भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(सार्वजनिक क्षेत्र का उपक्रम)
Bharat Heavy Electricals Limited
(A Public Sector Undertaking)
Maharatna Company
Golden Jubilee 1964 - 2014
50 Years
पावर सेक्टर- पश्चिमी क्षेत्र Power Sector-Western Region
श्रीमोहिनी काम्पलेक्स, 345 किंग्सवे, नागपुर Shreemohini complex, 345 Kingsway Nagpur - 440 001
फोन / Phone 0712- 3048600, फैक्स FAX: 0712- 3048699 www.bhelpswr.co.in

Ref: BHE/PW/PUR/1346, 1347, 1349/Clarification Date 13/11/2014

To
ALL BIDDERS

Sub: Corrigendum-02: Clarification.

TENDER NUMBER	**BHE/PW/PUR/DJRI-STG U-1 2 3 BLOCK I/1346**
Broad Scope of job	COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD; TRANSPORTATION TO SITE; ERECTION, TESTING & COMMISSIONING, TRIAL OPERATION AND HANDING OVER OF TURBINE AND GENERATOR SET AND ITS AUXILIARIES, HEAT EXCHANGERS, SURFACE CONDENSER, HP/LP HEATER, DEARATORS, TANKS & VESSELS, PUMPS & AUXILARIES, HANGERS & SUPPORTS, INSULATION, AND FINAL PAINTING ETC FOR **Unit # 1, 2 & 3 of 3X90.3 MW RUPPL DMD Dahej Project** At **RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL), DAHEJ TALUKA : VAGRA, DIST- Bharuch, GUJARAT: BLOCK # I**
TENDER NUMBER	**BHE/PW/PUR/HZRI-STG U-1&2 BLOCK II/1347** **BHE/PW/PUR/HZRI-STG U-3&4 BLOCK III/1349**
Broad Scope of job	COLLECTION OF MATERIALS FROM BHEL/CLIENT'S STORES/STORAGE YARD; TRANSPORTATION TO SITE; ERECTION, TESTING & COMMISSIONING, TRIAL OPERATION AND HANDING OVER OF TURBINE AND GENERATOR SET AND ITS AUXILIARIES, HEAT EXCHANGERS, SURFACE CONDENSER, HP/LP HEATER, DEARATORS, TANKS & VESSELS, PUMPS & AUXILARIES, HANGERS & SUPPORTS, INSULATION, AND FINAL PAINTING ETC FOR **BLOCK # II (Unit # 1 & 2)** & **BLOCK III (Unit # 3 & 4)** of 4X93.1 MW RUPPL HMD Hazira Project At RELIANCE UTILITIES AND POWER PVT. LIMITED (RUPPL), HAZIRA District: Surat GUJARAT

Bidders to kindly take note of the following:

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AA) Following documents is issued herewith:

- Construction Design and Management Health and Safety (CDM H&S) Plan
- Consolidated PAINTING & COATING SCHEDULE
- Drawings

==========

All other Terms and conditions of the Tender Specification shall remain unaltered unless expressly amended by BHEL in writing.
Bidders are requested to submit as a part of Technical Bid, a copy of this corrigendum duly countersigned by the authorized signatory and stamped with the Official seal as a token of Bidder's unqualified acceptance of this corrigendum.
This letter is hosted as file titled "Corrigendum-02 (Clarification-1346-1347-1349)" against NIT-20154 in BHEL web page (www.bhel.com→Tender Notifications → View Corrigendum).

Thanking you,

Yours faithfully,

AGM (Purchase)

Construction Design and Management Health and Safety (CDM H&S) Plan for STG and TCE

(BHEL, HYDERABAD)

Contr Job No.	Sub. No.	BHEL Doc. No.	Rev.
MDA10470 01	00	PEMC-04266	01

REV. NO.	DATE	REVISION STATUS	BY	CHK	APPR
01	26.02.14	Revised as per comments	SS	CLT	CBK
00	01.01.14	Issued for Review	VJK	CLT	CBK

RIL DOCUMENT NO.		REV
HAZIRA	10090-G16-HAT000-BHB-0001	001
DAHEJ	10091-G16-DAT000-BHB-0001	001

Contents

Purpose

BHEL has received an order for Design, Supply Erection & Commissioning of 4x93.1MW STGs for Hazira manufacturing Division and 3x90.3MW STGs for Dahej manufacturing Division from M/s. Reliance Utilities & Power Pvt. Ltd (RUPPL). Bechtel Power Corp., USA is Detailed Engineering Contractor (DEC).

Site interface meeting with BHEL/customer/other contractors, held on 25th and 26th September 2013 at DMD, Dahej and HMD, Hazira respectively. After the site visit, preliminary information related to Site facilities, Material Management, HSE Execution Plan, Site Mobilization Plan & Construction approach for Generator assembly, condenser, deaerator and steam turbine was furnished. Now an Erection plan for all equipment's is outlined below.

It is assumed that necessary civil front, platforms & roads inside plant boundary are available before actual execution. Drawings & pictures presented below are for better understanding.

There may be changes in erection methodology during erection based on OEM recommendations, safety considerations and actual site conditions.

The erection sequence for various equipment's may be decided by site as per actual site conditions like civil front availability, product availability at site, etc.

Information provided below is applicable for each of the HMD & DMD sites, unless otherwise specified.

Trailer movement plan and crane/Hydra movement plan inside Hazira manufacturing division & Dahej manufacturing division is enclosed in the appendix.

Reference Documents :

Sl.	Drawing Name	Drawing No	Rev	No of Sheets
1.	Overall Layout	10090-P15-HASI10-BEF-0001	04	1
2.	Input for STG Hall Equipment Layout	0-381-01-01529	02	4
3.	Machinery Arrangement and Foundation	0-313-01-08635	00	5
4.	General Arrangement of Drain Cooler	2-162-01-00363	00	1
5.	GA of GSC	2-162-14-00573	00	1
6.	GA of HP Heater 5	2-175-01-01595	00	1
7.	GA of HP Heater 6	2-175-05-01054	00	1
8.	GA of LP Heater 1	2-162-18-00377	00	1
9.	GA of LP Heater 2	2-162-22-00285	00	1
10.	GA of LP Heater 3	2-162-26-00241	00	1
11.	GA of SJAE	1-161-01-00780	00	1
12.	GA of Spray cum Tray Deaerator	1-163-10-11431	00	1
13.	GA of ST Twin Oil Cooler	3-165-01-20579	00	1
14.	GA of STG Air Cooler	2-166-03-00525	00	1
15.	GA of Surface Condenser	1-160-10-01465	00	1
16.	Generator Foundation Drawing	0-137-01-31037	06	1
17.	General Arrangement of BFP SET	HY-DG-1-18000-57626	00	1
18.	Foundation Details of BFP Set	HY-DG-1-18000-57627	00	1
19.	Interconnected Piping of Turbine Assembly	0-308-59-00003	01	1

1. Surface Condenser

a. Transport arrangements

Dimensions of Condenser (Main assembly) to be handled.

Length - 10900 mm
Width - 4400 mm
Height – 5400 mm
Weight – 80 MT

It is planned to transport the condenser by trailer right up to STG hall. The trailer route is shown in trailer movement plan.

b. Storage

On arrival to site, condenser goes directly to the foundation. In case front is unavailable for placing equipment in position, alternative plan is that condenser shall be temporarily placed near to foundation. Storage is as per Field Quality Plan.

c. Access/Interface details within STG Hall :

Tubing of condenser shall be assembled at site after placing of condenser on its foundation. To avoid damage of tube during insertion, temporary platform of length 15 M length is planned to install for tubing works along grid
4-5, 10-11, 23-24 & 29-30 outside A-row.
All works between road (in front of A-row) and TG hall along grid 4-5, 10-11, 23-24 & 29-30 to be planned after condenser handling for trailer movement.

d. Lifting & placement arrangements

Shifting of surface condenser from trailer to final location is by chain pulley block.
The procedure of handling of condenser on receipt of same at site comprises the following major activities.

a) Construction of foundation for condenser by RIL.
b) Placement of 4 Nos. of Structural frames each having L-4 m, W-4m and Height of 3.3 m.
c) Install two I-beam structural steel (ISMB 300) sections below the condenser supports, such a way that the extension of I-section bottom rests on top of condenser pedestals.
d) Condenser will be shifted from Trailer to Structural steel frames with crane.
e) Install adequate capacity chain pull block for winching.
f) Pull the condenser to the required position.

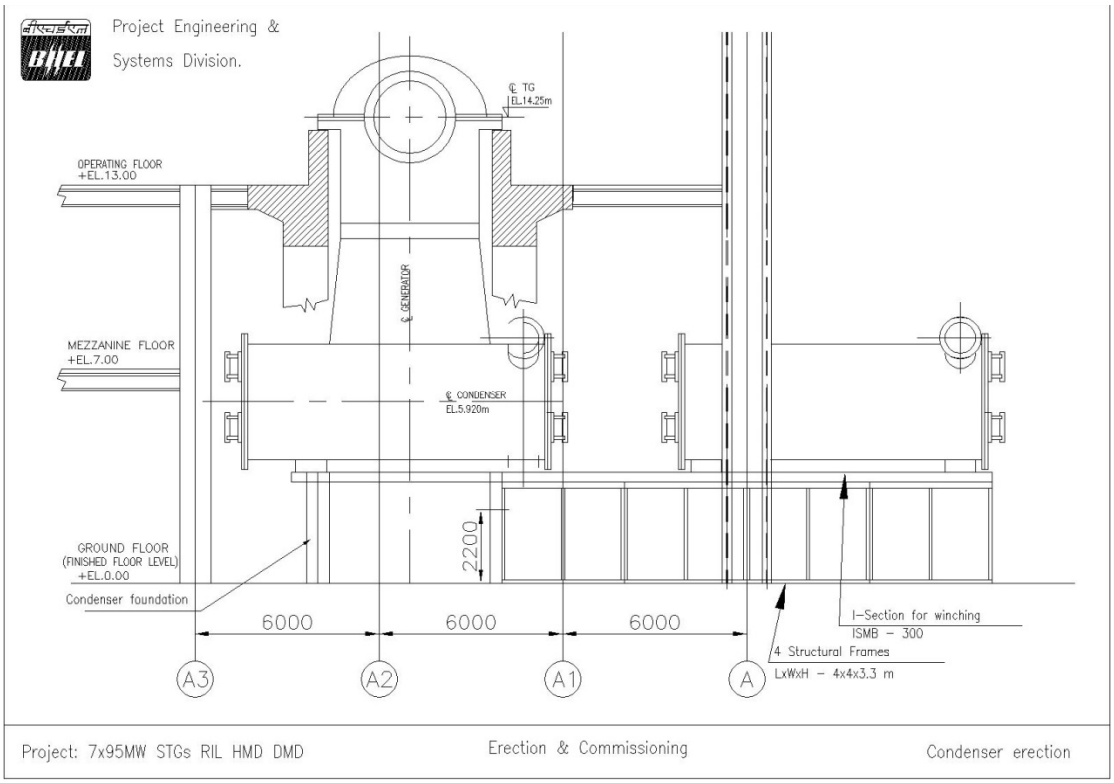


Diagram : Condenser-1A

2. Boiler Feed Pump with motor

a. Transport arrangements

Dimensions of BFP to be handled.
Length - 10340 mm
Width - 2600 mm
Height – 3050 mm
Weight – 35 MT
Numbers – 3 per unit

It is planned to transport BFP with Base frame mounted Motor Driven BFP, Booster Pump, Hydraulic Coupling and Auxiliaries.

BFP will be transported from Hyderabad unit works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure 1 & 3

b. Storage

On arrival to site, BFP goes directly to the foundation. In case front unavailable for placing equipment in position, alternative plan is that BFP shall be temporarily placed near to BFP foundation. Storage is as per Field Quality Plan.

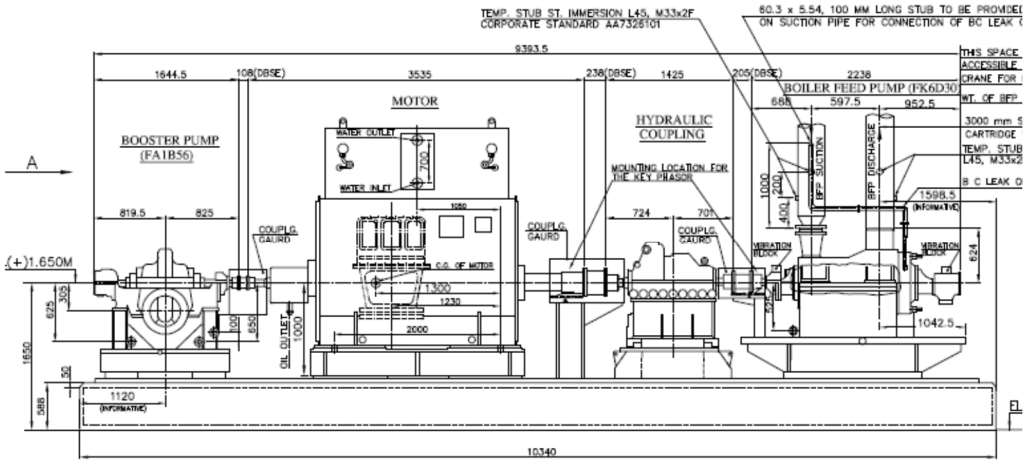
c. Access/Interface details within STG Hall

Interface required:

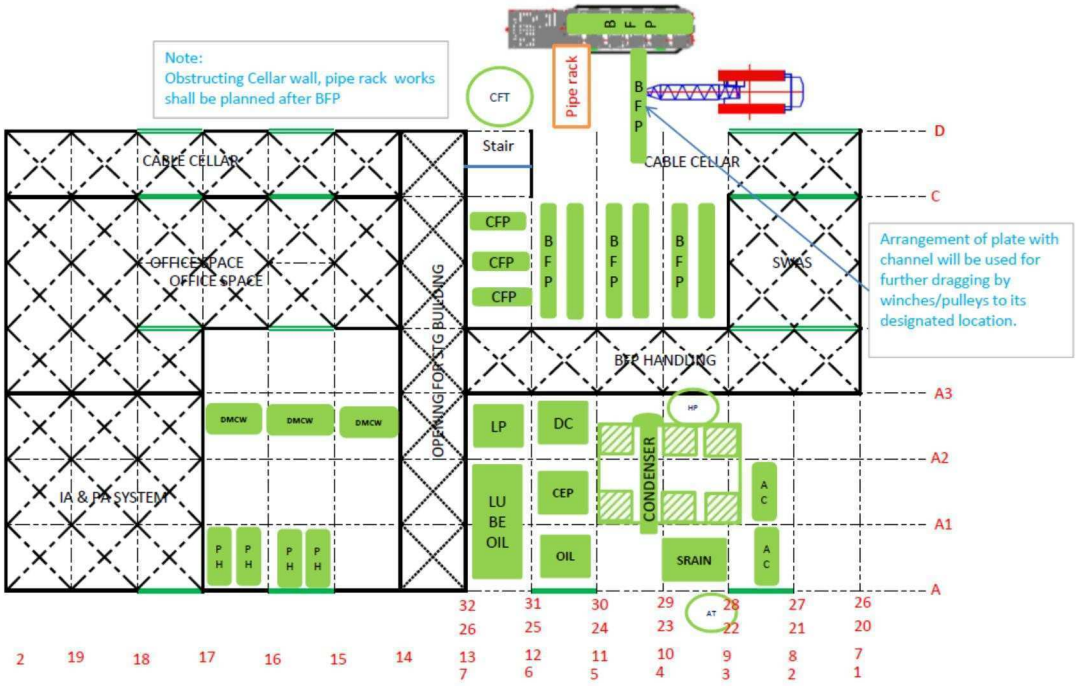
1. Cable cellar wall upto 7.0 M height shall be planned after BFP placement along
   Horizontal grid : C & D row
   Vertical grid : 3-6, 9-12, 22-25 and 28-31
2. Inter connecting pipe rack for unit 2&3 between boiler and STG by Others shall be planned after BFP placement.
   Horizontal grid : D row
   Vertical grid : 11-12, 24-25

d. Lifting arrangements

Crane is used for lifting from trailer to place on ground.
Jack and crib method is used for placing and setting the equipment in position.
Structural steel sections, rail will be placed on ground level for skidding the equipment.



ELEVATION (WITHOUT COOLERS)



3. Condensate extraction Pump

a. Transport arrangements

Dimensions of CEP to be handled.
Diameter - 1000 mm
Height – 4500 mm
Weight – 10 MT
Numbers – 2 per unit

It is planned to transport CEP with Auxiliaries from vendor works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, CEP goes directly to the foundation. Alternative plan is that CEP shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

CEP is lifted using EOT crane directly from the trailer through the erection opening, carried till the turbine deck. The same is placed in the vertical position through CEP opening of size 5.0 x 2.5 M and placed in the designated location.

d. Lifting arrangements

EOT crane of the TG building will be used for erection of condensate extraction pumps. The CEPs will be brought to the erection opening. From there using the EOT crane, the CEPs will be lifted over the turbine floor.
It should be ensured beforehand that the removable gratings / structures at operating & mezzanine floor over designated mounting location of CEPs are removed. CEPs will be lowered from these openings onto the foundation & installed.

4. Lube Oil Console

a. Transport arrangements

Dimensions of Lube Oil Console to be handled.

Assembly	Content description	Numbers per unit	Length x Width x Depth (mm)	Weight (Kg)
1.	Lube Oil Console Assembly-I (including Main Oil Pump Assembly along with AC motor ,Auxiliary Lube Oil Pump Assembly along with AC motor , Emergency Lube Oil Pump assembly along with DC motor)	1	4000 X 3500 X 1000	2250
2.	Lube Oil Console Assembly -II (including Lube Oil Tank, Duplex Oil Filter, Oil Vapor Extraction fan assembly)	1	4200 X 3000 X 3000	6000

It is planned to transport Lube Oil Assembly from Hyderabad unit works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, LO assembly goes directly to the foundation. Alternative plan is that the same shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

Lube oil console will access through grid 6-7/A.

d. Lifting arrangements

Jack and crib method is used for lifting and setting the equipment in position.

5. Flash Tanks (AT & HP)

a. Transport arrangements

Sl.No.	Content description	Numbers per unit	Diameter x Depth (mm)	Weight (Kg)
1	Atmospheric Flash Tank	1	2000 x 3000(approx.)	1000
2	HP Flash Tank	1	3032 x 6100	8500

It is planned to transport these tanks from vendor works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1 & 3.

b. Storage

On arrival to site, the tank goes directly to the foundation. Alternative plan is that the tank shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

HP tank will access through maintenance bay (B-A3).
Atmospheric tank will be access through along A-row.

d. Lifting arrangements

The flash tanks shall be brought near A-row side. From here winches/pulley will be used to lift and move the flash tank under the TG deck.
EOT crane through the opening of TG deck will be used for its final alignment / installation. The photographs below show typical Flash Tank erection.

Flash tank being brought from A-row side

Flash tank being positioned below TG deck

6. Plate Heat Exchanger

a. Transport arrangements

Dimensions of PHE (1set = 4 numbers) to be handled.

Length – 3910 mm
Width - 1370 mm
Height – 2000 mm
Weight – 10.6 MT

It is planned to transport PHE with from vendor shop to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, PHE goes directly to the foundation. Alternative plan is that PHE shall be temporarily placed outside D-row.

c. Access/Interface details within STG Hall

PHE will access in front of A-row along grid 15-17.

d. Lifting arrangements

Jack and crib method is used for lifting and setting the equipment in position.

7. Condensate Forwarding Tank

a. Transport arrangements

Dimensions of CFT to be handled.
Diameter - 5500 mm
Height – 6000 mm
Weight – 15 MT
Numbers – 1 per unit

It is planned to transport the steel plates from vendor works to work spot on a trailer.
The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

Works like cutting, bending is done at fabrication yard. Shifted to work spot for welding and subsequent lifting.

c. Access/Interface details within STG Hall

The access of materials along D-row.

d. Lifting arrangements

Lifting is by Jacking method or erection using crane.

8. Lube Oil/Working Oil Cooler of Boiler Feed Pump

a. Transport arrangements

Sl.No.	Content description	Numbers per unit	Length x Width x Depth (mm)	Weight (Kg)
1	Duplex Lube Oil Cooler of BFP	1	3800 x 1450 x 550	1350
2	Duplex Working Oil Cooler of BFP	1	3700 x 1620 x 620	2120

It is planned to transport BFP coolers with Base frame mounted from Hyderabad unit works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, BFP cooler goes directly to the foundation. Alternative plan is that BFP cooler shall be temporarily placed outside D-row.

c. Access/Interface details within STG Hall

BFP cooler will be brought to site along D-row road, lifted by crane and kept perpendicular to D-row.

d. Lifting arrangements

Jack and crib method is used for subsequent placing and setting the equipment in position.

9. Condensate Forwarding Pump

a. Transport arrangements

Dimensions of CFP to be handled.
Length – 3705 mm
Width – 1700 mm
Weight – 4 MT
Numbers – 3 per unit

It is planned to transport CFP from vendor shop to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, CFP goes directly to the foundation. Alternative plan is that CFP shall be temporarily placed outside D-row.

c. Access/Interface details within STG Hall

CFP will access through STG building main approach/perpendicular to D-row.

d. Lifting arrangements

Equipment <5MT, based on site conditions, one of the above possible means of lifting is adopted.

10. ACW Pump

a. Transport arrangements

Dimensions of ACW to be handled.

Length – 4600 mm
Width – 1520 mm
Weight – 6.89 MT
Numbers – 2 per unit

It is planned to transport ACW from vendor works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, ACW goes directly to the foundation. Alternative plan is that ACW shall be temporarily placed outside D-row or near to its foundation.

c. Access/Interface details within STG Hall

Maintenance bay (B-A3) will be used for access ACW pumps within site.

d. Lifting arrangements

ACW pumps will be shifted by Hydra to work spot and Jack and crib method is used for setting the equipment in position.

11. Drain Cooler

a. Transport arrangements

Dimensions of drain cooler to be handled.

Length - 6250 mm
Width – 1400 mm
Depth – 1400 mm
Weight – 5.8 MT
Numbers – 1 per unit

It is planned to transport drain cooler from vendor shop to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

Foundation bolts embedment/sole plate grouting is prerequisite to commence erection.
On arrival to site, drain cooler goes directly to the foundation. Alternative plan is that drain cooler shall be temporarily placed outside D-row.

c. Access/Interface details within STG Hall

Maintenance bay (B-A3) will be used for access drain cooler within site.

d. Lifting arrangements

Jack and crib method is used for lifting and setting the equipment in position.

12. DMCW Pump

a. Transport arrangements

Dimensions of DMCW to be handled.
Length – 4600 mm
Width – 1520 mm
Weight – 10 MT

It is planned to transport DMCW from vendor works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, DMCW goes directly to the foundation. Alternative plan is that DMCW shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

DMCW will access through A-row or maintenance bay.

d. Lifting arrangements

Jack and crib method is used for lifting and setting the equipment in position.

13. Centrifuge/JOP/HP Control Oil unit

a. Transport arrangements

Dimensions of equipment to be handled are

Equipment	Length mm	Width mm	Height mm	Weight kg
Centrifuge	2300	1700	1500	1500
Jacking oil skid	2200	2200	1600	3000
HP Control oil unit	4200	3000	1500	4000

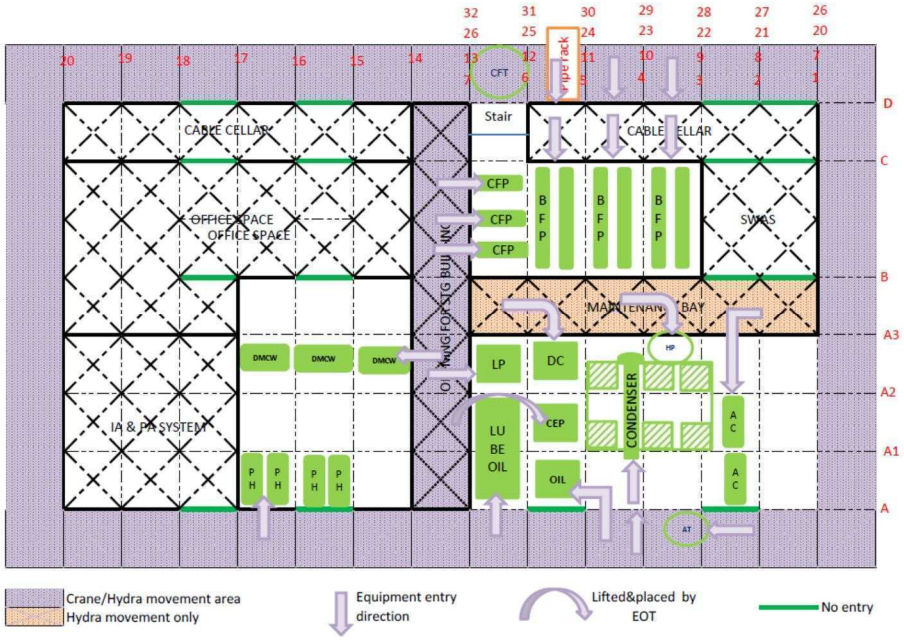
It is planned to transport the equipment from vendor works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, the above equipments goes directly to the foundation. Alternative plan is that the same shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall



d. Lifting arrangements

Equipment <5MT, based on site conditions, one of the above possible means of lifting is adopted.

14. LP Dosing Skid (Ammonia/Hydrazine/NaOH)

a. Transport arrangements

Dimensions of equipment to be handled are
Length – 7000 mm
Width – 5000 mm
Weight – 3.5 MT

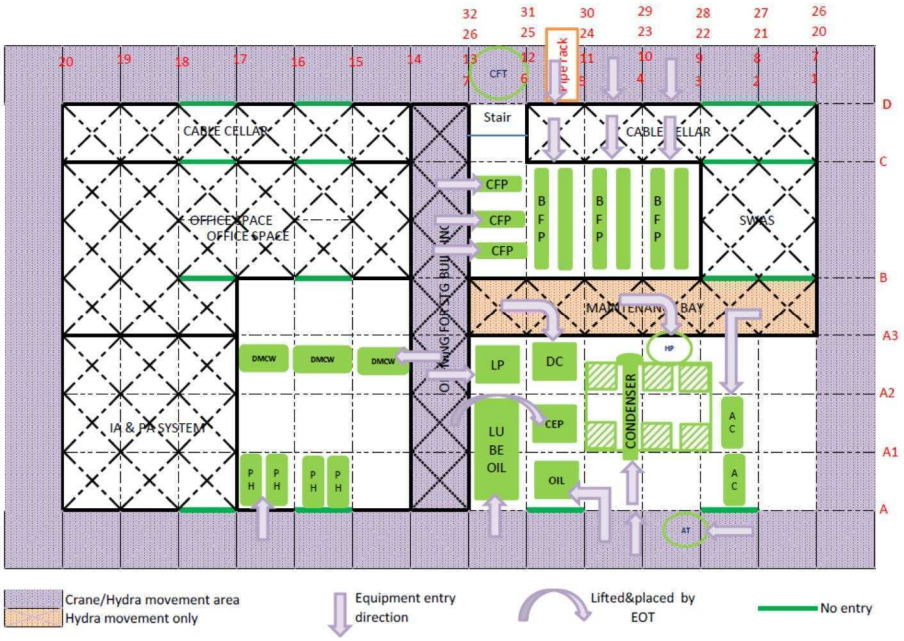
It is planned to transport the equipment from vendor works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, the above equipments goes directly to the foundation. Alternative plan is that the same shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall



d. Lifting arrangements

Equipment <5MT, based on site conditions, one of the above possible means of lifting is adopted.

15. LP Heater

a. Transport arrangements

Dimensions of LP heater to be handled.
Length - 13650 mm
Width – 2000 mm
Height – 1700 mm
Weight – 20 MT
Numbers – 3 per unit

It is planned to transport LP Heaters in one assembly from Hyderabad unit works to work spot on a hydraulic trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

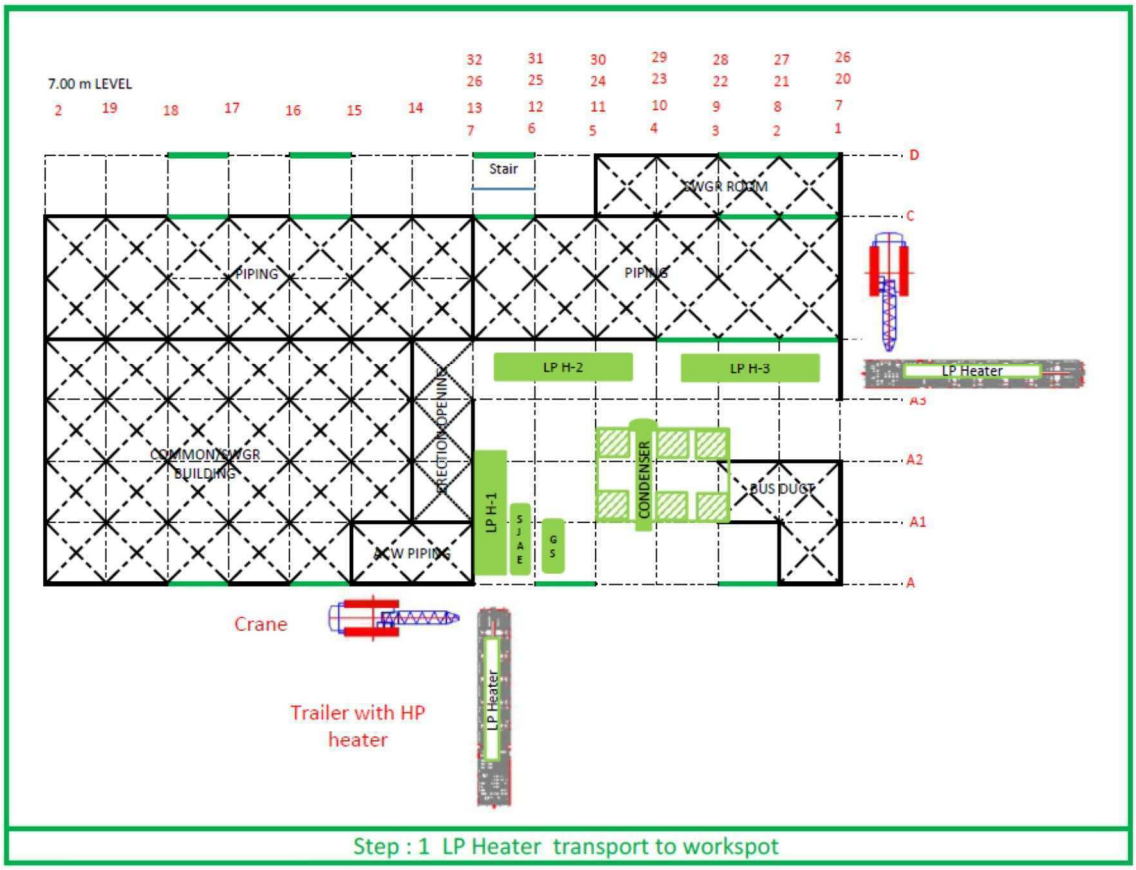
On arrival to site, LP Heater goes directly to the foundation. Alternative plan is that LP Heater shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

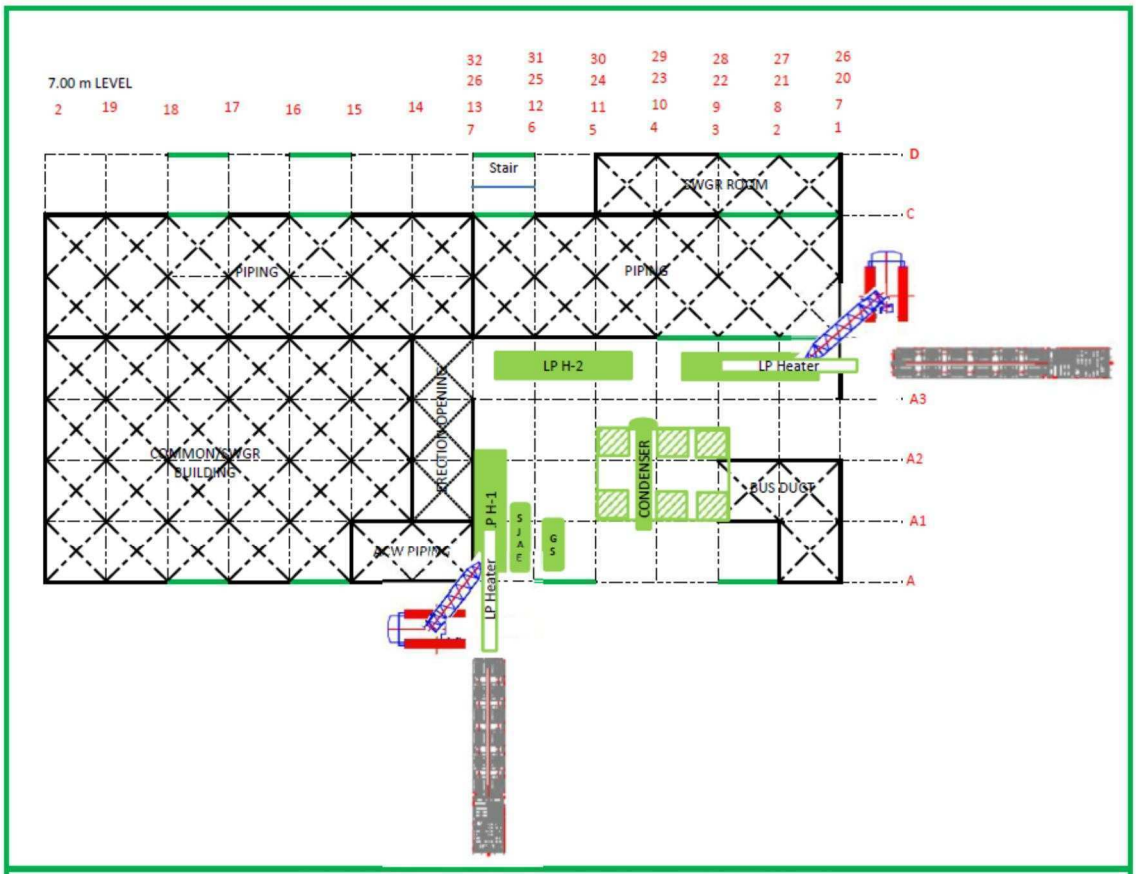
The access of LP Heater is either through A-row or through erection/maintenance opening.
Generator assembly lifting foundation and temporary tower occupies the space of some LPH-1 heaters. So these heaters shall be placed near to its location and final placement shall be planned after removal of generator assembly lifting towers and subsequent structural works.

d. Lifting arrangements

Option-1:
The LP Heater will be brought in front of A-row facing condenser. By using mobile crane, the LPH will be lifted and placed perpendicular to A-row. The heater will be placed such that heater outermost support rests on the 3m extended roof outside A-row in condenser bays(temporary arrangement by site team). The heater will then be dragged inside condenser neck by winches/pulleys.



Step : 1 LP Heater transport to workspot

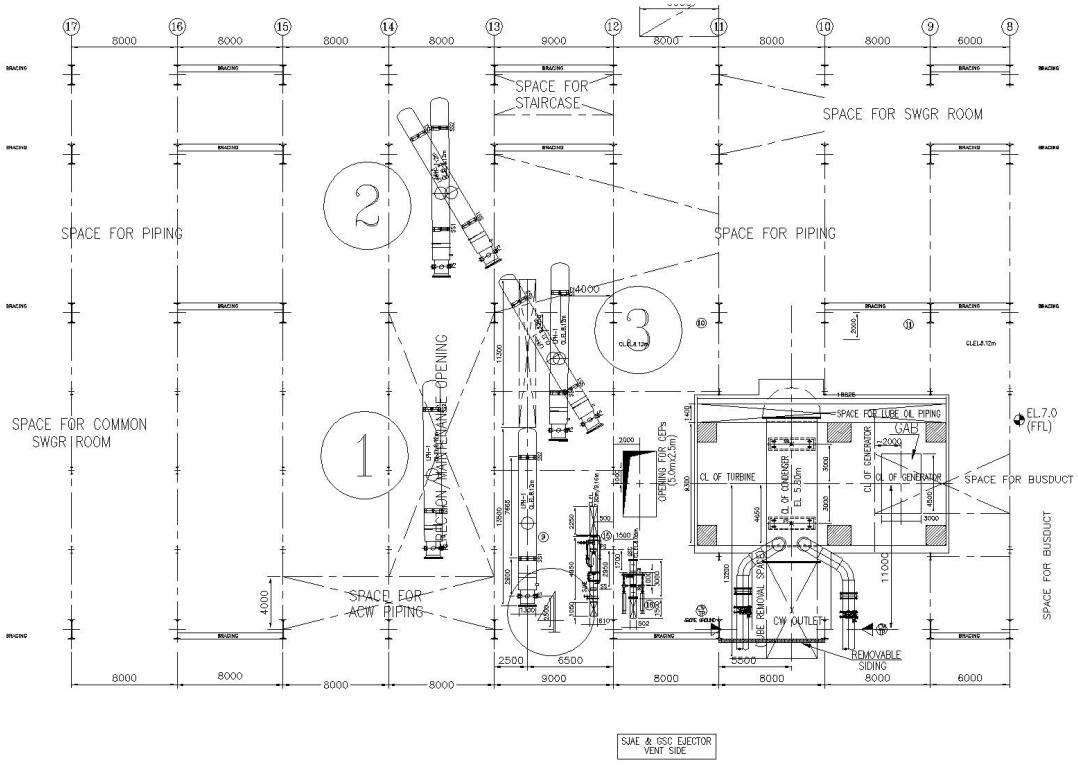


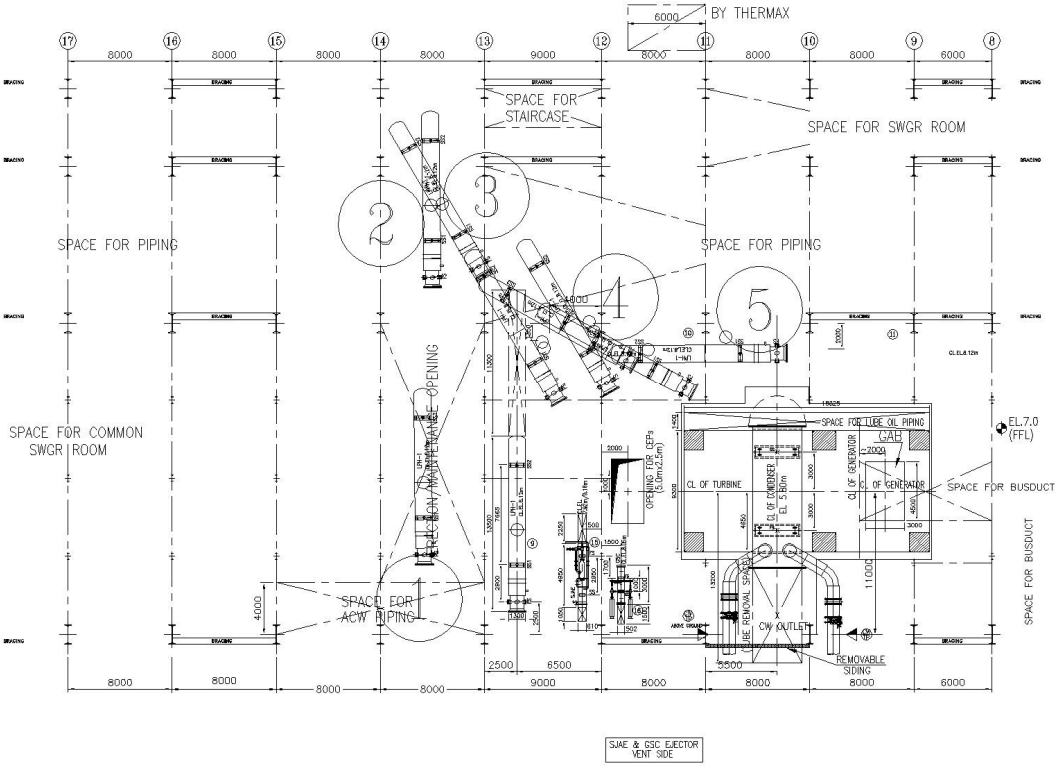
Step : 2 LP Heater lifted and placed at 7.00 M Level

Option: 2

LP Heater will be brought to the erection opening. From here by the use of EOT crane, it will be lifted over to mezzanine floor for bringing it to place its designated location:

Rotate anticlockwise using EOT crane.
Arrangement of plate with channel will be used for further dragging by winches/pulleys to its designated location.





The procedure to be followed from the above options will be decided during erection based on material availability, civil front readiness, mobile crane availability, etc.

16. Steam Jet Air Ejector (SJAE)

a. Transport arrangements

Dimensions of SJAE to be handled.

Length - 5400 mm
Width – 3000 mm
Height – 2000 mm
Weight – 7.5 MT
Numbers – 2 per unit

It is planned to transport SJAE from Hyderabad unit works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, SJAE get assembled at ground level at site and place in the designated position. Alternative plan is that SJAE shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

SJAE will access perpendicular to A-row.

d. Lifting arrangements

This operation is performed by a crane.

17. Gland Steam Condenser (GSC)

a. Transport arrangements

Dimensions of GSC to be handled.

Length - 3500 mm
Width – 1400 mm
Height – 1400 mm
Weight – 2 MT
Numbers – 1 per unit

It is planned to transport GSC from Hyderabad unit works to stores on a truck. From stores it will be shifted to site using tractor.

b. Storage

On arrival to site, GSC goes directly to the foundation. Alternative plan is that GSC shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

GSC will access through A-row.

d. Lifting arrangements

This operation is performed by a Hydra.

18. Generator Assembly

a. Transport arrangements

Dimensions of generator assembly to be handled.
Length - 9300 mm
Width - 4650 mm
Weight – 190 MT

It is planned to transport the generator assembly from unit works to workspot on a special trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, generator assembly goes directly to the foundation.

c. Access/Interface details within STG Hall

Generator assembly will access through A-row

d. Lifting of generator stator

a. Lifting of generator assembly will be by Strand Jacks and Tower Lift system.
b. Strand jack lifting methods requires TG deck construction shall be completed before the receipt of the stator.
c. Location of anchor bolt & temporary structures are typical and such details will be furnished after finalization of vendor.

Lifting generator consists of following major activities.

a. Construction of temporary tower foundation for strand jack system by customer.

b. Erection of the strand jack system using EOT crane. (Ensure EOT availability by customer)

c. Lifting and placing of generator assembly onto its foundation by strand jack system.


12.05.2012 14:34


15.05.2012 14:48


15.05.2012 14:53


UNIT-I Stator Erection
5x270 MW,
IndiaBulls Power Ltd.
Amravati

19. Steam Turbine

a. Transport arrangements

Dimensions of STG subassemblies to be handled area

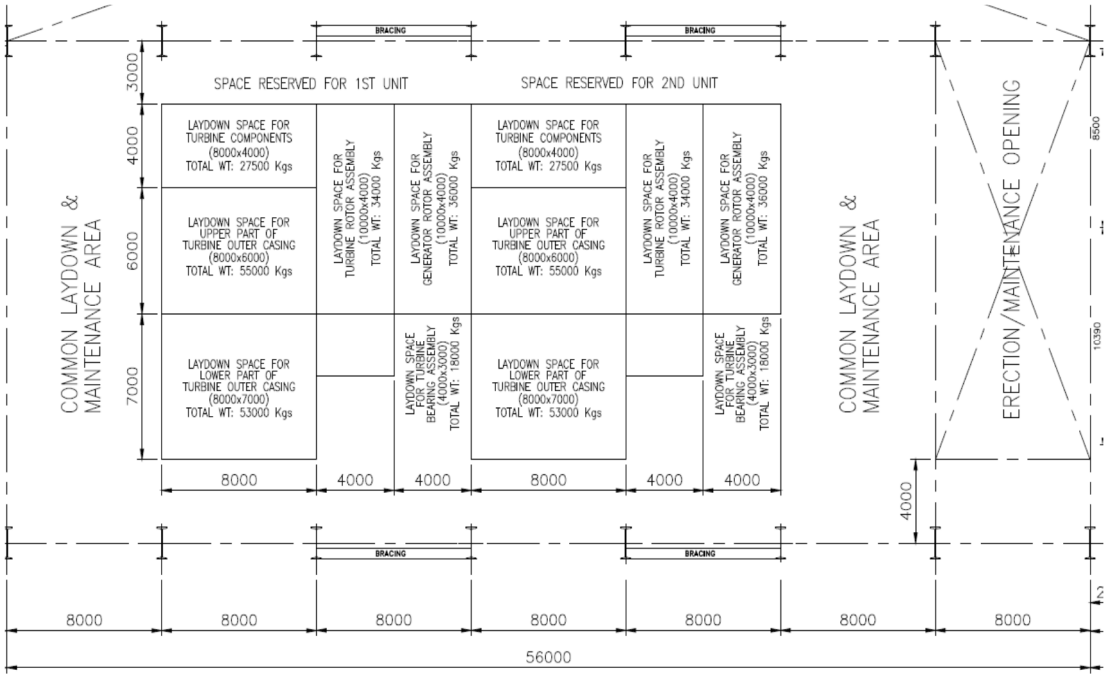
SL. No.	Sub-assemblies	Qty.	Dimensions (mm) LxWxH	Weight (Kgs) each	Total Weight
1.	Outer Casing Upper Part	1	4865 X 5600 X 3500	34162	34162
2.	Outer Casing Lower Part	1	4700 X 3060 X 1400	23335	23335
3.	Inner Casing Assembly	1	1784 X 1740 X 1600	8960	8960
4.	Guide Blade Carrier -I	1	490 X 1780 X 1735	3500	3500
5.	Guide Blade Carrier - II	1	540 X 1780 X 1735	3400	3400
6.	Guide Blade Carrier - III	1	620 X 1980 X 1935	4500	4500
7.	Guide Blade Carrier - IV	1	520 X 2200 X 2185	6900	6900
8.	Exhaust Hood Upper Part	1	2050 X 5800 X 2500	11980	11980
9.	Exhaust Hood Lower Part	1	2230 X 6140 X 2700	20731	20731
10.	Rear Bearing Housing Assembly	1	1405 X 1400 X 900	1928	1928
11.	Front Bearing Housing Assembly	1	1690 X 2610 X 950	15791	15791
12.	Rotor Assembly	1	8650 X Dia. 2230	34000	34000
13.	Hydraulic oil supply unit	1	4200 X 3000 X 1500	4000	4000
14.	High Pressure electrohydraulic actuators for stop valve	2	1300 X 900 X 800	850	1900
15.	High Pressure electrohydraulic actuators for control valve	4	1300 X 900 X 800	850	3800
16	Turbine Enclosure	1	-	-	13000
17	Upper Part of Outer Casing & Exhaust Hood – Bolts	1	-	-	9000
18	Lower Part of Outer Casing & Exhaust Hood – Bolts	1	-	-	9000
19	Turbine Mounted Piping (8”)	lot	-	-	3127
Total					**213014**

It is planned to transport turbine sub-assemblies from Hyderabad unit works to work spot on truck / trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

By EOT crane, the turbine sub-assemblies will be moved through erection opening over the operating floor to their respective laydown locations grid (A-B/ 13-20) on TG deck as shown below.



c. Access/Interface details within STG Hall

Turbine sub-assemblies access through erection opening.

d. Lifting arrangements

Turbine sub-assembly / components will then be placed on TG deck to do the further assembly / alignment.

20. HP Heater

a. Transport arrangements

Dimensions of HP Heater to be handled.

Length - 10750 mm
Width - 2350 mm
Height – 2000 mm
Weight – 37 MT
Numbers – 2 per unit

It is planned to transport HP Heaters in one assembly from Hyderabad unit works to work spot on a hydraulic trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, HP Heater goes directly to the foundation. Alternative plan is that HP Heater shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

The access of HP Heater is through erection opening.

Generator assembly lifting foundation and temporary tower occupies the space of HP heaters. So heaters shall be placed near to its location and final placement shall be planned after removal of generator assembly lifting towers and subsequent structural works.

d. Lifting arrangements

The heaters will be lifted by EOT crane and placed on operating floor between grids 14-15 and 19-20 in common laydown area.

Arrangement of plate with channel will be used for further dragging by winches/pulleys to its designated location in BC bay once the construction constraint (generator assembly) is removed.

21. Generator Cooler Assembly

a. Transport arrangements

Dimensions of generator air cooler be handled.

Length - 3800 mm
Width - 1000 mm
Height – 600 mm
Weight – 1.5 MT
Numbers – 5 per unit

It is planned to transport this cooler from Hyderabad unit works to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, cooler goes directly to the foundation. Alternative plan is that Cooler shall be temporarily placed outside A-row.

c. Access/Interface details within STG Hall

Cooler will be lifted through erection opening by EOT crane and placed on its designated position.

d. Lifting arrangements

This operation is performed by EOT crane.

22. Deaerator

a. Transport arrangements

Dimensions of De-aerator to be handled.

Length - 27000 mm (transported in 3 pieces of 9000mm approximately)
Width - 3600 mm
Weight – 82 MT (each piece approx.. 28MT)
Numbers – 1 per unit

It is planned to transport the de-aerator storage tank in three pieces and heater assembly by trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, deaerator sections will be lifted and placed near to deaerator foundation. Alternative plan is that sections shall be temporarily placed outside D-row.

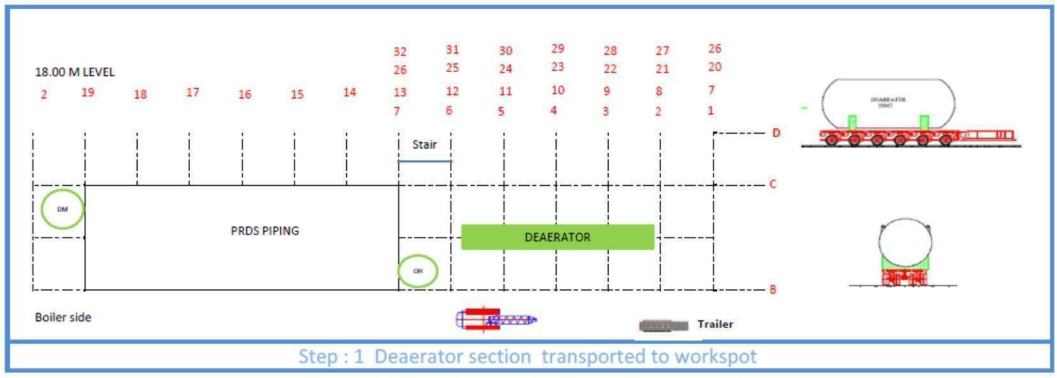
c. Access/Interface details within STG Hall

The access of the tank within site is as per Annexure A2.

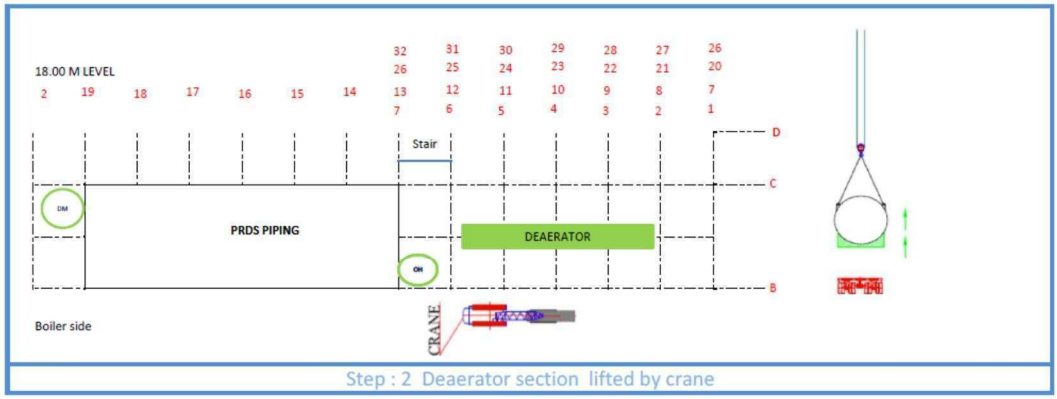
d. Lifting arrangements

A mobile crane of suitable capacity shall be placed along D-row. With the help of mobile crane, each part of storage tank will be lifted & then placed in position & dragged over temporary beams / sleepers.

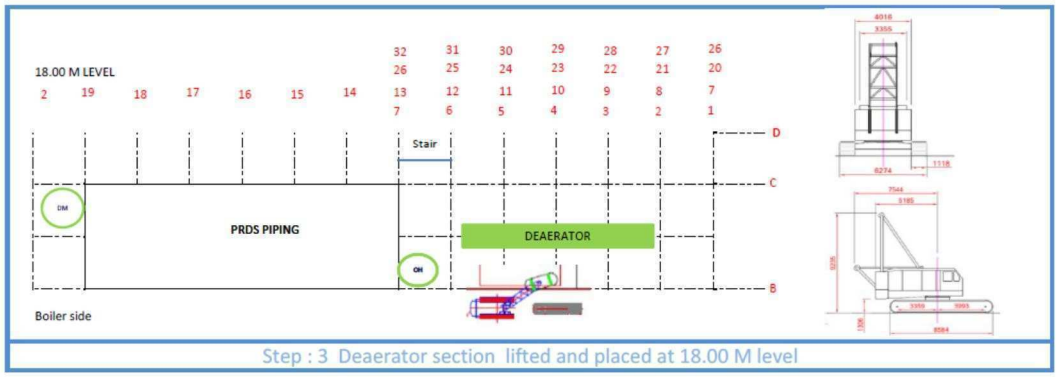
After assembly over permanent supports, temporary beams / sleepers will be removed.
The photographs below show the typical sequence of Deaerator erection by mobile crane.



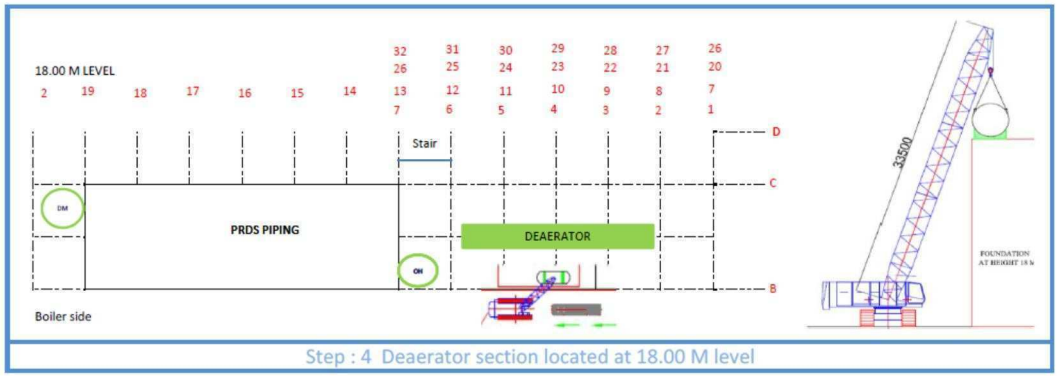
Step : 1 Deaerator section transported to workspot



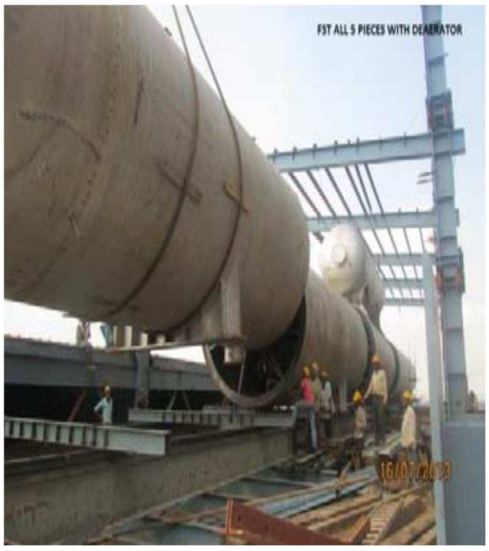
Step : 2 Deaerator section lifted by crane



Step : 3 Deaerator section lifted and placed at 18.00 M level



Step : 4 Deaerator section located at 18.00 M level


FST ALL 5 PIECES WITH DEAERATOR

23. DMCW Expansion Tank

a. Transport arrangements

Dimensions of DM tank to be handled.
Diameter – 4500 mm
Weight – 10 MT
Numbers – 1 per unit

It is planned to transport DM tank along with lube oil console assembly from Hyderabad Unit to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, this tank goes directly to the foundation. Alternative plan is that the same shall be temporarily placed outside D-row.

c. Access/Interface details within STG Hall

The access of the tank is through D-row within site.

d. Lifting arrangements

This operation is performed by crane.

24. Over Head Oil Tank

a. Transport arrangements

Dimensions of Over Head Oil tank to be handled.

Diameter - 2750 mm
Height – 2750 mm
Weight – 2 MT
Numbers – 1 per unit

It is planned to transport Over head oil tank from vendor shop to work spot on a trailer.

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

b. Storage

On arrival to site, this tank goes directly to the foundation. Alternative plan is that the same shall be temporarily placed outside D-row.

c. Access/Interface details within STG Hall

The access of the tank is through D-row within site.

d. Lifting arrangements

This operation is performed by crane.

25. Piping

a. Transport arrangements

Dimensions of tentative piping to be handled are as below.

SL NO	LINE DESCRIPTION	IBR	PIPE MATERIAL	PIPE SIZE (in)	PIPE LENGTH (m)
A	COMMON				
1	MAIN STEAM FROM TP TO HEADER	IBR	A335GRP91	20	16
2	MAIN STEAM HEADER	IBR	A335GRP91	20	276
3	BOILER STARTUP STEAM FROM TP UPTO PCV	IBR	A335GRP91	10	89
4	BOILER STARTUP STEAM FROM FROM PCV UPTO DS	IBR	A335GRP11	32	40
5	BOILER STARTUP STEAM HEADER	IBR	A106GRB	28	140
6	FEED WATER HEADER	IBR	A106GRB	18	160
7	FEED WATER FROM HEADER TO TP	IBR	A106GRB	18	36
8	DEAERATOR OVERFLOW & DRAIN HEADER	IBR	A106GRB	8	175
9	CCCW PIPING		IS3589GRFE330	44	27
10	CCCW PIPING		IS3589GRFE330	32	9
11	CCCW PIPING		IS3589GRFE330	10	65
12	CCCW PIPING		IS3589GRFE330	24	124
13	CCCW PIPING		IS3589GRFE330	20	157
14	CCCW PIPING		IS3589GRFE330	30	511
15	CCCW PIPING		IS3589GRFE330	6	32
16	CCCW PIPING		IS3589GRFE330	3	27
17	DRAIN PIPING (P91)	IBR	A335GRP91	1.5	1089
18	DRAIN PIPING (P11)	IBR	A335GRP11	1	364
19	DRAIN PIPING (CS)	IBR	A106GRB	1	1804
20	SWAS PIPING (IBR)	IBR	A335GRP91	0.75	360
21	SWAS PIPING (CS)		A106GRB	0.75	1632
22	SWAS PIPING (SS)		A312GRTP304	0.75	456
23	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	3	252
24	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	2	848
25	INSTRUMENT AIR DISTRIBUTION PIPING		IS1239(GALV)	1	1204
26	SERVICE AIR DISTRIBUTION PIPING		IS1239	3	252
27	SERVICE AIR DISTRIBUTION PIPING		IS1239	2	848
28	SERVICE AIR DISTRIBUTION PIPING		IS1239	1	1204
29	LP DOSING PIPING		A312GRTP304	1	1329
	COMMON PIPING				**13526**

SL NO	LINE DESCRIPTION	IBR	PIPE MATERIAL	PIPE SIZE (in)	PIPE LENGTH (m)
B	PER UNIT				
1	MAIN STEAM PIPING FROM HEADER TO TURBINE	IBR	A335GRP91	16	39
2	MAIN STEAM PIPING FROM HEADER TO TURBINE	IBR	A335GRP91	12	22
3	TURBINE WARM UP VENT PIPING	IBR	A335GRP91	2	27
4	BOILER STARTUP STEAM PIPING FROM HEADER TO CONDENSER	IBR	A106GRB	18	62
5	BOILER STARTUP STEAM PIPING FROM HEADER TO CONDENSER	IBR	A106GRB	12	10
6	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-6	IBR	A106GRB	8	30
7	TURBINE EXTRACTION STEAM PIPING TO HP HEATER-5	IBR	A106GRB	10	45
8	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	10	20
9	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	14	2
10	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	14	23
11	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	24	20
12	TURBINE EXTRACTION STEAM PIPING TO DEAERATOR	IBR	A106GRB	8	16
13	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	16	10
14	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	24	2
15	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-3	IBR	A106GRB	24	27
16	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-2	IBR	A106GRB	20	8
17	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-2	IBR	A106GRB	30	34
18	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-1	IBR	A106GRB	30	14
19	TURBINE EXTRACTION STEAM PIPING TO LP HEATER-1	IBR	A106GRB	44	33
20	BALANCE PISTON LEAK-OFF PIPING	IBR	A106GRB	8	17
21	BFP DISCHARGE PIPING	IBR	A106GRB	10	38
22	BFP RECIRCULATION PIPING TO DEAERATOR	IBR	A106GRB	4	101
23	BFP DISCHARGE HEADER	IBR	A106GRB	14	9
24	FEED WATER PIPING FROM BFP DISCH HEADER TO HPH-5 (INCL HPH-5 BYPASS)	IBR	A106GRB	14	59
25	FEED WATER PIPING FROM HPH-5 TO HPH-6 (INCL HPH-6 BYPASS)	IBR	A106GRB	14	39
26	FEED WATER PIPING FROM HPH-6 TO FEED WATER HEADER	IBR	A106GRB	14	51
27	OVERFLOW & DRAIN PIPING FROM DEAERATOR TO HEADER	IBR	A106GRB	6	87
28	CCCW PIPING		IS3589GRFE330	6	263
29	CCCW PIPING		IS3589GRFE330	4	159
30	CCCW PIPING		IS3589GRFE330	3	143
31	CCCW PIPING		IS3589GRFE330	8	41
32	CCCW PIPING		IS3589GRFE330	2	47
33	CCCW PIPING		IS3589GRFE330	14	2

34	CCCW PIPING		IS3589GRFE330	20	27
35	CONDENSATE PIPING (CS)		A106GRB	14	15
36	CONDENSATE PIPING (CS)		A106GRB	2	6
37	CONDENSATE PIPING (CS)		A106GRB	10	120
38	CONDENSATE PIPING (CS)		A106GRB	8	8
39	CONDENSATE PIPING (CS)		A106GRB	3	29
40	CONDENSATE PIPING (SS)		A312GRTP304	20	23
41	CONDENSATE PIPING (SS)		A312GRTP304	6	86
42	CONDENSATE PIPING (SS)		A312GRTP304	14	233
43	CONDENSATE PIPING (SS)		A312GRTP304	2	6
44	CONDENSATE PIPING (SS)		A312GRTP304	10	6
45	CONDENSATE PIPING (SS)		A312GRTP304	12	9
46	CW/ ACW PIPING		IS3589GRFE330	14	49
47	CW/ ACW PIPING		IS3589GRFE330	18	37
48	CW/ ACW PIPING		IS3589GRFE330	36	26
49	BFP SUCTION PIPING		A106GRB	16	15
50	BFP SUCTION PIPING		A106GRB	16	42
51	BFP SUCTION PIPING		A106GRB	12	51
52	BFP SUCTION PIPING		A106GRB	12	18
53	HP HEATERS DRAIN PIPING		A106GRB	6	201
54	HP HEATERS DRAIN PIPING		A106GRB	6	9
55	HP HEATERS DRAIN PIPING		A106GRB	8	14
56	LP HEATERS DRAIN PIPING		A106GRB	6	58
57	LP HEATERS DRAIN PIPING		A106GRB	6	2
58	LP HEATERS DRAIN PIPING		A106GRB	8	93
59	LP HEATERS DRAIN PIPING		A106GRB	8	16
60	LP HEATERS DRAIN PIPING		A106GRB	10	61
61	VENT PIPING		A106GRB	6	31
62	VENT PIPING		A106GRB	4	27
63	VENT PIPING		A106GRB	10	5
	PER UNIT PIPING				**2823**

b. Storage

Major pipes will be kept in storage yard and balance will be stacked at work spot depending upon the space availability at the time of erection.

c. Access/Interface details within STG Hall

The trailer route plan within Hazira and Dahej plant area is marked as per Annexure-1&3.

d. Lifting arrangements

Lifting operation is performed by winch, crane, EOT crane or chain block based on front, material and inputs availability.

26. Requirements on Help / Fronts for Equipment Erection.

a. Generator Erection

Concrete column & pedestals at 1A1, 1A2, 2A1, 2A2, 7A1, 7A2, 8A1, 8A2, 18A1, 18A2, 19A1, 19A2, 24A1, 24A2, 25A1 & 25A2 grids to be deferred till Generator Erection.

Ensure availability of Stand jack pockets as mentioned in Equipment layout, BHEL will provide anchor bolt, casting of anchor bolt to carried out by Civil agency of RIL.

Ensure availability of EOT crane for Stand Jack tower assembly and erection.

b. Condensor

All works between road (in front of A-row) and TG hall along grid 4-5, 10-11, 23-24 & 29-30 to be planned after condenser handling for trailer movement.

c. Boiler Feed Pumps

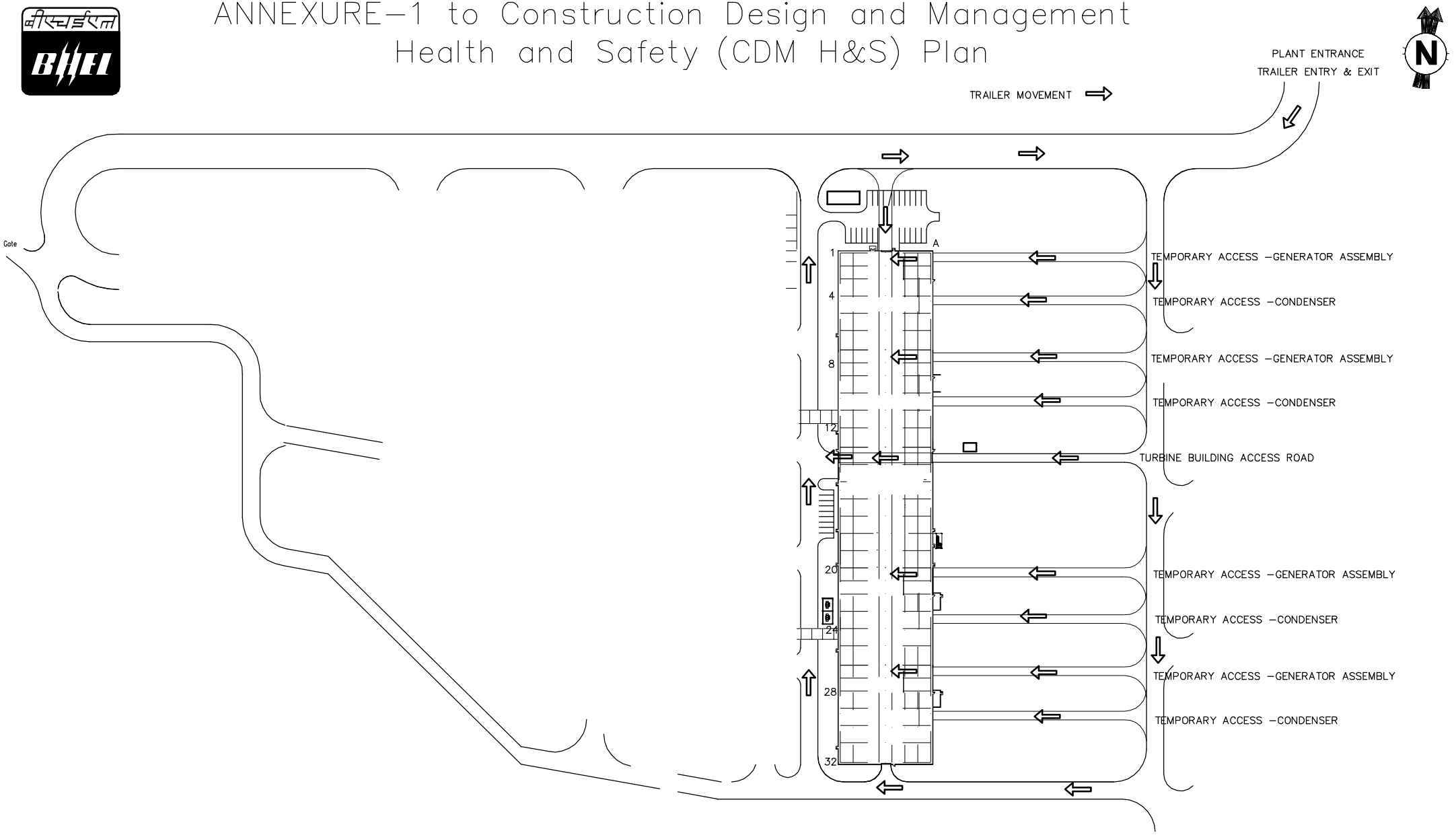
1. Cable cellar wall upto 7.0 M height shall be planned after BFP placement along
   Horizontal grid : C & D row
   Vertical grid : 3-6, 9-12, 22-25 and 28-31
2. Inter connecting pipe rack for unit 2&3 between boiler and STG by Others shall be planned after BFP placement.
   Horizontal grid : D row
   Vertical grid : 11-12, 24-25

d. Turbine

Availability of EOT Crane for assembly of turbine.

ANNEXURE

ANNEXURE–1 to Construction Design and Management Health and Safety (CDM H&S) Plan

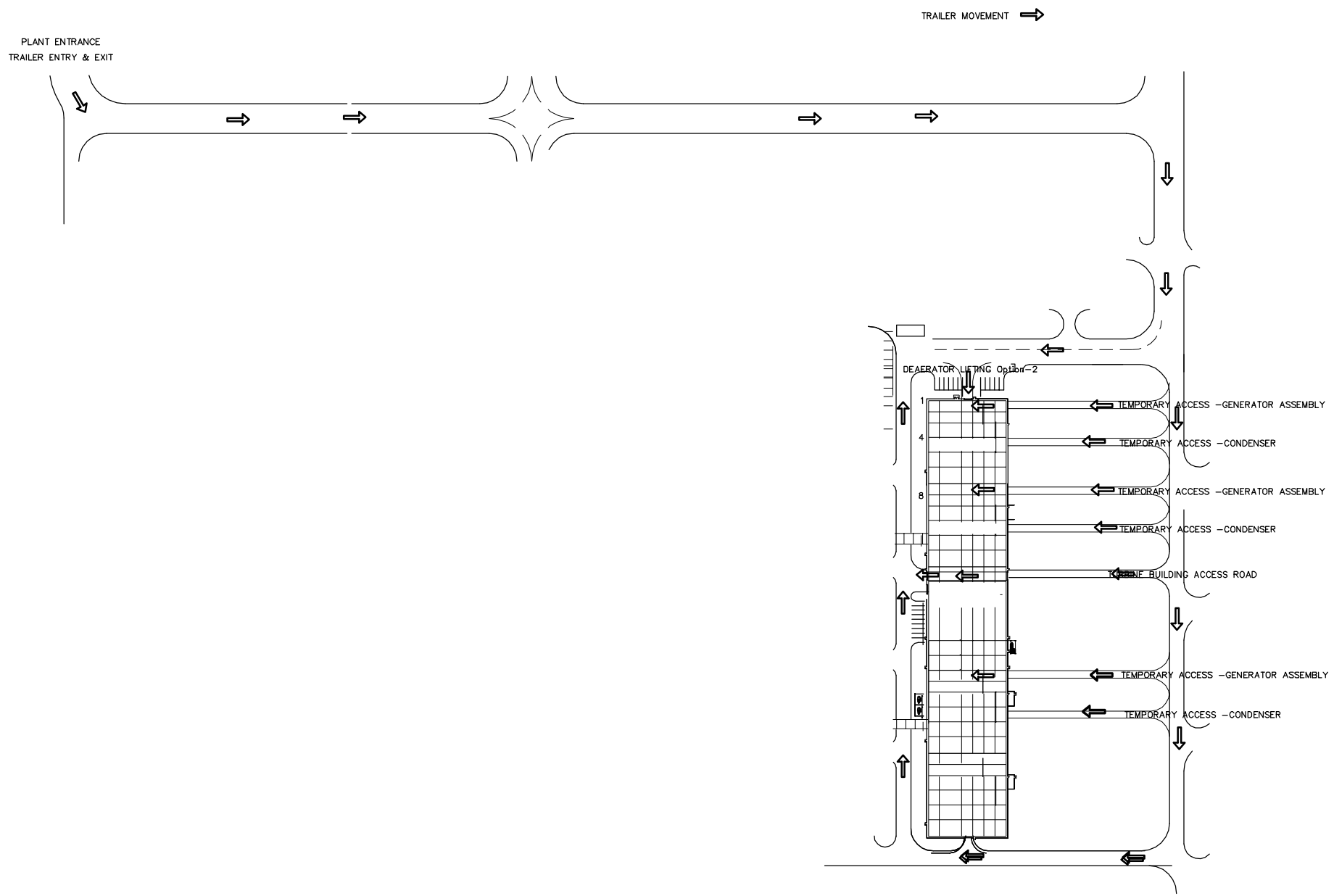


PROJECT: 7X95 MW STG RIL HMD DMD

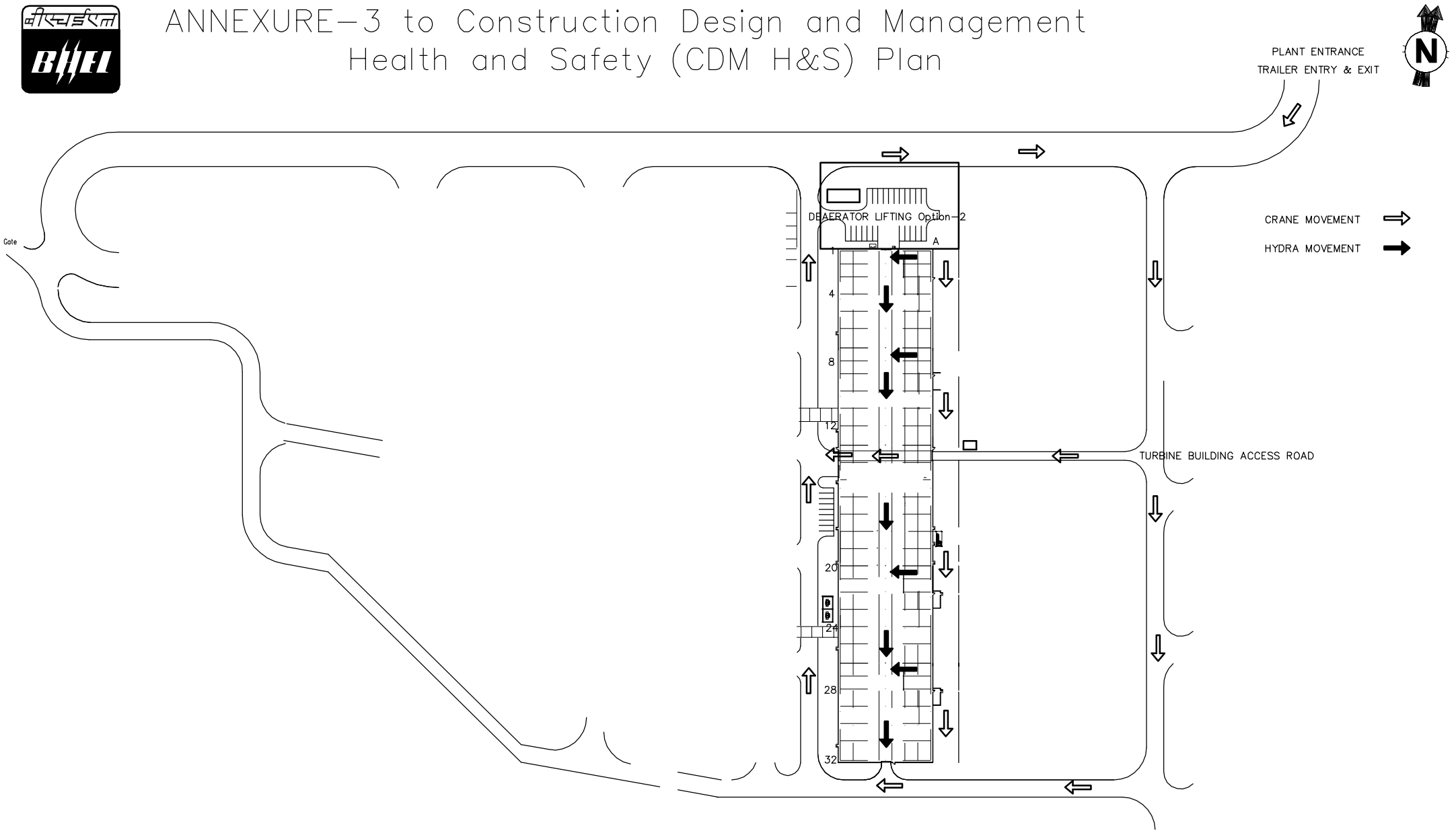
ERECTION & COMMISSIONING

TRAILER MOVEMENT PLAN–HMD

ANNEXURE–2 to Construction Design and Management Health and Safety (CDM H&S) Plan



ANNEXURE–3 to Construction Design and Management Health and Safety (CDM H&S) Plan

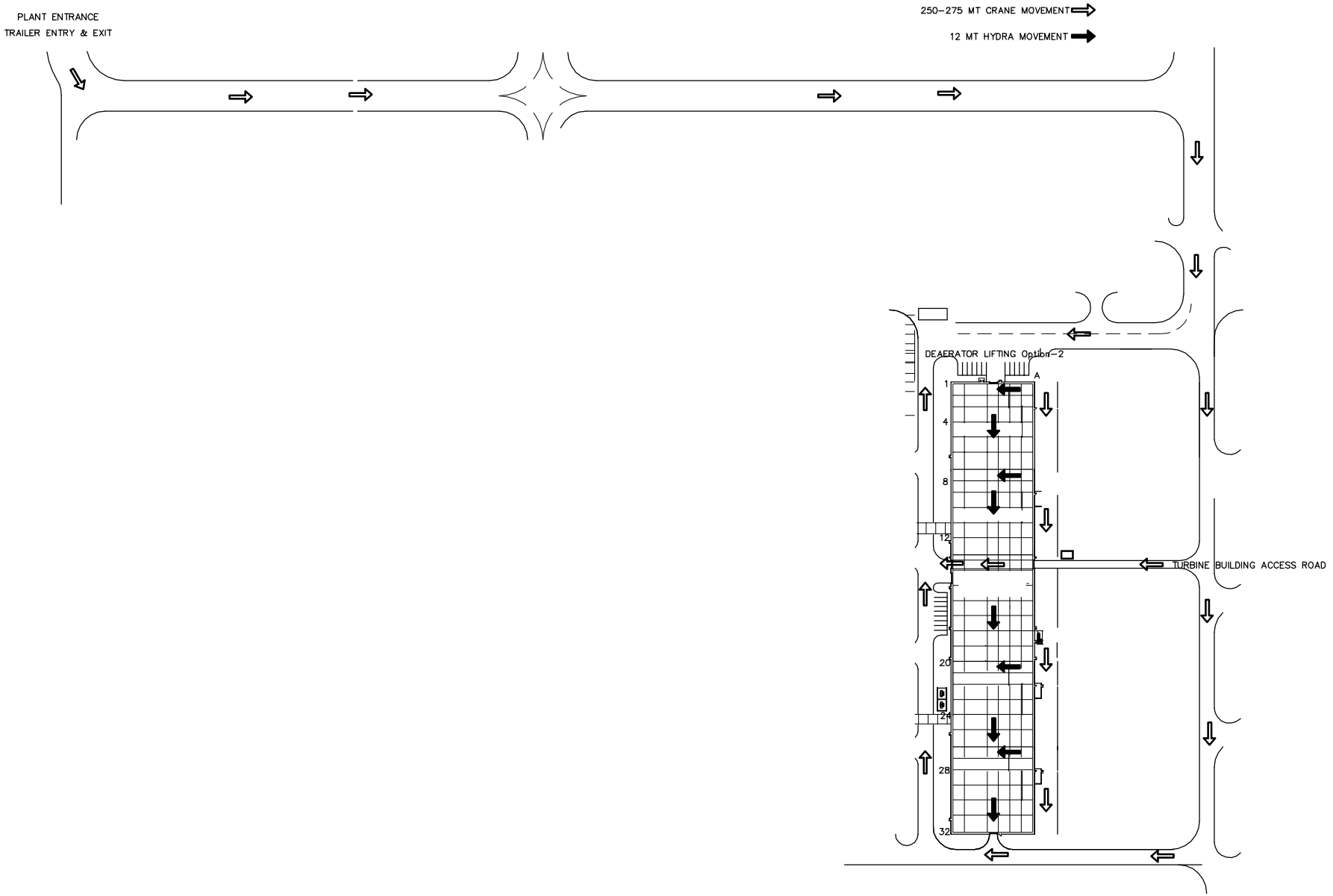


PROJECT: 7X95 MW STG RIL HMD DMD

ERECTION & COMMISSIONING

CRANE/HYDRA MOVEMENT PLAN–HMD

ANNEXURE–4 to Construction Design and Management Health and Safety (CDM H&S) Plan



Project Engineering & System Division
Erection & Commissioning department

ANNEXURE-5

4x93.1 MW STG - HMD

Equipment Lifting/placement tentative schedule

	Major Equipments	Sep-14				Oct-14				Nov-14				Dec-14				Jan-15				Feb-15				Mar-15				Remarks
		W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	
1	Steam turbine																1	1			2	2		3	3			4	4	
2	Generator														2	2	2		1	1	1		4	4	4		3	3	3	LP/Heater front
3	Surface condenser							1	1			2	2			3	3			4	4									
4	LP Heater-1				2				1				4				3													1, 3 temporarily placed near to its fdn
5	LP Heater-2				2				1				4				3													
6	LP Heater-3				2				1				4				3													
7	Deaerator						1	1			2	2			3	3			4	4										
8	HP Heater-1					2				1												4				3				after unit 2 gen. lifting/steel placing
9	HP Heater-2					2				1												4				3				
10	SJAE/GSC						2				1												4				3			
11	Drain cooler				1				2				3				4													
12	Boiler Feed Pump assembly with motor					2				1				4				3												piperack constraint
13	Condensate Extraction Pump with motor					1				2				3				4												
14	Lube Oil Console (Lube oil tank, MOP, AOP, EOP, Twin Lube oil coolers)											1	1			2	2			3	3			4	4					

3x90.3 MW STG - DMD

	Major Equipments	Sep-14				Oct-14				Nov-14				Dec-14				Jan-15				Feb-15				Mar-15				Remarks
		W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	
1	Steam turbine																1	1			2	2		3	3					
2	Generator														2	2	2		1	1	1		3	3	3					LP/Heater front
3	Surface condenser							1	1			2	2			3	3													
4	LP Heater-1				2				1				3																	1 temporarily placed near to its fdn
5	LP Heater-2				2				1				3																	
6	LP Heater-3				2				1				3																	
7	Deaerator						1	1			2	2			3	3														
8	HP Heater-1					2				1												3								after unit 2 gen. lifting/steel placing
9	HP Heater-2					2				1												3								
10	SJAE/GSC						2				1												3							
11	Drain cooler				1				2				3																	
12	Boiler Feed Pump assembly with motor					2				3				1																piperack constraint
13	Condensate Extraction Pump with motor					1				2				3																
14	Lube Oil Console (Lube oil tank, MOP, AOP, EOP, Twin Lube oil coolers)											1	1			2	2			3	3									

Annexure-6

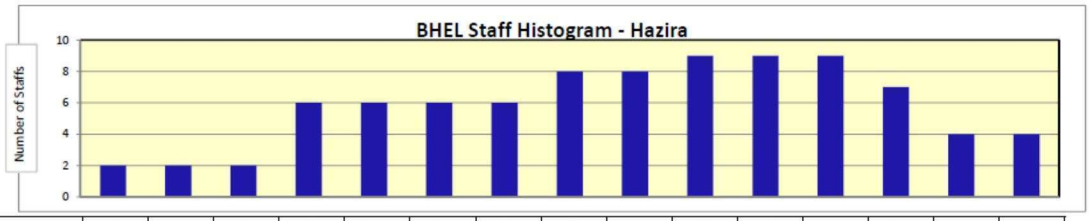
Site Mobilization plan

Receipt of materials at site is expected by June'2014. Prior to these site offices, store facilities shall be established to receive these materials.

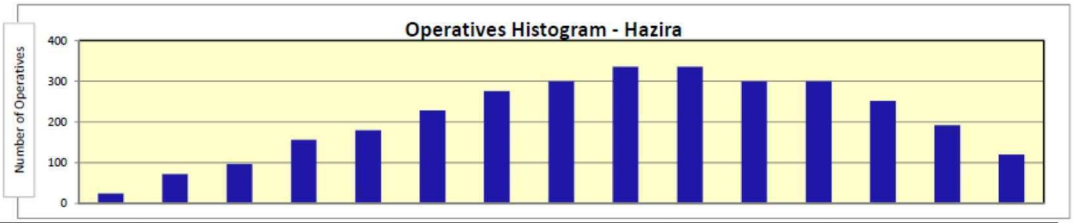
Plan for erection subcontractor

Subcontractor	Mechanical works	Electrical, C&I	Enabling works
Hazira location	1	1	1
Dahej Location	1	1	

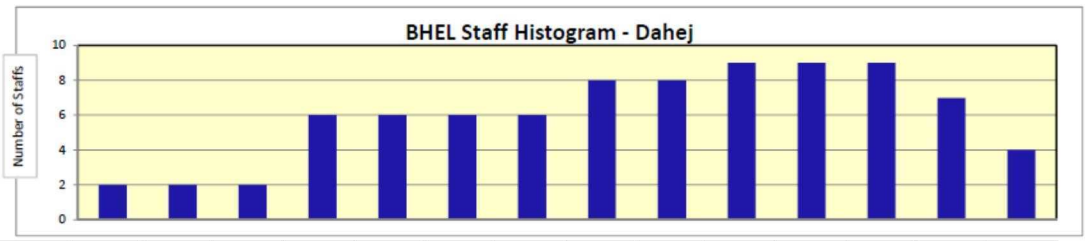
Staff and Operatives histogram (Hazira & Dahej) is shown below for information and the actual deployment will be based only on site conditions.



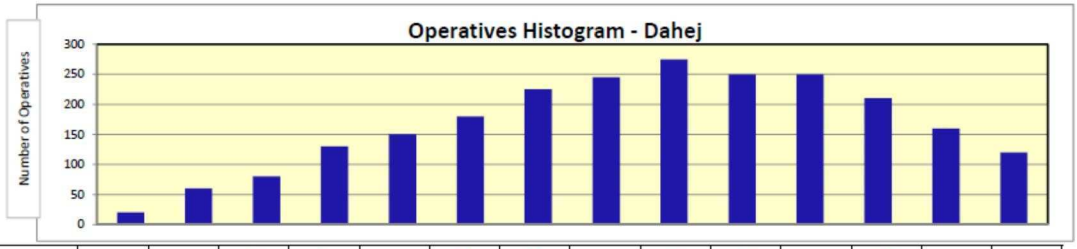
	Months	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15
	Milestones (Zero date - 23.08.13)	Enab. works start			Erec. Start								Unit-1 Commn	Unit-2 Commn	Unit-3 Commn	Unit-4 Commn
BHEL Staff	Construction manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Erection - Mechanical				2	2	2	2	2	2	2	2	2			
	Electrical Engineer								1	1	1	1	1	1		
	Enabling works	1	1	1	1											
	Instrumentation Engineer								1	1	1	1	1	1	1	1
	Commissioning Engineer										1	1	1	1	1	1
	Piping + Welding + NDT					1	1	1	1	1	1	1	1	1		
	Quality/Safety				1	1	1	1	1	1	1	1	1	1		
	Material Mgmt				1	1	1	1	1	1	1	1	1	1	1	1
	Total	2	2	2	6	6	6	6	8	8	9	9	9	7	4	4



	Months	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15
	Milestones (Zero date - 23.08.13)	Enab. works start			Erec. Start								Unit-1 Commn	Unit-2 Commn	Unit-3 Commn	Unit-4 Commn
Subcontractor (RCM, staffs, operatives etc.,)	Material Management	12	24	24	36	36	36	36	36	36	36	24	24	24	12	12
	Enabling works	12	24	36	36	12										
	Mechanical works				48	96	120	144	144	144	144	120	96	72	72	48
	Electrical, C&I works							24	48	48	60	72	96	96	72	48
	Piping works						48	72	72	108	96	84	84	60	36	12
	Critical lift works		24	36	36	36	24									
	Total	24	72	96	156	180	228	276	300	336	336	300	300	252	192	120



	Months	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15
	Milestones (Zero date - 23.08.13)	Enab. works start			Erec. Start								Unit-1 Commn	Unit-2 Commn	Unit-3 Commn
BHEL Staff	Construction manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Erection - Mechanical				2	2	2	2	2	2	2	2	2		
	Electrical Engineer								1	1	1	1	1	1	
	Enabling works	1	1	1	1										
	Instrumentation Engineer								1	1	1	1	1	1	1
	Commissioning Engineer										1	1	1	1	1
	Piping + Welding + NDT					1	1	1	1	1	1	1	1	1	
	Quality/Safety				1	1	1	1	1	1	1	1	1	1	
	Material Mgmt				1	1	1	1	1	1	1	1	1	1	1
	Total	2	2	2	6	6	6	6	8	8	9	9	9	7	4



	Months	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15
	Milestones (Zero date - 23.08.13)	Enab. works start			Erec. Start								Unit-1 Commn	Unit-2 Commn	Unit-3 Commn
Subcontractor (RCM, staffs, operatives etc.,)	Material Management	10	20	20	30	30	30	30	30	30	20	20	20	10	12
	Enabling works	10	20	30	30	10									
	Mechanical works				40	80	90	115	115	115	100	80	60	60	48
	Electrical, C&I works							20	40	40	60	80	80	60	48
	Piping works						40	60	60	90	70	70	50	30	12
	Critical lift works		20	30	30	30	20								
	Total	20	60	80	130	150	180	225	245	275	250	250	210	160	120

Annexure-7

Site Facilities

i. Contractor offices

Offices

- Conventional/Pre-Engineered Building(PEB) /Porta cabin buildings of size approx. 150 SQM
- Field offices (Porta cabins) of approx. size – 20'x10' near to work site – 2 Numbers
- Porta Cabin toilet block – 1 Number

BHEL Contractor offices

- Field offices (Porta cabins) of size – 20'x10' near to work site – 3 Numbers

Stores

Closed Shed for storage of materials

- Conventional/PEB of approx.. size 30 M(L) x 15M.(W) x 5.25M Height – 2 Numbers

Open Storage & FabricationYard

- 12750 SQM for Hazira Manufacturing Division (inclusive of closed store)
- 10500 SQM for Dahej Manufacturing Division (inclusive of closed store)

The preliminary layout for the above mentioned facilities for Hazira & Dahej locations are shown below in this document.

ii ES&H interfaces and Site Security

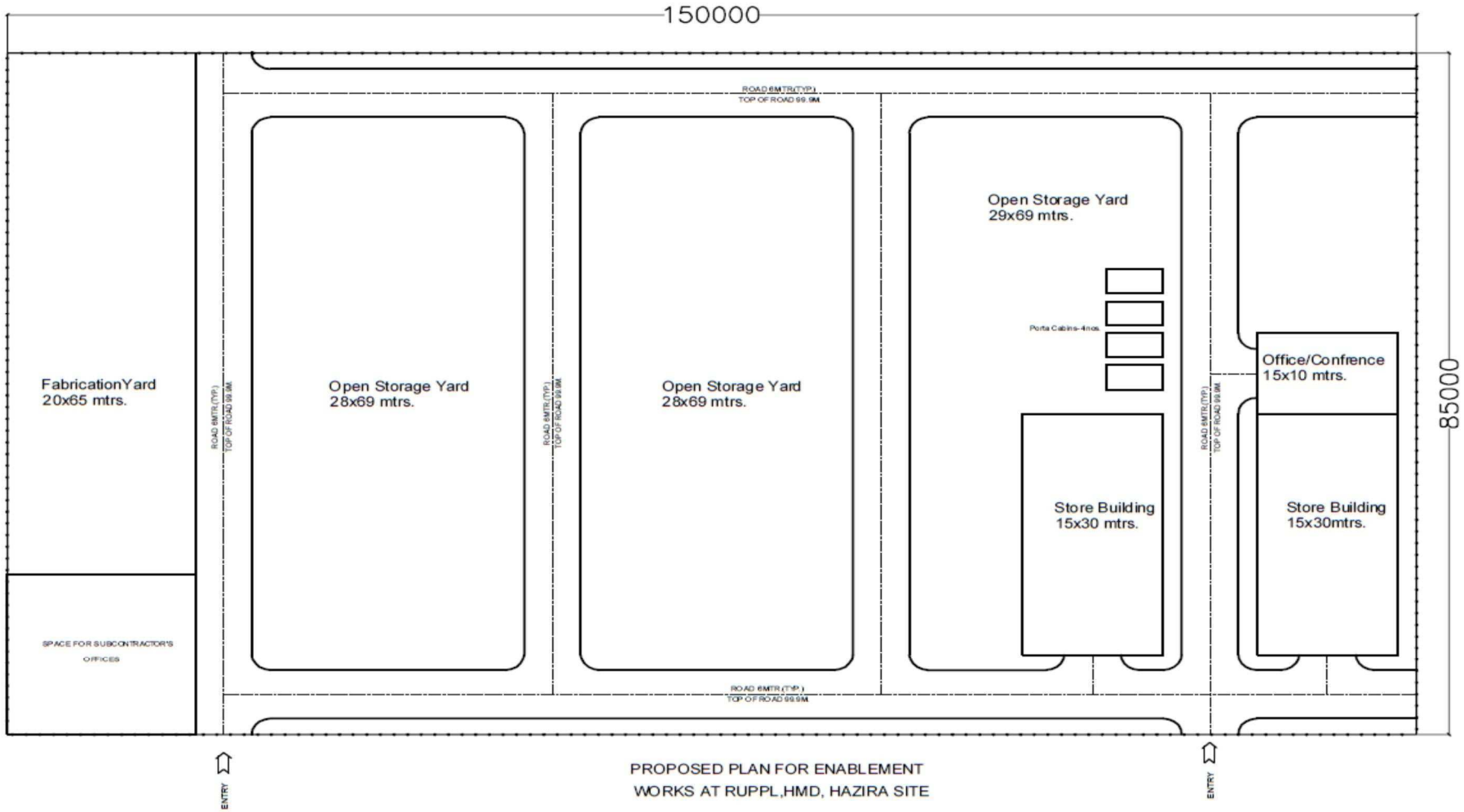
Watch and ward of BHEL's stores, open yard, fabrication yard, site spot:
Adequate security personnel will be deployed round the clock.

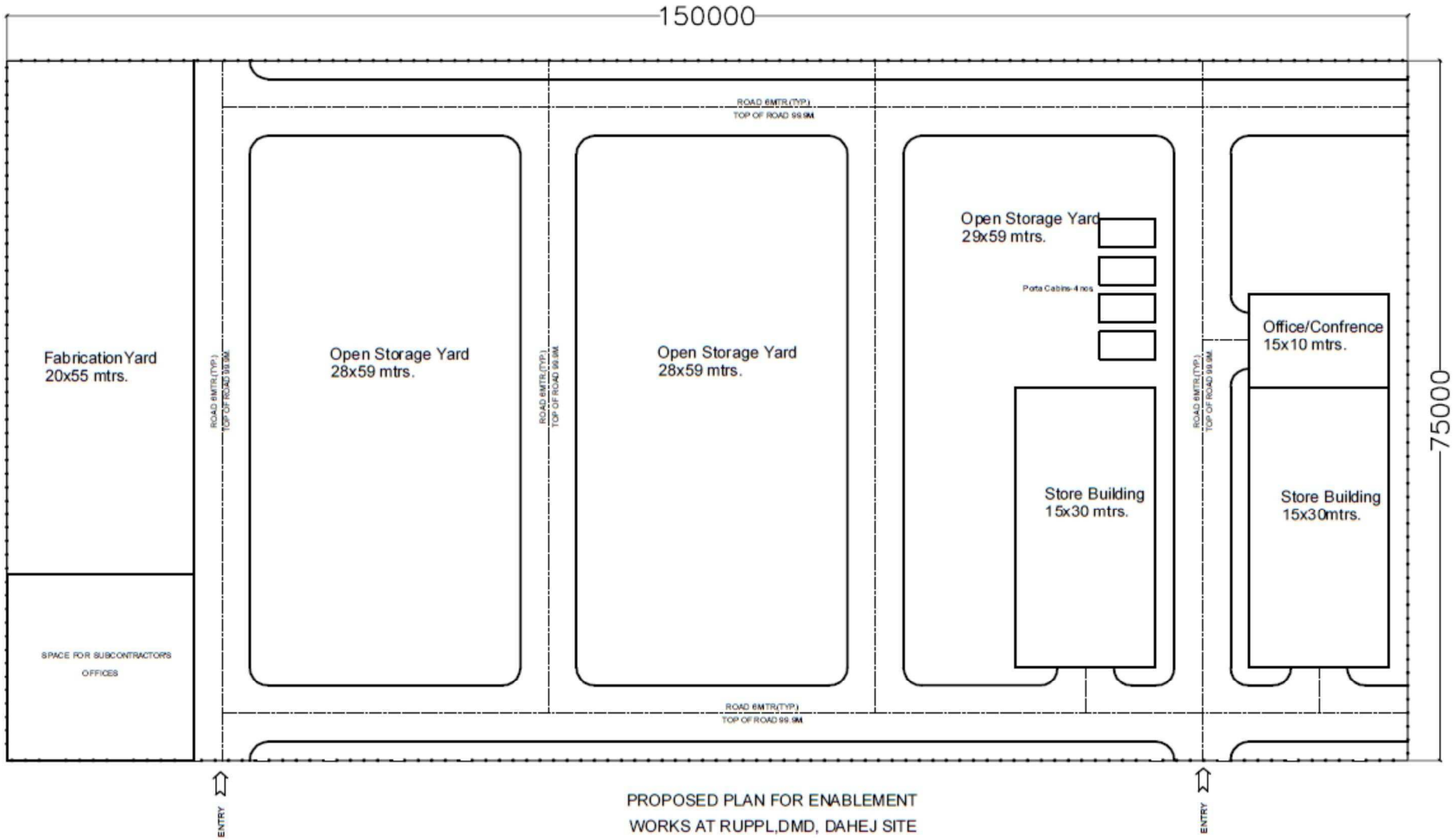
iii Erection coordination between Hazira and Dahej

Construction Manager of each site will co-ordinate for resources to match priority and schedule.

iv Camp location and labour access

It is estimated that around 340 labour will be required to be accommodated in camp. Customer to allocate space with adequate drinking water, electricity facilities.


150000
85000
FabricationYard
20x65 mtrs.
SPACE FOR SUBCONTRACTOR'S OFFICES
ROAD 6MTR(TYP.)
TOP OF ROAD 99.9M
Open Storage Yard
28x69 mtrs.
Open Storage Yard
28x69 mtrs.
Open Storage Yard
29x69 mtrs.
Porta Cabins-4nos.
Store Building
15x30 mtrs.
Office/Confrence
15x10 mtrs.
Store Building
15x30mtrs.
ENTRY
ENTRY
PROPOSED PLAN FOR ENABLEMENT
WORKS AT RUPPL,HMD, HAZIRA SITE

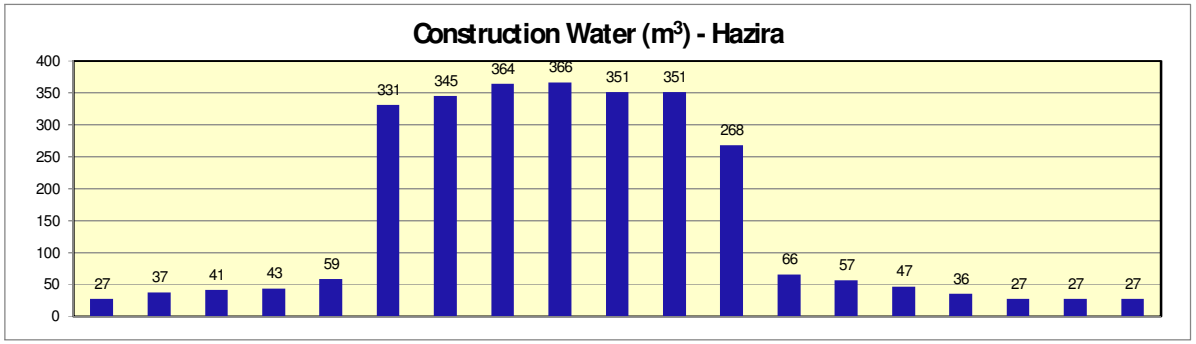

150000
75000
ROAD 6MTR.(TYP.)
TOP OF ROAD 99.9M
Fabrication Yard
20x55 mtrs.
SPACE FOR SUBCONTRACTORS
OFFICES
Open Storage Yard
28x59 mtrs.
Open Storage Yard
28x59 mtrs.
Open Storage Yard
29x59 mtrs.
Porta Cabins-4 nos
Store Building
15x30 mtrs.
Office/Confrence
15x10 mtrs.
Store Building
15x30mtrs.
ENTRY
ENTRY
PROPOSED PLAN FOR ENABLEMENT
WORKS AT RUPPL,DMD, DAHEJ SITE

Bharat Heavy Electricals Limited
Project Engineering & Systems Division
Erection & Commissioning Department

ANNEXURE-8

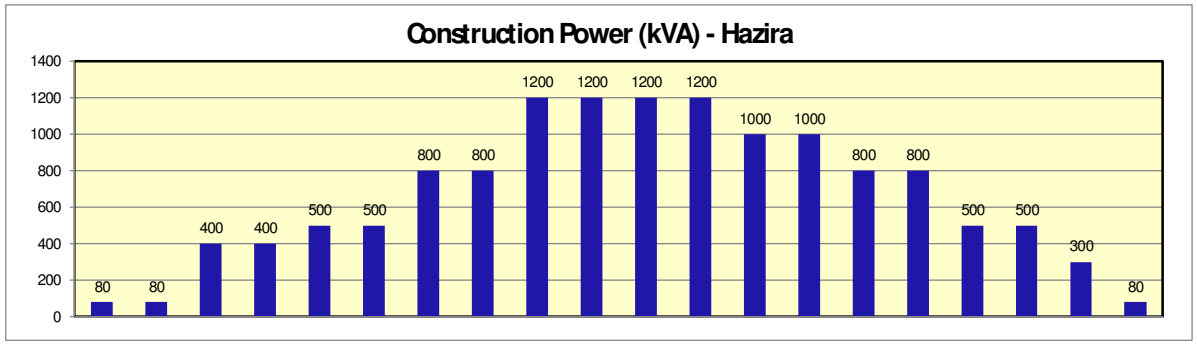
Tentative water & power requirement for 4x95MW Hazira Manufacturing Division site(for DMD to be considered as 90% of HMD)

Major activities	Unit	Qty	Water Qty per unit, m^3	Water Qty, m^3	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Remarks
		a	b	a x b																					
Construction purposes																									
DM Water																									Assumed to re-use the water from one tank to another. If not permitted, the quantity shall be doubled for DM water.
De-aerator tank											275	275													
De-aerator header															75	75									
Condenser													290	290											
Service water																									
Storage tank															197	197	197								
Piping	day		25							10	15	25	25	25	25	25	20	15	10	5					
Cont. Machinery maintenance	day		10		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Safety	day		5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Miscellaneous	day		10		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Office, stores & canteen																									
Office, stores, canteen	nos.		0.03		0.78	0.78	0.78	2.22	2.94	4.86	5.58	7.02	8.46	9.24	10.32	10.35	9.27	9.27	7.77	5.88	3.72	0.78	0.78	0.78	
Labour colony	nos.		0.05		1.3	1.3	1.3	3.7	4.9	8.1	9.3	11.7	14.1	15.4	17.2	17.25	15.45	15.45	12.95	9.8	6.2	1.3	1.3	1.3	
Site infrastructure	m2						10	10	10	10															
Drinking purpose	day		0.005		0.13	0.13	0.13	0.37	0.49	0.81	0.93	1.17	1.41	1.54	1.72	1.73	1.55	1.55	1.30	0.98	0.62	0.13	0.13	0.13	
			Total		**27**	**27**	**37**	**41**	**43**	**59**	**331**	**345**	**364**	**366**	**351**	**351**	**268**	**66**	**57**	**47**	**36**	**27**	**27**	**27**	



Construction Power

Gen. lifting											400	400												
E&C	80	80	400	400	500	500	800	800	800	800	800	1200	1200	1000	1000	800	800	500	500	300	80			
Total	**80**	**80**	**400**	**400**	**500**	**500**	**800**	**800**	**1200**	**1200**	**1200**	**1200**	**1000**	**1000**	**800**	**800**	**500**	**500**	**300**	**80**				



Project Details

Customer	M/s. Reliance Utilities & Power Pvt. Ltd.
Consultant	M/s. Bechtel, USA
Contractor	M/s. Bharat Heavy Electricals Limited
Project	4x93.1MW STGs for HMD + 3x90.3MW STGs for Hazira & Dahej Manufacturing Division
Document Reference	HSE Construction Design and Management Health and Safety (CDM H&S) Plan for STG and TCE

REV	DATE	DESCRIPTION OF REVISION	PREP'BY (BHEL)	REV' & APP' BY (BHEL)	APP'BY (CLIENT/PMC)

बी एच ई एल
BHEL

OCCUPATIONAL HEALTH, SAFETY AND ENVIRONMENTAL (HSE) POLICY

We at PE&SD/BHEL are committed to provide Safe, Healthy and Environmental friendly atmosphere and prevention of injury and ill health in all our endeavours and strive to continually improve these through ::

- ***Compliance with applicable Legislation and Regulations of Occupational Health, Safety and Environment.***
- ***Minimising risks arising from hazards in Occupational Health & Safety***
- ***Minimising pollution and waste generation.***
- ***Maximising Conservation of natural resources.***
- ***Periodic review of our Objectives, targets and HSE Management System for their adequacy and effectiveness.***
- ***Creating awareness amongst our Employees, Suppliers and Stake holders through communication and Training.***

Dt :: 16.01.2013

Arvind Gupta
Executive Director-PE&SD

Project Engineering & Systems Division,
Bharat Heavy Electricals Limited,
R C Puram, Hyderabad 502 032

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this Safety and Health Plan is to provide for the systematic identification, evaluation, and prevention and control of general construction hazards, specific job hazards and potential hazards that may arise from foreseeable conditions during construction ,installation and servicing of power plant.

2.0 REFERENCES

Building and other construction works 1996
Factories Act 1948
Health & Safety Manual of BHEL

3.0 POLICIES

HSE Policy shall be implemented by site management throughout the construction activity.

Our company's Health & Safety and Environment policies are described here under: -

3.1 HEALTH & SAFETY POLICY

It is the policy of BHEL – PE&SD to:

1. Provide safe working environments, and to perform all company activities for installation of Power Plants in a manner that reduces risk to all employees and to all other workers.

2. Comply with applicable Legislation and other requirements concerning Occupational Health and Safety Ensure continual improvements in Occupational Health and Safety Performance through Periodic Review of Objectives and Control procedures.

3. Foster awareness amongst Employees, Vendors and other interested parties on Occupational Health and Safety Aspects.

4.0 TERMS AND DEFINITIONS

4.1 DEFINITIONS

ACCIDENT
An unplanned, undesired event or condition that, results in harm to people or damage to plant / equipment.

INCIDENT
Any undesired event or condition that could have resulted in harm to people or damage to property or the environment or loss.

AUDIT
A systematic and Independent examination of the Health and Safety management systems and their outcomes to determine the effectiveness of the Health & Safety management system.

COMMUNICATION
It is the process of conveying information to other party or parties, so it can be understood correctly and acted upon.

NEAR MISS
An unexpected, unwanted event not causing loss, injury or illness but which under slightly altered conditions can lead to an accident.

FATAL
Death resulting from an accident.

MAN HOURS WORKED
The total hours worked by all employees working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contractor labors.

FIRST AID CASES
First aid cases are where the injured person is given medical treatment and discharge immediately for reporting on duty, without counting any lost time.

LOST TIME INJURY (LTI)

Any work injury which renders the injured person unable to perform his regular job or an alternative restricted work assignment on the next scheduled work day after the day on which the injury occurred.

MEDICAL TREATMENT CASE (MTC)

A Medical Treatment Case is any work-related injury that involves neither Lost Workdays nor Restricted Workdays but which requires treatment by, or under the specific order of, a physician or could be considered as being in the province of a physician.

HEALTH & SAFETY REVIEW

A formal recorded management evaluation of the effectiveness of the Construction Health & Safety management systems and identification of actions for continual improvement.

SUB-STANDARD PRACTICE OR CONDITIONS

Deviation from a standard practice or conditions.

4.2 TYPE OF INCIDENT / ACCIDENT & THEIR REPORTING

All body Injury, damage to property or other loss that may arise out of or in consequence of the execution and completion of works shall be reported to client and relevant govt. agencies.

The two categories of accidents, which are as follows: -

Non Reportable Cases (minor / non LTA cases)

An accident, where the injured person are disabled for less than 24 hours.

Reportable Cases (major / LTA cases)

In this case the injured person is disabled for 24 hours or more and is not able to perform his duty.

LOST WORKDAYS – DAYS AWAY FROM WORK

The total number of calendar days on which the injured person was temporarily unable to work as a result of lost workday case or permanent partial disability.

FREQUENCY RATE

Frequency rate is the number of Lost Time Accident (LTA) per two Million Man hours worked. Mathematically, the formula read as: -

$$\frac{\text{Number of LTA}}{\text{Total Man Hours Worked}} \times 2{,}000{,}000$$

SEVERITY RATE

Severity rate is the Number of days lost due to Lost Time Injury (LTI) per two Million Man hours worked. Mathematically, the formula reads as: -

$$\frac{\text{Days lost due to LTI}}{\text{Total Man Hours Worked}} \times 2{,}000{,}000$$

4.3 VARIOUS TERMS USED

COMPANY	RELIANCE INDUSTRIES LIMITED (RIL)
BECHTEL	Bechtel Corporation USA
HSE COMMITTEE	Committee of management supervisors and employees, which aims to promote zero accident performance.
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED
NCR	Non Conformance Report - this addresses an act of violation carried out by an individual/a group of people against any clause of a written procedure.
SUBCONTRACTOR	Subcontractor to CONTRACTOR
PPE	Personal Protective Equipment.
SITE	The location where the work is to be constructed within the plot plan.

5.0 ORGANISATION AND RESPONSIBILITIES

Every employee whether he or she at work-site or office has a responsibility to themselves, to the other employee, and to the company to work safely. This responsibility includes the elimination of hazards wherever possible, and reporting actual or potential hazards to management Supervisors and executives are accountable for maintaining good standard of safety and compliance of all safety procedures in the performance of every activity.

The fact that the company has assigned a Safety Officer does not release managers/ engineers / supervisors from their safety responsibilities in any way. The Safety Officer is available to assist and guide them in implementing the company's safety policy.

5.1 RESPONSIBILITIES

Responsibilities of Construction Manager –

Construction Managers are responsible for maintaining a good standard of safety at the construction sites. He is obligated to comply with central, state and local laws having jurisdiction over the work and the site. Duties of Construction Manager shall include:

- Provide safe working conditions.
- Perform all activities in ways that eliminate risk of injury or health impairment to any employee/workman.
- Maintain all areas in ways that eliminates risk to public.
- Eliminate risk of damage to property and equipment.
- Plan construction activities so that work is performed in accordance with established safety laws, procedures and guidelines.
- Assist in the preparation, notification and monitoring of the work site safety program.
- Establish post and maintain all work site safety and health notices, signs, etc.
- Regularly conduct work site inspections to identify unsafe or potentially unsafe conditions and/or activities of personnel.
- Make recommendations for both immediate and future improvements in above conditions. Follow up on such recommendations in order to ensure continuing improvements.
- Be knowledgeable of all applicable local, state laws and BOCW Acts & rules procedures, regulations and standards.

- Be aware of all procedures needed to deal with industrial hygiene issues
- Conduct monthly safety review meetings and ensure participation of all members.
- Ensure that proper safety equipment and protective devices are available, well maintained and used whenever required.
- Instruct all package-in-charges in safety requirements and make certain that each of them passes the instruction to their workmen.
- Review all accidents, oversee correction of all unsafe practices and send accident reports
- Ensure conformance of safety standards by all subcontractors as required in the work orders issued to them
- Coordinate the organization and development of emergency systems such as, first aid, fire protection, fire alarm and evacuation etc
- Provide for the protection of the public from site operations
- Regularly attempt to ensure safe performance and enforce all compliances by others at site including subcontractors and their employees.
- Attend HSE meetings, as & when scheduled by RUPL / Bechtel.

Responsibilities of Site Safety Coordinator-

The site safety coordinator is responsible for assisting Construction Manager for implementation of safety systems and procedures.
In all matters related to safety, he shall work in close liaison with RUPL / Bechtel and his duties shall include:

- Familiarize all employees with company safety program, and applicable state, local and Building and Other Construction Workers Act 1996 (BOCW), procedures and standards.
- Implement the company Safety program and monitor compliances.
- Assist each site employee with compliance with all company and BOCW safety and health policies and regulations.
- Organize and conduct training programs for site employees and contractor‘s workmen.
- Conduct site inspections to identify unsafe conditions and / or actions of work site personnel. Make verbal and written recommendations for both immediate and future

correction. Follow up for implementation of corrections. Issue warnings of persistent, uncorrected unsafe conditions. Maintain daily safety observation register.

- Coordinate deployment of emergency systems such as, first aid, fire protection, fire alarm and evacuation etc
- Pursue health-related and hygiene-related activities and impart education with respect to it.
- Assist Construction Manager in the implementation of the site-specific safety program.
- Ensure that daily toolbox safety meetings & management site walkthroughs are conducted.
- Assist the Construction Managers in the establishment and maintenance of all worksite notices, signs, banners and posters etc
- Maintain all accident reporting and other safety documentation, including preparation of reports, notification to all parties and accident investigation reporting.
- Represent company management during any local, state or third party inspections at site.
- Coordinate monthly safety review meetings and preparation of weekly safety reports, quarterly fire safety reports, accident reports and manpower reports.

Responsibilities of BHEL Site Employees:

All employees must familiarize themselves with this safety plan as well as company's safety rules and procedures as per annexure and comply with them in every respect. Workmen, supervisory staff and management personnel at all levels are responsible for taking immediate correction action when a violation is observed. All employees are responsible for compliance in their area of operations.

- Each employee will be responsible for safety in his area of work.
- All safety equipment issued by company must always be used as intended.
- Company property and all equipment must not be damaged, removed or misused.
- Employees must be familiar with and observe all safety rules, procedures and policies as these may change from time to time
- All employees will ensure that all rules and procedures are complied with in their area of operations and immediately enforce appropriate corrective measures

whenever violations are noticed.

Responsibilities of Sub-contractors:

Each sub-contractor is completely responsible for the safety and health of the workmen and their employees in their employment. He shall also be responsible for safety of BHEL property and other equipment issued to him for carrying out the work and creates unsafe conditions for others. Each sub-contractor is required to comply with the requirements of the safety program as incorporated in their respective sub-contract agreements, and with all laws regulations, and requirements of local, state and BOCW, the owner / PMC and every other agency having jurisdiction over the work.

- Each sub-contractor is required to submit to the Construction Manager copies of their respective safety plan prior to start of work. Each sub contractor will:
- Abide by all company and site safety rules
- Participate in all periodic safety meetings and site safety inspections
- Appoint one representative with responsibility to take corrective actions on the notified safety violations and respond to them
- Provide necessary personal protective equipment required for the work
- Provide an adequate first aid kit for use by its employees/workmen
- Provide a list of employees qualified in first aid who may be available to administer first aid.
- Notify all other contractors when their activities could possibly affect the health or safety of employees of other contractors/agencies
- Report all injuries, accidents and any unsafe conditions to Construction Manager.

6.0 HSE PROCEDURES FOR CONSTRUCTION ACTIVITIES

6.1 HSE OBJECTIVES

Objectives

We seek to provide a workplace that is free of occupational injuries and illnesses. We believe that a safe and healthy workplace is essential to achieve high quality and productivity necessary to complete erection/commissioning targets. To achieve our long term goal of zero injury, we have set following objectives:

- Provide sufficient information, instructions, training and supervision to enable all personnel including contractors' workmen to minimize hazards and contribute positively to their own and workplace safety

- Continuously support, promote and provide sufficient resources for the effective implementation of Health and Safety Policy

- Develop safe systems of work for erection, commissioning, servicing handling and storage of materials and maintain tools and plants in good and healthy condition.

- Develop and implement systematic program for examination of work activities to identify hazards and accident prevention

- Exchange health and safety information with subcontractors 'and monitor and evaluate their performance.

- Continuously improve our injury rate over previous years.

6.2 TOOLBOX MEETING

Each site engineer / work supervisor shall conduct daily toolbox meetings to discuss health and safety issues before commencement of any activity. Work Supervisors shall lead these meetings. This meeting shall be no longer than 5-10 minutes of duration and items covered at these meetings shall include:

- Hazards and its control applicable to the particular activity.
- Safety measures / controls to be adopted during executing the job

Any important information / happening related to particular activity.

6.3 ACCIDENT INVESTIGATION, REPORTING AND RECORDS:

Every accident or injury of any kind and at any level of severity must be immediately reported by the employees in their work area (whether to BHEL employee or to the contractor's workmen) to the site safety coordinator, Activity in-charge, or Construction Manager, even if it is believed that the Incident / accident to be minor.

For any injury to any employee or to the contractor's workmen, the safety coordinator shall report the accident in accident safety format, to RUPPL/ Bechtel.

In the case of serious injury requiring hospitalization or fatality, communication should be made to RUPPL / Bechtel immediately with submission of accident report within 24 hrs and detail investigation report may be forwarded in accident safety format within two days.

Every site shall maintain record of accidents / incidents at site, and must be available for inspection by representatives of statutory agencies / officials visiting site from RUPPL / Bechtel. Site safety coordinator must maintain these records.

Accident Investigation Procedure:

The purpose of the investigation procedure is to find out route cause of accident / incident & not to find out faults, so as to avoid recurrences, in future.

BHEL Site in-charge shall constitute a committee of at-least 2 site engineers within 24 hours of such accidents. The investigation shall aim at finding out the basic unsafe acts / conditions that have caused the accidents. Immediately after all appropriate emergency measures, first aid and damage containment measures have been taken, every effort shall be made by the committee to:

- Preserve physical evidence
- Take photographs
- Take statement from accident victim(s) and eyewitnesses and any one who may have knowledge of possible cause(s) of accidents

The committee shall also recommend measures to prevent recurrence of similar accidents.

Accident Investigation Report:

The investigation committee on completion of the all investigations shall prepare and submit the report to the Construction Manager. The report shall also include measures to be taken at site to prevent similar accidents in future.
The construction Manager shall forward the copy of the investigation report to RUPPL / Bechtel.

6.4 HSE INSPECTIONS & REVIEW:

Each worksite must be regularly analyzed on continuing basis in order to identify actual or potentially hazardous conditions. It is the responsibility of the Construction Manager to administer the complete Worksite Safety Plan through the Package in-charges and in a manner coordinated with the Site Safety Coordinator.

It is the responsibility of all BHEL supervisors and engineers to regularly observe worksites, tools, equipment and storage area daily and take all appropriate actions necessary to eliminate or control any hazard that are identified. If it goes beyond their authority, the Safety Coordinator/Activity In-charge should be asked for assistance.

In addition to inspecting worksite and work areas for unsafe conditions, they should also observe operations, work procedures and workmen actions. Unsafe activities must be eliminated and workmen should be told about safe procedures.

The safety coordinator should make both scheduled and surprise inspections. He should discuss the results of the inspections with Activity In-charges and Construction Manager.The safety co-coordinator should forward the results of scheduled and unscheduled inspections to activity in-charges and Construction manager for corrective actions.

Any unsafe conditions / actions of 'workmen must be brought to that subcontractors notice for immediate attention.

6.5 PERMIT TO WORK SYSTEM (PTW)

Certain work connected with Construction shall be carried out under a Work Permit System where the risk ranking is high.

- The most formal method of ensuring safe working practices - safe systems of work - is to have a permit-to-work procedure. A permit-to-work system shall ensure that a trained authorized person shall pre-assess the hazardous circumstances involved and then prescribe the conditions and limits for the work to take place.
- The permit certificate requires acknowledgement by the performing authority (team leader) that is responsible for doing the work to indicate that working conditions and limits are thoroughly understood.

Work Permit Requirement
Work permit systems are the most formal method of ensuring safe systems of working. Their use shall be reserved for work where there are potential hazards and that the precautions necessary for that work need positive enforcement.

Definitions

Issuing Authority
Is the person who signs a Work Permit and authorizes the work to start, provided that all the prescribed special conditions have been or shall be complied with. He shall ensure that all supporting documentation has been obtained and is properly completed before the Work Permit is signed.

Performing Authority
Is the person who 'receives' the Work Permit. Normally a supervisor of the operatives carries out the work. He shall ensure that he, and all the operatives involved, understands the conditions, limitations, and precautions necessary as stipulated in the Work Permit, and that these are complied with.

Description and Limitations of Permits

Description
There are different Work Permit Forms to cover Construction Works. These are:

- The Cold Work Permit (After commissioning)
- The Hot Work Permit (After commissioning)
- The Excavation Permit
- The Electrical Isolation Work Permit
- The Height Work Permit (for working above 4 m ht.)
- Radiation permit.
- Erection/lifting permit.
- Road blockade permit.
- Night works permit.
- Hydro test / pneumatic test

Procedures for Work Permit Issue

a) Requirement
Work Permits are required for all work carried out within the site.

b) Application
An application for a Work Permit shall be given to the Issuing Authority.

c) Preparation and Issue
The Issuing Authority shall prepare Work Permits. All sections of the Work Permit Form must be completed.

Where necessary, the Issuing Authority, or his delegate, shall arrange for a gas test of the Vessel or area. When the Issuing Authority is satisfied that all conditions and precautions have been complied with, he may sign and issue the permit original to the applicant. The Recipient shall sign the Acknowledgement Section of the Permit.

d) Acknowledgement
All Work Permit categories require a formal acknowledgement from the Recipient where he is required to sign the Permit Form, acknowledging that he understands all the conditions, precautions and restraints imposed by the Issuing Authority. And that these conditions etc., have been fully explained to the operatives who shall carry out the work. The 'Acknowledgement' section shall be signed at the time of issue.

e) Posting, Suspension, Completion and Cancellation
All Permits are automatically suspended upon emergency alarms sounding. Before work re-commences after an alarm stoppage, permission must be obtained from the Issuing Authority. When all work is finished, the person in charge of the work, normally the recipient of the Work Permit shall sign the 'Work completed' section of the Form and return it. When the Issuing Authority has received the completed Permit it shall automatically be cancelled.

f) Validity

A Work Permit is only valid until the time / date shown. Normally a Work Permit shall be issued for a period not exceeding 12 hours. Each Permit may be extended on a 12-hour basis. The permits shall be presented for re-validation each day before work commences. A Work Permit ceases to be valid upon the sounding of an emergency alarm.

6.6 FIRST AID TRAINING

BHEL will arrange in-house training in basic first aid from time to time (once in a year). Construction Manager shall contact local Red Cross/Area hospitals or fire departments for arranging above training program. Participation by every site employee should be encouraged.

6.7 HSE COMMUNICATION

HSE MEETINGS

Construction Manager shall conduct regular safety meetings to:

- Orient all sub contractors and their workmen to site requirements and objectives.
- Identify areas that require special concerns and determine the best corrective actions for each situation.
- To review the safety shortfalls / Safety deviation report / safety audit findings and other observations made during the previous meeting
- To identify corrective / preventive actions
- To review the response of Tool Box Meeting

6.8 PERSONAL PROTECTIVE EQUIPMENT

BHEL will provide all necessary standard personal protective equipment (as per National & International Standard) on each work site for use by company employees. All subcontractors on the site are required to provide personal protective equipment in manners adequate for the type of work being performed by them.

6.9 Welding and Gas Cutting Operations

(After commissioning)

- No welding or torch operations are to be performed by any subcontractor without a proper hot work permit in confined areas, storage areas etc.
- When possible, items to be welded, cut, heated, etc. shall be moved to a safe

location free of combustible or flammable material. If this is not possible, then all combustibles/flammables that can be removed from the area will be removed and a positive means of confining arcs and sparks generated by the process will be taken and additional person(s) will be stationed as fire watch for the area(s) still exposed.

- Appropriate fire-fighting equipment is to be available in close proximity of any welding and gas cutting operations at all times.

- Drums, tanks, and similar containers that have contained flammable or toxic material shall not be welded, cut, or heated until they have been made safe by water filling, thorough cleansing, or similar accepted practices. The container must also be ventilated during the welding, cutting, or heating process.

- Proper ventilation is required for any welding or torch operations performed in a confined space.

- Any welding or gas cutting operations performed on metals of toxic compounds or coating such as zinc, stainless steel, lead, cadmium, chromium, and beryllium must be properly ventilated and/or proper respiratory protection must be worn by any person that could be exposed to fumes, vapors, and gasses created by the welding and gas cutting processes.

- Wherever it is practical, all arc welding operations shall be shielded to prevent direct light rays or sparks from contacting persons in the vicinity or from reaching areas normally used to travel through or into the vicinity. Where this is not practical, persons who must be in the area are to use proper eye and skin protection. Other persons who are not participating in the welding or gas cutting operations are not to be allowed into the hazard zone.

- Welders and other employees who are exposed to arc welding radiation must wear suitable clothing and protective apparel to prevent burns and other types of ultraviolet radiation damage to the skin.

- Arc welding machines must be shut down when being moved or when they are not in continuous use.

- Electrode holders left unattended must have electrodes removed and must not be left where they might contact employees or conducting objects.

- Welders must guard against allowing materials adjacent to or behind them to reflect radiation back toward them or towards others in the area. Reflected radiation can cause skin burns and eye flash burns.

- Compressed gas cylinders must always be secured from tipping or falling, whether in use, in storage or in transit. The cylinders must always be secured

upright, except during times when actually being hoisted or carried.

- Valve caps must be in place when cylinders are not in use. Valve caps must never be used for lifting the cylinder vertically.
- Regulators must be removed when cylinders are not in use or are in transit, unless the cylinder is firmly secured on a special carrier designed for this purpose.
- Cylinders being transported by a powered vehicle must be secured in an upright position.
- Cylinders containing oxygen or fuel gasses must not be taken into confined spaces.
- Oxygen cylinders shall be stored a minimum of (6) meters from fuel gas cylinders or must have an approved firewall between them.
- Torches must only be lit by approved strikers; never with matches, cigarette lighters, or hot work.

6.10 COMPRESSED GAS :

- All cylinder valves must be closed when any work is finished and when any cylinders are empty or being moved.
- Valve protection caps must be placed and secured properly before gas cylinders are transported, moved or stored.
- Compressed gas cylinders must be secured in an upright position with chain or other appropriate means.
- All cylinders must be kept at a safe distance from welding or cutting operations or shielded from safe.
- All cylinders must be placed where they cannot become part of the electrical circuit.
- Oxygen and acetylene must not be stored together.
- Oxygen and fuel gas regulators, hoses and associated equipment must not be altered and must be in proper working order while in use.
- Compressed air can be extremely dangerous if allowed to penetrate the skin. As such, the use of compressed air to clean off yourself or other workers is strictly prohibited.

- Compressed air used for cleaning purposes may not exceed 2Kg/cm2 only in conjunction with personnel protective equipment that is designed for that application.

6.11 SCAFFOLDS :

- All scaffolds must be erected / dismantled by scaffolding crew under direct supervision of competent scaffolding supervisors.

- All scaffolds will be capable of supporting 4 times maximum intended load and erected on sound, rigid footing, capable of carrying the maximum intended load without settling or displacement.

- Guard rails and toe boards will be installed on all open sides and ends of platforms more than (4) meter above ground or floor.

- Scaffold planks will extend over end supports not less than 6 inches nor more than 12 inches. Scaffolding and accessories with defective parts will be immediately repaired or replaced.

- All platforms are to be tightly planked for the full width of the scaffold, except as may be necessary for entrance openings. Platforms will be secured in place.

- On suspension scaffolds designed for a working load of 500 pounds, no more than two workers are permitted to work on the scaffold simultaneously.
  On suspension scaffolds with a working load of 750 pounds, no more than three workers are permitted on the scaffold simultaneously. Each employee on the scaffold must use an approved safety harness attached to a lifeline. The lifeline is to be securely attached to substantial members of the structure (not the scaffold itself) or to securely rigged lines, which will safely suspend a worker in event of a fall.

6.12 Excavation:

- Preplanning of every excavation by the responsible supervisor is required in order to prevent problems with items such as underground utilities, overhead utility lines, surfaced drainage, substructures and superstructures, excessive noise laws, environmental impact laws, medical and/or emergency response facilities, potential for hazardous atmosphere, communications and back-up availability, and normal amounts of vibration in the area.

- Dewatering as required to sustain a dry excavation must be initiated and maintained while work is being performed.

- Persons working in or around an excavation must be alert to any unnatural or

suspicious changes in the excavation. Any observation or concern must be reported to their immediate supervisor immediately. Such concerns may include cracks in walls or surface, water seepage, suspicious odors, change in surrounding vibrations, incoming drainage etc.

- Prior to starting any work in the excavation area, the immediate supervisor shall inspect the excavation for possible hazards and to see that all safety regulations are met. Additional inspections will be made throughout the day as required by changing conditions and at the beginning of each new workday or work shift.

- At the end of the work shift or when the work area must be left unattended at any time, the immediate supervisor shall perform a walk-around inspection of the area assuring that no hazardous or unsafe conditions are left exposed or unprotected.

6.13 CRANES AND HOISTING EQUIPMENTS:

- On every crane or piece of hoisting equipment notices of all rated load capacities, recommended operating speeds, and any hazard warnings or special instructions must be conspicuously posted. All instructions and warning must be visible from the equipment operator‘s station.

- All areas within swing radius of cranes that are potentially accessible by pedestrian, vehicular, or equipment movement must be barricaded to prevent anyone or any vehicle or equipment from being struck by the crane or hoisting equipment, or its load(s).

- Except where electrical distribution and transmission lines have been de-energized and visible grounded, or where insulating barriers not a part of or an attachment to the equipment or machinery have been erected to prevent within 15 ft. of any power line.

- Cranes will be inspected before use by the operator. Any defects must be corrected before use. Logs of crane inspection must be kept with the crane.

- Hydras shall only be allowed for loading & unloading works & shall not be allowed to transport materials in project roads.

6.14 Temporary electrical installations:

The following guidelines are to be considered the absolute minimum requirements to be supplemented by requirements of all applicable codes and standards for such work; Wiring and Branch Circuits Must be protected by a proper amperage over current device such as a HRC fuse or circuit breaker. Such installations must be located so as to prevent physical damage to the wire conductors & panels.

- Portable electric lights used in wet or potentially wet locations must be either low voltage type (12 volts or less) or protected by a GFI (ground fault interrupter).

- Must be visually checked before each use and periodically while in use to assure their original integrity is maintained. Cords with cuts, breaks, deep abrasions, etc. shall be taken out of service immediately. Repairs to extension cords shall only be performed by qualified/ licensed electricians.

- Must not be allowed to lie in wet or potentially wet areas.

- Every electric line or cable of unknown origin that is discovered or exposed during a digging, drilling, probing, or similar operation is to be considered as energized and life threatening. The senior company employee on the site will ensure that all necessary safety precautions are taken in order to isolate the line from all workers and the public. Such precautions may include halting the operation if appropriate. The senior company employee on the site is to then contact the proper authorities to have the line identified and either confirmed to be abandoned and/or made safe for continuing the work.

- Any and all underground lines that are discovered or become severed must be considered energized on both sides, and be treated accordingly.

- In general, equipment or machinery being moved or transported must maintained minimum clearances of 25 ft to all power lines. If equipment or machinery operates within 25 ft. of energized power lines, one of the following must occur before beginning work.

6.15 First Aid and Medical Check-Up:

- The contractor is responsible for providing first aid and medical treatment for their workmen .

- The contractor is required to provide its own first aid kit conspicuously located in the vicinity of each of his work area, and readily accessible at all times.

- The contractor shall arrange for medical examination of all workmen before their employment and thereafter at periodic intervals. The details of the pre-employment medical checkup and medical checkup to be conducted at periodic intervals.

6.16 HEALTH & HYGIENE

DRINKING WATER

Drinking water shall be provided and maintained at suitable places. It should be accessible to labour and employees with sufficient supply of cold fit for drinking. All water supply or storage shall be away from any latrine drain or other source of pollution. Regular analysis of water (as recommended by client/PMC- once in a quarter) shall be done to ensure its potability.

LATRINES AND URINALS

Latrines shall be provided in every work place.
Where female is employed there shall be a separate latrine for females. Where males are employed there shall be latrine for males. Every latrine shall be so partitioned off as to secure privacy and shall have a proper door and fastenings.

Where workers of both sexes are employed there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers. '**For men only' or 'For women only'.** The latrine and urinal shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

EATING FACILITIES (IN PLANT CATERING)
Meals shall be provided within a non-metallic container and shall be consumed only in the designated messing area. Proper waste disposal facilities shall be provided. Waste shall be removed immediately from the site after the lunch period and the area kept neat and clean at all times.

GOOD HOUSE KEEPING
Used canisters, trash or other materials shall be collected and removed daily. Flammable materials will be properly stored. Areas will be maintained free of tripping hazards or excess materials.

PROVISION OF REST SHELTER
At every place there shall be provided free of cost four suitable sheds, two for meals and the other two for rest separately.

6.17 OCCUPATIONAL HEALTH

i) All operations shall be identified that can adversely affect the health of workers and mitigation measures shall be implemented.
ii) To eliminate radiation hazard, it shall be ensured that Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.
iii) Inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc. shall be avoided by using appropriate respiratory protective devices.
iv) Improper lifting, carrying, pushing & pulling of heavy loads shall be avoided. Wherever possible, manual handling shall be replaced by mechanical lifting equipments.
v) Power driven hand-held tools shall be maintained in good working condition to minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good circulation in hands'.

6.18 SMOKING

The rules in effect at the Work site and contractors corporate guidelines shall determine the project policy towards smoking. Smoking shall be prohibited at all locations designated by "NO SMOKING" signs. The use of matches, other than safety matches or transportation of them into area shall be prohibited.

6.19 SAFETY PROMOTIONAL ACTIVITIES –

AWARENESS PROGRAMS- Safety training, Demos etc. will be given to workers from time to time, at least once in a fortnight, while motivational programs shall be conducted at least once in a month.

DISPLAY BOARDS- Display boards / sign boards & safety posters will be displayed at prominent places in adequate nos. so that worker can adopt safety culture and in language which is understandable to workers.

7.0 EMERGENCY PROCEDURES:

The emergency procedures described in this section have been prepared with the intention for actions to be taken in the event of serious injury, property damage or other catastrophe. Such emergency procedures may include -

- Necessary action to be taken
- Who should be responsible to take those actions?
- The names of all individuals who should be notified
- The location of emergency equipment and supplies

7.1 General Emergency Procedure:

- All emergencies are to be handled by the highest-ranking person present, and to be assisted by whoever may be available.

- The ranking person shall delegate responsibility for making emergency telephone calls.

- Emergency phone numbers are to be displayed at conspicuous location throughout the work place and office.

- The ranking person present shall determine the need for an ambulance or other emergency equipment.

In all emergencies, the RHQ shall be notified immediately by phone, upon completion of any necessary first aid treatment.

7.2 Fire Procedure:

- Make a safe attempt to extinguish the fire.

- Also, immediately notify the fire tender
- Have a site employee meet the fire tender at the site gate to direct them to the location of fire.
- Keep all spectators and non-essential personnel away from the fire.
- If explosives, oil etc materials are involved, immediately evacuate all personnel.

7.3 EMERGENCY PLANNING AND PREPAREDNESS

Procedures to clearly define the action to be taken in the event of an emergency or potential emergency shall be drawn up. The emergency procedures shall be regularly reviewed and updated. All visitors arriving on site shall be instructed on the emergency arrangements prior to being allowed on site. Practice drills for identified emergency situations, including rescue operations shall be undertaken.

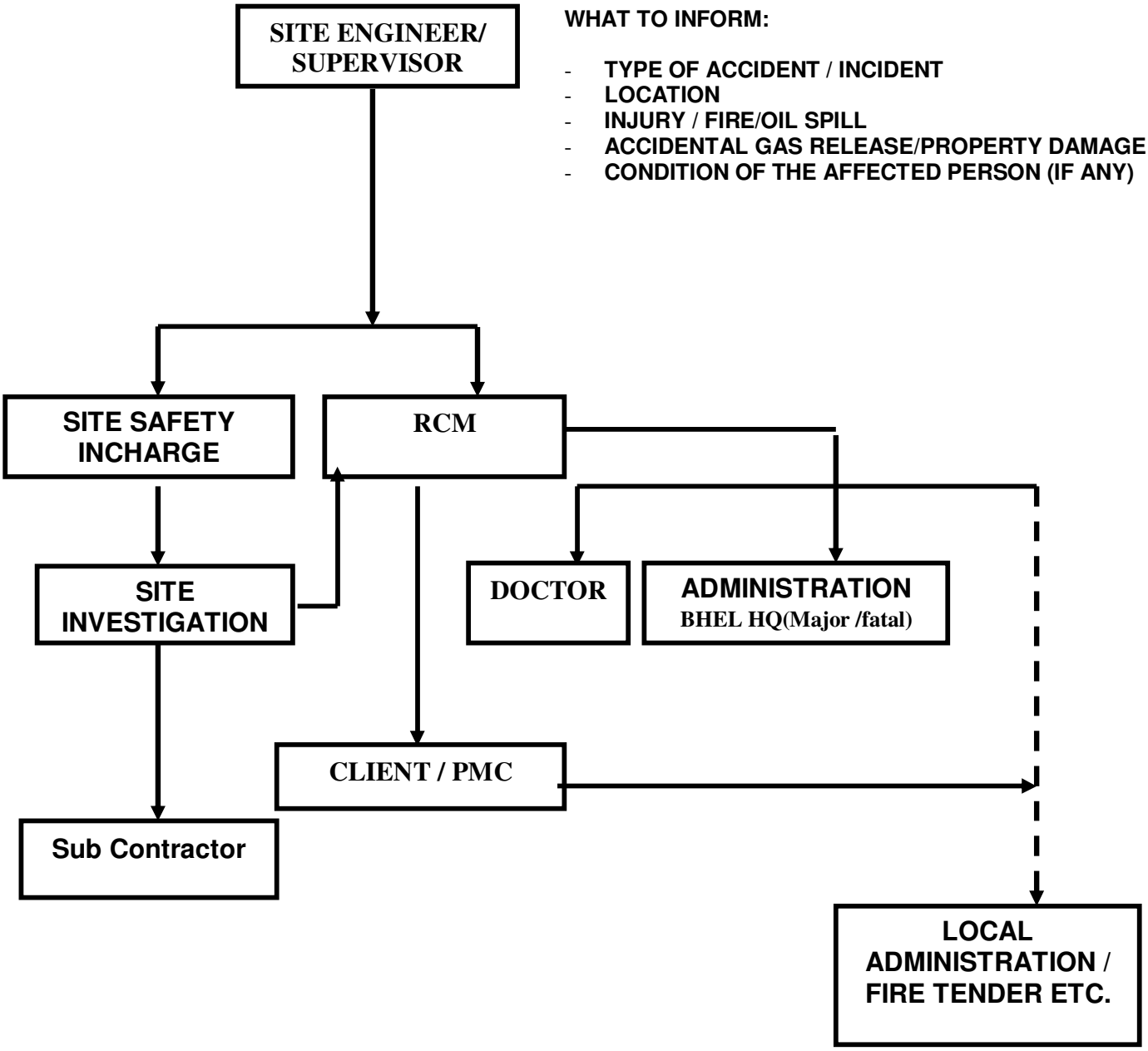
Foreseeable emergencies would include, but not necessarily be limited to:

- Fire,
- Accident
- Gas release
- Natural calamities
- Security alerts.

In order to ensure an adequate response to emergency situations it shall be ensured that an adequate number of suitably trained personnel are appointed who are competent in the use of firefighting equipment and provision of First Aid. Each site office shall produce and implement suitable fire safety plans which shall detail the actions to be taken on discovering fire, as well as the duties of Fire Wardens, evacuation procedures and roll calls.

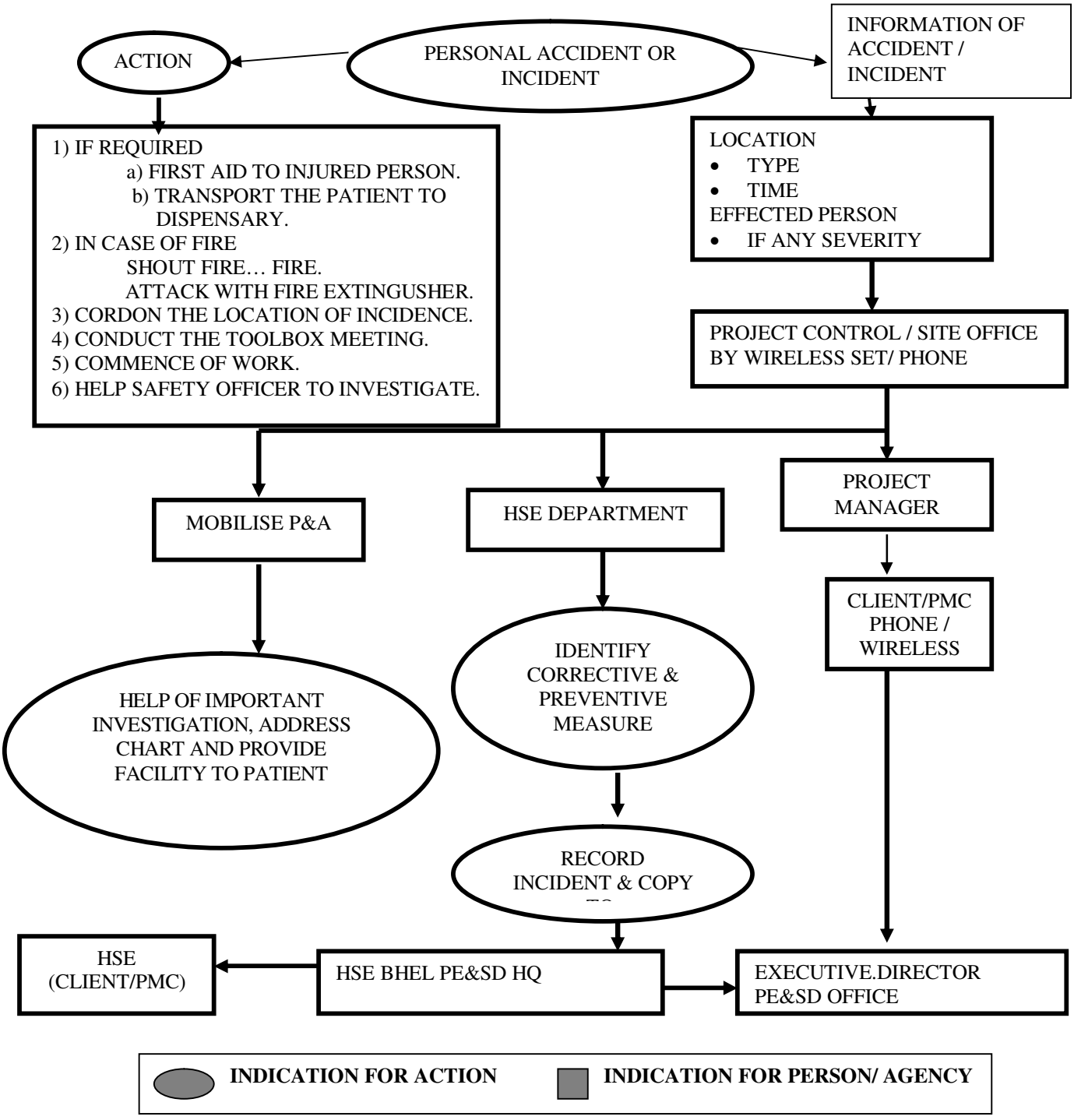
EMERGENCY COMMUNICATION CHANNEL

Emergency communication channel in case of emergency shall be followed as below:



EMERGENCY ACTION PLAN

Detailed action plan as below shall be followed in an event of emergency.



8.0 SECURITY PLAN

8.1 PHYSICAL BARRIERS

Premises such as the office / lay down area shall be enclosed with a physical barrier such as a fence or wall. Entrances shall be provided through which vehicles and personnel shall be controlled.

8.2 ACCESS CONTROL

Access to the project area shall be controlled at the gate provided on the perimeter fence. shall provide security guards to monitor entry of all employees .

8.3 CONTROLLING MOVEMENT OF MATERIALS

The main purpose of security is protecting the assets of any organization from the risks of fire, theft, sabotage and vandalism. Therefore close attention by security shall be given to the movement of materials both in and out of the premises.

Entry of vehicles (Particularly delivery trucks) shall be checked. Delivery notes shall be examined and loads shall be directed to the authorized recipient and where necessary an escort shall be provided. Vehicle entry and exit shall be recorded by security.
Hydras shall never be used for transportation of materials at project roads.

Any materials to be removed from the area shall be the subject of a material movement gate pass. Security shall examine such materials against the material movement gate pass and if in order shall allow it to proceed by countersigning the pass with his signature, date and time. A copy of such pass shall be maintained by security.

9. HSE Induction Training:

BHEL will provide training to workmen in safe work practices. All new workmen employed by its sub contractors shall have to undergo job induction training. The workers shall be permitted to work at the construction sites only on successful completion of training.

9.1 Training and competence:

BHEL shall also arrange periodic training programs for the benefits of workers.

10. Site safety committee:

Safety Committee will be formed with BHEL site in-charge as chairman and Safety in-charge as Secretary. All BHEL site functional heads at site & site in-charge of contractors shall be members of the committee. Wherever possible the customer representative may be invited to participate in the deliberations of the committee.

11. Work at height:

For doing work at height all the safety measures will be followed and safety training will be given from time to time. Scaffoldings will be provided at height so that worker can do their work safely.

12. Lifting Operations:

All the lifting materials are lifted by cranes and all the cranes are inspected from time to time. As well as safety measures will be followed. All tools tackles,lifting appliances; material-handling equipment etc used by the contractor shall be of safe design and construction. These shall be tested and certificates of fitness will be obtained before deploying at site.

13. Radiation Safety:

At the site where radiation testing is going to happen will be done by only authorized persons . All safety related equipment will be provided to them and that area will be vacated so that no worker come in contact of radiation .

14. Painting /Grit Blasting:

Painting and grit blasting will be done in separate area that will be cordoned off to ensure a healthy working environment around the place. All safety measures will be followed during painting/grit blasting.

15. RISK ASSESSMENT:

15.1 Hazard

Risk assessment is the systematic identification of the hazards associated with construction work and the evaluation of the risks associated with those hazards. A hazard - risk assessment must take account of all the work activities and consideration must also be given to anyone else who could be affected by the work activities.

15.2 HAZARD OBSERVATION AREAS

All Health, Safety & Environmental hazards that may be present during the Contractor's construction activities include:

SAFETY	HEALTH	ENVIRONMENTAL
• Fire • Toxic gas • Falling from height • Dropped objects/materials Handling. • Excavation collapse • Incorrect use of tools • Unsafe driving of vehicles leading accident • Failure of lifting gear (in case of any lifting operation)	• Catering problems • Water problems • Animal / Insect Bites, etc. • Hygiene • Sanitation • Noise • Sickness • Others	• Oil Spills • Atmospheric Emissions • Waste disposal • Hazardous and toxic waste disposal • Others

• Accident due to equipment • Scaffolding		

Hazard identification shall be conducted prior to commencement of construction for the reduction of potential major hazards and the preparation of procedures. The objective being to ensure the risk associated with construction is as low as reasonably practicable.

15.3 Risk Assessment

Risk assessment analysis process will identify certain activities for which safe systems of work are required to ensure that the activities are properly controlled and executed safely and without risk to health and the environment.

All such safe systems of work will clearly identify the objective, the sequence of operations, foreseeable hazards, precautionary and protective measures required and will be easily understood by the personnel who are to supervise and carry out the work.

15.4 HAZARD CONTROL

For each identified hazard work supervisor must stipulate the systems to prevent the hazard and minimize the consequences. These shall include:

- Maintenance of equipment
- Inspection of equipment
- Personnel protective equipment
- Fire and gas detection and firefighting equipment
- Scaffolding
- Excavation support
- Competence and training of personnel
- Inspection of facilities, catering, accommodation etc
- Local doctor with appropriate medical supplies
- Emergency plans and procedures
- Oil spill clean up
- Hazardous and toxic waste management
- Regular audits

16. HSE Audit:

Periodic Health Safety and Environment audit shall be conducted at site as per client requirement.

17. Formats

The formats for various Work Permit Form, check lists, Trainings, Tool Box Meetings, etc. will be finalized as per RUPPL/BECHTEL's requirement at the time of execution of the work.

Annexure-10

Material Management

i. Material Deliveries

List of deliverables will be made at the beginning of the project and before commencement of deliveries from various manufacturing units/vendor shops. This list will be up dated depending on the revision in project requirement/Engineering inputs/product changes.

All efforts will be made to ensure sequential dispatch of material to match with the project/erection schedule. Dispatch of various materials will be made so as to supply them in the sequence of erection.

ii.Material Receipt

On receipt of materials, material Identification shall be carried out using any of the following documents as applicable:

- Railway Receipt (RR)/Lorry Way Bill (LWB)/ other similar document.
- Material Loading Advice.
- Packing Slip/ List.
- Shipping List/ Completion Schedule
- Purchase Order
- Drawings or any other relevant documents.

Inspection shall be carried out to verify physical condition and quantity of packings/ items in line with documents referred as above. In case of any apparent physical damage or quantity shortage of packings/ items, it shall be recorded on RR/LR & intimated to originator.

Details of material shall be entered in Day Book along with Date of receipt and source of supply.

All materials received shall be inspected at the earliest to verify physical condition/correctness of material and quantity in line with above documents.

In case of any discrepancy (e.g. short supply/ excess supply/ wrong supply/ damage of material) observed during receipt inspection, Site in charge or his nominee shall raise Material Discrepancy Report (MDR) in format on concerned agencies supplying the material.

MDR NUMBERING SCHEME:

XXX: XX: X: XXXX: Running Serial

XXX : Site Code

XX : MU Code (MU codes are as per SP-10)

X : Set No.

e.g. UKT: TP: 6: 0001 for Ukai site, Trichy Unit, Ukai TPS Unit-6, 1st MDR

All kinds insurance for materials damages during transit, storage, erection and commissioning is in the scope of RUPPL. To facilitate RUPPL/BECHTEL settle insurance claims for damages to the materials occurred during transit, storage, erection and commissioning, BHEL will inform them at the earliest after any damages to the materials is noticed.

Non conformity observed on materials shall be recorded in Day Book/ Stock Register and such materials shall be suitably identified to ensure that nonconforming materials are not used till cleared for use.

Non-conforming materials not usable shall be identified and stored separately in areas earmarked for such purpose.

Issue of materials for erection and commissioning shall be against authorized Requisition cum Issue Voucher. Material Identification and Traceability shall be maintained.

iii.Material Storage

Storage and preservation of materials shall be done in closed, semi closed and open storage areas as per guidelines issued by Engineering Centre or given in respective equipment manuals. Heavy Equipment's, viz. Turbine, Generator, Condenser, Stator and other such items as suggested by Engineering Center will be directly unloaded either on respective foundations or near to their installation site to suit project schedule, duplicity of storage space, risks, etc

iv.Fabrication and Laydown area

Fabrication area as marked in the attached plan will be developed wherein all kinds of piping, structural and other fabrication will be carried out. While majority of fabrication works will be done in this area, certain unavoidable fabrication works will also be done at works spot.

v.Staging area of construction and equipment

As per drawing no. 0-381-01-01529/530 Sheet 03, STG hall layout at 13.0 M level for Hazira and Dahej, common laydown and maintenance bay is earmarked between grid A to B. The same shall be used for steam turbine laydown.

SIGN. AND DATE | REF. DRG. NO. | A4 FORMAT

INVENTORY NO

REVISION REASON:				REVISION REASON:			
REV.	DATE	ALTERED	CHECKED	REV.	DATE	ALTERED	CHECKED

GEN. DIM. LIMITS , FITS , & TOLERANCES AS PER P.S :- HY0230261

CONSULTANT: BECHTEL
FREDERICK, MARYLAND, U.S.A

PROJECT:
STG PACKAGE (4 X 93.1 MW STGs), CCPP
HAZIRA MANUFACTURING DIVISION (HMD)
STG PACKAGE (3 X 90.3 MW STGs), CCPP
DAHEJ MANUFACTURING DIVISION (DMD)

CUSTOMER: Reliance Industries Limited
RELIANCE INDUSTRIES LIMITED
COAL BASED CAPTIVE POWER PLANT (CCPP)

RIL DRG. NUMBER DAHEJ: 10091-G69-DAT000-BHB-0001

RIL DRG. NUMBER HAZIRA: 10090-G69-HAT000-BHB-0001

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	KD	---	04.03.14	-N.A-
CHD.	KG	---	04.03.14	
APPD.	PSB		04.03.14	

DEPT. PE&SD	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 450	¢/M/f		-NTS-	-N.A-	-N.A-	-N.A-	-N.A-

TITLE :
Painting and Coating Schedule (STG BOP)

CARD CODE -N.A-

BHEL DRAWING NO. PEMC-04398

REV. 00

SHT. No 01 NO. OF SHT. 07

PAINTING & COATING SCHEDULE FOR RIL- DMD

Sl.No.	Equipment/ Surface	Units involved	Area/ Location	Arrangement (Indoor / Outdoor)	Temp.	Surface Prepatation	Primer or 1st Coat Name of paint /DFT	2nd Coat Name of paint /DFT	3rd Coat Name of paint /DFT	Total DFT	Colour	Remarks
1	**STEAM TURBINE**											
a	Outer Casing	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	75	Aluminium RAL 9006	
b	Exhaust Hood	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Inorganic Zinc Silicate/50	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	100	Aluminium RAL 9006	
c	Steam Pipes & Brackets (Interconnecting Pipes & Piping on casing)	PESD	TG HALL	Indoor	113 deg.F	Pickling/ Mechanical Cleaning	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	75	Aluminium RAL 9006	
d	Steam Gland Body Cover	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Inorganic Zinc Silicate / 50	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	100	Aluminium RAL 9006	
e	Governing Actuators	PESD	TG HALL	Indoor	113 deg.F	Solvent Cleaning/Mech. Cleaning	Epoxy Zinc Rich	High Build MIO Epoxy / 100			As per supplier standard	
f	Governing: HPSU	PESD	TG HALL	Indoor	113 deg.F	Solvent Cleaning/Mech. Cleaning	Epoxy Zinc Rich / 50	High Build MIO Epoxy / 100			As per supplier standard	
g	Bearing Pedestals, Bed Plates,	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Epoxy Zinc Rich / 50	High Build MIO Epoxy / 100	Aliphatic Urethane / 50	200	Grey White RAL 9002	
2	**ST GENERATOR**											
a	Generator Enclosure	EM	TG HALL	INDOOR	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
b	Generator air duct	EM	TG HALL	INDOOR	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
c	Generator stator frame	EM	TG HALL	INDOOR	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
d	Generator bearings	EM	TG HALL	INDOOR	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
e	Exciter stator frame	EM	TG HALL	INDOOR	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
3	**BOILER FEED PUMP**	HPEP-HYD.	TG Hall	Indoor	Room Temp.	Surface of equipment shall be made free from rust ,mill scales,grease,oil,dirt,etc and made fit to receive one coatof primer.	Inorganic Zinc Silicate Primer	Heat Resistant Air Drying Silicon Aluminum	Heat Resistant Air Drying Silicon Aluminum	50	Aluminium of IS: 5	1. One coat of rust penetrative,hard film yellow to be applied on all exposed machined surfaces. 2.Grease IS:958 shall be applied liberally on all exposed threded portions
4	**SURFACE CONDENSER**	HPEP-HYD.		Indoor	≤ 199.4 deg. F	SP 10	Epoxy Zinc Rich/100-150	Finishing paint at site Polyurethane/80-120	-	180-270	Red/Grey	
5	**HP HEATER**	HPEP-HYD.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
6	**LP HEATER**	HPEP-HYD.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
7	**DEAERATOR**	HPEP-HYD.		Outdoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
8	**SJAE**	HPEP-HYD.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
9	**GENERATOR AIR COOLER**	HPEP-HYD.		Indoor	< 392 Deg. F	SP 10	Epoxy based zinc rich/100-150	Polyurethane/80-120		180-270	Grey	
10	**GLAND STEAM CONDENSER**	HPEP-HYD.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
11	**LUBE OIL CONSOLE**	PESD										
a	Lube Oil Tank (C.S.) (Outer)	PESD	TG HALL (6-7,12-13, A-A2/ 25-26,31-32)	Indoor	113 Deg. F	Blasting SA2½	Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
b	Lube Oil Tank (C.S.) (Inside)	PESD		Indoor	113 Deg. F		Temperature Rust Preventive coating, Category 'E'/ 40	Temperature Rust Preventive Rust Base 394 / 40	Temperature Rust Preventive Rust Base 394 / 40	120	--	
c	Duplex Filter (Outer)	PESD		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
d	Oil Seperator	PESD		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
e	Lube Oil Pump (LOP, AOP & EOP)	PESD		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
f	Vapour Exraction Fan	PESD		Indoor	113 Deg. F	Solvent Cleaning or Mechanical Cleaning	Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
g	Oil Purification Unit (Not a console part)	PESD		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
h	Jacking Oil Pump (Not a console part)	PESD		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
i	Gov Oil Accumulator (Not a console part)	PESD		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
j	Acoustic Enclosure for Turbine (Not a console part)	PESD		Indoor	113 Deg. F	Blasting SA2½ / mechanical cleaning	Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
k	Overhead Oil Tank (Not a console part) # Painting is not required on inner side of Tank.	PESD	TG HALL B-C Bay	Outdoor	122 Deg. F	Blasting SA2½	Epoxy Zinc Rich/75	High Build MIO Epoxy for SS / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
12	**PIPING & VALVES**											
a	Valves -BHEL Trichy											
a.1	Safety valves - BHEK Trichy	HPBP-TRICHY			400/600 Deg. F	SSPC-SP3	HR ALUMINUM GR.II UP TO 400deg.C/GR. I UP TO 600deg.C - DFT = 20microns	HR ALUMINUM GR.II UP TO 400deg.C/GR. I UP TO 600deg.C - DFT = 20microns	NIL	40 MICRONS		
a.2	Silencers - BHEL Trichy	HPBP-TRICHY			>400 Deg. F	SSPC-SP3	HR ALUMINUM GR. I UP TO DFT = 20microns	HR ALUMINUM GR. I UP TO DFT = 20microns	NIL	40 MICRONS		
b	Valves - BHEL Bhopal											
a.1	For External Unmachined Surface	BHEL- Bhopal	CW/ACW/CCW Water system	-	149 Deg. F	Shot Blast	Chemical Resistant Epoxy (Zinc Chromate/Zinc Phosphate) primer	Chemical Resistant Epoxy Finish paint (Colour-Grey)		(Total DFT - Primer +Finish Paint = 150 microns)		
b.2	For Direct Water passage & Water immersed surfaces	BHEL- Bhopal		-	149 Deg. F	Shot Blast	Chemical Resistant Epoxy (Zinc Chromate/Zinc Phosphate) primer	Coal Tar Pitch Epoxy Paint (Colour-Black)		(Total DFT - Primer +Finish Paint = 175 microns)		
b.3	For mated machined surface	BHEL- Bhopal		-	149 Deg. F	Shot Blast	-	Liberal Coat of Temporary Rust Preventive coat to get jet black finish				
c	Expansion bellows -BHEL Bhopal	BHEL- Bhopal	Flanges	-	149 Deg. F	Sand/Shot Blasted	Chemical Resistant Chlorinated Rubber based Primer paint	Chemical Resistant Chlorinated Rubber based Finishing paint				
d	IBR piping input - Piping centre				60 deg.C and Above	SSPC-SP3/Power Tool Cleaning	2 coats of Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	-----	-----	Total DFT = 60 microns min. Shade : Redoxide		
					Below 60 deg.C	SSPC-SP3/Power Tool Cleaning	2 coats of 50 microns each of HB Chlorinated Rubber based Zinc Phosphate Primer	-----	2 coats of 30 microns each of Chlorinated Rubber based finish paint	Total DFT = 160 microns min. Shade : Smoke Grey Shade No 692 of IS 5		
d.1	Uninsulated Carbon Steel Piping with Operating Temp <= 93 Deg C (Outdoor)	PE&SD,PC	TG HALL	INDOOR	<= 93 Deg C	SP-6	3-5 mils (76-127 microns) of Inorganic Zinc	4-6 mils (102-152 microns) of Epoxy	3-5 mils (76-127 microns) of Polyurethane	60 microns	Redoxide	2nd & 3rd Coat in Shop or Field
d.2	Uninsulated Carbon Steel Piping with Operating Temp > 93 & <= 400 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	INDOOR	> 93 & <= 400 Deg C	SP-10	3-5 mils (76-127 microns) of Inorganic Zinc	1.5-2.5 mils (38-64 microns) of Silicone Aluminium	1.5-2.5 mils (38-64 microns) of Silicone Aluminium			2nd & 3rd Coat in Shop or Field
d.3	Insulated Carbon Steel / Stainless Steel Piping with Operating Temp <= 200 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	INDOOR	<= 200 Deg C	SP-7/15	6-8 mils (152-203 microns) of High Temp Epoxy Phenolic with Glass Flakes	-	-			
d.4	Uninsulated Stainless Steel Piping with Operating Temp <= 93 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	INDOOR	<= 93 Deg C	SP-7/15	4-6 mils (102-152 microns) of Epoxy Mastic	3-5 mils (76-127 microns) of Polyurethane	-			
d.5	Insulated Carbon Steel / Stainless Steel Piping with Operating Temp > 200 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	INDOOR	> 200 Deg C	SP-3	2 coats of Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	-	-	60 microns		Shade : Redoxide
d.6	Insulated Alloy Steel Piping (Outdoor/Indoor)	PE&SD,PC	TG HALL	INDOOR	> 400 Deg C	SP-3	2 coats of Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	-	-	60 microns		Shade : Redoxide
e	Valves - Others											refer d.1 to d.6
f	Expansion bellows - others											refer d.1 to d.6
g	Pre-Fabricated Piping (Non-IBR service)											covered in the above demarcation
h	Steam Traps											refer d.1 to d.6
i	Piping Insulation											no -pinting for insulation
j	Pipe hangers											refer d.1 to d.6
k	Pre-fabricated pipe support shoes											refer d.1 to d.6
l	Structural steel for pipe supports											refer d.1 to d.6
m	Pre-Fabricated Piping (Non-IBR service_Integral scope)											
i	Oil piping-Carbon Steel		TG HALL	Indoor	149 Deg. F	SA 2 1/2 Shop	Inorganic Zinc Silicate/50	NA	Zinc Free" High Temperature Air Curing Finish Coat /100-125	165-215	Light Grey IS 631	
ii	Oil piping- Stainless steel		TG HALL	Indoor	113 Deg. F	SSPC SP 16 Shop	High Temperature Epoxy Novolac / 50-80	NA	High Temperature Epoxy Novolac / 50-80	200-300	Light Grey IS 631	
iii	Control oil piping_Carbon Steel		TG HALL	Indoor	149 Deg. F	SA 2 1/2 Field	Inorganic Zinc Silicate/50	NA	Zinc Free" High Temperature Air Curing Finish Coat /100-125	165-215	Light Grey IS 631	
iv	Control oil piping_Stainless steel		TG HALL	Indoor	113 Deg. F	SSPC SP 16 Field	High Temperature Epoxy Novolac / 50-80	NA	High Temperature Epoxy Novolac / 50-80	200-300	Light Grey IS 631	
v	Integral steam piping_Carbon Steel		TG HALL	Indoor	500 Deg. F	SA 2 1/2 Shop	Inorganic Zinc Silicate/50	NA	Zinc Free" High Temperature Air Curing Finish Coat /100-125		Light Grey IS 631	

vi	Integral steam piping_Alloy steel		TG HALL	Indoor	984 Deg. F	SA 2 1/2 Field	High Temperature Silicone Aluminium/25-40	High Temperature Silicone Aluminium/25-40	High Temperature Silicone Aluminium/25-40	75-120	Light Grey IS 631	
13	**HEAT EXCHANGERS**											
a	Equipment and Supports (≥ 2.5 square meter surface)	PE& SD			≤ 93 Deg. F	SP 10	Zinc Rich epoxy DFT- 3-5 mils	Epoxy DFT - 4-6 mils	Polyurethane DFT -3-5 mils		Aluminium/Grey	
14	**DOSING SYSTEMS**											
	CHEMICAL DOSING SKIDS(HYDRAZINE/AMMONIA & NaOH)											
i.	Not Exposed to Coal, coal Dust, Ash (Fly & Bottom), lime Stone or Bed sand – Structural steal, Misc. steel, Stairways (not galvanized), pipe racks, platforms, walkways Steel,& Supplement Support steel, etc.	PE& SD			≤ 93 Deg. F	SP 10	Inorganic zinc / 3-5 mils	---	---		Light Grey Colour For Beams And Pipe Supports	
iia	Stair Support Steel, Stringers, ladders, including safety cages	PE& SD			≤ 93 Deg. F	SP 10	Inorganic zinc or Epoxy Zinc rich / 3-5 mils	Epoxy /4-6 mils	Polyurethane / 3-5 mils		Black Colour For Platform	
	or											
iib	Stair Support Steel, Stringers, ladders, including safety cages	PE& SD			≤ 93 Deg. F	--	Hot Dip galvanized / To a minimum of 600 g/m2 per ASTM A123	Brush Blast (SP-7) / 4-6 mils of Epoxy mastic	Polyurethane / 3-5 mils		Black Colour for Ladders	
iii.a	Handrails Assemblies Steel	PE& SD			≤ 93 Deg. F	SP 10	Inorganic zinc or Epoxy Zinc rich /3-5 mils	Epoxy /4-6 mils	Polyurethane / 3-5 mils		Golden Yellow for Handrails	Safety Yellow Colour
	or											
iii.b	Handrails Assemblies Steel	PE& SD			Ambient	--	Hot Dip galvanized / To a minimum of 600 g/m square per ASTM A123	Brush Blast (SP-7) / 4-6 mils of Epoxy mastic	Polyurethane / 3-5 mils		Golden Yellow for Handrails	2nd and 3rd costs in shop or field with safety yellow colour
iv.	Safety Showers, Eye Wash Stations	PE& SD			Ambient	--	Manufacturer's Standard suitable for seacoast to extent possible				Green	
v.a	Electricals cabinets and panels	PE& SD			Ambient	SP 10					Light Grey	
	or											
v.b	Electricals cabinets and panels	PE& SD			Ambient	Galvanized or galvalumed steel coated with 5 to 6 mils of TGIC powder coating or acceptable equal.					Light Grey	
vi.	Exposed Instrument Tubing	PE& SD			Ambient	Suitable grade of 2205 Duplex stainless steel or acceptable equal.					Light Grey	
vii.	Off-The-Shelf items or small pumps, Instrument, motors (<15HP) components/Equipment (<2.5 M)	PE& SD			Ambient	Supplier standard's coating suitable for sea coast exposure to the extent possible					Light Grey	
15	**POWER CYCLE SYSTEMS**											
a	Control Valves	As per Manufacrurar's Standard										
b	Desuperheaters											
c	Atmospheric Flash Tank	PE&SD	Outside STG building	Outdoor	-196˚C to 230˚C	SA 2 ½	High temperature Epoxy Novolac / DFT: 100-150 microns	NA	High temperature Epoxy Novolac / DFT: 100-150 microns	200-300 microns	White(BS: Code 00-E-55)	External surface
					150˚C	SA 2 ½	Amine Adduct Cured Epoxy / DFT: 100-150 microns	NA	Amine Adduct Cured Epoxy / DFT: 100-150 microns	200-300 microns		Internal surface
16	**PUMPS**											
a.1	Condensate Extraction Pumps	Each Unit	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
a.2	Motors for Condensate Extraction Pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
b.1	CCW Pumps (For PHE)	Common for All 3 Units	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
b.2	Motors for CCW Pumps (For PHE)	Common for All 3 Units	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
c.1	Potable sump pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
c.2	Motors for Potable sump pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
d.1	Condensate forwarding pumps	Each Unit	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
d.2	Motors for Condensate forwarding pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
e.1	ACW Pump	Each Unit	STG Builiding	Outdoor	50	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
e.2	Motors for ACW Pump	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
f.1	Air Compressor	Common for All 3 Units	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
f.2	Motors for Air Compressor	Common for All 3 Units	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
17	**TANKS**											
17.1	Condensdate Storage tank (150m3)											
a	External Uninsulated upto 120 Deg. C	PE&SD		Outdoor		SA 2½	-Inorganic Zinc Silicate Primer -Dry film thickness: 65-90 microns -Required surface profile: 50 microns -Maximum temperature resistances: 400°C -Minimum Volume Solids: 58 ASTM D2697 1. The product shall conform to SSPC Paint 20 Type 1-C with a zinc dust level of greater than 70% by weight in the dry film. The zinc dust shall have a "metallic" zinc content that meets the requirements of ASTM D-520 Type 1. Random sample for zinc dust content to be checked at site/lab.	High Build MIO Epoxy -Intermediate Dry film thickness: 100-150 microns -Required surface preparation: Clean, dry epoxy primer (type 04) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 55ASTM D2697 The quantity of MIO in the main pigment shall be 80% by weight.	Aliphatic Urethane Finish -Dry film thickness: 40-75 microns -Required surface preparation: Clean, dry epoxy intermediate(type 05) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 60 ASTM D2697	215-350	White(BS: Code 00-E-55)	Where prep. Is carried out in a shop or offsite it is mandatory that the painting to be carried out at the same location.

b	Internal(Condensate Tanks)	PE&SD		Outdoor		SA 2 1/2	HB Epoxy Phenolic -Required surface profile: 50-80 microns -Minimum Volume solids : 65% ASTM D2697 -Dry film thickness : 100-150 microns/coat -Maximum temperature resistance :150°C	HB Epoxy Phenolic -Required surface profile: 50-80 microns -Minimum Volume solids : 65% ASTM D2697 -Dry film thickness : 100-150 microns/coat -Maximum temperature resistance :150°C	HB Epoxy Phenolic -Required surface profile: 50-80 microns -Minimum Volume solids : 65% ASTM D2697 -Dry film thickness : 100-150 microns/coat -Maximum temperature resistance :150°C	300-375		
c	Tank Bottom plate (inside)	PE&SD		Outdoor		SA 2 1/2	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	200-300		Shop built tanks will be shop painted.
d	External of underside of all tank	PE&SD		Outdoor		SA 2 1/2	Coal Tar Epoxy -Dry film thickness: 150-200 microns -Required surface profile: 75 microns	NA	NA	150-200		A strip 75 mm wide at plate edge shall be left bare to avoid welding cantamination
17.2	Expansion Tank for DMCW Circuit											
a	External Uninsulated upto 120 Deg. C	PE&SD		Outdoor		SA 2 1/2	-Inorganic Zinc Silicate Primer -Dry film thickness: 65-90 microns -Required surface profile: 50 microns -Maximum temperature resistances: 400°C -Minimum Volume Solids: 58 ASTM D2697 1. The product shall conform to SSPC Paint 20 Type 1-C with a zinc dust level of greater than 70% by weight in the dry film. The zinc dust shall have a "metallic" zinc content that meets the requirements of ASTM D-520 Type 1. Random sample for zinc dust content to be checked at site/lab.	High Build MIO Epoxy -Intermediate Dry film thickness: 100-150 microns -Required surface preparation: Clean, dry epoxy primer (type 04) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 55ASTM D2697 The quantity of MIO in the main pigment shall be 80% by weight.	Aliphatic Urethane Finish -Dry film thickness: 40-75 microns -Required surface preparation: Clean, dry epoxy intermediate(type 05) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 60 ASTM D2697	215-350	White(BS: Code 00-E-55)	Where prep. Is carried out in a shop or offsite it is mandatory that the painting to be carried out at the same location.
b	Internal(Demineralised water)	PE&SD		Outdoor		SA 2 1/2	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	NA	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	300-200		Shop built tanks will be shop painted.
c	Tank Bottom plate (inside)	PE&SD		Outdoor		SA 2 1/2	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	200-300		Shop built tanks will be shop painted.
d	External of underside of all tank	PE&SD		Outdoor		SA 2 1/2	Coal Tar Epoxy -Dry film thickness: 150-200 microns -Required surface profile: 75 microns	NA	NA	150-200		A strip 75 mm wide at plate edge shall be left bare to avoid welding cantamination
18	**ELECTRICAL SYSTEM ITEMS**											
a	LV PMCC's	PE&SD	Switchgear room/ Indoor	Ambient	Ambient	As per manufacturers standard					Shade 631 of IS 5	
b	LV MCC's	PE&SD		Ambient	Ambient	As per manufacturers standard					Shade 631 of IS 5	
c	Cable tray material	PE&SD	Entire STG & Switchgear building/Indoor	Ambient	Ambient	Hot Dip Galvanization as per IS 2629 & minimum thickness of Galvanization shall be 610gm/m ^{2}					Not Applicable	
d	LV Power cables	PE&SD		Ambient	Ambient	Not Applicable					Outer sheath shall be black	
e	Control cables	PE&SD		Ambient	Ambient	Not Applicable					Outer sheath shall be black	
f	Cable Glands & Lugs	PE&SD		Ambient	Ambient	Not Applicable					Not Applicable	
	Structural steel for cable tray supports	PE&SD	Entire STG & Switchgear building/Indoor	Ambient	Ambient	Red oxide Zinc Chromate primer					Not Applicable	
19	**C & I SYSTEM ITEMS**											
a	Field instrument package	PE&SD	Each Unit	indoor & out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	
b	Instrument hook up material	PE&SD	Each Unit	indoor & out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	
c	Instrumentation cables	PE&SD	Each Unit	indoor & out door	Amb. Temp	NA	NA	NA		NA	Black	
d	SWAS System	PE&SD	Each Unit	Indoor	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	RAL 7035	
e	Flow elements-Orifice	PE&SD	Each Unit	Out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	
g	Flow elements-Nozzle	PE&SD	Each Unit	Out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	

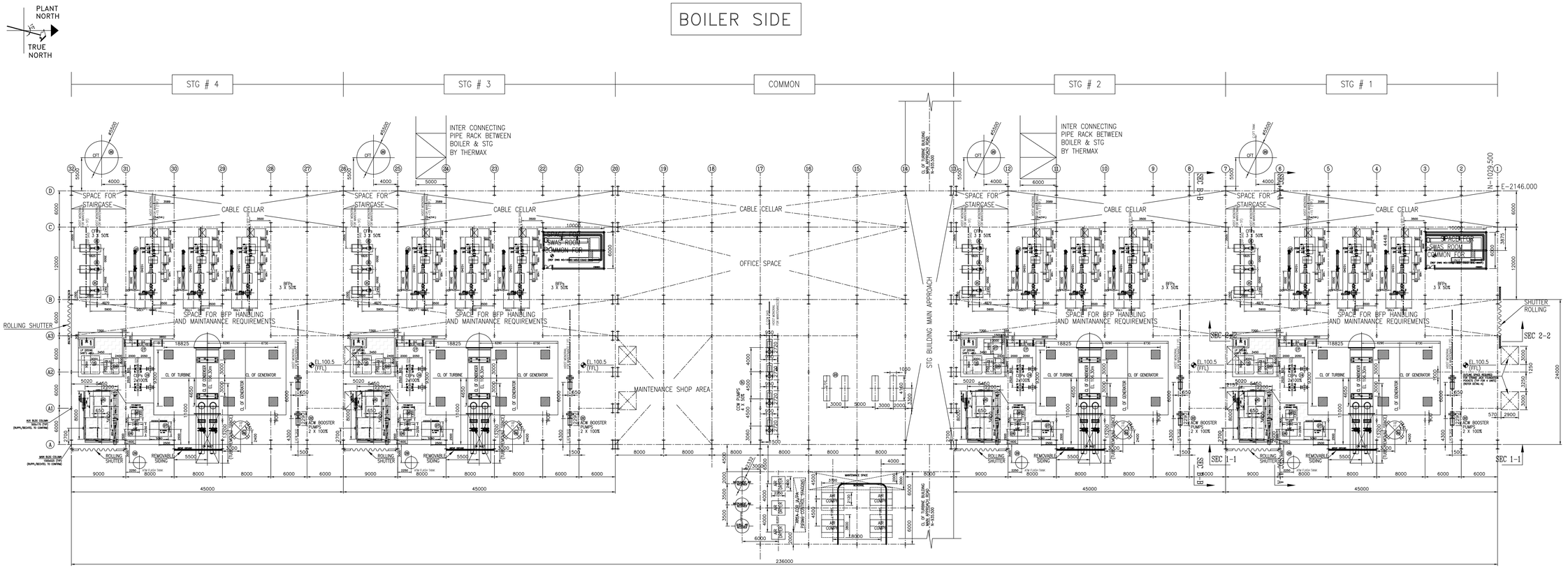
PAINTING & COATING SCHEDULE FOR RIL- HMD

Sl.No.	Equipment/ Surface	Units involved	Area/ Location	Arrangement (Indoor / Outdoor)	Temp.	Surface Prepatation	Primer or 1st Coat Name of paint /DFT	2nd Coat Name of paint /DFT	3rd Coat Name of paint /DFT	Total DFT	Colour	Remarks
1	**STEAM TURBINE**											
a	Outer Casing	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	75	Aluminium RAL 9006	
b	Exhaust Hood	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Inorganic Zinc Silicate/50	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	100	Aluminium RAL 9006	
c	Steam Pipes & Brackets (Interconnecting Pipes & Piping on casing)	PESD	TG HALL	Indoor	113 deg.F	Pickling/ Mechanical Cleaning	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	75	Aluminium RAL 9006	
d	Steam Gland Body Cover	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Inorganic Zinc Silicate / 50	Heat Resistant Air drying Aluminium/ 25	Heat Resistant Air drying Aluminium/ 25	100	Aluminium RAL 9006	
e	Governing Actuators	PESD	TG HALL	Indoor	113 deg.F	Solvent Cleaning/Mech. Cleaning	Epoxy Zinc Rich	High Build MIO Epoxy / 100			As per supplier standard	
f	Governing: HPSU	PESD	TG HALL	Indoor	113 deg.F	Solvent Cleaning/Mech. Cleaning	Epoxy Zinc Rich / 50	High Build MIO Epoxy / 100			As per supplier standard	
g	Bearing Pedestals, Bed Plates,	PESD	TG HALL	Indoor	113 deg.F	Blasting SA2 1/2	Epoxy Zinc Rich / 50	High Build MIO Epoxy / 100	Aliphatic Urethane / 50	200	Grey White RAL 9002	
2	**ST GENERATOR**											
a	Generator Enclosure	EM	TG HALL	Indoor	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
b	Generator air duct	EM	TG HALL	Indoor	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
c	Generator stator frame	EM	TG HALL	Indoor	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
d	Generator bearings	EM	TG HALL	Indoor	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
e	Exciter stator frame	EM	TG HALL	Indoor	Ambient	Shot Blasting SA 2 1/2	Epoxy Zinc Rich/75	2 Coats of Epoxy high build/100	2 coats of Epoxy Polyurethane/75	250	Light Grey shade no 631 of IS 5	
3	**BOILER FEED PUMP**	HPEP-Hyd.	TG HALL	Indoor	Room Temp.	Surface of equipment shall be made free from rust ,mill scales,grease,oil,dirt,etc and made fit to receive one coatof primer.	Inorganic Zinc Silicate Primer	Heat Resistant Air Drying Silicon Aluminum	Heat Resistant Air Drying Silicon Aluminum	50	Aluminium of IS: 5	1. One coat of rust penetrative,hard film yellow to be applied on all exposed machined surfaces. 2.Grease IS:958 shall be applied liberally on all exposed threded portions
4	**SURFACE CONDENSER**	HPEP Hyd.		Indoor	≤ 199.4 Deg. F	SP 10	Epoxy Zinc Rich/100-150	Finishing paint at site Polyurethane/80-120	-	180-270	Red/Grey	
5	**HP HEATER**	HPEP Hyd.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
6	**LP HEATER**	HPEP Hyd.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
7	**DEAERATOR**	HPEP Hyd.		Outdoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
8	**SJAE**	HPEP Hyd.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
9	**GENERATOR AIR COOLER**	HPEP Hyd.		Indoor	< 392 Deg. F	SP 10	Epoxy based zinc rich/100-150	Polyurethane/80-120		180-270	Grey	
10	**GLAND STEAM CONDENSER**	HPEP Hyd.		Indoor	≥ 428 Deg. F	SP 10	Inorganic Zinc/80-120	Silicone Aluminium/80	-	160-200	Aluminium	
11	**LUBE OIL CONSOLE**	HPEP Hyd.										
a	Lube Oil Tank (C.S.) (Outer)	HPEP Hyd.	TG HALL A-A2/ (6-7,12-13, 25-26,31-32)	Indoor	113 Deg. F	Blasting SA2½	Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
b	Lube Oil Tank (C.S.) (Inside)	HPEP Hyd.		Indoor	113 Deg. F		Temperature Rust Preventive coating, Category 'E'/ 40	Temperature Rust Preventive Rust Base 394 / 40	Temperature Rust Preventive Rust Base 394 / 40	120	--	
c	Duplex Filter (Outer)	HPEP Hyd.		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
d	Oil Seperator	HPEP Hyd.		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
e	Lube Oil Pump (LOP, AOP & EOP)	HPEP Hyd.		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
f	Vapour Exraction Fan	HPEP Hyd.		Indoor	113 Deg. F	Solvent Cleaning or Mechanical Cleaning	Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
g	Oil Purification Unit (Not a console part)	HPEP Hyd.		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
h	Jacking Oil Pump (Not a console part)	HPEP Hyd.		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
i	Gov Oil Accumulator (Not a console part)	HPEP Hyd.		Indoor	113 Deg. F		Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
j	Acoustic Enclosure for Turbine (Not a console part)	HPEP Hyd.		Indoor	113 Deg. F	Blasting SA2½ / mechanical cleaning	Epoxy Zinc Rich/75	High Build MIO Epoxy / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
k	Overhead Oil Tank (Not a console part)	HPEP Hyd.	TG HALL B-C Bay	Outdoor	122 Deg. F	Blasting SA2½	Epoxy Zinc Rich/75	High Build MIO Epoxy for SS / 100	Aliphatic Urethane /50	225	Light Grey RAL 7035	
12	**PIPING & VALVES**											
a	**Valves -BHEL Trichy**											
a.1	Safety valves - BHEK Trichy	HPBP-TRICHY			400/600 Deg. F	SSPC-SP3	HR ALUMINUM GR.II UP TO 400deg.C/GR. I UP TO 600deg.C - DFT = 20microns	HR ALUMINUM GR.II UP TO 400deg.C/GR. I UP TO 600deg.C - DFT = 20microns	NIL	40 MICRONS		
a.2	Silencers - BHEL Trichy	HPBP-TRICHY			>400 Deg. F	SSPC-SP3	HR ALUMINUM GR. I UP TO DFT = 20microns	HR ALUMINUM GR. I UP TO DFT = 20microns	NIL	40 MICRONS		
b	Valves - BHEL Bhopal											
a.1	For External Unmachined Surface	BHEL- Bhopal	CW/ACW/CCW Water system	-	149 Deg. F	Shot Blast	Chemical Resistant Epoxy (Zinc Chromate/Zinc Phosphate) primer	Chemical Resistant Epoxy Finish paint (Colour-Grey)		(Total DFT - Primer +Finish Paint = 150 microns)		
b.2	For Direct Water passage & Water immersed surfaces	BHEL- Bhopal		-	149 Deg. F	Shot Blast	Chemical Resistant Epoxy (Zinc Chromate/Zinc Phosphate) primer	Coal Tar Pitch Epoxy Paint (Colour-Black)		(Total DFT - Primer +Finish Paint = 175 microns)		
b.3	For mated machined surface	BHEL- Bhopal		-	149 Deg. F	Shot Blast	-	Liberal Coat of Temporary Rust Preventive coat to get jet black finish				
c	Expansion bellows -BHEL Bhopal	BHEL- Bhopal	Flanges	-	149 Deg. F	Sand/Shot Blasted	Chemical Resistant Chlorinated Rubber based Primer paint	Chemical Resistant Chlorinated Rubber based Finishing paint	9,700.00	=J36/100		
d	IBR piping input - Piping centre				60 deg.C and Above	SSPC-SP3/Power Tool Cleaning	2 coats of Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	-----	-----	Total DFT = 60 microns min. Shade : Redoxide		
					Below 60 deg.C	SSPC-SP3/Power Tool Cleaning	2 coats of 50 microns each of HB Chlorinated Rubber based Zinc Phosphate Primer	-----	2 coats of 30 microns each of Chlorinated Rubber based finish paint	Total DFT = 160 microns min. Shade : Smoke Grey Shade No 692 of IS 5		
d.1	Uninsulated Carbon Steel Piping with Operating Temp <= 93 Deg C (Outdoor)	PE&SD,PC	TG HALL	Indoor	<= 93 Deg C	SP-6	3-5 mils (76-127 microns) of Inorganic Zinc	4-6 mils (102-152 microns) of Epoxy	3-5 mils (76-127 microns) of Polyurethane	60 microns	Redoxide	2nd & 3rd Coat in Shop or Field
d.2	Uninsulated Carbon Steel Piping with Operating Temp > 93 & <= 400 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	Indoor	> 93 & <= 400 Deg C	SP-10	3-5 mils (76-127 microns) of Inorganic Zinc	1.5-2.5 mils (38-64 microns) of Silicone Aluminium	1.5-2.5 mils (38-64 microns) of Silicone Aluminium			2nd & 3rd Coat in Shop or Field
d.3	Insulated Carbon Steel / Stainless Steel Piping with Operating Temp <= 200 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	Indoor	<= 200 Deg C	SP-7/15	6-8 mils (152-203 microns) of High Temp Epoxy Phenolic with Glass Flakes	-	-			
d.4	Uninsulated Stainless Steel Piping with Operating Temp <= 93 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	Indoor	<= 93 Deg C	SP-7/15	4-6 mils (102-152 microns) of Epoxy Mastic	3-5 mils (76-127 microns) of Polyurethane	-			
d.5	Insulated Carbon Steel / Stainless Steel Piping with Operating Temp > 200 Deg C (Outdoor/Indoor)	PE&SD,PC	TG HALL	Indoor	> 200 Deg C	SP-3	2 coats of Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	-	-	60 microns		Shade : Redoxide
d.6	Insulated Alloy Steel Piping (Outdoor/Indoor)	PE&SD,PC	TG HALL	Indoor	> 400 Deg C	SP-3	2 coats of Red oxide Zinc Phosphate Primer (Alkyd Base) to IS 12744	-	-	60 microns		Shade : Redoxide
e	Valves - Others											refer d.1 to d.6
f	Expansion bellows - others											refer d.1 to d.6
g	Pre-Fabricated Piping (Non-IBR service)											covered in the above demarcation
h	Steam Traps											refer d.1 to d.6
i	Piping Insulation											no -pinting for insulation
j	Pipe hangers											refer d.1 to d.6
k	Pre-fabricated pipe support shoes											refer d.1 to d.6
l	Structural steel for pipe supports											refer d.1 to d.6
m	Pre-Fabricated Piping (Non-IBR service_Integral scope)											
i	Oil piping-Carbon Steel		TG HALL	Indoor	149 Deg. F	SA 2 1/2 Shop	Inorganic Zinc Silicate/50	NA	Zinc Free" High Temperature Air Curing Finish Coat /100-125	165-215	Light Grey IS 631	
ii	Oil piping- Stainless steel		TG HALL	Indoor	113 Deg. F	SSPC SP 16 Shop	High Temperature Epoxy Novolac / 50-80	NA	High Temperature Epoxy Novolac / 50-80	200-300	Light Grey IS 631	
iii	Control oil piping_Carbon Steel		TG HALL	Indoor	149 Deg. F	SA 2 1/2 Field	Inorganic Zinc Silicate/50	NA	Zinc Free" High Temperature Air Curing Finish Coat /100-125	165-215	Light Grey IS 631	
iv	Control oil piping_Stainless steel		TG HALL	Indoor	113 Deg. F	SSPC SP 16 Field	High Temperature Epoxy Novolac / 50-80	NA	High Temperature Epoxy Novolac / 50-80	200-300	Light Grey IS 631	
v	Integral steam piping_Carbon Steel		TG HALL	Indoor	500 Deg. F	SA 2 1/2 Shop	Inorganic Zinc Silicate/50	NA	Zinc Free" High Temperature Air Curing Finish Coat /100-125		Light Grey IS 631	
vi	Integral steam piping_Alloy steel		TG HALL	Indoor	984 Deg. F	SA 2 1/2 Field	High Temperature Silicone Aluminium/25-40	High Temperature Silicone Aluminium/25-40	High Temperature Silicone Aluminium/25-40	75-120	Light Grey IS 631	
13	**HEAT EXCHANGERS**											

a	Equipment and Supports (≥ 2.5 square meter surface)	PE& SD			≤ 93 Deg. F	SP 10	Zinc Rich epoxy DFT- 3-5 mils	Epoxy DFT - 4-6 mils	Polyurethane DFT -3-5 mils		Aluminium/Grey	
14	**DOSING SYSTEMS**											
	CHEMICAL DOSING SKIDS(HYDRAZINE/AMMONIA & NaOH)											
i.	Not Exposed to Coal, coal Dust, Ash (Fly & Bottom), lime Stone or Bed sand – Structural steal, Misc. steel, Stairways (not galvanized), pipe racks, platforms, walkways Steel,& Supplement Support steel, etc.	PE& SD			≤ 93 Deg. F	SP 10	Inorganic zinc / 3-5 mils	---	---		Light Grey Colour For Beams And Pipe Supports	
iia	Stair Support Steel, Stringers, ladders, including safety cages	PE& SD			≤ 93 Deg. F	SP 10	Inorganic zinc or Epoxy Zinc rich / 3-5 mils	Epoxy /4-6 mils	Polyurethane / 3-5 mils		Black Colour For Platform	
	or											
iib	Stair Support Steel, Stringers, ladders, including safety cages	PE& SD			≤ 93 Deg. F	--	Hot Dip galvanized / To a minimum of 600 g/m2 per ASTM A123	Brush Blast (SP-7) / 4-6 mils of Epoxy mastic	Polyurethane / 3-5 mils		Black Colour for Ladders	
iii.a	Handrails Assemblies Steel	PE& SD			≤ 93 Deg. F	SP 10	Inorganic zinc or Epoxy Zinc rich /3-5 mils	Epoxy /4-6 mils	Polyurethane / 3-5 mils		Golden Yellow for Handrails	Safety Yellow Colour
	or											
iii.b	Handrails Assemblies Steel	PE& SD			Ambient	--	Hot Dip galvanized / To a minimum of 600 g/m square per ASTM A123	Brush Blast (SP-7) / 4-6 mils of Epoxy mastic	Polyurethane / 3-5 mils		Golden Yellow for Handrails	2nd and 3rd costs in shop or field with safety yellow colour
iv.	Safety Showers, Eye Wash Stations	PE& SD			Ambient	--	Manufacturer's Standard suitable for seacoast to extent possible				Green	
v.a	Electricals cabinets and panels	PE& SD			Ambient	SP 10					Light Grey	
	or											
v.b	Electricals cabinets and panels	PE& SD			Ambient	Galvanized or galvalumed steel coated with 5 to 6 mils of TGIC powder coating or acceptable equal.					Light Grey	
vi.	Exposed Instrument Tubing	PE& SD			Ambient	Suitable grade of 2205 Duplex stainless steel or acceptable equal.					Light Grey	
vii.	Off-The-Shelf items or small pumps, Instrument, motors (<15HP) components/Equipment (<2.5 M)	PE& SD			Ambient	Supplier standard's coating suitable for sea coast exposure to the extent possible					Light Grey	
15	**POWER CYCLE SYSTEMS**											
a	Control Valves	As per Manufacrurar's Standard										
b	Desuperheaters											
c	Atmospheric Flash Tank	PE&SD	Outside STG building	Outdoor	-196˚C to 230˚C	SA 2 ½	High temperature Epoxy Novolac / DFT: 100-150 microns	NA	High temperature Epoxy Novolac / DFT: 100-150 microns	200-300 microns	White(BS: Code 00-E-55)	External surface
					150˚C	SA 2 ½	Amine Adduct Cured Epoxy / DFT: 100-150 microns	NA	Amine Adduct Cured Epoxy / DFT: 100-150 microns	200-300 microns		Internal surface
16	**PUMPS**											
a.1	Condensate Extraction Pumps	Each Unit	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
a.2	Motors for Condensate Extraction Pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
b.1	CCW Pumps (For PHE)	Common for All 4 Units	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
b.2	Motors for CCW Pumps (For PHE)	Common for All 4 Units	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
c.1	Potable sump pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
c.2	Motors for Potable sump pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
d.1	Condensate forwarding pumps	Each Unit	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
d.2	Motors for Condensate forwarding pumps	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
e.1	ACW Pump	Each Unit	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
e.2	Motors for ACW Pump	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
f.1	Air Compressor	Common for All 4 Units	STG Builiding	Outdoor	50 Deg. C	SP-10	1 Coat of two component of Inorganic Zinc Silicate Coating@ 65-75µ DFT /Coating Total: 65-75µ	1 Coat of Two component Epoxy Zinc phosphate primer cured with polyamine hardener@40µ DFT/Coat Total: 40µ	2 Coat of High Build Epoxy finish coating cured with polyamine harder@ 100 µ DFT/Coat & 1 Coat of Two component Acrylic-Polyurethane finish paint@ 400 µ DFT/Coat: Total=2x100+40=240 µ	345-355 µ	Navy Blue (RAL 5014)	
f.2	Motors for Air Compressor	Each Unit	STG Builiding	Outdoor	Ambient	SP-10	3 mils of Epoxy Primer	3 mils of Epoxy	3 mils of Epoxy Polyurethane	225 µ	Blue Grey (RAL 7031)	
17	**TANKS**											
17.1	Condensdate Storage tank (150m3)											
a	External Uninsulated upto 120 Deg. C	PE&SD		Outdoor		SA 2½	-Inorganic Zinc Silicate Primer -Dry film thickness: 65-90 microns -Required surface profile: 50 microns -Maximum temperature resistances: 400°C -Minimum Volume Solids: 58 ASTM D2697 1. The product shall conform to SSPC Paint 20 Type 1-C with a zinc dust level of greater than 70% by weight in the dry film. The zinc dust shall have a "metallic" zinc content that meets the requirements of ASTM D-520 Type 1. Random sample for zinc dust content to be checked at site/lab.	High Build MIO Epoxy -Intermediate Dry film thickness: 100-150 microns -Required surface preparation: Clean, dry epoxy primer (type 04) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 55ASTM D2697 The quantity of MIO in the main pigment shall be 80% by weight.	Aliphatic Urethane Finish -Dry film thickness: 40-75 microns -Required surface preparation: Clean, dry epoxy intermediate(type 05) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 60 ASTM D2697	215-350	White(BS: Code 00-E-55)	Where prep. Is carried out in a shop or offsite it is mandatory that the painting to be carried out at the same location.

b	Internal(Condensate Tanks)	PE&SD		Outdoor		SA 2 1/2	HB Epoxy Phenolic -Required surface profile: 50-80 microns -Minimum Volume solids : 65% ASTM D2697 -Dry film thickness : 100-150 microns/coat -Maximum temperature resistance :150°C	HB Epoxy Phenolic -Required surface profile: 50-80 microns -Minimum Volume solids : 65% ASTM D2697 -Dry film thickness : 100-150 microns/coat -Maximum temperature resistance :150°C	HB Epoxy Phenolic -Required surface profile: 50-80 microns -Minimum Volume solids : 65% ASTM D2697 -Dry film thickness : 100-150 microns/coat -Maximum temperature resistance :150°C	300-375		
c	Tank Bottom plate (inside)	PE&SD		Outdoor		SA 2 1/2	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	200-300		Shop built tanks will be shop painted.
d	External of underside of all tank	PE&SD		Outdoor		SA 2 1/2	Coal Tar Epoxy -Dry film thickness: 150-200 microns -Required surface profile: 75 microns	NA	NA	150-200		A strip 75 mm wide at plate edge shall be left bare to avoid welding cantamination
17.2	Expansion Tank for DMCW Circuit											
a	External Uninsulated upto 120 Deg. C	PE&SD		Outdoor		SA 2 1/2	-Inorganic Zinc Silicate Primer -Dry film thickness: 65-90 microns -Required surface profile: 50 microns -Maximum temperature resistances: 400°C -Minimum Volume Solids: 58 ASTM D2697 1. The product shall conform to SSPC Paint 20 Type 1-C with a zinc dust level of greater than 70% by weight in the dry film. The zinc dust shall have a "metallic" zinc content that meets the requirements of ASTM D-520 Type 1. Random sample for zinc dust content to be checked at site/lab.	High Build MIO Epoxy -Intermediate Dry film thickness: 100-150 microns -Required surface preparation: Clean, dry epoxy primer (type 04) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 55ASTM D2697 The quantity of MIO in the main pigment shall be 80% by weight.	Aliphatic Urethane Finish -Dry film thickness: 40-75 microns -Required surface preparation: Clean, dry epoxy intermediate(type 05) -Maximum temperature resistance: 120oC -Minimum Volume Solids: 60 ASTM D2697	215-350	White(BS: Code 00-E-55)	Where prep. Is carried out in a shop or offsite it is mandatory that the painting to be carried out at the same location.
b	Internal(Demineralised water)	PE&SD		Outdoor		SA 2 1/2	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	NA	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	300-200		Shop built tanks will be shop painted.
c	Tank Bottom plate (inside)	PE&SD		Outdoor		SA 2 1/2	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	Amine Adduct Cured Epoxy -Dry film thickness: 100-150 microns -Required surface profile: 50 microns	200-300		Shop built tanks will be shop painted.
d	External of underside of all tank	PE&SD		Outdoor		SA 2 1/2	Coal Tar Epoxy -Dry film thickness: 150-200 microns -Required surface profile: 75 microns	NA	NA	150-200		A strip 75 mm wide at plate edge shall be left bare to avoid welding cantamination
18	**ELECTRICAL SYSTEM ITEMS**											
a	LV PMCC's	PE&SD	Switchgear room	Indoor	Ambient	As per manufacturers standard					Shade 631 of IS 5	
b	LV MCC's	PE&SD			Ambient	As per manufacturers standard					Shade 631 of IS 5	
c	Cable tray material	PE&SD	Entire STG & Switchgear building	Indoor	Ambient	Hot Dip Galvanization as per IS 2629 & minimum thickness of Galvanization shall be 610gm/m^2					Not Applicable	
d	LV Power cables	PE&SD			Ambient	Not Applicable					Outer sheath shall be black	
e	Control cables	PE&SD			Ambient	Not Applicable					Outer sheath shall be black	
f	Cable Glands & Lugs	PE&SD			Ambient	Not Applicable					Not Applicable	
g	Structural steel for cable tray supports	PE&SD	Entire STG & Switchgear building	Indoor	Ambient	Red oxide Zinc Chromate primer					Not Applicable	
19	**C & I SYSTEM ITEMS**											
a	Field instrument package	PE&SD	Each Unit	indoor & out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	
b	Instrument hook up material	PE&SD	As reqd.	indoor & out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications					Vendor standard	
c	Instrumentation cables	PE&SD	As reqd.	indoor & out door	Amb. Temp	NA	NA	NA	NA	NA	Black	
d	SWAS System	PE&SD	Each Unit	Indoor	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	RAL 7035	
e	Flow elements-Orifice	PE&SD	Each Unit	Out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	
g	Flow elements-Nozzle	PE&SD	Each Unit	Out door	Amb. Temp	Supplier standard coating suitable for power plant/Industrial applications				As reqd.	Vendor standard	

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

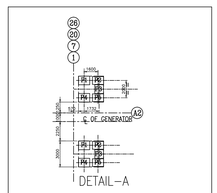
PLAN AT GROUND FLOOR EL.100.5m (FFL)

NOTES:

1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2) EQUIPMENT DIMENSIONS ARE TENTATIVE, WHICH SHALL BE CONFIRMED AFTER DETAIL ENGINEERING.
3) PIPING INTERFACE AREAS BETWEEN BHEL AND RUPPL/BECHTEL/THERMAX SHALL BE AS GIVEN BELOW. (TO BE FINALISED)

PIPING TERMINAL POINT AREA	TERMINAL POINTS	GRID REFERENCE
PTPA-01	1) MAIN STEAM-1 FROM BOILER HEADER (TP-77) 2) FEED WATER-1 TO BOILER HEADER (TP-148) 3) BOILER FLASH TANK VENT-1 FROM BOILER (TP-199) 4) BOILER STARTUP STEAM BYPASS FROM BOILER (TP-79) 5) FEED WATER SUPPLY FOR LIMESTONE DRYING (BY BECHTEL) 6) CONDENSATE RETURN FROM LIMESTONE DRYING (BY BECHTEL) 7) CLOSED CIRCUIT COOLING WATER SUPPLY TO BOILER AUXILIARIES (TP-80) 8) CLOSED CIRCUIT COOLING WATER RETURN FROM BOILER AUXILIARIES (TP-81) 9) POTABLE WATER (TP-9) 10) SERVICE AIR (TP-4) 11) INSTRUMENT AIR (TP-5) 12) SERVICE WATER (TP-201) 13) BOILER FILL (TP-6)	BETWEEN GRID 11 & 12 1M INSIDE STG BUILDING ALONG ROW-D ABOVE GROUND
PTPA-02	1) MAIN STEAM-2 FROM BOILER HEADER (TP-78) 2) FEED WATER-2 TO BOILER HEADER (TP-149) 3) BOILER FLASH TANK VENT-2 FROM BOILER (TP-200)	BETWEEN GRID 24 & 25 1M INSIDE STG BUILDING ALONG ROW-D ABOVE GROUND
PTPA-03	1) CIRCULATING WATER SUPPLY TO UNIT-1/2/3/4 CONDENSER (TP-119 & 120/TP-123 & 124/TP-127 & 128/TP-131 & 132) 2) CIRCULATING WATER RETURN FROM UNIT-1/2/3/4 CONDENSER (TP-121 & 122/TP-125 & 126/TP-129 & 130/TP-133 & 134)	BETWEEN GRID 3&5/9&11/22&24/28&30 ALONG ROW-A ABOVE GROUND
PTPA-04	1) CONDENSATE RETURN FROM PROCESS TO UNIT-1/2/3/4 CFT (TP-168/TP-169/TP-170/TP-171)	AT CFT NOZZLE OF EACH UNIT
PTPA-05	1) CONDENSATE FILL TO UNIT-1/2/3/4 CONDENSER (TP-172/TP-173/TP-174/TP-175) 2) CONDENSATE RETURN FROM LIMESTONE DRYER TO UNIT-1/2/3/4 CONDENSER (TP-160/TP-161/TP-162/TP-163)	AT CONDENSER NOZZLE OF EACH UNIT

4) MINIMUM CRANE HOOK ELEVATION SHALL BE 122.25 M.
5) WEIGHT OF SINGLE HEAVIEST PIECE FOR MAINTENANCE IS 55 TONN.
6) ELEVATION 0.00 CORRESPONDS TO FINISHED GROUND FLOOR LEVEL OF STG BUILDING WHICH CORRESPONDS TO SITE RL EL.+100.5M
7) DEAERATOR FLOOR ELEVATION IS 118.5 m.(BECHTEL TO CONFIRM THE SAME)
8) LAYDOWN & MAINTENANCE SPACE IS INDICATED ON THE OPERATING FLOOR COMMON AREA WITH THE ASSUMPTION THAT 2 UNITS ARE TAKEN FOR MAINTENANCE AT THE SAME TIME.
9) REVISED EQUIPMENT LOADS INDICATED BECHTEL TO CONSIDER THE SAME.
10) HATCH PATTERN FOR BUND AREA REQUIREMENT.
11) CENTER LINE OF SKID DIMENSIONS MENTIONED IN THIS DRAWING MATCHES WITH THE CENTER LINE DIMENSION OF EQUIPMENT FOUNDATIONS .FOR FOUNDATION DIMENSIONS REFER TO THE AUXILIARY EQUIPMENT FOUNDATION DRAWINGS .
12) FOR FLOOR OPENING REQUIREMENTS OF THE ELECTRICAL ,REFER RESPECTIVE DRAWING .
13) FOR FLOOR OPENING REQUIREMENTS OF THE PIPING & EQUIPMENTS ,REFER RESPECTIVE DRAWING .



NOTE :POCKET AND ANCHOR BOLT DETAILS UNDER HOLD.LOCATION IS FINAL.

Strand Jack tower foundation (Pocket Details)

Pocket No.	Load (MT)	Length (mm)	Width (mm)	Depth (mm)
P1	150	1300	1000	800
P2	50	1300	900	800
P3	150	1000	1000	800
P4	100	1300	1000	800
P5	50	1300	900	800

EQUIPMENT LIST (PER UNIT)

SL NO.	EQUIPMENT	QTY (Nos)	EMPTY WT(Kg)	FLOODED WT(Kg)	STATUS NOT TO EXCEED(NE) FINAL (F)
1	STEAM TURBINE	1	COVERED IN "MACHINERY ARRANGEMENT AND FOUNDATION" DRG.NO.1-313-01-08634		
2	GENERATOR	1			
3	SURFACE CONDENSER	1			
4	GENERATOR AIR COOLER ASSEMBLY	1			
5	LUBE OIL CONSOLE (LUBE OIL TANK, MOP, AOP, EOP, TWIN LUBE OIL COOLERS,FILTERS)	1	16465	34120	F
6	JACKING OIL SKID	1	2250	2500	F
7	HP CONTROL OIL SKID	1	3900	4950	F
8	OIL CENTRIFUGE(TROLLEY TYPE)	1	1200	2200	F
9	LP HEATER - 1	1	31100	62000	F
10	LP HEATER - 2	1	34000	64000	F
11	LP HEATER - 3	1	32000	59500	F
12	DEAERATOR	1	80420	401090	F
13	HP HEATER - 5	1	53500	73100	F
14	HP HEATER - 6	1	63100	84600	F
15	STEAM JET AIR EJECTOR ASSEMBLY	1	7500	11500	F
16	GLAND STEAM CONDENSER WITH EJECTOR	1	2000	2700	F
17	DRAIN COOLER	1	5800	8400	F
18	BOILER FEED PUMP ASSEMBLY WITH MOTOR	3	-	34752	F
19	CONDENSATE EXTRACTION PUMP WITH MOTOR	2	-	3350	F
20	CONDENSATE FORWARDING TANK	1	6765	195500	F
21	CONDENSATE FORWARDING PUMP WITH MOTOR	3	-	2068	F
22	ACW BOOSTER PUMP WITH MOTOR	2	-	2200	F
23	PHE FOR CLOSED CIRCUIT CW SYSTEM	1	9323	11890	F
24	HP FLASH TANK FOR STG	1	8500	51000	F
25	AMMONIA DOSING SKID	1	650	1000	F
26	HYDRAZINE DOSING SKID	1	600	750	F
27	NAOH DOSING SKID	1	400	850	F
28	OVER HEAD TANK (OIL)	1	2066	10450	F
29	ATMOSPHERIC FLASH TANK	1	1500	4000	F
30	GENERATOR ADAPTER BOX	1	-	12000	F
31	LUBE OIL ACCUMULATORS (1 SET)	1	620	815	F

EQUIPMENT LIST (COMMON)

SL NO.	EQUIPMENT	QTY (Nos)	EMPTY WT(Kg)	FLOODED WT(Kg)	STATUS NOT TO EXCEED(NE) FINAL (F)
51	CLOSED CIRCUIT CW SYSTEM PUMP	4	-	6026	F
52	IA & PA SYSTEM	1	-	61060	F
52.A	AIR COMPRESSOR	4	-	8250	F
52.B.1	AIR RECIEVER (WET)	1	-	8000	F
52.B.2	AIR RECIEVER (DRY)	2	-	11000	F
52.C	AIR DRYER	3	-	3020	F
53	CCW EXPANSION TANK AND NAOH BREATHER	1	2000	15000	F
54	SWAS PANEL (TOTAL PER SWAS UNIT)	2	-	3200	F
55	LOCAL GAUGE BOARD	2	-	800	F

NOTE: WEIGHTS FURNISHED ARE UNIT WEIGHTS

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE UTILITIES AND POWER PRIVATE LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)

RUPPL DRG. NUMBER HAZIRA: 10090-P50-HAT000-BHB-0001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	
CHD.	G.S	-SD-	09.09.13	NA
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG | UNTOL. DIMS. OR. | SCALE 1:250 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

CODE NO. 9M/F

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT

CARD CODE

BHEL DRAWING NO: 0-381-01-01529 REV. 09

SHT. No 01 NO. OF SHT. 04

REV.	DATE	ALTERED	CHD/APPD	ZONE
09	11/10/14	VUK GS/VVSS	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	
08	08/08/14	VUK GS/VVSS	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	
07	09/07/14	VUK GS/VVSS	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	
06	17/06/14	VUK GS/VVSS	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	
05	06/05/14	VUK GS/VVSS	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	
04	25/03/14	VUK GS/VVSS	DRAWING REVISED GENERALLY AND IN LINE WITH M/s BECHTEL'S COMMENTS ,REVISED INPUTS.	
03	21/12/13	VUK GS/VVSS	DRAWING REVISED GENERALLY AND IN LINE WITH BECHTEL'S COMMENTS.	
02	29/10/13	VUK GS/VVSS	DRAWING REVISED GENERALLY AND IN LINE WITH BECHTEL'S COMMENTS.	
01	14/09/13	VUK GS/VVSS	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.	

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

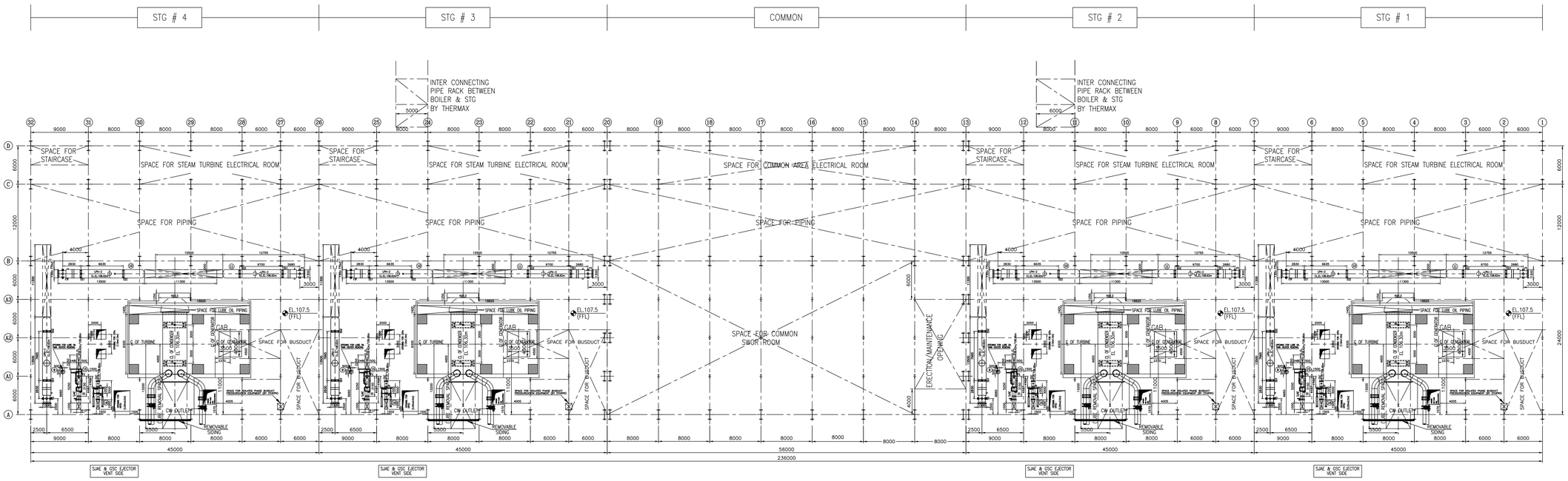
DRG. NO. 0-381-01-01529 SHT. 02 OF 04

PLANT NORTH

15°

TRUE NORTH

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT MEZZANINE FLOOR EL.107.5m (FFL)

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME (3801010529-SH2-R03.DWG)

SIGN. AND DATE | REF. DRG. NO. | INVENTORY NO

REV.	DATE	ALTERED	REMARKS
09	11/10/14	CHD/APPD GS/WSS	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.
08	08/08/14	CHD/APPD GS/WSS	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.
07	08/07/14	CHD/APPD GS/WSS	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.
06	17/06/14	CHD/APPD GS/WSS	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.
05	06/05/14	CHD/APPD GS/WSS	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.
04	25/03/14	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH M/s BECHTEL'S COMMENTS ,REVISED INPUTS.
03	21/12/13	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
02	29/10/13	CHD/APPD GS/WSS	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.
01	14/09/13	CHD/APPD GS/WSS	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE UTILITIES AND POWER PRIVATE LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)

RUPPL DRG. NUMBER HAZIRA: 10090-P50-HAT000-BHB-0001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION, HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	-SD-	09.09.13	NA
CHD.	G.S	-SD-	09.09.13	
APPD.	V.V.S.S	-SD-	09.09.13	

DEPT. PESD-ENGG | CODE NO. | UNTOL. DIMS. OR. | SCALE 1:250 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT

CARD CODE

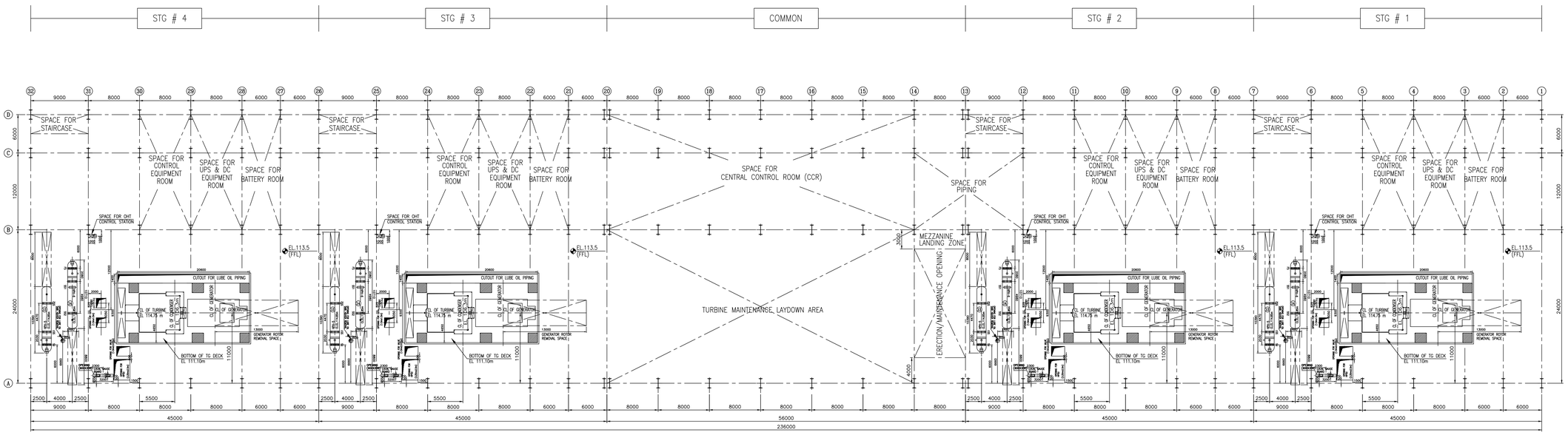
BHEL DRAWING NO: 0-381-01-01529 REV. 09

SHT. No 02 | NO. OF SHT. 04

PLANT NORTH

TRUE NORTH

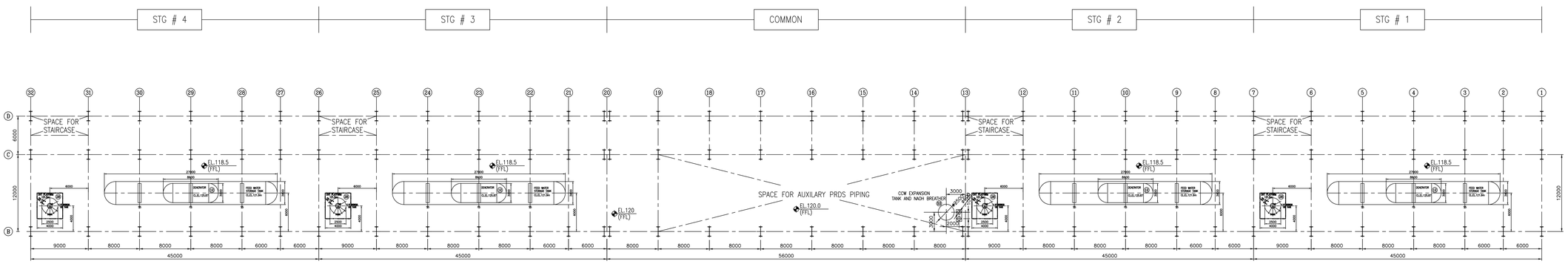
BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT OPERATING FLOOR EL.113.5m (FFL)

BOILER SIDE



COOLING WATER SIDE | TRANSFORMER YARD

PLAN AT DEAERATOR FLOOR EL.118.5m (FFL)
PLAN AT COMMON BUILDING FLOOR EL.120m (FFL)
AND AT OHT PLATFORM EL.121.5m (TOS)

REV.	DATE	ALTERED	CHD/APPD
09	11/10/14	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	VUK CHD/APPD GS/VSS
08	08/08/14	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	VUK CHD/APPD GS/VSS
07	08/07/14	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	VUK CHD/APPD GS/VSS
06	17/06/14	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	VUK CHD/APPD GS/VSS
05	06/05/14	REVISION REASON : IFA DRAWING REVISED GENERALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.	CHD/APPD
04	25/03/14	DRAWING REVISED GENERALLY AND IN LINE WITH M/s BECHTEL'S COMMENTS /REVISED INPUTS.	VUK CHD/APPD GS/VSS
03	21/12/13	DRAWING REVISED GENERALLY AND IN LINE WITH BECHTEL'S COMMENTS.	VUK CHD/APPD GS/VSS
02	29/10/13	DRAWING REVISED GENERALLY AND IN LINE WITH BECHTEL'S COMMENTS.	VUK CHD/APPD GS/VSS
01	14/09/13	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.	VUK CHD/APPD GS/VSS

CONSULTANT: BECHTEL, FREDERICK, MARYLAND, U.S.A

PROJECT: STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)

CUSTOMER: RELIANCE UTILITIES AND POWER PRIVATE LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)

RUPPL DRG. NUMBER HAZIRA: 10090-P50-HAT000-BHB-0001

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGG & SYSTEMS DIVISION HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	–SD–	09.09.13	
CHD.	G.S	–SD–	09.09.13	NA
APPD.	V.V.S.S	–SD–	09.09.13	

DEPT. PESD–ENGG | CODE 450 | UNTOL DIMS. OR g/m/y | SCALE 1:250 | WEIGHT (KG) NA | REF. TO ASSY. DRG. NA | ITEM NO. NA | NO.OF ITEMS NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT

CARD CODE

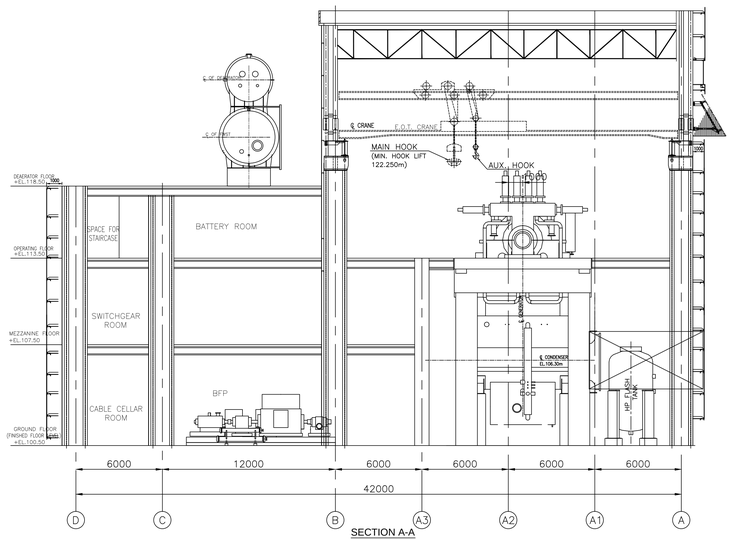
BHEL DRAWING NO: 0-381-01-01529 REV. 09

SHT. No. 03 NO. OF SHT. 04

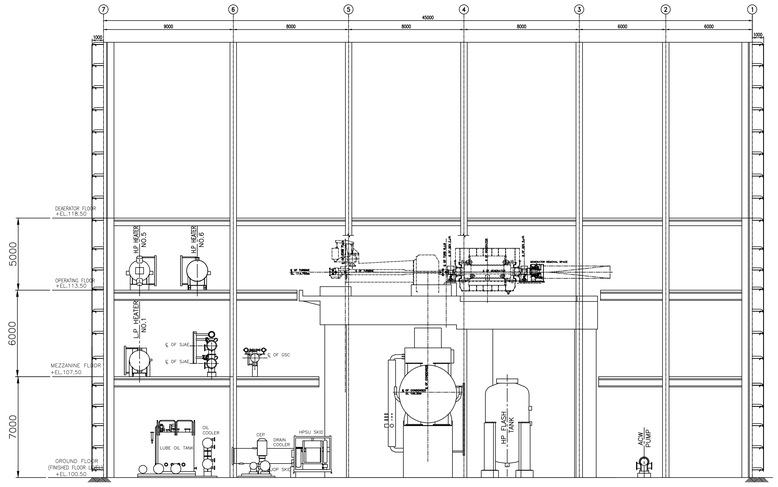
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SHT. 04 OF 04 DRG. NO. 0-381-01-01529



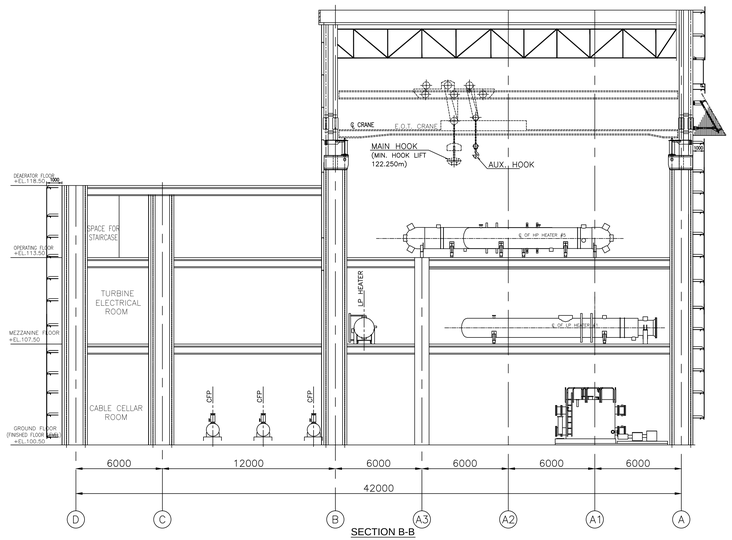
SECTION A-A



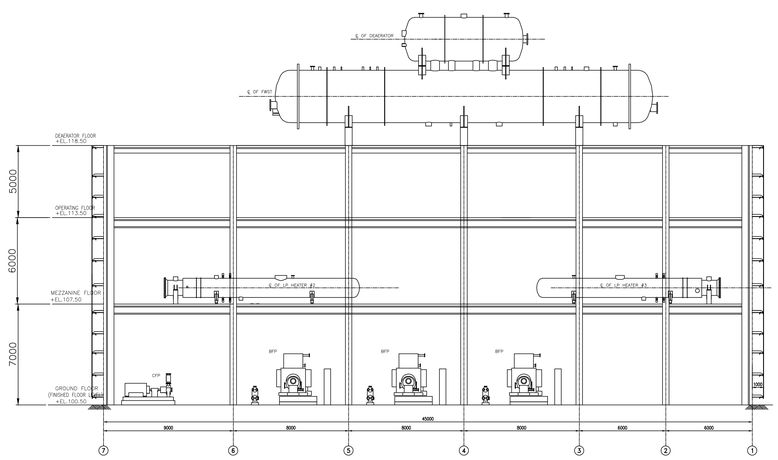
SECTION 1-1

(FOR STG # 1)

(TYPICAL)



SECTION B-B



SECTION 2-2

(FOR STG # 1)

(TYPICAL)

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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

DIMENSIONS SCALE/UNIT	
REF. DRG. NO.	
COMPUTER FILE NAME	
SIGN. AND DATE	
INVENTORY NO	

REV.	DATE	ALTERED	
		CHD/APPD	
ZONE			

REV.	DATE	ALTERED	
		CHD/APPD	
ZONE			

REV.	DATE	ALTERED	
		CHD/APPD	
ZONE			

REV.	DATE	ALTERED	
		CHD/APPD	
ZONE			

REV.	DATE	ALTERED	
		CHD/APPD	
ZONE			

REV.	DATE	ALTERED	VUK
09	11/10/14	CHD/APPD	GS/WSS
ZONE	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
08	08/08/14	CHD/APPD	GS/WSS
ZONE	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
07	08/07/14	CHD/APPD	GS/WSS
ZONE	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
06	17/06/14	CHD/APPD	GS/WSS
ZONE	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
05	06/05/14	CHD/APPD	GS/WSS
ZONE	REVISION REASON : IFA DRAWING REVISED GENRALLY AND IN IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
04	25/03/14	CHD/APPD	GS/WSS
ZONE	DRAWING REVISED GENRALLY AND IN LINE WITH W/s BECHTEL'S COMMENTS JREVISED INPUTS.		

REV.	DATE	ALTERED	VUK
03	21/12/13	CHD/APPD	GS/WSS
ZONE	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
02	29/10/13	CHD/APPD	GS/WSS
ZONE	DRAWING REVISED GENRALLY AND IN LINE WITH BECHTEL'S COMMENTS.		

REV.	DATE	ALTERED	VUK
01	14/09/13	CHD/APPD	GS/WSS
ZONE	DRAFTING ERRORS CORRECTED. SHEET 5 REMOVED. GENERALLY REVISED.		

CONSULTANT:	BECHTEL FREDERICK, MARYLAND, U.S.A
PROJECT:	STG PACKAGE (4 X 93.1 MW STGs), CCPP HAZIRA MANUFACTURING DIVISION (HMD)
CUSTOMER:	RELIANCE UTILITIES AND POWER PRIVATE LIMITED COAL BASED CAPTIVE POWER PLANT (CCPP)
RUPPL DRG. NUMBER HAZIRA:	10090-P50-HAT000-BHB-0001

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGG & SYSTEMS DIVISION
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	V.U.K	–SD–	09.09.13	NA
CHD.	G.S	–SD–	09.09.13	
APPD.	V.V.S.S	–SD–	09.09.13	

DEPT. FDD–ENGG	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE ASD	CR ±1/2° ±1/2°	1:100	NA	NA	NA	NA

TITLE: INPUT FOR STG HALL EQUIPMENT LAYOUT

CARD CODE | BHEL DRAWING NO: 0-381-01-01529 | REV. 09

SHT. No 04 | NO. OF SHT. 04