SCT:NKP-M1987:19
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-M1987:7577 Date: 27-09-2019.
	3.0	Other References, if any.

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

1. Clause No 48.6 under Clause No 48.0- TAXES AND DUTIES of VOLUME-IF-TCC-R-0 shall be revised as below:
Clause No 48.6: TDS under GST shall be deducted at applicable rates on gross invoice value from the running bills (RA bills).
2. Tender no written in header of VOLUME-IF-TCC-R-0 shall be read as TENDER NO PSER:SCT:NKP-M1987:19 instead of TENDER NO – PSER:SCT:NKP1987:19.
3. Introduction of the following drawing/sketches/specification for general guidance & tender purpose only which may undergo changes during execution.
 - Side View of Air cooled Condenser Drg No HAC-NKP-J-T-01-03
 - ERECTION MANUAL- HAC DOC No.: HAC-NKP-J-D18
 - Painting schedule- Annexure- IV.5-1
4. Revised 'No deviation certificate' is attached. Bidder to submit 'No deviation certificate' as per attached format only.
5. All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HEAVY ELECTRICALS LTD

Dy. Mgr (SCT)

Encl: As Above.

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50-10J-1-JAN-CYH
 ON STANDARD

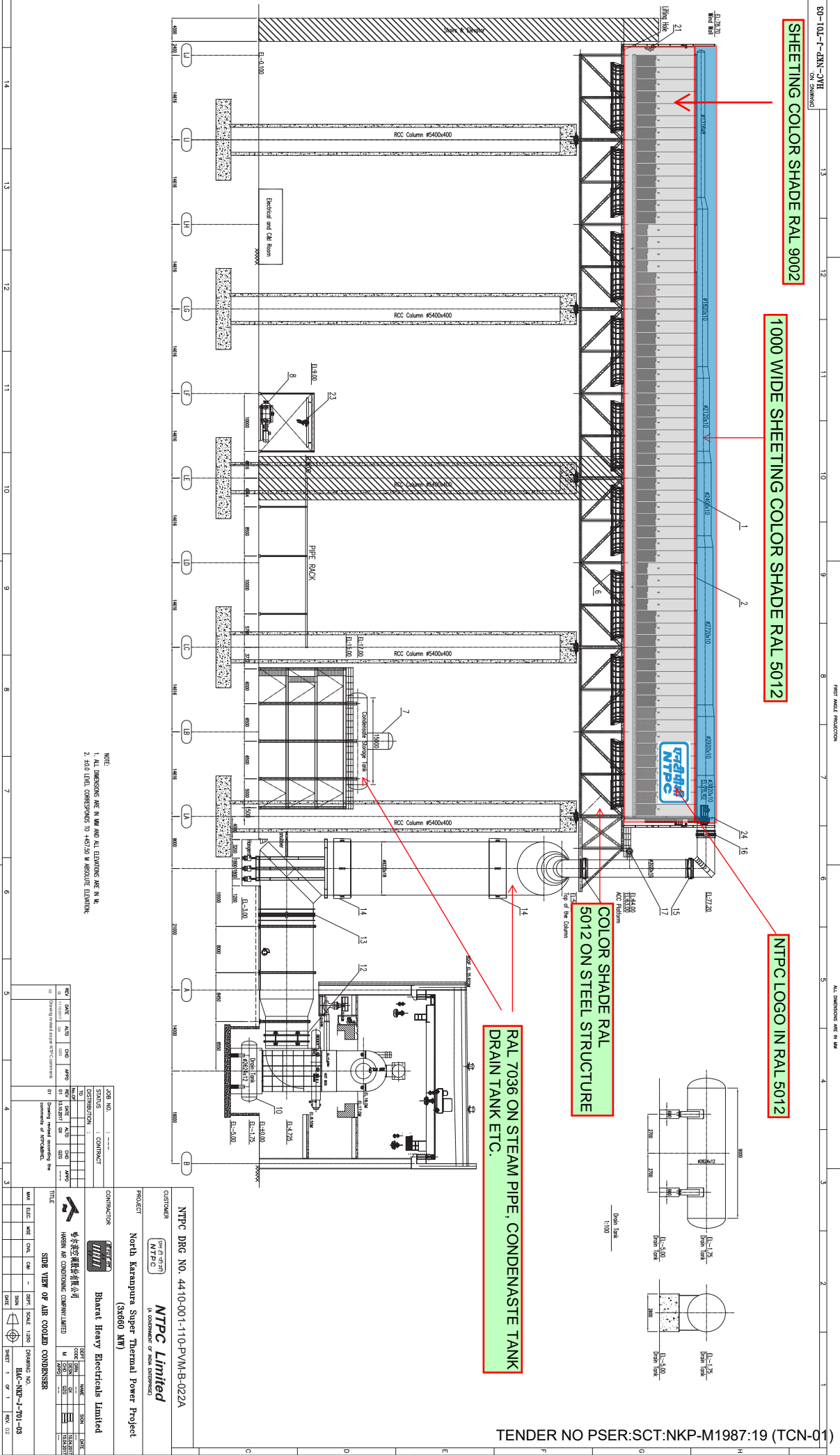
SHEETING COLOR SHADE RAL 9002

1000 WIDE SHEETING COLOR SHADE RAL 5012

NTPC LOGO IN RAL 5012

COLOR SHADE RAL 5012 ON STEEL STRUCTURE

RAL 7036 ON STEAM PIPE, CONDENSATE TANK DRAIN TANK ETC.



- NOTE:
1. ALL DIMENSIONS ARE IN MM AND ALL ELEVATIONS ARE IN M.
 2. 5.00 LEVEL CORRESPONDS TO +457.50 M ABSOLUTE ELEVATION.

REV	DATE	BY	CHK	APP	REVISION
01	11/03/2024
02	11/03/2024

JOB NO. :		STATUS : CONTRACT	
DISTRIBUTION :		DISTRIBUTION :	
CONTRACTOR : Bharat Heavy Electricals Limited		PROJECT : North Karapuram Super Thermal Power Project (35660 MW)	
CUSTOMER : NTPC Limited		PROJECT : North Karapuram Super Thermal Power Project (35660 MW)	
TITLE : SIDE VIEW OF AIR COOLED CONDENSER		PROJECT : North Karapuram Super Thermal Power Project (35660 MW)	
DATE	SCALE	SHEET	TOTAL SHEETS
11/03/2024	1:100	1	1

ERECTION MANUAL

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1. Introduction

1.1 ESTABLISH SITE

When necessary, an introduction meeting will be organised by Client. During such meeting, the Client shall give the following information:

- a) Site evacuation procedures.
- b) Site Health and Safety Rules.
- c) Site Health and Safety Representative.
- d) Welfare facilities to be shared.
- e) First Aid facilities.
- f) Alarm raising procedures.

Erection subcontractor should carry out an inspection of working area and report any anomalies noted to Client for further action / elimination such as:

- a) Third working parties in vicinity of operations.
- b) Public that could be affected.
- c) Compliant location and size of erection working, assembling and discharging areas.
- d) Compliance of the ground characteristics for erection:
 - Suitable soil compactness for access of mobile crane of 20 tons per axle.
 - Drained ground ensure adequate dryness for material storage and erection works.
 - Free access around ACC structure will be defined. Site offices, workers

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lavatories and bathroom etc. shall be installed within 10m around the area as far as possible. Erection subcontractors shall offload the in the working area as agreed by parties.

Client or Erection Subcontractor's shall ensure that water, electricity and communication facilities have been gotten through the offices, at the same time, lumber room shall be set up in the discharging area.

1.2 SITE SAFETY

All work shall be carried out in accordance with Site safety regulations.

All work shall be carried out in accordance with the Vendor Health and Safety manual which is the current edition.

Entering the safety access and working areas shall be by agreed routes as per Health and Safety Plan drawings or local requirements.

Only tested and certified cranes shall be utilised and shall be sufficient for task.

Copies of certificates for cranes shall be maintained by the clients & Safety principle and will be checked to use on request at the site.

All lifting tackle shall be tested and certified and suitable for designated tasks.

Copies of Certificates have to be available at the site.

The crane driver shall be competent and will have an accredited qualification in conformity with local requirements.

Safety principle shall be responsible for controlling, monitoring and reporting of all safety matters.

The safety principle shall visit site to ensure Health and Safety will be put into practice basing on regulations.

All work shall be carried out in line with Risk Assessments and Method Statements as applicable by competent personal. Training on site shall observe the relevant information as defined from "Health& Safety Plan" by client and instruct the staff in 'tool box' manners.

1.3 PERSONAL PROTECTIVE EQUIPMENT (P.P.E.)

Any of the items listed below shall be compliant with Site Rules, Risk Assessments, and other agreements.

- a)Helmet (Welders exempted only whilst welding)
- b)Safety Footwear

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- c)Overalls
- d)Ear Defenders
- e)Eye Protection
- f) Gloves
- g)Welding Masks
- h)High Visibility Vests (Welders exempted whilst welding)
- i) Safety Harnesses
- j) Intern Reels
- k)Breathing Apparatus
- l) Others as identified

1.4 EMERGENCY PROCEDURES

- a)Site Evacuation plan shall be submitted by Client.
- b)Emergency & contact phone numbers shall be submitted by Client.

1.5 SUMMARY OF ERECTION SEQUENCES OF THE ACC. ACC

The following proposed sequences shall be further detailed in the specific site erection schedule.

STEP 1

Unit will start with the streets 1

Firstly the steel trusses of the streets 1 will be preassembled at the ground level and erected, then the corresponding fan deck supporting, fan screen/fan bell, fan duct and fan deck plates

STEP 2

Erection from the steel trusses of the street 2

Firstly the steel trusses of the streets 2 will be preassembled at the ground level and erected, then the corresponding fan deck infill & fan screen / fan bell, fan duct and fan deck plates

STEP 3

Erection of the motor support bridges of street 1 & 2 with gearboxes & motor & blades & grating and handrails already fitted. (In case of missing parts or late delivery alternative erection PRO will be submitted later)

Erection of A- frames of the street 1 & 2 above fan deck.

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Installation of tube bundles & steam manifold (include the spring hangers & guiding rails for the cleaning ladder and manhole axis platforms & ladders) and condensate header of street 1 & 2.

STEP 4

Erection from the steel trusses of the street 3.

Erection of motor support bridges of street 3 with gearboxes, motor & blades & grating and handrails already fitted. (In case of missing parts or late delivery alternative erection PRO will be submitted later) Erection of A- frames of the street 3 above fan deck.

Installation of tube bundles & steam manifold (include the spring hangers & guiding rails for the cleaning ladder and manhole axis platforms & ladders) and condensate header of street 3

STEP 5

The access of the turbine table area should be available.

Installation of the exhaust ducting at the exit of the TEB (Include the Blank Plate).

Pre-assembling and erection of the horizontal T-section of the main duct for the street 1 & 2 Pre-assembling and erection of the horizontal main duct sections for the street 3

STEP 6

Erection & tack welding the horizontal bellows and butterfly valves at the horizontal distribution manifolds.

STEP 7

Pre-assembling and erection the risers & longitudinal Bellow and this between the main duct and the distribution manifold after welding for steam distribution manifolds.

STEP 8

Preassembled wind wall sections are fixed around the ACC.

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Condensate manifolds of each street are welded as soon as the related tube bundles are welded to the steam manifolds and all the tube bundles in the vicinity have been placed into position.

The internal partition will be then installed between fan cells for air seals.

Note: Survey / Topographic report must be performed during installation of the Main Steam manifold sections to verify final placement / vertical alignment to each Riser connection.

Piping will be erected when condensate manifold is welded to the tube bundles and various equipment (pumps and vacuum equipment) are installed. The piping delivery consists of vertical segments with the required elbows and fittings from ACC platform to condensation collector, which should suit HAC piping routing. The erection company will assemble the pieces accordingly.

2. List of Tools & Tackles (capacity, quantity, detail list etc.to be mentioned)

2.1. All lifting equipment for the Contract shall be tested and will have current certificates available. (Test & expiry date and load)

2.2. All plant and equipment shall be suitably maintained and

recorded to be kept. 2.3. Principle workload (per unit) (maximum weight of single component)

S.L.	Name	Size,mm _v	Weight (kg)	Quantity	Total Wt. (Kg)	Remarks
1	Steam Duct	∅9000	150000	2	300000	
2	Steam Duct Tee	∅9000	80000	1	80000	
3	Steam Duct Elbow	∅9000	80000	1	80000	
4	Steam Distribution Manifolds	∅3000 X 15000	18000	10	180000	
5	Current Flow Bundles	11600×2088	5000	1100	5500000	
6	Counter current Flow Bundles	11400×2088	5000	160	800000	
7	Bundle Bellow	∅508×11780	1800	40	72000	
8	Condensation Water Tank	∅3600×20000	70000	1	70000	Including deaerator

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9	Axial Fan Unit	ĩ10974	2200	90	198000	
10	Fan Duct and Screen		5000	90	450000	
11	Motor	200kw	1200	90	108000	
12	Gearbox		1300	90	117000	
13	One Truss Steel	29232	36000	110	3960000	
	Total Wt.				11915000	

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2.4 General Construction Arrangement

Road

Storage area for steel structure, fan bridge, A frame Storage area for steam duct, steam distribution manifolds, fan units and other apparatuses. expansions etc.

road 800m X 290m

Road

Road Road

Living area Storage area for ACC Bundles 82.0m X 36.0m

170m X 600m Configuration Area for Big Duct Road

Around 8000 Road

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A. Construction Machinery Arrangement

- (1) During the construction for ACC supporting foundation and column, one 25T level jib crane shall be arranged respectively inside per unit of ACC, Turing radius of which shall be set as 70m value for working of column within the radius respectively. Details see general arrangement.
- (2) During installation for ACC truss and top thereof, 300t main jib, 64m fly jib and 45m crawler crane shall be respectively arranged inside per unit of ACC for lifting truss, steam distribution manifolds and main steam duct along with the equipment that cannot be lifted by 25t level jib crane. Details see general arrangement.
- (3) Two 25t auto cranes and one 20t platform car shall be equipped with per unit for coordinating transportation, loading & unloading of equipment, along with equipment installation on the ground such as steel structure, screen, fan units, A frame, wind wall etc.

B. General Construction Arrangement Management (1) Storage Area 15000m²

Storage area and configuration area should be designated by owner for equipment and big duct that mainly are ACC bundles, steel structure, fan fittings, steam duct etc., which the usage area shall be amount to 15000 around.

(2) Fabrication Area and Tools House

400 m² Fabrication area should be respectively established on the east and west of ACC for assembling truss, A frame, and fan units etc.

One 40m² tools house should be established respectively inside the fabrication area of ACC.

(3) Office Area and Living Area 1200m²

Temporary office building shall be set up within the area designated by owner, viz HAC Project Manager department; temporary building shall be set up within the area designated by owner for living. The usage area for the office and living shall be amount to 1200 m². **General items of plant and equipment required are as follows:**

a) Mobile Cranes:

350 T Crawler Crane: 65m Main Jib + 41m Fly Jib

25 T Auto Crane: 24.5m Main Jib + 7.5m Fly Jib

25 T Flat Jib Crane: Range of 70m Height of 74m

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b) Welding Plant Z X 7400 500

Contravariant DC manual welder ZX7400 500

c) Generators

d) Compressors, 1.0 M³ / Min 1.0Pa

Amount of steam exhausted: 1.0m³/Min

Pressure 1.0Pa, Power.7.5KM/P



Air compressor for site painting

e) Scaffolding including tower and walkway

Scale for each concrete column of ACC

(each ACC unit including 25 concrete columns totally 3 units) .

Barling: 6m – 700 pieces; 4m – 60 pieces; 2m – 400 pieces;

Pedal: 200 pieces; Fastening: 2000 sets

f) Activity cabins 20 M²

Project manager office conference room financial room specialist engineer office,
document centre guardian room factory representative office tools crib
warehouse of material etc. minimum totally 9 rooms, separated each room 20

g) Angle grinders, 100mm

Grinding disk diameter: 100mm, Power, 670W

h) Impact wrench + Sockets. M10 M30

i) Torque wrench. M30

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Electric Torque wrench used in high strength bolts



Manual torque wrench used in retesting

j) Measuring / levelling equipment.



Theodolite used in measuring

k) Soft Nylon rings + Chain blocks + Pull-Lifts + U shaped shackles.

Nylon sling: 2 M - 2t, 5 M - 10t, 10 M - 20t, Chain blocks 5t, 10t

U shaped shackles 10t, 20t

l) Hand Tools / Spanners etc.: Sledge hammer in 10 psi, hammer in 2 psi, drilling tool in 5-M 30-M, Steel tape in 10-30, box spanner adjustable spanner in 200mm-

ERECTION MANUAL

maximum opening 25mm, adjustable spanner in 300mm - maximum opening 35mm etc.

- m) Safety Harnesses + Personal Protection Equipment: Each person will be equipped with one set according to the number of people in ACC building.

2.5 Recommended storages area for materials

Outdoor Storage

Steel supports structure
 Fan Bells
 Motor bridges
 Grids and checked plates
 Railings
 Fan screens
 Piping
 Cleaning ladders

Storage under protective foil

Fin tube bundles
 Expansion joints
 Air extraction unit (s)
 Wind wall & intermediate sheeting / cladding
 Fan drive units (complete)
 Fan impellers
 Gear boxes

Please Note: During unloading, correct lifting equipment / tackle (s) should be used and if necessary additional protection should be done during lifting activities in order to avoid damage to the equipment or material. Good solid timber cribbage / packing should also be placed under the equipment or material before placing onto the ground to avoid damage and contamination with the soil.

Storage in closed rooms
 Valves / Fittings
 Measuring instruments
 Cleaning system (pump, motor and associated material like sprays, hoses, ...)
 Rupture disks

ERECTION MANUAL

Connection materials such as screws, nuts, washers, dowels, etc.

ACCESS EQUIPMENT

Erector would normally provide their own access equipment Workings platforms consisting of:

- Top handrail- solid / tubular
- Platform clips
- Floor boards- 3" wide
- Platform bracket
- Mid handrail- solid/ tubular
- Kick/ toe boards
- Ladders
- Site scaffolding
- Mobile scaffold towers
- Or other methods proposed by erecting company

3. Assembly-wise Erection Procedure

Erection subcontractors have to check that all materials are delivered against drawing and transport documents, any damaged or missing items are to be reported immediately or ASAP within 2 two weeks so as to replace or repair. If notifications & report of any missing items has not been received within the same time, it would be assumed that all material identified on the delivery / packing list would be correct,

- Any missing / damaged items reported after this time will then become the responsibility of the erection subcontractor to replace & repair.

Site cranes shall be established.

Erection subcontractor's is responsible for welding consumables that are stored in the correct manner and in line with weld procedures/specifications. A report / record reference about electrode storage & issuance should be submitted each week and inserted into the site records All erection bolts, nuts and washers will be stored in suitable containers.

Crane details will be defined in the method statement (see paragraph 1.7.5).

A method statement for each heavy manipulation shall be issued and will contain following information,

Detailed description of the necessary preparation steps

ERECTION MANUAL

Necessary crane movements shall be explained and documented on a drawing showing crane radius and working area. Such document is to be prepared by the Erector.

A documented file about crane(s) shall be used, which gives the crane dimensions and load chart. Such document is to be prepared by the Erector.

Per major part and/or heavy manipulations should be having on safety analysis. Such analysis is to be prepared by the Erector.

All hand tools should be in good order and correctly stored in properly container.

MAIN ERECTION SEQUENCES

REFERENCES

Drawing HAC-NKP-J-T01

Unit 1	
Street 1	Between axis (L1-1) -(L1-2)
Street 2	Between axis (L1-2) -(L1-3)
Street 3	Between axis (L1-3) -(L1-4)
Street 4	Between axis (L1-4) -(L1-5)
Street 5	Between axis (L1-5) -(L1-6)
Street 6	Between axis (L1-6) -(L1-7)
Street 7	Between axis (L1-7) -(L1-8)
Street 8	Between axis (L1-8) -(L1-9)
Street 9	Between axis (L1-9) -(L1-10)
Street 10	Between axis (L1-10) -(L1-11)

3.1 Mechanical System

DETAILED SEQUENCES FOR ONE STREET

Lift and erect the ground-assembled steel trusses parts (these assembled structural steel trusses should be safely stabilised by cables and mainly for the first two erected truss).

After erection of the main support structure, Level and dimensional checks plus Bolt Torque should be performed and any correction work should be completed (Max

ERECTION MANUAL

Tolerance of +/-3mm should be maintained) for TOS. Include being square and aligned and this to avoid problems with other & further parts who have to be erected. One final Topographical placement report will be supplied, after receiving & accepted of the report. The fan deck structural parts (for the current module) can be pre-assembled at the ground level and then installed, the small fan deck structure will be erected with man lift (cherry picker) or by crane. After installation another dimensional check / survey and bolt torque report should be performed & supplied to ensure that the supports are correct – diagonally, elevation & level and central for the installation of the Fan Bell.

Steel trusses of this street will be put on level @ TOS Fan Deck, columns base plates will be fully fastened after alignment meeting HAC requirements. All the bolts will be tight up as supplier's specifications.

3.1.1 Steam Exhaust System

3.1.1.1 Main Steam Duct

Preassembly & erection of hinge bellow & main steam ducting “including blank plate” (following erector statement approved by HAC). Fig 1 & 2 & 3

Pre-assembly and erection of elevated horizontal ducting (following erector statement approved by HAC)

Fig.4.



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Fig. 1



Fig 2

ERECTION MANUAL



Fig. 3



Fig. 4

Welding of the manifold in accordance with WPS and procedures.

ERECTION MANUAL

3.1.1.2 Steam duct Riser

Preparation & erection & welding of riser at the ground level and erect. Fig 5



Fig. 5

3.1.1.3 Steam Distribution Manifold

After alignment check from top and bottom bundle tubes-sheets and accepted by HAC, erection and tack welding can be start from the Distribution Manifold & Condensate Headers. Fig 6 & 6a.

ERECTION MANUAL



Fig. 6

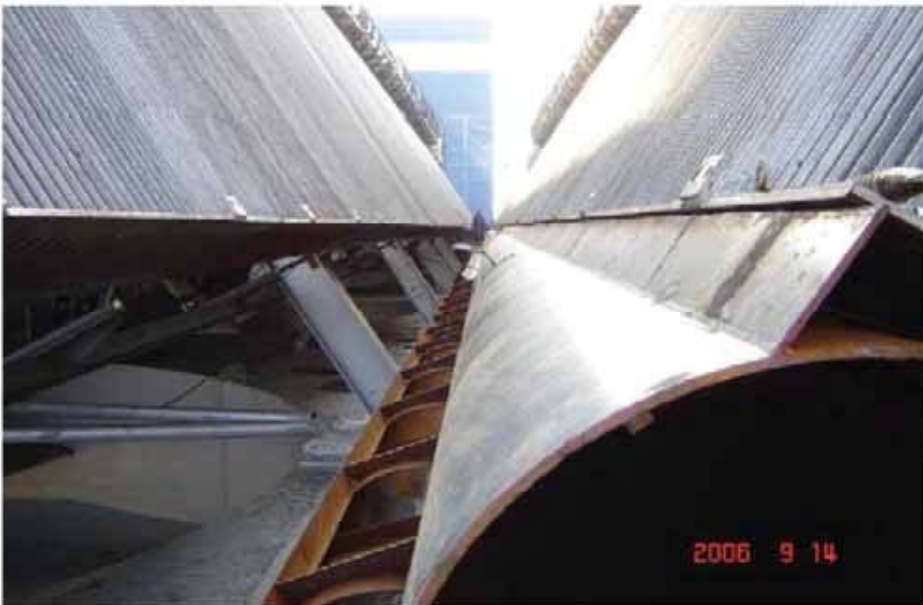


Fig. 6a

Start erection of DSM, alignment, welding in accordance with procedures.
(If isolated valve, which should be installed on the ground.) Fig - 7

ERECTION MANUAL



Fig 7

3.1.2 Tube Bundle System

3.1.2.1 Tube Bundles

Bundle erection can have started when one & two streets are finish completely & bolted up. Prior to lifting bundles, one survey report showing top grinder levelness and straightness would be made by the erection company and submitted to HAC for inspection and acceptance. fig 8 & 8a & 8b

ERECTION MANUAL



Fig. 8



Fig 8a



Fig. 8b

Preparation of bundles. Fig.9 ACC

ERECTION MANUAL



Fig.9

Installation of bundles, alignment and welding in accordance with procedure.
Preparation of top steam manifolds (DSM) with access platform and cleaning
guiding rails.

3.1.2.2 Condensate Header the entire condensate header is welded,
remove the bundle jacking supports. Fig.10

ERECTION MANUAL



Fig.10

Welding of bottom condensate manifold.

Proceed further with the erection of the other streets of the ACC as described above, after under structure is completed.

Continue with piping location and welding.

3.1.3 Air Moving System

3.1.3.1 Fans

Sorting out of fan deck plates can be done at the ground level, and later be placed up the fan deck level. Fig 11 (These plates should be secured against falling down due to wind or others.)

ERECTION MANUAL



Fig 11

Start with fan deck plate location under the motor bridge. (Before location of the motor bridge)

Prepare 2 temporary supports to assemble the motor bridge and allow access enough for working space & introduction of gearboxes, motor, blade & structural parts such as handrails and grating. (all these parts will be erected in accordance with the crane lifting capacity) Fig 12& 12a

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Fig. 12



Fig 12a

Assembling for fittings such as motor briede etc. should be performed at ground level near their final location along each street (fan blades to be installed provisional in max. vertical position)

3.1.3.2 Fan Belt

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Start the assembly of the Fan Screen & Fan Bell at the ground level. The assembly of the fan bell should be performed on levelled ground & long timber packing or tables in order to avoid any distortion during assemble of the parts (fig 13 & 14).



Fig. 13



Fig.14

The fan ring and bell should be assembled to its diameter avoiding any roundness and circle deviation.

ERECTION MANUAL

Recommended Survey / Dimensional Record of each ring and bell will made, the fan ring and bell should be in accordance with the DWG. & records from the supplier.

Lifting operation can have started to locate the whole assembled fan bell & Fan Screen from the ground to its supports onto the Fan Deck level (fig 15).



Fig. 15

The fan bell will be fixed onto the 8 supports plates & fan deck structure with the correct connection bolts. Fig 16

ERECTION MANUAL



Fig. 16

2.4.1 Continue with the assembly & erection of the other air inlet bells till 2 or 3 streets are completed. Fig.17

ERECTION MANUAL



Fig

17 3.1.3.3 Gear Box NOTES:

Gearbox shall be filled with lubrication oil, quantity is indicated at the gearbox label & gearbox data sheet (Mineral oil shall be added before commissioning first, and then the mineral oil shall be changed into composite oil as per instruction of gear box.)

3.1.3.4 Fan Bridge

After completion of motor bridge at the ground level, lifting onto the fan deck level (fig 18).

After the basic structure including motor bridges of the whole street is located and erected, a final survey will be performed and recorded for all installed pieces.

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Fig 18

Continue and perform the same operation on each adjacent cell.

Preparation & assembly and bolting up for A - frames can start at the ground level. (fig 19)

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Fig 19

3.1.4 Structure (Upper)

The Client should officially furnish & show & identify all the site references (Datum Points) such as the main level reference Points, Marked at different fixed places / locations, the North orientation reference and the main ref. Axes X, Y and Z of the concrete slab & pedestals. All locations should be recorded on one survey report.

The erector subcontractor will check the concrete slab, pedestal before starting any erection of steel parts and confirm the preparation work is in compliance with drawing HAC-NKP-T-T02-02

The client will issue a survey report (Refer to section 2.2.1) which will be verified & confirmed by the Erector Contents of the Report should identify the following:

Indication of the slab level and anchor bolts orientation.

Location of all the concrete slabs following reference axes: X, Y, Z.

All deviation from HAC-NKP-T-T02-02 information's.

HAC-NKP-T-T02-02

Status of concrete construction on the day of site opening.

Above information will be also available after any new concrete slab is installed.

Interface with ACC scope of supply.

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3.1.3.1 A Frame Structure A

Pre-assembled A-Frames can be erected (see Fig 14 &14a) followed with the top girders & distance bracings & diagonal bracings & monorails.



Fig. 20



Fig 20a

Make the same operations to erect the adequate streets.

Installation of internal & external doors. Fig.21

ERECTION MANUAL



Fig.21

Starting intermediate cladding (sheeting) on the internal and external “A” frame of each street. Fig. 22



Fig. 22

3.1.4.2 Winds Wall Structure

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Prepare the wind wall structure sections & sheeting at the ground level and erect.
Fig.23 & 24



Fig. 23



Fig. 24

3.1.5 Air Evacuation System/Vacuum System

3.1.5.1 Piping and Walls

Installation see the PID drawings.

3.1.5.2 Vacuum Pump and Its Piping

Air take –off lines between secondary bundles and holding pumps.

See the Vacuum Piping drawings of HAC and Installation Instructions of Vacuum Pump.

3.1.6 TANK & DRAIN SYSTEM

3.1.6.1 Drain Tank and Its Piping

3.1.6.2 Drain Pump and Its Piping

3.1.6.3 Condensate Tank and Its Piping

Condensate lines between condensate manifolds and turbine exhaust box

Preparation & prefabrication at site the condensate and air take- off piping. Fig-25

ERECTION MANUAL



Fig 25

Location of main piping. Fig. 26



Fig. 26

3.1.6.4 Condensate Pump and Its Piping

3.1.7 Other Balance Items

3.1.7.1 Cleaning System Along with Ladder

ERECTION MANUAL

Erection from valley walkway structure for grating and Introduction of the cleaning ladder. Fig. 27



Fig. 27

2.5.25 Introduction of the cleaning ladder. Fig. 28

ERECTION MANUAL



Fig. 28

Erection of cleaning system, pump and associated pipe works.

3.1.7.2 Stairs and Elevator

3.1.7.3 Air Conditioning and Ventilation System

Air Conditioning of C&I room for ACC adopt split units, composed of indoor unit and outdoor unit.

Installation of split units should according to the manual for split units.

Installation step as follows:

1. Confirm the installation location

Indoor unit installation location is in C&I room and nearby the wall; Outdoor unit installation location is outdoor and fix on the wall or on the ground. The distance of indoor unit and outdoor unit should not exceed 5 meters.

2. Installation of indoor unit

According to the manual for split units.

3. Installation of outdoor unit

According to the manual for split units.

ERECTION MANUAL

4. Connection of pipeline

According to the manual for split units.

5. Note

Installation of unit should be grounding, prevent of creep age accident.

3.2. Electrical System

Installation see the product design drawings of electrical systems.

Installation instrumentation cables tray and cabling after erection of junction boxes.
Fig. 29



Fig. 29

3.3 C & I SYSTEM

Installation see the product design drawings of C & I system.

4.0 Special Precaution to Be Taken During Erection

4.1 Bolting

- a. Steel structure supplier will submit bolting torque.
- b. Bolts fastening of hub, blades and retaining plates should be fixed following recommendations
given in the relevant procedure and recorded on survey sheets.

ERECTION MANUAL

4.2 Site welding principles

- a. On structure and parts of structure as well as all the items that are protected by paint, welding is forbidden. Repairing and/or adaptation of assembling parts are subject to agreement by client before proceeding.
- c. All site-welding assemblies are foreseen and indicated on drawing and all sites welding are associated with predetermined WPS.
- c. Welding map: each weld should be itemised with a particular reference number recorded in the welding map drawing and listed on record sheets with location and WPS
- d. Erection WPS must be in accordance with HAC recommendations. All additional WPS must be approved. Additional WPS concerning material with thickness above 1" and special treatments should be submitted.
- e. In case of bad weather conditions special protection during the welding must be taken to avoid weld failure; such prevention will be listed before starting main welding operation and must follow the general welding recommendations.

4.3 Record of deviations and accepted tolerance on construction

- a. The whole construction can be subject to deviations. The maximum and minimum deviations admitted must be recorded and evaluated before construction. Required adjustment will be achieved, if necessary.
 - b. Recording of deviations
 - Under structure fan deck level (with reference to ref. x, y, and z).
 - At fan deck level, record of all axial deviations at each top column.
 - Top A-Frame level and alignment (with reference to ref. x, y, z).
 - A-Frame level: starts at fan deck to top steam manifold level which should be recorded concerning all deviation.
- A - Bundle alignment (level, gap between tubes-sheets, etc. see procedures).
- Record top and bottom level and axial / lateral deviation after installation of all bundles of the streets, check compliance with relevant procedure for bundle alignment.

ERECTION MANUAL

- Clearance between fan bell and blade tip. Blade pitch. Gear shaft verticality and fan bell diameter have to be recorded. Fig 30



Fig 30

- c. Value of admitted tolerances is given on each particular procedure.
- d. Turbine outlet, main duct, riser, manifolds and bellows are subject to particular surveys and the deviation alignment will be done during pre-erection of parts to be assembled.

4.4 Finish with all remaining interconnecting piping between:

Installation of tubes spacers outside the bundles.

Finalisation of welding riser in accordance with procedures and particular statement Proceed with air leak test.

After leak test, remove the blank plate with the man hole.

Electrical consumption test on motor to confirm fan blade pitch and adjustment of fan pitch on all other fans.

Introduction of hoisting equipment.

Erection of cleaning system, pump and associated pipe works.

Final control of ACC concerning erection.

PAINTING SCHEDULE

ANNEXURE- IV.5-1

Worked by	Ashish 3/9/2016 (ASHISH GUPTA)			
Checked by	Rohit 30/11/16 (ROHIT KANWAR)			
Approved by	SKD/17 03/09/2016 (SMASHI RAJPUT)		QAX	
	Name	Signature	Name	Signature
Deptt.	HXE		CIE	Agreed Depts

CLAUSE NO.	TECHNICAL REQUIREMENTS	PAINTING SCHEDULE PAGE 1 OF 7		
1.00.00	Specification of surface preparation & painting			
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.			
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.			
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.			
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering..			
1.05.0	SURFACE PREPARATION			
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.			
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer. SP1 Solvent cleaning SP2 Application of rust converter (Ruskil or equivalent grade) SP3 Power tool cleaning SP4 Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer) SP4* Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns SP5 Shot blasting/ abrasive blasting. SP6 Emery sheet cleaning/Manual wire brush cleaning.			
1.06.00	APPLICATION OF PRIMER/PAINT			
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.			
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.			
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.			
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			PAINTING SCHEDULE PAGE 2 OF 7
1.06.05	<p>Following are the Primer/painting schemes envisaged herein:</p> <p>PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104.</p> <p>PS3* - Zinc Chrome primer (Alkyd base) by dip coat.</p> <p>PS4 - Synthetic Enamel (long oil alkyd) to IS2932.</p> <p>PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744</p> <p>PS9 - Aluminium paint to IS 2339.</p> <p>PS9* - Heat resistant Aluminium paint to IS-13183 Gr.-1</p> <p>PS13 - Rust preventive fluid by spray, dip or brush.</p> <p>PS14 - weldable primer-Deoxaluminat or equivalent.</p> <p>PS16 - High Build Epoxy CDC mastic `15' .</p> <p>PS17 - Aliphatic Acrylic Polyurethane CDE134 ,%V=40.0(min.)</p> <p>PS18 - Epoxy based TiO2 pigmented coat</p> <p>PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=40.0(min.)</p> <p>PS-20 - Epoxy based finish paint</p>			
1.06.06	All weld edge preparation for site welding shall be applied with one coat of weldable primer.			
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.			
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.			
1.06.09	<p>a) all un-insulated equipments, pipes, valves etc covered in sub-section A-06 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron.</p> <p>The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner:</p> <ul style="list-style-type: none"> ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO2 pigmented coat ▪ Finish coat - Epoxy based finish coat <p>b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron.</p> <p>c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard</p>			
1.06.10	<p>A) Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows:</p> <p>Primer : One coat of unmodified epoxy resin along with polyamide hardener.</p> <p>Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct hardener.</p> <p>Total thickness of primer and paint should not be less than 400 microns.</p> <p>B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows:</p> <p>i) For Indoor vessel, tanks, piping, valves & other equipments:</p> <p>(a) Surface preparation shall be done either manually or by any other approved method.</p>			
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TECHNICAL REQUIREMENTS

- (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns.
- (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns.
- (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns.

Total DFT of paint system shall not be less than 150 microns.

ii) For Outdoor vessel, tanks, piping, valves & other equipments:

- (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard.
- (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
- (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
- (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied.

Total DFT shall not be less than 300 microns.

1.06.10 Primer/Painting Schedule

Sl. No	Description	Surface Preparation	Primer Coat		Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade	
			Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats			Min. DFT/ Coat (Microns)
A) Power Cycle Piping													
1.	All insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
2.	All un-insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3	35	155	As per NTPC Colour shade/ coding scheme
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)	SP4*	PS19	1	35	-	-	-	PS17	1	30	70	
4	Piping hangers/ supports (other than (3) above. (un-insulated)	SP4 (SP6 - for cleaning of weld joints after erection,)	PS 5	1	40	PS 4	1	40	PS 17	1	40	120	
Valves													
5.	a.) Cast / Forged Design Temo < 60 °C Design Temo > 60 °C	SP1/SP2 /SP3	PS9	1	20				PS 9	1	20	40	
			#PS9*	1	20	-	-	-	#PS9*	1	20	40	

6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat b) Final coat of paint PS17	2 1	35 30	250
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat b) Final coat of paint PS17	2 1	25 30	150
7.	Weld Edges		SP6 (Hand cleaning by wire burshing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	-
B) Steam Generator & Auxiliaries:													
1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	-	PS 4	2	20 \$	100 \$
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	-	PS9*	1	20	40
Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection. 2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.													
C) LOW PRESSURE PIPING													
1	All Pipes, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Colour

2	Condensate storage tank, (External painting)	SP3/SP5	Epoxy paint minimum DFT 150 micron (finish paint to be preceded by suitable primer paint)	shade/ coding schem e
3	Condensate storage tank (Inside protection)	SP3/SP5	Solvent free epoxy coating (minimum two coats) of total DFT 200 microns.	
4	Drinking water tank (Protection of Internal surface)(if applicable)	Two coats of food grade epoxy paint.		
5	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting		
6	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.		
D) Fire Detection & Protection System, Compressed air system, Hydrogen generation plant and Air-conditioning & Ventilation System				
For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-16, Fire Detection & Protection System				
For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-15, Air Conditioning System.				
For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-23, Ventilation System.				
For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-14 compressed air system.				
For hydrogen generation plant, Surface preparation and painting should be as per the Part-B, Sub-Section-A-17 hydrogen generation plant.				

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D) ESP												
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP 4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP 4	PS5	2	30	-	-	-	-	-	-	60

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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	Erection, Testing and Commissioning of Air Cooled Condenser (ACC) with Associated Auxilliary System etc. for unit # 2 of 3x660 MW North Karanpura STPP, Jharkhand.	
Ref	1.0	Tender no PSER:SCT:NKP-M1987:19
	2.0	BHEL's NIT, vide reference no PSER:SCT:NKP-M1987:7577 Date: 27-09-2019.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT: NKP-M1987:TCN-01 Date: 04-10-2019.
	4.0	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/uploaded offer/documents in accordance with tender instructions with acceptance of the terms & conditions of the tender by us 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

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