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TECHNICAL SPECIFICATION

FOR

WATER BASED FIRE PROTECTION SYSTEM

PROJECT : 2 x 250 MW UNIT # 8 & 9, BARAUNI-TPS, BEGUSARAI

CUSTOMER : BIHAR STATE ELECTRICITY BOARD (BSEB)

CONSULTANT : M/S STEAG ENERGY SERVICES (INDIA) PVT. LTD.

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1. INTENT OF SPECIFICATION:

1.1. The intent of this document is to establish the minimum requirement of design, engineering, selection, manufacture, assembly, inspection, shop testing, shop painting, delivery FOR site properly packed for transportation suitably protected from weather including transit insurance of all equipment, supervision of Erection & Commissioning, final handling over as mentioned hereinafter for the Water Based Water Based Fire Protection System (WFPS), which form part of project.

1.2. It is not the intent to completely specify all details of design, manufacture and construction. Nevertheless the equipment and installation shall conform to high standard of engineering and shall be capable of performing in continuous commercial operation in a manner acceptable to the Purchaser and end customer.

2. SPECIAL NOTES TO BIDDERS

2.1. This specification shall be read in conjunction with all its enclosures. In case of any discrepancy arising between this job specification & its enclosures, the most stringent of all (as determined by purchaser) shall be followed. Further, if a requirement in this specification or any of the enclosures, calls for a decision from the Purchaser, it shall be bidder's sole responsibility to clearly bring out/highlight the same distinctively in his pre-bid queries, so as to enable purchaser to furnish their decision/clarification. If such issues/requirements are not duly addressed by bidder during the pre-bid stage and if such issues/requirements are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.

2.2. Any additional equipment, material, services etc., which are not specifically mentioned in this specification, but required to make the WFPS complete in all respects, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification.

2.3. Any specific hardware/software/item/ etc. required as indicated in 2.2. above but not listed elsewhere in this specification or its enclosures, shall be deemed to be included in the basic price quoted by the bidder.
Also, all mounting hardware/ accessories/fittings/conduits/etc. required for the completion of the Water Based Water Based Fire Protection System

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package shall be deemed to be included in the basic price quoted by the bidder. Bidder, at no point of time, shall be eligible to raise any extra claim in this regard.

2.4. The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipments and the WFPS as a whole. These shall be executed on the basis of proven design principle and in accordance with the latest state of the art in such a manner that the purpose to be served by the plant is fulfilled in every respect and a maximum of operational dependability and efficiency are assured. Standardization of equipment, materials etc. shall be employed in the design. Care shall be taken to ensure safe operation as well as simplicity of assembling and dismantling of all parts of the plant.

2.5. By accepting the contract, the bidder shall be deemed to have accepted the obligation of supplying everything that is necessary for the completion of the WFPS as per the intent of this specification, regardless of any omission in the specification or on the drawings.

2.6. Even though, the requirements are specified in detail to the extent possible, bidder to apply good engineering practices in the design, selection of equipment, manufacturing, procurement, transportation, fabrication, painting, inspection & testing, supervision of erection & commissioning of system etc., wherever same is not clearly spelt out.

2.7. Bidder to note that the Purchase Order for the entire WFPS system for the 2 x 250 MW BSEB Barauni thermal power project shall be placed on lump sum fixed prices based as per tender specification requirements.

Bidder to further note that they shall not be permitted for any claim for additional commercial implication on any account during the detail engineering stage including the following:

- Change (increase/decrease) in dimensions of equipments/areas
- Change in location of equipments/areas within the battery limits.
- Change (increase/decrease) in quantities in the equipments/areas covered by different FPS facilities.
- Furnishing of any Input drawing to bidder at any stage of contract execution
- Changes in any of the Input drawings.
- Other conditions mentioned elsewhere in this specification.

2.8. Bidder shall quote strictly as per the scope of supply and requirements of this specification.

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2.9. Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained.

2.10. In case bidder feels that it is necessary to exclude some components of scope of supply or some of the features of specification requirements due to any technical constraints, bidder shall bring the same to the notice of purchaser during pre-bid stage and take their prior approval before submission of their bid.

2.11. All such clarifications required by the bidder shall be intimated to BHEL together as a single notice **within a week of receipt of enquiry by bidder**. In case no such clarifications are sought during pre-bid stage, it will be assumed that bidder has no comments or observations on BHEL's specification and no deviations to the specifications will be taken by the bidder.

2.12. Bidder to quote strictly as per BHEL's price format. Failure to do shall make their offer liable for rejection. Any tampering/modification/change of the BHEL's price format is not allowed and is liable for rejection of bidders offer.

2.13. Incase Bidder is unable to offer due to any specific requirement of specification, Bidder shall bring out the same in their regret letter. Otherwise it will be considered that non participation by the bidder is attributable to reasons other than any specification requirements.

2.14. Compliance with this specification shall not relieve the bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.

2.15. Accordingly, bidder to furnish their comments if any on this specification as a part of pre-bid query.

2.16. The design information, specifications and drawings indicate the "Minimum" requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid.

2.17. The intending tenderers shall be deemed to have visited the site and have studied the conditions before submitting the Bids. Non-familiarity with the site conditions will not be considered a reason either for extra claims or for not carrying out the work in strict conformity with the drawings and specifications.

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3. PROJECT DESCRIPTION

1	Owner	Bihar State Electricity Board (BSEB).
2	Project	2 X 250 MW Unit # 8 & 9, Barauni-TPS, Begusarai
3	Consultant	M/S Steag Energy Services (India) Pvt. Ltd.
4	Location	Town: Barauni, District: Begusarai, State: Bihar
5	Site	Existing ash dyke are of about 340 acres
6	FFL/FGL	FFL EL+/- 0.0 corresponds to **RL 45.50 M** above MSL FGL corresponds to **RL 45.00 M** above MSL
7	Nearest Airport	Patna-115 Kms.
8	Nearest Rail Head	Simaria Railway Station on North Eastern railways
9	Access to site	The site is at Barauni-Mokama section of National Highway (NH-31)

4. GEOGRAPHICAL & METEOROLOGICAL DETAILS

Sl. No.	Description	Data
1	Latitude	N 25023'13.5" to N 25023'54"
2	Longitude	E 86001'05.1" to E 86001'46.3"
3	Maximum Ambient Air Temperature	35.2° C
4	Minimum Ambient Air Temperature	11.4°C
5	Dry Bulb Temperatures	
5.1	Highest recorded :	35.3°.C
5.2	Lowest recorded :	12.1° C
6	Wet Bulb Temperatures	
6.1	Design AMB WBT	Minimum – 12.0°.C Maximum- 29.0°.C
7	Relative Humidity	
7.1	Design AMB Humidity	Minimum- 26% Maximum- 98%
7.2	Annual Mean	52 %
8	Rainfall	
8.1	Annual Total	1003.4 mm
9	Wind data	
9.1	Wind Speed	47 m/sec
9.2	Prevailing Wind Direction	East (blowing from)
9.3	Wind Pressure	Minimum 990 hPa. Maximum 1011.5 hPa.
10	Seismic coefficient	Zone IV as per IS-1893 Part-I (2002)

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Coal Analysis

S.No.	Parameters	Worst Coal	Designed Coal
A	**Proximate Analysis (%)**		
1	Fixed Carbon (FC) %	29.4	29.7
2	Volatile Matter (VM) %	17.7	20.6
3	Moisture %	10.0	8.0
4	Ash%	42.9	41.7
B	**Ultimate Analysis (% by weight)**		
1	Carbon %	37.66	40.3
2	Hydrogen %	4.08	4.47
3	Sulphur %	0.3	-
4	Nitrogen %	1.8	1.89
5	Oxygen (by diff) %	3.26	3.64
6	Moisture %	10	8
7	Ash	42.9	41.7
8	GCV, Kcal/kg	3100	3300
9	Grindability Index (HGI)	55.0	50
10	Ash Fusion Temperature	1350	1350

5. GENERAL PLANT REQUIREMENT

5.1. WFPS shall be designed to operate 24 hours per day and 365 days in a year.

5.2. The life span to be considered in the design, equipment and component selection shall be a minimum of 20 years.

5.3. For the design of the plant, it is necessary not only to consider the requirements of operation, but also, by suitably planning the layout, the convenience of inspection, cleaning, maintenance and repair.

5.4. In order to achieve the reliability, high efficiency and safe operation of the plant, it is also necessary to consider various precautions to safeguard the operating and maintenance personnel.

5.5. The design of the plant shall ensure that the plant can, in the state of normal operation, adapt itself to load, pressure with primary parameter variation within the allowable range of design.

5.6. Equipments installed outdoors shall be able to operate in all-weather conditions and to withstand the work site environment. For equipment in

operation or in standby that may be influenced by direct sunshine, shelter or cover shall be provided.

5.7. After award of work, before finalizing his layout especially the layout/levels of equipments cable/pipe routes and other services, the bidder shall carry out a site survey to identify the location & details of existing facilities that may interfere with his proposed facilities. He shall suitably modify his layout/levels to prevent dislocation of existing facilities without any commercial implication to the purchaser.

5.8. If during the execution of works it is found that there is interference with other facilities / structures, the Bidder shall revise his design/detailed drawings to clear the interference and shall provide all necessary measures for the safety of structures under construction. No claim in terms of cost or relaxation in time shall be entertained for any redesign, rework and for the safety measures provided. If at any stage of work, any dismantling or modification or relocation of any facilities is required to be done to complete the work in bidder's scope and which has been agreed by the Purchaser, the same shall be done by the bidder at no extra cost or time implication to the Purchaser. All such changes will be executed only after the proposed drawings and work plan are approved by the purchaser.

5.9. The Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the Bidder on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the Bidder at his own cost to the satisfaction of the purchaser.
The Bidder shall also take all necessary safety measures at his own cost, to avoid any harm or injury to his workers and staff from the equipment and facilities of the power station.

5.10. Supplies shall be rendered in conformity with proven design principles. The purpose of this contract must be fulfilled in its entirety and the maximum of reliability and economy guaranteed. All the components shall be so designed that repairs and overhauling is minimum and can be carried out easily in the shortest possible time.

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6. BIDDER'S SCOPE OF SUPPLY

6.1. The Water Based Water Based Fire Protection System (WFPS) of this project shall consists of the following major systems which are included in bidder's scope of supply and supervision of erection- commissioning:

6.1.1. Fire Water Pump House Equipments
6.1.2. Hydrant system
6.1.3. High Velocity Water Spray (HVWS) System
6.1.4. Medium Velocity Water Spray (MVWS) System
6.1.5. Other systems required to complete the package as per the intent of this specification.

6.1.1.1 **Fire Water Pump House Equipments**

Fire water pump house shall consist of main equipments such as hydrant and water spray pumps, jockey pumps, air compressors, hydro-pneumatic tank and diesel engines. All controls and interlocking for fire water pumps are PLC based and the Annunciation cum control panel for the Fire water pump shall be located in control room adjacent to firewater pump house.

Electrical interlocking shall be such that at any instance either the Jockey pump/Compressor or Main pumps would operate. Also when jockey pump starts the Air compressor will stop automatically.
Water for the Fire water requirement shall be tapped from two nos. Fire water storage tanks of adequate capacity as per TAC. Fire water make-up connection shall be from Clarified water P/H (for normal filling) & emergency tapping from raw water reservoir.
Tripping of fire pump(s) at low level is not allowed.

6.1.2.1 **Hydrant System**

Areas to be covered (within the battery limit):

a) Complete main plant (TG hall, boiler, ESP)
b) Transformer yard
c) Fuel oil unloading area and fuel oil storage tanks including dyke
d) Water treatment plant bldgs. / DM plant building
e) All auxiliary Pump Houses / CW pump house / Ash handling pump house
f) CHP plant including crusher house, junction towers, conveyor galleries, Coal pile, wagon tippler.
g) Ash Handling Pump House
h) All Switch gear rooms, MCC rooms, Control rooms.
i) All other auxiliary buildings including stores.

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j) Non plant bldg. Canteen, Administration bldg. etc. as per Plot Plan.
k) All other areas included within BHEL's battery limit.

6.1.3.1 **Automatic High Velocity Water Spray (HVWS) System**

Areas to be covered by HVW Spray System:-

a) Transformers located in the transformer yard
   - Generator Transformer
   - Station Transformer
   - Unit Auxiliary Transformers
   - Any other transformer greater than 10 MVA.
b) Main turbine lubes oil tanks, oil coolers & purifier unit.
c) Central lube oil tanks (both clean & dirty oil tanks) & its purifier units
d) Turbine oil canal pipeline in the main plant
e) Generator seal oil system, tanks, cooler assembly etc
f) BFP lube coolers & consoles etc.
g) Boiler burner fronts.

6.1.4.1 **Automatic Medium Velocity Water Spray (MVWS) System**

Areas to be covered under MVW Spray System:

a) Cable galleries / cable vault / cable spreader rooms in main plant building
b) Cable vault in ESP Control Room.
c) All Coal conveyor transfer points, crusher house and all the coal conveyor galleries & conveyor tunnel.
d) Fuel oil storage tanks (HFO tanks (2 nos.) / LDO tanks (2 nos.)
e) Fuel oil unloading P/H

NOTES:

1. All equipments connected with the above systems shall be ISI marked or from companies which carry ISO certification or FM/UL/Vds approved.
2. All deluge valves and spray nozzles used in the spray system shall be UL/FM/Vds approved.

6.2. Other Items Included in Bidder's Scope of Supply for Completion of E&C of complete Water Based Fire Protection System as per the intent of this document.

6.2.1. FIRST FILL OF CONSUMABLES

6.2.1.1. All the first fill consumables like lubricants etc. and replacements, if any, are in bidder scope till successful handing over of plant to BHEL and subsequently by

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BHEL to end customer after successful completion of erection and commissioning and /or site performance test.

6.2.1.2. Price of these items shall be construed to be included in the main package price. No separate price for the same shall be offered.

6.2.2. ERECTION AND COMMISSIONING SPARES:

6.2.2.1. All commissioning spares as required during erection and commissioning of the Water Based Fire Protection System is included in bidder's scope.

6.2.2.2. Bidder to ensure that all the spares are procured from the original equipment manufacturers (as per their recommendation) and shall make them available at site well before the start of commissioning activities.

6.2.2.3. All spares having a shelf life shall be dispatched to site only after completion of major erection activities. The dispatch schedule of these spares shall however be planned in a way that in doesn't delays any commission activity.

6.2.2.4. Bidder shall also ensure supply of all erection & commissioning spares along with main equipment as per his experience, for replacement of damaged or unserviceable ones during the execution of the project by bidder at site, to avoid delay in the project schedule.

6.2.2.5. Price of all the above items shall be construed to be included in the main package price. No separate price for the same shall be offered.

6.2.2.6. Any equipment not specifically mentioned above but required for satisfactory operation of complete Water Based Fire Protection System and to meet desired intent of specification shall be included in scope of supply of bidder.

6.2.2.7. Such requirements, if any, whenever noticed during any stage of order execution shall be deemed to be included in bidder's scope without any commercial implication to purchaser.

6.2.3. SPECIAL TOOLS AND TACKLES:

6.2.3.1. The bidder shall furnish a complete set of all special tools, wrenches etc. with necessary tools boxes as required for operation and maintenance of the system supplied, as a part of scope of supply.

6.2.3.2. All special tools and tackles which are necessary or convenient for erection and commissioning of the Water Based Fire Protection System shall be supplied at site by bidder. Price of these items shall be construed to be included in the main package price. No separate price for the same shall be offered

6.2.3.3. All the special tools and tackles shall be shipped in separate heavily constructed wooden boxes.

6.2.3.4. The list of special tools and tackles shall be furnished by bidder.

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3. All Tools and tackles required for dismantling, maintenance, adjustment, and calibration of the all the equipments that form part of Water Based Fire Protection System shall be supplied.
4. Bidder to note that if at a later stage the requirement of any other special tool & tackles is required for the Package, same has to be supplied by bidder without any delivery or commercial implication. Decision of the Purchaser regarding the requirement of any additional tools and tackles will be final and binding on the Purchaser.
5. All special tools and tackles shall be handed over to end customer warehouse / place informed by the Purchaser, prior to the issuance of the provisional acceptance certificate for the WFPS.

6.3. RECOMMENDED 3 YEARS SPARES:

6.3.1. The bidder shall quote separately with unit prices as optional price for the recommended list of spare parts for 3 years operation, with recommended quantities for the equipment covered under this specification.

6.3.2. Bidder shall furnish such a list with unit rate for each item along with offer.

6.3.3. Bidder to note that item shall not be considered for price bid evaluation to finalize the L1 bidder.

7. BIDDER'S SCOPE OF SERVICES

7.1. TAC APPROVAL

Obtaining TAC (or the authority presently having jurisdiction or as may be applicable) shall be in the scope of the bidder.

The system shall be designed for maximum insurance rebate.

All activities related to this including preparation of documents, furnishing clarifications, information etc. as and when required, till final approval is obtained, will have in bidder's scope.

All comments, modifications etc. suggested by the TAC / TAC accredited agency shall have to be incorporated by the bidder without any extra cost to the purchaser.

7.2. SUPERVISION OF ERECTION & COMMISSIONING:

7.2.1. Supervision of erection, commissioning performance testing & final handing over to end customer for the supplied system shall be included in bidder's scope of service.

7.2.2. Bidder to note that the supervision charges for erection & commissioning shall consists of the following:

- Per day supervision charges of an Engineer including all other expenses like boarding, lodging, local travel, insurance etc.

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- Travel expenses (inclusive of any clearance charges like Visa fee etc, insurance) from / to vendor works to site.

7.2.3. Per diem charges shall be applicable from the day bidder's person reaches site, up to the day he leaves the site.

7.2.4. For the purpose of tender a total no of 200 man days to be covered in 13 visits have been considered. However, either or both of the number of man days or no of visits may change on either side based on the actual site requirement.

7.2.5. All payments towards supervision of E&C shall be made only after BHEL-site supervision.

7.2.6. Bidder to mobilize concerned competent person for supervision of Erection & commissioning activities within a period of 7 days of receipt of intimation in this regard by BHEL.

7.2.7. Bidder to quote supervision of erection and commissioning activities strictly as per BHEL's price format.

7.3. LIST OF MAJOR SERVICES INCLUDED IN BIDDER'S SCOPE:

a. Detailed Engineering
b. Engineering for interfacing all inputs and outputs
c. Submission and obtaining approval of all engineering documents
d. Engineering for procurement
e. Preparation of all MTOs and MRs, as required
f. Ordering of all equipments and materials
g. Preparation of Documentation and obtaining owner/consultant approvals for the same
h. Overall Project Management and progress reporting to owner/consultant
i. Expediting suppliers and sub vendors
j. Procurement
k. Manufacture, fabrication and assembly at works
l. Inspection and testing including third party Inspection
m. Painting at works , painting at site including touch up paint
n. Dispatch and transportation of equipments, consumables, construction aids and other material to site.
o. Preparation of all fabrication drawings.
p. Furnishing activity wise work program and taking necessary approvals from the related department in the refinery before carrying out any activity. Any statutory approval, if required, shall also be taken.

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q. Supervision of erection and commissioning of the complete Water Based Fire Protection System.

r. Material Reconciliation

Material re-conciliation will be done jointly by Purchaser's erection office (BHEL-PSER) & Sub-vendor. Bidder to note that the payment towards the supply for any item will be made only after the completion of the material reconciliation activity at site.

Bidder to further note that no separate payment shall be made by Purchaser for material reconciliation activity (material reconciliation at site will not be considered as a part of supervision of E&C activity) & any price of this service will be deemed to be included in the basic price of supply of the package quoted by the bidder.

s. Mechanical Completion

t. Supply of consumables and spares during start up, pre-commissioning and commissioning.

u. Preparation of startup and operating manuals

v. Supervision of Pre-commissioning activities and rectification

w. Supervision of Commissioning and reliability run

x. Running of the Water Based Fire Protection System as per Purchaser / End customer's requirements till final handing over.

y. Successful Performance guarantee testing

z. Handing over the plant to the owner

aa. Coordination and statutory approval from government/non-government bodies/agencies

bb. Supply of all test reports /certificates

cc. Providing as built drawings

dd. Training of the Clients Engineering and Operating Personnel

NOTES:

6. Bidder to note that the above list is not exhaustive and any other service required as per the intent of this specification / project requirements /good engineering practice shall be deemed to be included in bidder's scope without any commercial implication to the purchaser.

7.4. Training To End Customer:

7.4.1. Prior to handing over of the system to Owner, the supplier shall provide operational training to Owner's operating personnel, which shall consist of control system operation, troubleshooting procedures, emergency procedures, safety requirements etc.

7.4.2. The duration of the training shall be for a minimum of seven working days.

7.4.3. The cost of all such training shall be included in the price quoted by the bidder.

7.5. After award of work, before finalizing his layout especially the layout/levels of equipments cable/pipe routes and other services, the bidder shall carry out a

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site survey to identify the location & details of existing facilities that may interfere with his proposed facilities. He shall suitably modify his layout/levels to prevent dislocation of existing facilities without any commercial implication to the purchaser.

7.6. Arrange for services of manufacturer's installation / commissioning engineer at site during mechanical completion / pre-commissioning & commissioning of all the major equipment and systems is included in bidder's scope. All the cost including that towards boarding, lodging, servicing, Insurance, Local Travel, Service charges etc. for arranging all the above visits shall be deemed to be included in the bidder's quoted price. Bidder shall not be eligible to raise any extra claim in this regard.

7.7. Bidder is also required to provide on the job training to Purchaser /End Customer's operation personnel by associating them in all the day to day pre-commissioning, commissioning and maintenance activities and process operations, however, responsibility for adequate manning the system shall be that of bidder. The cost of all such training shall be deemed to be included in the price quoted by the bidder. Bidder shall not be eligible to raise any extra claim in this regard.

7.8. MONTHLY RATES FOR MAINTAINING AND RUNNING PLANT:

7.8.1. Bidder shall quote Monthly rates for maintaining and running the plant at bidder's risk and cost till the plant is taken over by customer from BHEL (after handing over to BHEL subsequent to successful commissioning and conductance and acceptance of site performance test.)

7.8.2. All the required manpower ,consumable, maintenance spares etc. during such period shall be in included in bidder's scope of supply only.

7.8.3. Following shall be the minimum scope of work for the above.

Sl. No.	Item	By Bidder	By BHEL/ Customer
1.	Round the clock supervision, operation and maintenance of plant in three shifts as per the requirement of engineering in charge by deputing/deploying the required no. of operator at site to ensure continuous supply of water as per specified quantity & quality.	√	X
2.	Maintaining the log sheets of operation and present the same whenever asked for.	√	X
3.	All lubricants, lubrication and control oils, greases, filters, etc., required for the operation of the project.	√	X
4.	Spares required for the operation of the system during O&M period	√	X

Sl. No.	Item	By Bidder	By BHEL/ Customer
5.	Solving technical problems related to system operation	√	X
6.	Keeping the plant neat & clean	√	X
7.	Compliance to various industry safety measures	√	X
8.	Providing inputs like Instrument Air etc. for system as per specification	X	√
9.	Store room for keeping spares and consumables	√	X
10.	Independent sitting /monitoring arrangement for bidder's operators	X	√
11	Any other activity deemed necessary by Purchaser/End Customer for the safe and intended operation of the complete WFPS	√	X

NOTES:

7. Bidder to note that this is an Optional Item and shall not be considered for price bid evaluation to finalize the L1 bidder.
8. Bidder to note that this rate will be operated only after successful completion and acceptance of performance guarantee test and handing over the WFPS to Purchaser / End customer's.
9. Till the successful completion and acceptance of performance guarantee test and eventual handing over the WFPS to purchaser all activities & consumables towards the running and maintenance of the complete /Partly completed WFPS as per Purchaser / End customer's requirement shall be included in bidder's scope and no extra payment shall be made on account of this.

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8. CLARITY OF SCOPE IN OTHER AREAS (SCOPE MATRIX)

8.1. MECHANICAL

Sl. No.	Item	By BHEL	By Bidder
1.	Support structure for piping, cabling etc	No	Yes
2.	Insert plates for support of pipes cables etc	No	Yes
3.	Support structure like structural steel, anchor bolts, brackets etc [Supply / exhaust], piping, cabling, etc	No	Yes
4.	Pump house crane/lifting equipments (in Fire water pump house/Foam Pump House), Fire Tender and Safety equipments	Yes	No
5.	Wrapping and Coating of the pipes inside pipe trenches & in underground buried pipes	No	Yes

8.2. ELECTRICAL, CONTROL & INSTRUMENTATION SYSTEMS

SL. NO.	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1.	6.6kV / 415V Switchgear	BHEL	BHEL	1. 6.6kV / 415 V AC/240 V AC supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. DC supply (battery bank, charger etc) and any other supply as required for PLC/control panel (as applicable) shall be provided by vendor. 2. Interposing relays (RE 302 of Jyoti make or equivalent), if required for PLC and microprocessor based systems, shall be provided by BHEL in MCCs. Requirement of these relays shall be furnished by vendor during detailed engineering stage.
2.	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3.	Power cables, control cables and screened control cables for			1. Sizes and quantity of cables required shall be informed by vendor at contract stage (based on

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	a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL Vendor BHEL	BHEL BHEL BHEL	inputs provided by BHEL). Finalization of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Laying of cables by BHEL except for cabling in vendor scope. 3. Termination at BHEL equipment terminals by BHEL. 4. Termination at Vendor equipment terminals by Vendor.
4.	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	BHEL	
5.	Lighting	BHEL	BHEL	
6.	Cable trays, accessories & cable tray supporting system.	BHEL	BHEL	BOQ to be furnished by the vendor after award of contract.
7.	Below grade grounding system.	BHEL	BHEL	
8.	Conduit and conduit accessories for cabling between equipments supplied by vendor	Vendor	BHEL	Cabling shall be through conduits. However vendor can use the trunk route where available for laying of cables. Conduits shall be supplied by vendor and shall be medium duty, hot dip galvanized cold rolled mild steel rigid conduit as per IS: 9537. Makes of conduits shall be subject to customer/ BHEL approval at contract stage
9.	Equipment grounding & lightning protection	BHEL	BHEL	
10.	Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to customer/ BHEL approval at contract stage.
11.	Cable glands and lugs for equipment supplied by vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables.
12.	Recommended O & M spares, E & C spares, erection & maintenance	Vendor	-	

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	tools & tackle.			
13.	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
14.	a) Input cable schedules b) Cable interconnection details (diagram) c) Cable block diagram	Vendor Vendor Vendor	-	Cable listing for control cables for vendor-supplied equipment (soft copies in the BHEL cable schedule format) shall be furnished during detail engineering by vendor.
15.	Equipment layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipments requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Electrical equipment layout drawing shall be to BHEL approval.
16.	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

10. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
11. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

8.3. **CIVIL**

Sl. No.	Item	By BHEL	By Bidder
1.	Construction of Fire water pump house / Foam pump house including equipment foundation	Yes	No
2.	RCC trenches for pipe supports within the main plant area, TG hall to chimney & excavation and backfilling of earth for underground piping	Yes	No
3.	Pedestals, deluge valve housing, central hose station, isolation	Yes	No

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Sl. No.	Item	By BHEL	By Bidder
	valve chamber, all insert plates, anchor fasteners, clamps, tie rod, other metallic supports etc. for pipes running on pedestals for the complete plant		
4.	Construction of pedestals for the complete power plant WFPS Piping	Yes	No
5.	All civil buildings, Box Culverts/Pipe bridges for road/railway/cable trench/duct bank/drain/sewer lines crossing	Yes	No
6.	Excavation of soft soil and back filling after laying of pipes, ramming, leveling, etc, as may be necessary	Yes	No
7.	Construction of Deluge Valve foundation & sheds, as may be necessary.	Yes	No
8.	Construction of underground Valve Chambers, and foundation/support for aboveground valves, as may be necessary.	Yes	No
9.	Construction of sleepers wherever required, as may be necessary.	Yes	No
10.	Making openings in walls for and making them good after installation for the purpose of installing bidder's supplied items	Yes	No
11.	Grouting/fixing of all equipment including supply of grouting material, insert angle/plain frames in the walls, support structures, foundations bolts, anchor bolts etc	Yes	No
12.	Supply and fixing of framework	No	Yes
13.	Supply of vibration isolators / fixing hardware to be embedded / mounted on foundations	No	Yes

8.4. **TERMINAL POINTS**

8.4.1. **Mechanical:**

8.4.1.1. One no tapping with isolation valve each for Hydrant line & Spray line for Switchyard Protection shall be provided near to transformer yard for others (BHEL-TBG Group). Size of header for Hydrant System and Water Spray System shall be of Minimum 150 mm NB.

8.4.1.2. Tap off point for hydrant system shall be;
E – 100420.00
N - 79110.80
The tap-off point for Spray System shall be:
E - 100630.00
N-79110.80

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8.4.1.3. The terminal points for Foam Protection system shall be provided by the WFPS bidder with valve connections and with blind flanges nearest to Foam Pump house.

8.4.1.4. Suction line from each Fire Water Storage Tank (MS Tank) with a counter flange, stud nuts, isolation valve & gasket shall be provided by the WFPS bidder.

8.4.1.5. Recirculation/Testing line connection to each Fire Water Storage Tank (MS Tank) with a counter flange, stud nuts, isolation valve & gasket shall be provided by the WFPS bidder.

8.4.2. **Electrical:**

8.4.2.1. 6.6 kV Power Supply for Motor : At Motor terminals
8.4.2.2. LT Power Supply for Motors : At Motor terminals
8.4.2.3. LT Power Supply for Battery charger : At UPS panel terminals
8.4.2.4. LT Power Supply at Local LCP : At LCP terminals

8.4.3. **Control & Instrumentation:**

8.4.3.1. Interconnection cable between Main PLC panel (in Fire water pump house) and Main Fire Alarm Panel shall be done by others.
8.4.3.2. Interconnection cable between Main PLC panel (in Fire water pump house) and Plant DCS shall be done by others. However provision for the interconnection shall be available in PLC panel.

8.5. **EXCLUSIONS**

8.5.1. Storage, preservation of Materials/Equipments at site (however detailed storage and preservation procedure shall be furnished by bidder)
8.5.2. Erection and Commissioning (supervision of Erection and Commissioning is in the bidder's scope)
8.5.3. Construction of Fire Water Pump House and Booster Pump House

NOTES:

12. Counter flanges at all the terminal points is included in bidder's scope.
13. Isolation Valve at all terminal points is in bidder's scope.
14. All necessary supports cross over, approach ladder required for the proper erection and operation of all equipment supplied by bidder shall be included in bidder's scope.
15. All lugs, glands and termination kits for the equipments supplied by the bidder shall also be included in bidder's scope.

16. Bidder to furnish utility list with the offer indicating the requirements of the above services.

ADDITIONAL POINTS

GENERAL

1. Bidder shall note that Water Based Fire Protection System shall be offered on turnkey basis for areas specified, meeting specification requirements.
2. Bidder to note that bypass valves shall be provided across deluge valve.
3. Bidder to note that booster pumps shall be provided if required.
4. Bidder to confirm that there is no technical deviation from the tender specification no. PEMC-03843.
5. Bidder shall also note that the deviation in any form is not acceptable and same shall not be considered for review/ evaluation purpose / comments and it is assumed that the system/ materials/ equipments have been offered strictly in line with specification requirements.
6. Bidder shall confirm the requirement of vibration level, noise level as per specification.
7. Bidder shall confirm complete basis of design, all calculations, equipment selection criterion, layout drawings/schemes/G.A. drawings and documents like data sheet, technical particulars etc. shall be subject to CUSTOMER & or BHEL approval during detailed engineering stage.
8. Bidder shall confirm that all drawings and documents shall be AutoCAD based. For inputs from customer, BHEL will extend all efforts to get the same in soft copy, but there is no commitment about soft copy.
9. Bidder to confirm adherence to codes and standards indicated in the specification.
10. Bidder shall note that quality plan shall be subject to CUSTOMER & BHEL approval after award of contract i.e. during detailed engineering. All comments as given by BHEL/ customer shall be taken care by bidder without any commercial & delivery implication.
11. Bidder to comply with sub-vendor list enclosed with the specification. If any item is left over other than indicated in the sub-vendor list, sub-vendor name shall be furnished during detail engg. subject to BHEL/ customer approval. Non-acceptance of any sub-vendor by BHEL / customer shall not have any commercial & delivery implication.
12. Bidder shall include adequate necessary supports / frames as required for supporting the piping / equipments etc. on lump sum basis and no unit rates shall be applicable for these items. Bidder to note this and confirm.

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13. Bidder shall note that makes of equipments / items not specified in the enclosed sub vendor list shall be subject to CUSTOMER & BHEL approval during detailed engineering stage.
14. Materials required for earthings at the vendor-supplied equipments shall be included in the bidder's scope of supply.
15. Bidder to confirm that the performance guarantee of the equipments shall be as per data meeting specification requirements and system requirement.
16. Bidder to confirm acceptance to furnish drawings/documents as per the drawings/documents distribution as per project requirements.
17. Bidder to confirm that instruments required for performance testing of various Equipments / systems of the package shall be arranged by bidder at site without any cost Implication to BHEL.
18. Bidder to confirm that all instruments for testing shall be calibrated before taking up testing.
19. Bidder shall furnish one set of catalogue for equipment items offered for this package.
20. Bidder to furnish characteristic curves for all major equipments offered indicating duty point.
21. Bidder to confirm that entire Water Based Fire Protection System shall be subject to approval by TAC accredited agency to qualify maximum premium discount and responsibility to get approval from TAC Accredited agencies shall rest on the Bidder only.
22. Bidder to furnish the Hydraulic calculation from standard approved software subjected to approval from BHEL/customer.
23. Noise level near equipments at 1 m horizontal and 1.5 above floor level shall be max. of 85 dB.

Additional following points/clauses to be noted by the bidder:

1. Fire protection for switchyard area is beyond the scope/purview of this specification. Suitable tapping from nearest network of hydrant (two nos) and spray main (one no) shall be provided by the bidder with isolation valves.
2. The contract for entire Water Based Fire Protection System shall be placed on lump sum fixed prices based on tender specification. However, no commercial implicationshall be allowed due to any variation (addition/deletion) of the following:
   i) Change (increase/decrease) in dimensions of equipments/areas
   ii) Change in location of equipments/areas within the battery limits.
   iii) Change (increase/decrease) in quantities in the equipments/areas covered by different fire protection facilities
   iv) Due to type of soil

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v) Due to change in routing of pipe to avoid interference with underground facilities/unforeseen site interferences

Note: - Should there be any change in the scope from tender specification other than specified above, unit rate shall be applicable for addition/deletion.

3. Painting to suit environment for all equipments/items for this package shall be in the scope of Water Based Fire Protection System bidder.

4. Adequate/necessary supports/frames as required for supporting the piping/equipment etc. as lump sum basis is in the scope of fire protection plant bidder and no unit rate shall be applicable for these items.

5. Makes of equipment/items shall be subject to approval by Customer and or BHEL.

6. The minimum grade of concrete for the pedestals and pipe encasings shall be M25. The reinforcement shall be TMT bars of minimum grade Fe500D. The minimum founding level of pedestal footings shall be 1 m below the finished ground level. The pedestals shall be designed for the piping loads as per relevant IS codes. The maximum permissible net bearing pressure of 5 T/sqm shall be considered for the design of pedestals. All the road crossings shall be with cement concrete pipes of class NP3 with encasing. All the rail crossings shall be with cement concrete pipes of class NP4 with encasing.

7. BHEL informed pipe sizing for fire hydrant and water spray system shall be designed as per below:
a) At pump suction: max. velocity to be considered is 1.5 m/sec.
b) At pump discharge: max. velocity to be considered is 2.0 m/sec.
c) Outside piping (yard piping): velocity to be considered is 5.0 m/sec. (max) as per TAC.
Bidder Confirmed.

8. Pl. note that Hydraulic calculation shall be submitted strictly in Pipenet/ Flownet validated software's.

9. Pl. note that min. two nos. Deluge valves shall be provided for HVW spray system of Boiler burner Front i.e. one each at each side.

10. Pl. note that any crossovers, walkway, if required with in Fire water Pump House & Booster pump house building, shall be in bidder scope.

11. Pl. note that one no. tap-off point with isolation valve (minimum size of 200 mm NB) shall be provided for Air pre heater near boiler area & the minimum pressure available at terminal point shall be 8.0 kg/cm^2.

12. Pl. note that independent redundant UPS with one (1) hour battery backup shall be provided for each of local PLC system.

13. Pl. note that 240V, 1Ph power supply for IRD blower shall be provided by BHEL at one point. Bidder to lay a power supply cable for further working in its scope.

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9. TECHNICAL DETAILS:

9.1. Applicable Codes & Standards

9.1.1. The design, engineering, installation, testing, commissioning of the package shall be as per all relevant & applicable codes/standards, however specifically the following :

9.1.1.1. Tariff Advisory Committee (TAC) of India guidelines as below :

- Fire Protection Manual (Internal Appliances, Fire Engines, Trailer Pumps, & Hydrant System),
- Rules of Water Spray Systems,
- Rules for Automatic Sprinkler Installation,

9.1.1.2. BIS Codes for Fire Fighting Equipments

- IS 636 : Non percolating flexible firefighting hose.
- IS 884 : First aid hose reel for firefighting
- IS 902 : Suction Hose coupling for firefighting purpose
- IS 903 : Fire hose delivery coupling , branch pipe
- IS 2871: Branch pipe, universal ,for fire fighting purposes
- IS 2932 : Enamel , synthetic , Exterior
- IS 4927 : Unlined Flax canvas hose for fire fighting
- IS 5290 : Specification for landing valves
- IS 8423 Controlled percolating hose for fire fighting
- IS 8442 :Functional requirement for Stand Post type water monitor for fire fighting
- IS: 2026 -Power transformers
- IS:2026(Part I)-1977-General(first revision) with Amendments No.1to 3)
- IS:2026(PartII)-1977-Temperature -rise (first revision) with Amendments No.1 and 2
- IS: 2026(Part III)-1981 -Insulation levels and dielectric tests(Second revision) with Amendment No.1.)
- IS: 2026(Part IV-1977 -Terminal markings, tappings and connections (first revision) with Amendment No.1.)
- IS: 3700 -Essential ratings and characteristics of Semiconductor devices.
- IS:3700(Part I)-1972 -General(first revision)&(Reaffirmed IS:4400 (PartI) -1967,1988)
- IS:3700(PartII)-1972 -Low Power signal diodes(first & IS:4400(PartII)-1967 revision) (Reaffirmed 1988)
- IS:3700(PartIII)-1973 -Rectifier Diodes(First revision)&IS:4400(Part III)-1968 (Reaffirmed 1988)
- IS:3700(PartIV)-1968 -Low power small signal transistors& IS:4400(PartIV) 1981(Reaffirmed 1988)
- IS:3700(Part V)-1968 -Power transistors(Reaffirmed1988)

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- IS:3700(PartVI)-1968 – Switching transistors(Reaffirmed 1988)
- IS:3700(PartVII)-1970 -Reverse blocking triode thyristors & IS:4400(Part
- VII)-1970(Reaffirmed 1988)
- IS:3700(Part VIII)-1970 -Voltage regulator & voltage reference diodes (Reaffirmed 1988)& IS:4400(Part VIII)-1970
- IS:3700(Part II)-1984 -Light emitting diodes
- IS:8828-1978 -Miniature air-break circuit-breakers for AC circuits for voltages not exceeding 1000 volts(with Amendment No.1, Rs.1.50, and Amendment No.2)
- IS:9224 -Low voltage fuses.
- IS:9224(PartI)-1979 -General requirements
- IS:9224(PartII)-1979 -Supplementary requirements for fuses with high breaking capacity for Industrial application(with Amendment No.1)Superseeding IS:2208)
- IS:9224(PartIV)-1980 -Supplementary requirements for fuse-links for the protection of Semi conductor devices
- IS:4064 -Air-break switches, air-break dis connectors, air break switch-disconnectors and fuse-combinattion units for voltages not exceeding 1000V AC or 1200 V DC.
- IS:4064(PartI)-1978 -General requirements(first revision)(with Amendment No.1) (Superseeding IS:2607and IS:4047)
- IS:3070 -Surge arrestors for alternating current systems.
- IS:3070(Part I)-1985 -Non-linear resistor type surge arrestors(Second revision)
- IS:3070(Part II)-1966 -Expulsion type lightening arrestors(with Amendment No.1 (Reaffirmed 1977)
- IS:11548 -Capacitor for surge protection, above 650V
- IS:694-1977 -PVC insulated cables for working voltages upto and including 1100 volts(second revision) with Amendments No.1 to 3)(Amendment No.1, Rs.1.50)
- IS:3961 -Recommended current ratings for cables.
- IS:3961(Part II)-1967 -PVC insulated and PVC-Sheathed heavy duty cables(with Amendment No.1)
- IS:3961(PartIV)-1968 -Polyethylene insulated cables.
- IS:3961(Part V)-1968 -PVC-insulated light duty cables.
- IS:4800 -Enamelled round winding wires.
- IS:4800(Part I)-1968 -Conductor data (with Amendments No.1 and 2) (Reaffirmed 1978)
- IS:4800(Part-II)-1968-Maximum overall diameters (Reaffirmed 1978) (with amendment No.1)
- IS:4800(Part V)-1968 -Wires for elevated temperatures (with Amendments No.1 and 6) (Reaffirmed 1978)
- IS:4800(PartVII)-1970 -Wires with good dielectric properties under humid conditions(with Amendments No.1 to 3)(Reaffirmed 1978)

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- IS:4800(Part 12)-1986 -Self bonding wires, heat or solvent bonding enamelled round copper wire with temperature index 155.
- IS:1122-1985 -Dial, scales and indexes for indicating analogue measuring instruments.
- IS:1248(Part I)-1983 -Direct acting indicating analogue electrical measuring and their accessories: Part I General requirements(Second revision)
- IS:1248(Part II)-1983 -Direct acting indicating analogue electrical measuring instruments and their accessories: Part II Ammeters and Voltmeters (Second revision)
- IS:6236-1971-Direct recording electrical measuring instrument (Reaffirmed 1987)
- IS:3107-1974 -Portable multipurpose direct (Reaffirmed 1987) -acting electrical indicating instruments (first revision) (with Amendments No.1 & 2)
- IS: 2419-1979 -Dimensions for Panel mounted indicating & recording electrical instruments (first revision) (with Amendment No.1.)
- IS:8573-1977 -Digital electronic DC voltmeters and DC electronic analogue-to-digital convertors(with Amendment No.1) (Reaffirmed1991)

9.1.1.3. ANSI B 16.5 - Pipe flanges and flanged fittings.

9.1.1.4. NACE : RP-0169-97, RP-0285-95

9.1.1.5. BS : 7361 Part I-1991 (Formerly CP 1021-1973)

9.1.1.6. VDE: 0150, protection against corrosion due to stray currents from DC installations.

9.1.1.7. DIN :30676

9.1.1.8. Petroleum Act, 1976(Govt. of India., Corrosion control in Petroleum production TPC Publication No.5)

9.1.1.9. Statutory Requirements

9.1.2. Requirements of the following local statutory authorities (as applicable) shall be taken into account for compliance:

a. Factories Act
b. Indian Petroleum Rules
c. Tariff Advisory Committee (TAC) Guidelines (for Insurance purposes)

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d. Indian Boiler Regulation Act (IBR)
e. Civil Aviation Rules
f. Indian Railway Authority
g. Indian Electricity Act
h. Indian Electricity Rules
i. Central Electrical Authority (CEA)
j. NACE : RP-0169-97, RP-0285-95
k. BS : 7361 Part I-1991 (Formerly CP 1021-1973)
l. VDE : 0150, protection against corrosion due to stray currents from DC installations.
m. DIN : 30676
n. IEC/NEC : Relevant codes for Cathodic protection
o. Fire insurance regulations.
p. Regulations laid by Chief Electrical Inspector of State.
q. Regulations laid by Chief Inspector of Explosives.
r. Regulation laid by Factory Inspector of State.
s. Petroleum Act, 1976(Govt. of India., Corrosion control in Petroleum production TPC Publication No.5)
t. Director General, Factory Advice Service and Labour Institute, Bombay
u. Central Mines Research Institute (CMRI), Dhanbad
v. Department of Atomic energy
w. Requirement of Petroleum & Explosives Safety Organization (PESO), Nagpur, India.
x. Ministry of surface transport.
y. Department of Water Resources, Gujarat.
z. Stipulations stated in Environmental clearance granted by Ministry of Environment and Forest, Govt. of India.
aa. Liquid Effluent Discharge as per Minimal National Standards for Liquid effluents and air emissions confirming to Pollution Control Board Standards
bb. Stipulations of Environmental authorities of the State of Gujarat.
cc. Other legislations relating to Environmental protection such as (but not limited to) :
- Hazardous wastes (Management and Handling) Rules 1989.
- Water (prevention and control of pollution) Act, 1974
- Water (Prevention and Control of Pollution) Act, 1977.
- Environment (Protection) Act, 1986
- Forest (Conservation) Act, 1980
- Municipal Byelaws of Urban Development Authority of State Government for Buildings in Township.

dd. Pollution Control Board.
ee. Weights and Measures Dept.
ff. National Institute of Oceanology.

gg. Central/State Govt. regulations for ROU & land acquisition.
hh. National Highway Authority of India.
ii. Public Works Department (PWD).
jj. Forest Authority
kk. Imigration/Canal Authority

9.1.3. Latest edition of applicable codes/Standards/Statutory Regulations referred to in the Bid Document shall correspond to the edition as on the date of issue of bid.

9.1.4. All addenda including the latest addenda to all the above codes and standards (latest editions) shall be followed by the bidder.

9.1.5. In case of any conflict between this specification and above codes, standards and guidelines requirements, the most stringent requirement of these shall govern and the decision of purchaser in the resolution of the any such conflict shall be final.
It shall be bidder's sole responsibility to clearly bring out/highlight the same distinctively in his pre-bid queries, so as to enable purchaser to furnish their decision/clarification. If such issues/requirements are not duly addressed by bidder during the pre-bid stage and if such issues/requirements are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.

9.1.6. All materials supplied under this contract shall be new and unused. All equipments connected with the above systems shall be ISI marked or from companies which carry ISO certification or FM/UL/Vds approved. All deluge valves and spray nozzles used in the spray system shall be UL/FM/Vds approved. All monitors shall be UL/FM/Vds approved.

9.1.7. All equipment/items supplied shall conform to the provisions of statutory & other regulations in force in India and the State/Province where the project is executed, such as the Indian Factories Act, Indian Electricity (Supply) Act, Indian Electricity Act, Indian Electricity Rules, International Electric Technical Commission (IEC) Publication, Environmental Rules, etc. Obtaining of all permission and approvals from statutory authorities for the installation of the plant and machinery, and to ensure that the purchaser /end customer does not face any problems in future on account of non-conformance with these regulations as indicated above, shall be the responsibility of the bidder. All the legal formalities including preparation of documents, furnishing clarifications, information etc. as and when required, for obtaining any of the permissions and approvals related to the Water Based Fire Protection System will have to be done by the bidder.

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9.1.8. Any special approvals that may be applicable for certain items, like for explosion-proof items from CMERI-Dhanbad, etc., shall be have to be duly considered and ensured.

9.1.9. The bidder shall arrange, at his own cost, to keep a set of latest edition of above standards and codes at his office.

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10. DESIGN CRITERIA AND PHILOSOPHY

10.1. Design Data / Design Basis

10.1.1. **FIRE WATER PUMP HOUSE AND SOURCE OF WATER**

The main source of water to the fire pumps and jockey pumps shall be from raw water reservoir which shall feed two nos. Fire water MS storage tanks (supplied by others) located near Fire water pump house. The capacity of each tank is 2000 M^3.

EQPT. NO	NAME	NOS	DETAILS
H-M-01, H-M-02, H-M-03	Hydrant Main Pumps	3	Type: Horizontal& Centrifugal Pump set Capacity: 410 M^3/Hr Head: 105 MWC Drive -Electric Motor
H-D-01	Hydrant Diesel Pump (Standby)	1	Type: Horizontal& Centrifugal Pump Set Capacity: 410 M^3/Hr D Head: 105 MWC Drive - Diesel Engine
WS-M-01	Spray Main Pump	1	Type: Horizontal Centrifugal Pump set Capacity: 410 M^3/Hr Head: 105 MWC Drive -Electric Motor
WS-D-01	Spray Diesel Pump (Standby)	1	Type: Horizontal & Centrifugal Capacity: 410 M^3/Hr Head: 105 MWC Drive - Diesel Engine
JP-M-01 JP-M-02	Jockey Pumps	2	Type: Horizontal & Centrifugal Capacity: 40 M^3/Hr Head: 110 MWC Drive -Electric Motor
HPT-01	Hydro Pneumatic Tank	1	Capacity: 18 M^3
AC-01 AC-02	Air Compressors	2	Capacity: 40 M^3/Hr Discharge Pressure: 11.5 Kg/cm^2.

* Booster Pumps (1 W+1S) shall be provided if required.

10.1.2. 2 x 100% capacity basket type strainers located in the Spray discharge header downstream of water spray pump within fire water P/H shall be employed in the Water Based Fire Protection System installation to avoid any foreign particles in the spray system. Differential type pressure switch for basket strainer for annunciation purposes in clogged condition shall be provided.

10.1.3. The hydrant pumps and water spray pumps discharge headers shall be inter-connected with an isolation valve and a non-return valve so that hydrant pumps can feed to spray system, but reverse shall not be possible.

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10.1.4. Pressure switches shall be provided at discharge header of Hydrant & Spray line within the Fire water P/H.

10.1.5. Pumps shall be designed for continuous operation at its best efficiency point to meet the specific requirements of the system for which it is employed.

10.1.6. **Operational Philosophy for Hydrant & Spray pumps**

The pressurisation of feeding lines/ mains of both hydrant system and water spray system shall be done through the combination of hydro-pneumatic tank, Jockey pumps and air compressors. The system shall be kept pressurised at 10.5 Kg/cm^2 (g).
The hydrant & spray system mains/piping are normally pressurised up to 10.5 Kg/cm^2. Water leakage anywhere in the system shall cause a reduction in water level in HPT which in-turn cause's drop in pressure in the system.

The corresponding drop in pressure due to reduction in level is first taken care by the Air Compressors.

When the pressure in Hydro Pneumatic Tank (HPT) falls, pressure switch shall send signal to Air Compressor (AC-01) to start. If AC-01 fails to start, there will be further pressure drop in HP tank. This pressure drop is sensed by Pressure switch, which shall start the standby compressor (AC-02). The pressure switch will stop the Air compressor automatically, when the pressure reaches the system pressure.

The reduction in water level is sensed by level switch (LS) provided on HPT. This level switch is set at low levels i.e.1/3 will start (cut in) jockey pump (JP-01) and supply water to HP tank. In case the jockey pump (JP-01) fails to start due to any fault, the water level in HP Tank will further reduce. This further reduction in water level is sensed by LS at a preset level, which will cut in the standby jockey pump (JP-02) automatically. Jockey pump will cut-out automatically when the level of water in the HP tank reaches its higher limit.

In case of HPT pressure rises above the desired pressure level, pressure switch shall cut-in the HPT solenoid valve, thereby releasing the HPT pressure. This safety feature is provided to protect HPT from over pressurization during the pump running. Further to this safety shall be provided for HPT protection.
In the event of fire, pressure in the hydrant/spray system shall drop due to water loss. This, water loss in the first instance will be replenished by jockey pumps. Further reduction in pressure in the hydrant or spray line, a preset low set point, first electric driven pump of respective system shall start automatically. In case of failure of starting of above pumps, further reduction

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in the network pressure, will enable the commencing of subsequent pumps of respective system in a sequential manner through pressure sensing devices. Failure to start the pumps will generate an alarm. Pressure switches shall be provided for the pump operation.

Electrical interlocking shall be such that at any instance either the Jockey pump/Compressor or Main fire pumps would operate. Also when jockey pump starts the Air compressor will stop automatically.

Failure to start the pumps shall be indicated as an alarm.
Velocity of water thru' pipelines at pump's discharge header (within fire water pump house) shall be limited to 2.1 M/sec. to 2.5 M/sec. Hydrant Ring headers shall be designed with velocity not to exceed above 5 m/s as per TAC. Pipe size downstream of deluge valve shall be designed with velocity not to exceed above 10 m/s as per TAC.

All the pumps, both in hydrant system and water spray system shall be suitable for parallel operation.
Dual power supply (i.e. power from two sources) shall be provided for motor driven pumps.

10.1.7. HYDRANT SYSTEM

The pump head shall be so designed that when half the aggregate pumping capacity is being discharged at the farthest, hydraulically most remote, hydrant point and the other half in the most vulnerable area, a minimum running pressure of 3.5 Kg/sq.cm. is available at the farthest point, and the velocity of flow of water is generally not exceeding 5 m/sec. anywhere in the system (as per TAC).

Each loop shall be interconnected for better reliability of the system. To isolate the loop due to damage/ repair, suitable number of isolation valves shall be provided.

The operation of hydrant system shall be semi-automatic (starting of pumps shall be automatic; however, stopping of pumps shall be manual only).

Total number of outdoor and internal/fire escape hydrants shall be determined as per guidelines of TAC regulations. Similarly, number of branch pipes with nozzles and hoses shall be determined based on total number of outdoor/ internal hydrants. Necessary hose boxes containing two (2) lengths of 15 m. long hoses and branch pipes with nozzles shall be provided and located adjacent to each external hydrant & internal hydrant across main plant area. Hose cabinets containing two (2) lengths of 7.5 mtr, long hoses, nozzle

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and a branch pipe shall be provided and mounted adjacent to each internal & fire escape hydrant for offsite buildings.

For yard areas (outside main plant) external hydrants, hoses and accessories shall be provided in central hose stations located as per recommendation of TAC. Total number of hoses used on installation shall be Rubber impregnated woven jacketed type conforming to IS: 636 Type-II.

Water monitors as per the guidelines of TAC shall be provided in addition to hydrants for boiler area, ESP area, CHP area for the locations where water throw cannot reach with use of ground level hydrants including coal stock-yard and further fixed water monitors shall also be provided for coal conveyors/transfer points, etc having elevation 20 m or more.

Risers with landing valves/water monitors shall be provided for each of the transfer points, bunker floors, crusher house and track hopper/wagon trippler. Hydrant risers in staircases of other multi storeyed buildings, with internal hydrant at each landing, shall be provided with isolation valves.

All landings of boiler staircases, turbine buildings and other multi storeyed structures, coal handling plant transfer point etc., shall be provided with hydrant landing valves. For ESP areas / Tall buildings (having height greater than 20 m) /coal stock piles fixed water monitors will be provided apart from ground hydrant and landing valves. Coal conveyors at ground level shall be provided external ground level hydrant valves at required intervals. At locations where water cannot reach conveyors through ground level hydrants water monitors at required intervals shall be provided.

For fuel oil storage tank/dykes and fuel oil unloading area, double headed or single headed hydrants and fixed water monitors shall be provided. At least two water monitors and a hydrant valve shall serve each fuel oil storage tank. The monitor provided in the fuel oil handling area shall be dual type suitable for foam injection also. Each of the dual water monitors shall be provided with required foam supply/ apparatus approved suction equipments etc.

Air release valves shall be provided at the highest point in each wet riser.

Isolation valves (gate valves) shall be provided at suitable places in the ring mains to enable maintenance of any part of the ring main without affecting the balance part.

Hydrant piping in the main plant area (i.e. paved area) will be laid underground with RCC trench with pre-cast slabs covers and protected by means of wrapping and coating with 4mm thick corrosion protection tape. Outside the

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main plant area, the fire water pipes shall be running overground on the pedestals. Where ever road crossing, pipe shall be laid in RCC Hume pipe of NP-3 class. In case of fire water pipe crossing rails, it shall be laid in RCC Hume pipe of NP-4 class.

All hydrant valves shall be of stainless steel construction conforming to IS: 5290, Type-A.

Branch pipes shall be universal type (as per IS: 2871) for transformer yard area & straight jet type (IS: 903) depending on the location.

At least three hydrant ring mains shall be provided one ring for the main plant area (from transformer yard to chimney) & other ring for the area other than the main plant. If system requirement calls for additional ring main the same shall also be provided. Isolation valves between various ring mains shall be provided so that ring mains can be interconnected and water from any of the ring main can flow to other mains.

10.1.8. **Water Spray System**

The system shall be designed as per stipulations laid down in TAC manual for water spray system.

For system design of HVW & MVW spray system, followings shall be considered:

a) System shall be pressurised continuously to normal working pressure up to deluge valves.

b) The minimum running water pressure at any projector/spray nozzle in case of HVW spray system shall in no case be below 3.5 kg/cm^2(g) and shall not exceed 5.0 kg/cm^2(g). Similarly in case of MVW spray system it shall in no case be below 1.4 kg/cm^2 (g) and shall not exceed 3.5 kg/cm^2 (g). However for cable vaults/ cable spreader rooms and cable galleries, a minimum running pressure of 2.8 kg/cm^2 (g) shall be achieved at the hydraulically remotest nozzle/sprayer.

c) The location of wet pilot type deluge valve shall be kept away from the equipment to be protected. The water supply to the HVW spray system is controlled by deluge valve which shall be operated hydraulically and this valve normally closed by water pressure. The water pipe forms a ring around the equipment to be protected and quartzoid frangible bulb type detectors are mounted on this water line at selected places as per TAC norms. When the surrounding temperature rises more than the rated temperature of the detector, the detector quartzoid bulb

collapses and consequently the pressure in water line falls sharply. This fall of pressure opens the deluge valve and water starts projecting out from the projectors. Suitable detectors shall be provided for the oil tanks for initiation of HVWS system automatically. Local audible alarm is produced by water motor gong. No separate local push button units envisaged for the deluge valve.

d) Water requirement for Cable Spreader Room/Cable Vault and cable galleries shall be calculated considering three cable trays of a rack will be reckoned as a single tray. Water density for various surfaces shall be as per TAC / NFPA.

e) Wet type detection network employed for coal conveyors or any other equipment above 20m elevation from deluge valve, additional pressure switch shall be provided to actuate the deluge valve.

f) Sprayers/ projectors/ nozzles shall be arranged in the form of a ring around transformers and number of such rings/ tiers shall be decided considering maximum gap between two (2) consecutive tiers of rings shall be as per TAC. The distance of the deluge valves from the protected area / plant / equipment shall be 6 m. (min.) in line with TAC manual**.**

g) No. of nozzles/ sprayers/ projectors for any particular risk shall be selected considering the characteristics of nozzles provided and also the density of water needed to protect completely the risk as specified above.

h) Water spray systems yard piping's/ mains upto up-stream of deluge valve shall be sized based on velocity not exceeding 5 mtrs/sec. (As per TAC).

i) For areas having static heights above 28 meters. additional pressure switch on wet-detection line (inside the respective area protected) shall be provided for required interfacing and operations of solenoid valves to facilitate deluge valve operations.

j) A Strainer ('Y' type) & manual operated bypass valve (butterfly valve) incase of malfunction of deluge valve shall be provided for each deluge valve.

k) Pressure gauges at both upstream and downstream of deluge valves and in the detector pipe network shall be provided.

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l) Pressure switches shall be provided in spray and detector piping to exhibit "FIRE" and "SPRAY ON" annunciation and for interlock as well. Deluge valve open annunciation shall be included in the main fire alarm panel (supplied by others).

m) Spray piping in the main plant area (i.e. paved area) shall be laid underground with RCC trench with pre-cast slabs covers and protected by means of wrapping and coating with 4mm thick corrosion protection tape. Other than the main plant area, the pipes shall be running overground on the pipe pedestals. Where ever road crossing pipe shall be laid in RCC Hume pipe of NP-3 class. In case of fire water pipe crossing rails, it shall be laid in RCC Hume pipe of NP-4 class.

n) Facility for manual initiation of deluge valves locally, through hand operations (manually by operating the push button) shall also be provided.

o) Each of the outdoor deluge valves and its accessories shall be provided with deluge valve housing. (As per TAC)

p) Strainer wire shall be SS (AISI 316), 30 SWG, 30 mesh. Strainer area shall be at least 4 times the pipe cross-section at the pipe inlet, pressure drop across strainer in clean condition shall not exceed 1.0 kg/cm^2 at design flow of deluge valve.

q) The design features and make of all the projectors/spray nozzles shall be UL/FM or equivalent approved/listed.

r) Limit switch (open & close) for Deluge valves shall be provided for upstream & downstream isolation valve.

10.1.9. **LOCAL CONTROL PANELS**

CONTROL CUM ANNUNCIATION PANEL (CAP) - FOR FIRE WATER PUMP HOUSE & FOAM PUMP HOUSE.

The panel shall be PLC based and all controls of the firewater pump house equipments & foam pump house equipments (supplied by others) shall be controlled by PLC system.

The PLC panel shall have:
a) Required I/O cards
b) Redundant power Supply units
c) Redundant processor

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Control panel shall be having following features. The one no. PLC shall be located at control room within the Fire water P/H, which will take care the control aspects of system at Fire water P/H & Foam P/H. Remote I/O panel shall be provided at Foam Pump House.

However the details of I/O required for control & instrumentation of all foam pump house equipments shall be provided (by BHEL/Others) for Remote I/O panel during detail engineering stage.

Interconnection cabling between remote I/O panel to all foam pump house equipments are excluded from bidder's scope of supply.

A. Indication Lamps/Ammeter

i. Tripped, ON/OFF indication for motor driven hydrant pumps, spray pumps, jockey pumps, air compressors & ON/OFF Indication for diesel engine driven hydrant & spray pumps.

ii. Control Supply ON indication.

iii. Ammeter for motor driven hydrant pumps, spray pumps & jockey pumps.

iv. Healthiness of batteries/chargers, low level of fuel oil of diesel engine, low level/very low level of water supply system.

B. Controls

i. Control supply Main/Standby selector switch

ii. 1 no each Auto/Manual selector switch for jockey pumps, hydrant & spray pumps, air compressors, motorized valves, diesel engine driven hydrant & spray pumps.

iii. Start/Stop push buttons for jockey Pumps, air compressors.

iv. Breaker switches for Trip/Close function of the motor driven hydrant & spray pumps.

v. Accept, Reset & Test push buttons for Annunciation.

C. Annunciation windows for all major alarms

D. Each of the diesel engines shall be provided with batteries (2x100%) and battery chargers (2x100%). Battery of the diesel engine shall be automotive lead acid type and shall be large enough to crank the engine twelve times successively, each for duration of 10 sec. without any charging in between.

10.1.10. **INSTRUMENTATION & CONTROL**

All instruments i.e. pressure switches, pressure gauges, level switches, level indicators etc. as per approved drawings shall be provided.

10.2 Electrical design Parameters

1. Equipment design temperature (IS-9676) : 45°C
2. Minimum /Maximum Ambient Temperature : 5.6°C/ 47°C
3. Minimum temp for battery sizing : 10 ^{o} C
4. LT Motor Voltage: AC 415 V, 3 phase, 50 Hz (for motors up to 160 kW)
5. HT Motor Voltage: AC 6600 V, 3 phase, 50 Hz (for motors 160 kW and above)
6. Frequency : 50 Hz
7. Design voltage variation: +/- 6 %
8. Design Frequency variation: +/- 3 %
9. Combined variation (Voltage & Frequency) : +/- 10 %
10. Fault Level : 50 KA (1 sec) /105 KA (peak) on 415 V system

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11. WATER BASED FIRE SUB SYSTEM & EQUIPMENT DETAILS

11.1. FIRE PUMPS:

The pumps shall be horizontal centrifugal type.

The pumps shall be designed for continuous operation at its best efficiency up to 150% of rated flow to meet the specific requirements of the system.

Pumps shall have continuously rising head characteristic from its operating point towards shut-off without any zone of instability and power capacity characteristic shall be preferably non-over loading type. The pump shall be suitable for continuous operation up to 150 % of rated flow.

Pumps of each category shall be suitable for parallel operation.

Material of construction shall be as follows: -

Casing	-	Cast iron grade IS-210 FG260 with 2.5 % Ni
Impeller	-	Bronze, IS:318 GrIII, LTB2
Shaft	-	SS:410
Shaft Sleeve	-	SS: 410

The max. Speed of all main/stand-by pump(s) shall be 1500 RPM. However, max. Speed for jockey pump shall be 3000 RPM.

Pumps shall be capable of furnishing not less than 150% of rated capacity at a head of not less than 65% of rated head. The shut off head not exceed 120 % rated head.

11.2. MOTORS:

The motor shall be of continuous rating type and its rating shall be at least equivalent to the horsepower required to drive the pump at 150 % of its rated discharge as per TAC.

11.3. DIESEL ENGINE:

The diesel engine shall be of compression ignition mechanical direct injection type, capable of being started without wicks. It shall be capable of operating continuously on full load at site elevation for a period of six hours. The engine will accept the full load within 15 secs from the receipt of the signal to start.

The engine after correction for altitude and ambient temperature as per below:

(a) 3% for each 305 meter elevation above MSL

(b) 1% for each 5.6^0C rise in air temperature above 15.6^0 C

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The bare engine horsepower rating equivalent to the higher of the two values

a) 20% in excess of the maximum brake horsepower required to drive the pump at its duty point.
b) The brake horsepower required to drive the pump at 150% of its rated discharge.

Each of the diesel engines shall be provided with batteries (2 x 100%) and battery chargers (2 x 100%). The battery capacity shall be adequate for ten (10) consecutive starts without recharging with a cold engine under full compression.

Fuel pump (portable type) to fill up diesel oil from diesel drum. The pump has facility to operate by hand, in case electricity fails.
The diesel engine shall conform to all other TAC requirements.

11.4. **HYDRANT NETWORK (RING MAINS)**

11..4.1. Fire water network shall be analyzed for 120% of design water rate using "PIPENET" or other equivalent internationally accepted software.

11..4.2. The velocity in the system should not exceed 5.0m/sec. with minimum residual pressure at remotest point as 7.0kg/cm^2. Network shall be hydraulically so designed that when 50% of aggregate pumping capacity at farthest / hydraulically most remote point, and other half at most vulnerable area en-route, a minimum pressure of 3.5 kg/cm^2 is available at the farthest point and velocity does not exceed 5 m/s as per TAC guidelines.

11..4.3. For floating roof tanks, a case of roof collapse shall be considered and header around tank farm shall be sized accordingly.

11..4.4. The Hydrant network shall be divided into different ring mains, each serving various part of the plant.

11..4.5. All ring mains shall be suitably interconnected.

11..4.6. Hydrants or water monitors shall be located keeping in view the fire hazards at different sections of premises to be located and to give most effective coverage.

11..4.7. The ring mains shall be provided with adequate numbers of isolating valves with valve chambers, to obtain the best possible pressure at the seat of fire. This will also enable isolation of any damaged portion of the network when required.

11..4.8. The ring mains shall be laid in closed loops.

11..4.9. Number of hydrants shall be based on one hydrant or water monitor for every 30 m of external perimeter through the plant area.

11..4.10. Hydrants shall be located at a minimum distance of 15 M from the periphery of storage tanks or hazardous equipment under protection.

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11..4.11. Hydrants/monitors shall be generally located along road side berms for easy accessibility.

11..4.12. Monitor location shall be given special consideration for protection of cluster of towers, heaters and other high structures, where it may not be possible to approach the higher levels. A minimum of two monitors shall be provided for each such area.

11..4.13. Monitors and hydrants shall be located alternately around process units, so that monitors are available for the protection of inaccessible areas and tall structures.

11..4.14. Tower mounted remote operated long range monitors shall be provided for the protection of inaccessible equipments.

11..4.15. Fire hydrants and monitors shall be provided on elevated platforms of technological structures, Process building/ structure with loop to feed from two sides.

11.5. HYDRANTS

11..5.1. The Hydrant shall be stand post type.

11..5.2. Hydrant and Landing valves shall be as per IS :5290 Type A

11..5.3. 63 mm couplings shall comply to IS: 903 and lugs shall be twist release type.

11..5.4. All fire hydrant & landing valves shall be made of complete Stainless steel and shall be BIS marked.

11..5.5. All flanges for Landing Valve and base shall have all dimensions confirming to ANSI B 16.5, 150 lbs rating flat face and slip on type.

11..5.6. Each Hydrant shall be clearly and permanently marked with the followings:

a. Manufacturers name or trade mark
b. IS :5290
c. Year of Manufacture
d. Purchaser's Name

11.6. MONITORS

11..6.1. All monitors shall be non-aspirating type water cum foam Monitor with arrangement of Jet & Spray (Aqua fog/ foam).

11..6.2. The Water monitors shall have one 4" isolation valve.

11..6.3. The design and construction of Water cum Foam Monitor shall be single barrel type confirming to IS :8442

11..6.4. All water cum foam monitors shall be UL/FM/Vds approved.

11..6.5. Each water monitors shall be have nozzle bore size 38 mm & capacity 750 GPM capacity.

11..6.6. Monitors shall be made of Stainless steel -SS 304 constructions.

11..6.7. Monitors nozzles, locks, handles shall be made of stainless steel.

11..6.8. Pickup tube shall be made from PVC hose re-inforced with high tensile steel wire helix manufactured as per ASTM S1785 schedule 80. Pick up tube shall be

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3m long with dip pipe made of SS316 or SS304. Foam concentrate ball valve shall be SS316 /SS304.

11..6.9. Spring shall be SS304.

11..6.10. The monitor shall be self-locking type and capable of operated by a single person.

11..6.11. A foam inductor shall be provided behind the air intake chamber of the foam maker in the monitor. A flexible pick up tube of 3 M length having strainer at the inlet, shall be provided.

11..6.12. A drain connection of 15 NB size shall be provided near the base flange along with drain valve. The drain pipe shall be long enough to drain water away from the base flange.

11..6.13. The threaded end of the nozzle shall be hexagonal to facilitate screwing of the nozzle on the water barrel with nozzle spanner.

11..6.14. The Monitor shall be capable of discharging 2580 lpm of water and /or 15-20 m^3/minute of expanded foam at 7 kg/cm^2(at base flange of monitor)

11..6.15. The minimum horizontal ranges for water and foam jets shall be 55m and 50 m respectively at 7.0 kg/cm^2 pressure, 2580 lpm and 45^0 nozzle angle from horizontal plane in still weather condition.

11..6.16. Monitor shall be tested for minimum two directions at 0 degrees and second readings at opposite direction i.e. 180 degrees apart as specified above and average reading shall be considered as horizontal throw of the monitor.

11..6.17. The minimum vertical throw shall be 17 m and foam throw shall be 15 m for the monitor and shall be conducted at 45^0 degree nozzle angle form horizontal plane at 7.0 kg/cm^2 and 2580 lpm flow.

11..6.18. Projectile curves for the monitors showing horizontal and vertical throw for foam and water at angles 30, 45, 60 & 75 degrees nozzles angle from horizontal planes shall be submitted by the bidder.

11..6.19. None of the joints in the monitor shall be connected with permanent adhesive. No adhesive shall be used to arrest leaks or locking joint movement in threaded joints.

11..6.20. Remote operated long range foam monitors (1000 GPM and above) to fight tank fires shall be provided which should be of variable flow.

11..6.21. Anticorrosive Treatment and painting

a. All metallic components (except SS) subject to direct water or foam contact shall be hot dip galvanized, to a minimum thickness of 0.012mm.
b. The thickness of the coating shall be measured as per IS:5230
c. External surface and non-ferrous components shall be coated with Lead Tin Alloy by electrical deposition process.
d. Shades: Monitor steel part – Red, Nozzle: Yellow.

11..6.22. Each Monitor shall be clearly and permanently marked with the following:

a. Manufacturer's name or trade mark
b. Year of manufacture
c. Purchaser's name

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d. Discharge capacity in litres/minute
e. FM/ UL/Vds listing marks.

11.7. **HOSE**

11..7.1. Hose details including its flexibility , packing and marking shall be as per IS:636

11..7.2. Each Hose shall be clearly marked with the following:
a. Manufacturer's Name or Trademark
b. Month and year of manufacture
c. Type of Hose
d. Size of Hose
e. Length of Hose
f. BIS certification mark.

11.8. **HOSE REELS**

11..8.1. Hose reels shall be provided along with every landing valve. Hose reels shall be provided in all plant buildings.

11..8.2. Hose reels shall be hooked up to fire water header with an isolation valve.

11..8.3. Material , construction ,tests and all other requirements shall confirm to IS : 884, Type-A

11..8.4. Hose reel shall be RRL (reinforced rubber line) and shall be 40 m long with 20 mm / 25 mm bore size

11..8.5. Hose reel shall be capable of discharging not less than 24 lpm at the reel inlet pressure of 7 $Kg/cm^2(g)$.The horizontal range of water jet shall not be less than 6.0 m at the reel inlet pressure of 7 $Kg/cm^2(g)$

11..8.6. Hose reel shall be clearly and permanently marked with the following information along with Purchaser's name:
a. Manufacturer's name or trade mark
b. Year of Manufacture
c. The letter IS: 884
d. Length and size of tube carried on hose reel
e. Type of reel.

11..8.7. Hose reel valves shall be made of stainless steel.

11..8.8. Each hose reel shall have a jet/ spray/off nozzle.

11..8.9. Nozzles shall be shall be made of stainless steel (Gun metal/ brass parts shall not be used).

11..8.10. Each hose shall be connected permanently to the fire water supply via an isolation valve and shall be supplied with a suitable cabinet for wall mounting.

11..8.11. The reels shall be swing type.

11.9. **HOSE CABINETS**

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11..9.1. Hose cabinets along with hoses and accessories shall be provided at every alternate hydrant location/ every landing valve location.

11..9.2. Hose cabinet shall be BIS approved.

11..9.3. Hose cabinets (type-II) along with hoses (BIS marked) and accessories shall be provided at every alternate hydrant location and with every landing valve.

11..9.4. Hose cabinet shall be self-supporting type, suitable for outside installation. Necessary hangers and brackets for all accessories shall be provided.

11..9.5. MOC of Hose cabinet:

a. Cabinet shall be made of 18 gauge MS sheet suitably welded with double MS door frame glass covered.
b. Door shall be provided with standard Mortise type lock
c. Hammer shall be of MS with GI chain

11..9.6. Each Hose Cabinet Hose cabinet shall contain the following:

a. Two numbers of 15 M long delivery hose of 63 mm diameter
b. Stainless steel male and female coupling for the Hose
c. Two universal branch pipe
d. Stainless Steel triple purpose nozzle

11..9.7. Painting

a. The hose cabinet shall be painted with 3 coats of anticorrosive fire red paint confirming to shade no 536 of IS: 5 from outside and white from inside.
b. Paint shall confirm to IS :2932

11..9.8. Each cabinet shall be clearly and permanently marked with following:

a. Cabinet –Type-II
b. Instruction for use.

11.10. **RESTRICTION ORIFICE**

-

RO at Hydrant outlets shall be provided to reduce the pressure to: 7kg/cm^2
RO at tapings of water spray system to keep the system pressure in the range specified in the TAC.

11.11. **ISOLATION VALVES**

11..11.1. Isolation valves shall be provided at the following places:

a. In such a way that not more than 4 (four) hydrants are isolated at a time and at crossings (Junctions) to ensure easy maintenance and uninterrupted water supply in case of break down.
b. Shall be provided below monitor and at all hydrants and landing valves.
c. Shall be provided at all tapping points of all spray headers.

11..11.2. Isolation Valves shall be gate valve type.

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All isolation valve/cut-off valves shall be CI as per IS: 210, FG 260 body, with 13% Cr. SS stem & seating surfaces of gate valves as per guidelines/requirements specified in TAC.

All butterfly valves shall be CI as per IS: 210, FG 260 body, SS to AISI: 410 stem & seating surfaces of gate valves as per guidelines/requirements specified in TAC manual. All globe/check valves of sizes 50 NB and below shall be as per ASTM B62 / IS:318 Gr LTB2. These valves shall have screwed ends. All globe valves of sizes 65NB & above shall be CI valve confirms to BS:5152.

All check valves of sizes 65 NB and above shall be as per BS: 5312 (Part-I) CI as per IS 210, Gr. FG 260.

Valve shall have provision of locking arrangements in open and closed position.
All the flanges & counter flanges will conform to IS-2062 Gr. A Slip on (Dimension/Drilling as per ANSI B 16.5 Cl. 150./IS: 1538).

All valves shall be of minimum class of 150.

Strainer Body shall be as per IS:2062 (tested).

11.12. **LAYING OF FIRE WATER HEADERS AND BRANCHES:**

11..12.1. The Fire water header and branch lines shall be laid above ground on independent sleepers for offsite and utilities areas.

11..12.2. Hydrant piping in the main plant area (i.e. paved area) will be laid underground with rcc trench with pre-cast slabs covers and protected by means of wrapping and coating with 4mm thick corrosion protection tape. Outside the main plant area, the fire water pipes shall be running overground on the pedestals. Where ever road crossing, pipe shall be laid in RCC Hume pipe of NP-3 class. In case of fire water pipe crossing rails, it shall be laid in RCC Hume pipe of NP-4 class.

11..12.3. All above ground piping shall be painted with Fire red paint confirming to shade no 536 of IS:5

11..12.4. Pipes shall be laid on 100mm thick sand bed in FW trenches.

11..12.5. Provision of RCC Trenches, Removable pre –cast cover with sealing and sand filling is not included in bidder's scope. Bidder, however to note, that all the inputs for the same are to be furnished to BHEL within three months of receipt of order. Any such requirement informed by bidder after the stipulated period as above and for reasons not attributable to BHEL, will be summarily rejected by BHEL and the same shall be deemed to be included in the bidder's scope. Bidder shall not be eligible to raise any extra claim on account of this.

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11..12.6. RADIOGRAPHY: At least 10 % of all the welded joints shall be radio-graphically tested. At least 50 % of the welded joints selected for radiography shall be field joints

11.13. **WATER SPRAY SYSTEM**

11..13.1. Water spray system provided on all the hydrocarbon tanks, transformers, process equipment, cable cellar, Conveyors, Central Lube oil Tank, Turbine lube oil tanks, Boiler Burner fronts etc. and shall meet the requirements of TAC.

11..13.2. The rate of water applications & mode of operation shall be as per

Facilities	Mode of application	Rate of application
Hydrocarbon Storage tanks	Auto (Deluge system)	As per TAC, whichever is higher
Fuel Oil Unloading Pump house	Auto (Deluge system)	As per TAC, whichever is higher
Transformer	Auto (Deluge system)	As per TAC, whichever is higher
Cable cellar	Auto (Deluge system)	As per TAC, whichever is higher
Coal Conveyor Galleries, Conveyor transfer points	Auto (Deluge system)	As per TAC, whichever is higher
Main turbine lube oil tanks, oil coolers & purifier units	Auto (Deluge system)	As per TAC, whichever is higher
Central lube oil tanks (both clean & dirty oil tanks) & its purifier units	Auto (Deluge system)	As per TAC, whichever is higher
Boiler burner fronts	Auto (Deluge system)	As per TAC, whichever is higher
BFP lube coolers & consoles	Auto (Deluge system)	As per TAC, whichever is higher

11..13.3. Water spray on Hydrocarbon storage tanks shall be provided with two tapings, each for 100% flow from two different main headers.

11..13.4. Rim seal protection shall also be provided for all the TANKS

11..13.5. Water spray on every equipment, vessel, column, air fin cooler, within the process unit and transformers shall have one connection from main header for 100% flow.

11..13.6. While providing water spray on equipments/ vessels, special care shall be taken for the following:

a. To provide water spray on flanges of nozzle connected to equipments/ vessels.

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b. Isolation valve, strainer, deluge valve with upstream, downstream and bypass valve, drain valve, and RO shall be provided on automatic actuated water spray system.
c. Suitable break flanges shall be provided in the water spray rings for pumps, vessels, air fin coolers, transformers, tanks, columns etc. as per operation and maintenance requirement.
d. Low point drain shall be provided for water spray system on various equipments to avoid idle time corrosion of pipes.
e. The sprinkler flow rate shall be minimum 10 LPM

11..13.7. Material of Construction

Sl. No	ITEM	DETAILS
1.	Pipes and fittings	MS for mains and GI (HVY) screwed piping for spray system
2.	Spray nozzles	Brass to IS: 291 Gr-I/SS-316
3.	Deluge valves	CS
4.	Detector piping	GI

11.14. Auto Actuated Fire Water Spray System (HVWS) with pneumatic detection system (Deluge System)

11..14.1. HVWS system shall be provided for the following transformers:

a. Generator transformers - 2 Nos.
b. Station Transformers - 2 Nos.
c. Unit auxiliary Transformers – 4 Nos.

11..14.2. Auto actuated deluge system (water spray) with dry pilot trim shall be provided on oil filled transformers having oil capacity of 2000litres or more.

11..14.3. The detection network shall be pneumatic type (instrument air) with Quartzite bulb detectors (QBD). There should be provision for manual actuation of the system from Control Room and locally at site in addition to auto actuation.

11..14.4. HVWS extinguishes the oil-fires by forming an oil-water emulsification when sprayed on the oil-fire surface which does not support burning. It also cools the adjacent areas/parts of the equipment and provides exposure protection to such areas/parts.

11..14.5. HVWS system for each Transformer shall consists of dry type Deluge valve assembly (with pneumatic trim)

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11..14.6. Detection of fire is automatic by means of Quartzoid (Frangible) Bulb Heat Detectors (for mechanical fire detection). No automatic electrical fire detection system is envisaged.

11..14.7. The principle of working of the system is as follows :
Whenever there is a fire in any of the transformers, and the temperature near the quartzoid bulb (which is a glass bulb filled with a volatile fluid) rises above its set point temperature, the bulb/s burst, and the air in the detection line is drained out. This leads to a pressure unbalance in the deluge valve, and it opens allowing firewater to spray through the spray-nozzles.

11..14.8. Each of the detection line and the discharge of the deluge valve shall be provided with 1 no. of pressure switch – to give "Transformer In Fire" annunciation & "Deluge Valve Open" annunciation to the Central Fire cum Annunciation Panel (CFAP)(in the scope of bidder and to be located in the control room).

11..14.9. For emergency actuation or in case when automatic actuation has not occurred, a manual 'Emergency Release Device' in the form of a drain valve is provided to actuate the deluge valve.

11..14.10. Tapping for the HVWS system shall be taken from the nearest spray header.

11..14.11. Water spray on every transformer shall have tapings from two sides of main header.

11..14.12. HVWS system for other areas as listed shall be provided as per above principle:

a) Main turbine lubes oil tanks, oil coolers & purifier unit.
b) Central lube oil tanks (both clean & dirty oil tanks) & its purifier units
c) Turbine oil canal pipeline in the main plant
d) Generator seal oil system, tanks, cooler assembly etc
e) BFP lube coolers & consoles etc.
f) Boiler burner fronts.

11.15. Auto Actuated Manual Medium Velocity Water Spray (MVWS) system:

11..15.1. The Medium velocity water spray system shall be provided for the protection of following areas

a) All Cable galleries / Cable spreader rooms in Turbine Generator Building and ESP Building.
b) Underground portion of the coal conveyors and complete conveyor system.
c) Fuel Oil storage Tanks (LDO tanks and HFO tanks)
d) Fuel oil unloading pump house.

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11..15.2. In order to avoid total flooding of the area in the event of fire in a particular zone, the area shall be divided into number of zones. Each zone will have separate water supply network controlled by a deluge valve. The fire in the cable vault/gallery and coal conveyors will be detected by a detection system which will give an electrical signal for the operation of the deluge valve. In the event of fire in a particular zone, the deluge valve of corresponding zone and those of adjacent zone on either side shall be opened. The Bidder shall decide the number of zones. Water required for this system shall be tapped off from nearest spray water header. Opening of deluge valve will result in starting of pump. Fast acting butterfly vales shall be provided as a bypass to deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves. Isolation valves on upstream and downstream side of deluge valve shall also be provided.

11..15.3. The cable galleries will have number of rows of cable trays and each row will have number of tiers of cable trays. Each of the cable rows shall be provided with a network of water distribution piping and nozzles. The distribution network shall consist of distribution header for each row of cable tray and on these header drop pipes located at an interval not exceeding 3 metres shall be provided so as to cover all the tiers.

11..15.4. The MVWS system for underground coal conveyors shall be provided for both top and return conveyors. Hoppers and feeders shall also be covered. These conveyors shall be divided into number of zones. Operation of this system shall be in similar lines as explained for cable gallery.

11.16. ELECTRICAL SYSTEM

11..16.1. WIRING TYPE

Sl No	Area	Type of wiring
a.	Process plant / Building / Shed	Armoured cable
b.	Large service building	Surface conduit/Concealed conduit in office building
c.	Buildings with false ceiling	Surface conduit above false ceiling
d.	Substation (Switchgear Room)	METSEC channel/Concealed conduit
e.	Substation (Cable Cellar)	Surface Conduit/armoured cable
f.	Other buildings in safe area	Black enameled surface conduit/PVC

11..16.2. CABLE LAYING PHILOSOPHY

Sl No	Area	Details
a.	Offsite paved area	Above Ground cable tray on sleeper/

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		Overhead rack/RCC trench
b.	Offsite unpaved area	Above Ground cable tray (on sleeper/Overhead rack) /directly buried.
c.	Type of cable trays	Galvanized prefabricated
d.	Road Crossings for Underground cables	PVC Pipes /Cable culvert
e.	Road Crossings for Above Ground cables	Overhead cable bridge/culvert
f.	Walkways for overhead cable trays on pipe rack	I. Process area required II. Offsite areas required

NOTES:

11 Fire alarm cables shall be laid in overhead cable trays / instrumentation trenches as far possible. In case these are not available. Cable shall be laid along berm of the roads.

11..16.3. CABLE SIZE

The power and control cables shall have the following minimum cross sectional areas:

Sl No	Area	Details
a.	Medium voltage power cable	From 2.5 mm² up to 16 mm² -Copper, Above 16 mm² -Aluminium
b.	Control cables	2.5 mm² (Copper)
c.	Fire alarm system	1.5 mm² (Copper)

NOTES:

12 Fire alarm System cable sizes are indicative only and these shall be finalized as per the recommendations of equipment manufacturers. However minimum conductor size shall be as mentioned above.

11..16.4. LOCAL CONTROL STATION

11..16.5. Flameproof and/ or weatherproof control stations (IP-55) for Deluge Valve Operation shall be provided.

11..16.6. Provision for start addition to local/remote, Auto/manual selector switch as per operation requirements shall be provided.

11..16.7. Outdoor area Local control stations shall have canopies for additional weather protection.

11.17. INSTRUMENTATION

11..17.1. The design and installation of instruments shall be generally in accordance with ISA/API recommended practices and other applicable standards like BIS,

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IBR etc. Material specifications and practices shall, in general, conform to appropriate ASTM or equivalent standards.

11..17.2. All instruments and equipments shall be suitable for use in a hot, humid and tropical industrial climate in which corrosive gases and/or chemicals may be present As a minimum, all instruments and enclosures in field shall be dust proof and weatherproof to IP-55 as per IEC-60529/ IS-13947 and secure against the ingress of fumes, dampness, insects and vermin. All external surfaces shall be suitably treated to provide protection against corrosive plant atmosphere.

11..17.3. Instruments used in hazardous areas shall generally be intrinsically safe and shall be selected based on entity parameters, except for solenoid valves which shall be flameproof. If intrinsically safe item is not available for any instrument, then it must be flameproof.

11..17.4. Instruments shall be suitable for Zone 1 & 2 classified areas as applicable certified by a statutory body with gas grouping as per requirement. Additionally, Instruments shall be certified by PESO (Petroleum Explosive Safety Organization)/CCE (Chief Controller of Explosives), India. Also indigenous flameproof equipment shall comply with BIS requirement.

11..17.5. Following points must be considered while designing an intrinsically safe system: -

a. All intrinsic safety barriers shall be active isolating type and shall have isolation between input, output and power supply.
b. Barriers must be selected based on entity concept. Cable parameters shall also be considered while matching entity parameters.
c. The signal transfer accuracy of barrier shall be at least equal to or better than the transmitter selected.
d. Each instrument in the hazardous area and the intrinsic safety barrier shall be certified for intrinsic safety by a statutory authority.
e. Each input and output in a loop shall have separate barrier. No barrier shall be shared between two loops or input/outputs.
f. Any intrinsically safe loop requiring any device to be connected in the hazardous side permanently or temporarily shall also be intrinsically safe.
g. Configuration tools whenever required for any intrinsically safe item which forms part of the intrinsically safe item shall also be certified intrinsically safe.
h. Universal barrier with programmable capability shall be used for temperature inputs i.e. for thermocouple/RTD inputs.
i. It is desirable to use one make of barrier for entire plant. The series shall be of MTL / P&F or equivalent reputed makes.

11..17.6. Material of construction and end connection rating shall be as per piping material specification as a minimum.

11..17.7. Process switches, wherever specified, shall be provided with sealed micro switch contacts rated for the specified application. Contacts shall be 1 no.

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DPDT preferably. Otherwise 2 nos. SPDT can be considered. Contacts used in intrinsically safe applications shall be gold plated.

11..17.8. Smart transmitters where used shall be with an accuracy of ± 0.075% of span with a range ability of 10:1 unless specified otherwise. Hand held communicator shall be supplied for smart transmitters and fieldbus transmitters. All transmitters shall have minimum static pressure rating of 100 kg/sq.cm.g.

11..17.9. Threaded end connections shall be to NPT as per ANSI B 1.20.1. Flanged end connections shall be as per ANSI B 16.5.

11..17.10. All cable entries to junction boxes shall be from side or bottom.

11..17.11. Solenoid valves used in hazardous area shall be flameproof (Ex'd'). Solenoid coil shall be rated for continuous operation of the upper limit of supply voltage (i.e. rating shall be 110 V DC continuous). Class F rating for solenoid valves preferable.

11..17.12.

a. Following power supply voltage levels shall be used, unless otherwise specified:
   - For Instruments, Control Systems, 110 V AC± .10% (UPS) 50 Hz ±.3 Hz
   - Solenoid Valves, Relays, lamps 110 V DC± .10%
   - Input interrogation voltage .24 V DC± 10%
   - Panel/cabinets lighting 230 V AC ±. 10%

b. All instruments, control systems (PLC) shall be able to operate at the following power supply specification:
   - Voltage level: 110 V AC±10%
   - Frequency: 50 Hz ±3 Hz.
   - Switch over time: 5 milli seconds.

c. Any voltage level other than 110VAC UPS (including 24 V DC) if required for powering any subsystem, input interrogation, relays and lamps etc, same shall be generated by the bidder using dual redundant bulk power packs. The bulk power supplies shall be redundant and shall be sized for 35% loading of its capacity in normal time. In the event of failure of one of these supplies the load in backup power shall not exceed 70% of capacity of Bulk power supply (BPS).

11..17.13. **Signal Interface Philosophy**

11..17.13.1. Direct signals from field to control room and MFAP

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a. All signals from field to central control room/Satellite Rack Room (SRR) shall be terminated in the junctions boxes located at appropriate locations in the field.

b. Separate junction boxes shall be used for the following type of signals:

i. -Intrinsically Safe Analog Inputs/Outputs (4-20 mA)
ii. -Non Intrinsically Safe Analog Inputs/Outputs (4-20 mA)
iii. -Intrinsically Safe Thermocouple Inputs
iv. -Intrinsically Safe RTD Inputs
v. -Intrinsically Safe contact Inputs
vi. -Non Intrinsically Safe contact Inputs.
vii. -Non Intrinsically Safe contact Outputs.
viii. -Intrinsically Safe contact Outputs.

c. All pulsed signals or serial signals shall be routed directly to control room(s) without the use of intermediate junction boxes, in general. In case, where single cable length is a problem, intermediate junction boxes can be used, however in all such case, same junction box shall not share signals from two or more device.

d. Whenever multidrop serial communication is adopted, intermediate junction boxes may be used for multi-dropping purpose only.

11..17.13.2. Signals from bidder's scope to purchaser

a. Whenever signals are required to be routed for purchaser's use, bidder shall use separate dedicated junction box or terminal strip for each type of signal i.e for 4-20 mA/alarm/contacts/temperature element etc.

b. In case of serial signals, contractor shall provide a separate dedicated port for purchaser's use.

11..17.13.3. Repeat Signals from Sub-Package Local Panel

a. Generally separate junction boxes shall be used for interfacing signals from sub-package to control room.

b. Where signals as indicated in clause above is less in number and do not justify separate junction boxes, all such signals may be routed via local control panel if provided by bidder.

c. All such signals shall be terminated on separate terminal strips in the local control panel. The terminal strips shall be segregated as explained

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elsewhere. The non-intrinsically safe signals shall be provided in certified flame proof junction boxes in local panels.

d. Intrinsically safe barriers for all intrinsically safe signals, wherever required, shall be provided.

e. Repeat signal, which is a part of fieldbus segment, shall be repeated to LCP through remote indicator. Remote indicator shall be part of same segment, which the respective transmitter is connected in the same segment.

NOTES:

13 Generally locating barriers in the local panels shall be avoided.

11..17.14. BIDDER'S SCOPE OF SUPPLY AND INSTALLATION

Sl. No.	Description	Supply	Installation
1.	PANELS		
i.	PLC Panel	BY BIDDER	BY BHEL
ii.	Deluge Valve Local control panel	BY BIDDER	BY BHEL
iii.	Any other Panel as per this specification.	BY BIDDER	BY BHEL
2.	INSTRUMENTS		
i.	All field mounted instruments as per P&IDs and sub-package items	BY BIDDER	BY BHEL
ii.	Any other items required as per Bidder detailed engineering	BY BIDDER	BY BHEL
iii.	Remote panel/ cabinet mounted instruments (if applicable)	BY BIDDER	BY BHEL
3.	Junction boxes for the following:		BY BHEL
i.	For interconnection between field and local panels and remote panels	BY BIDDER	BY BHEL
ii.	For interconnection between field instruments and control room and any other areas instruments and equipments of Steam and Power Generation Package	BY BIDDER	BY BHEL
iii.	For 4-20 mA DC signals (intrinsic safe and non-intrinsic safe), two-wire, non-two-wire	BY BIDDER	BY BHEL
iv.	For Thermocouple/RTD signals	BY BIDDER	BY BHEL
v.	For contact signal	BY BIDDER	BY BHEL
vi.	For Interlock and Shutdown signals	BY BIDDER	BY BHEL
vii.	For FF field instruments (also including FF components like field barriers etc.)	BY BIDDER	BY BHEL
viii.	For any other signal not covered but required for completion of job	BY BIDDER	BY BHEL
ix.	Serial Links between field and control room (if applicable)	BY BIDDER	BY BHEL

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4.	Cables		
i.	Between field instruments and junction boxes & field instruments and local panel	BY BIDDER	BY BHEL
ii.	Between junction boxes and local panel.	BY BIDDER	BY BHEL
iii.	Between local panel and control room	BY BIDDER	BY BHEL
iv.	Cabling from substation /switchgear to control room and any other areas of Steam and Power Generation Package / field.	BY BIDDER	BY BHEL
v.	Serial link from PLC based control system to DCS in control room	BY BIDDER	BY BHEL
vi.	All types of system cables indoor/ outdoor for Bidder supplied systems	BY BIDDER	BY BHEL
vii.	All earthing cables and strips (GI / Cu)	BY BIDDER	BY BHEL
5.	Installation materials		BY BHEL
6.	Impulse tubing/ piping, tube/ pipe fittings, valves and valve manifolds	BY BIDDER	BY BHEL
7.	Cables, cable trays, cable glands and accessories	BY BIDDER	BY BHEL
8.	Instrument air valves and pipes, tubing, fittings etc.	BY BIDDER	BY BHEL
9.	Instrument Cable Ducts, RCC trenches, perforated trays, angle trays, structural supports, consumables for cable laying within the battery limits of Steam and Power Generation Package.	BY BIDDER	BY BHEL

11..17.15. **INTERLOCK AND SHUT-DOWN SYSTEM:**

Control panel / hard wired console instrumentation: Closed back, Non graphic, Console Type

Redundancy philosophy		
Controller Data Acquistion System	1:1 Redundant	
Communication sub system	1:1Redundant	
History	1:1 Redundant	
Powe supplies sub-system	1:1 Redundant	
Loading Philosphy		
Control Processor	60 %	
Communication Processor	50%	
Communication Bus	50 %	The maximum number of nodes in the network shall not exceed 70 % of the maximum capacity. There shall not be more than 80 closed loops per controller

11..17.16. **Power Supply Requirement**

		110V AC 50Hz.UPS	110V DC	24V DC See note below	110 V AC Non UPS	230 VAC 50Hz

a)	PLC	√				
	Solenoid valve		√			
	I/P , Transmitters Voltage			√		

NOTES:

14 24 V DC wherever required shall be generated by 110 V AC

11..17.17. **Signal type**

a) For Smart transmitters: 4- 20 mA DC with superimposed Digital Engineering Data (HART)
LCD display in Engineering Unit and % for level in field
b) Fieldbus : Foundation Fieldbus
c) Pneumatic : Signal 0.2- 1 kg/cm²g

11..17.18. Hazardous Area Protection:

a. Fieldbus system : field barriers
b. Field transmitters : Intrinsically safe.
c. Field switches : Intrinsically safe
d. I/P converters (wherever applicable: Intrinsically safe
e. Solenoid valves : Flame proof
f. Positioners : Intrinsically safe
g. Special instruments : Intrinsically safe
h. Analyzers etc. : Purged

NOTES:

15 If intrinsically safe item is not available for any instrument, then it must be flameproof. Hazardous Area protection is not applicable only for MCC I/Os. Intrinsic safe barriers: Required

11..17.19. **INSTRUMENT CABLES**

11..17.19.1. Single pair/triad cables shall be used between field instruments and corresponding type of junction box/ Local Control Panels/PLCs.

11..17.19.2. All the cables shall be Flame Retardant (FR) type. Fire resistant cables shall be used wherever specifically required.

11..17.19.3. Multi cables between junction boxes in the field and the Panels in the control rooms shall be as per following philosophy:

a. Signals: (4-20mA or switch contact) :6 / 12 pair individually and overall shielded (screened) and armoured, twisted, 0.5 mm^2 conductor.
b. RTD: 6 / 8 Triad individually and overall shielded (screened) and armoured, twisted, 1.5 mm^2 conductor.

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c. Solenoid valves: 6 /12 pair overall shielded, armoured, 1.5 mm2 conductor

NOTES:

16 Higher conductor size shall be selected to limit the voltage drop within the specified limit.

11..17.19.4. Fieldbus network cables between wiring/ terminal blocks and panels in control room / shall be individually shielded twisted pair overall screened cable, called Type A cable.

11..17.19.5. The color of outer sheath, inner sheath and individual core for each type of cable shall be as mentioned below:

Sl.No	Type of cable	Signal type	Outer sheath	Conductor +ve	Insulation -ve
a.	Signal	IS	blue	blue	Black
b.	Signal	Non IS	black	blue	Black
c.	Alarm /control/power	IS	blue	blue	Black
d.	alarm/control/power	Non IS	black	blue	Black
e.	extension cable	IS	As per IEC 60584-3		

NOTES:

17 Triad cable shall have blue, black and brown color.

11..17.20. **JUNCTION BOX**

11..17.20.1. The junction box shall be suitable for the type of signal and type of multicore cables used

11..17.20.2. The following types of junction boxes shall be used:

a. For all intrinsically safe and safe signals: Weatherproof junction boxes
b. For all input/output connected to explosion proof/flameproof instruments junction boxes : Explosion proof/flameproof
c. In addition separate junction boxes shall be used for DCS, PLC and/ or other system.

11..17.20.3. In general separate junction boxes shall be used for the following:

a. 4-20 mA DC signals (IS)
b. 4-20 mA DC signals (non-IS)
c. Thermocouples
d. RTDs
e. Contact signals [(Field switches push buttons etc (I.S)]
f. Contact signals [(Field switches push buttons etc (non I.S)]

g. Interlock and shutdown signals (Solenoid valves)
h. Power supply to various instruments

NOTES:

18 Separate junction boxes shall be provided for fieldbus instrumentation and non-field bus instrumentation.

11..17.20.4. 3-way junction boxes shall be used for connecting field transmitter and field mounted (remote type) analog indicator in series with control room receiving equipment.

11..17.20.5. Each JB shall be provided with 2 multi-cable entries with one plugged with weather proof plugs. Plugs shall be flame proof also in case of flameproof JBs.

11..17.20.6. Junction boxes, cable glands and accessories shall be weather proof if area classification is safe. Junction boxes, cable glands and accessories shall be weather proof and flameproof for flameproof instruments. Slipper type PVC sleeves shall be used over cable glands for all cable entries in junction boxes to avoid water entry in junction boxes.

11..17.20.7. One junction box shall be connected to one multicable only. The other cable entry shall be plugged.

11..17.20.8. The junction boxes in the field as well as local panels shall be provided with sufficient number of terminals to terminate all the pairs of multi-cable (including spare pairs) and shields of individual pairs as applicable.

11..17.20.9. The junction boxes shall have cable entries suitable for the multi and single cables used. 20% additional cable entries must be provided. Unused entries shall be plugged.

11..17.20.10. Junction boxes (JB) shall have the following features:

a. JB shall be either Weather proof type or Weather proof and flameproof type. No other type of junction boxes shall be offered / provided.
b. The enclosure shall conform to the following standards:
Weatherproof housing: IP 55 to IEC-60529/IS-13947
Flameproof housing: Flameproof/Ex (d) as per IEC-60079/IS-2148.
c. Junction boxes with top entries shall not be offered. The size of cable entries shall be as per the cable sizes.
d. Each junction box shall have spare entries as follows:
i) Minimum of 2 Nos. for 6P/12C JB
ii) 4 numbers for 12P/24C JB.
e. All spare entries shall be provided with plugs certified Exd for flameproof junction boxes.

11..17.21. **ELECTRICAL JUNCTION BOX**

a. The material of construction of electrical junction boxes shall be die-cast aluminium of minimum 5 mm thick (LM-6 alloy).

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b. Weather proof junction box shall have hinged type door with neoprene gasket, which shall be fixed to the box by plated countersunk screws.

c. Flameproof junction box shall have detachable cover, which shall be fixed to the box by means of cadmium plated triangular head/hexagonal head screws.

d. Flameproof junction boxes for signal, alarm and control shall have the following warning engraved/integrally cast on the cover:
"Isolate power supply elsewhere before opening"

e. Power junction boxes (junction boxes for power supply cable / distribution) shall have either the warning cast or shall have warning plate with following marking and shall be suitable for incoming armoured power cable up to 150 sq.mm conductor size:
"Isolate power supply elsewhere before opening".

f. Terminals shall be spring loaded, vibration proof, clip-on type, mounted on nickel plated steel rails complete with end cover and clamps for each row.

11..17.21.1. All terminals used in signal, alarm and control junction boxes shall be suitable for accepting minimum 2.5sq.mm copper conductor, in general.

11..17.21.2. Each junction shall have minimum of 30% spare terminal of those actually required to be utilized. Number of terminals for various types of junction boxes shall be as follows:
24 Nos. for 6 pair junction box.
48 Nos. for 12 pair junction box
36 Nos. for 6 triad junction box.
48 Nos. for 8 triad junction box.

11..17.21.3. Terminals shall be identified as per the type of input signal e.g all terminals for intrinsically safe inputs shall be blue while others shall be grey in color.
Junction boxes shall be provided with external earthing lugs.

11..17.21.4. The junction boxes shall have terminals suitable for the cable wire size and shall preferably be of Phoenix or equivalent make. All wiring/ terminal blocks used in FISCO service shall be orange in colour while other service shall be painted gray.

11..17.21.5. The multi cable entry for 6 pair Junction Box (JB) shall be 1" NPTF and for 12 pair/ 8 triad junction box, it shall be 1 1/2" NPTF.

11..17.21.6. Each junction box shall be provided with 2 multicable entries with one plugged with weatherproof, flameproof plug as required. Multicable entries shall be from the bottom whereas 1 pair/triad from the side.

11..17.21.7. One junction box shall be connected to one multicable only. The other cable entry shall be plugged.

11..17.21.8. The junction boxes in the field as well as local panels shall be provided with sufficient number of terminals to terminate all the pairs of multi-cable (including spare pairs) and shields of individual pairs as applicable.

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11..17.22. **GENERAL REQUIREMENT OF INSTRUMENTS**

11..17.22.1. Ranges for instruments shall be selected in general, such that in normal process operation the indication is between 40% to 60% of span for linear and 60% to 80% of span for square root inputs. The set range for field instruments shall be 1.1 times the maximum process value or 1.4 times the operating process value whichever is higher rounded to the nearest ten

11..17.22.2. All transmitters shall have an integral output meter. Remote mounted meters may be provided for specific applications.

11..17.22.3. Major instrumentation shall be electronic type with final control elements as pneumatic.

11..17.22.4. Electronic Instruments

a. All electronic instruments requiring separate power supply, shall generally operate on 24 V DC.

b. Electronic transmitters shall generally be two wire type. These shall have transmission/output signal of 4-20 mA DC and shall be capable of delivering rated current into external load of at least 600, When powered with 24 V DC nominal voltage.

c. Fieldbus based instrument shall be used in general. If FF transmitter is not available as standard, contractor may provide SMART transmitter. If Smart transmitter is not available electronic (microprocessor based) transmitter with 420mA output shall be used.

d. Fieldbus transmitter when selected, shall be digital, two-way, bus powered, multidrop communication link among intelligent measurement and control devices

e. All receiver instruments shall be microprocessor based and shall operate on voltage input of 0.25 to 1.25 V, 1 to 5 V, or 0 to 10 V DC, in general.

f. The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC 61000-4. All electronic instruments shall be immune to Radio frequency interference caused by Hand held Radios/ Radio stations/ Hands free systems/ Cell phone mobiles used in proposed wireless communication system.

g. Unless specified otherwise, the instruments shall have an over-range protection of at least 130% of range or maximum/ design pressure, whichever is higher, as a minimum.

h. The meter electronics shall be protected against transients induced by lightning and power supply surges. Transient protection of electronics shall preferably be provided in the terminal block. The transient protection shall meet the requirements specified in IEC-60587.

i. For flow meters which include transducer, preamplifier, transmitter, display unit, etc, contractor shall ensure that the input /output signals

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and performance characteristics of individual instruments are compatible with each other.

j. Terminals for electrical connections shall be clearly identified, and polarity shall be permanently marked. Electrical conduit entries shall have internal ½" NPT threads.

k. Peak to peak ripple and total noise level in the analog output signal shall not exceed 0.25% of the maximum signal.

l. The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC 61000-4 and shall be immune to RFI and EMI radiation.

11..17.22.5. Pneumatic instruments

a. Pneumatic Instruments whenever used shall operate on air supply of 1.4 kg/cm^{2}g and shall

b. They shall have transmission and output signal of 0.2 to 1.0 kg/cm^{2}g.

c. Instruments in oxygen and chlorine service shall be thoroughly degreased using reagents like trichloro-ethylene or carbon tetrachloride. All connections shall be plugged after degreasing process in order to avoid entrance of grease or oil particles.

d. Any gasket used in the assembly of the instruments shall be spiral wound type only with suitable filler material.

e. Compressed asbestos fibre (CAF) gaskets shall not be used.

11..17.23. **CONTROL PANELS**

11..17.23.1. All control panels shall be provided in pre-tubed/pre-wired conditioned and shall be completely tested at manufacturer's works prior to dispatch.

11..17.23.2. Control panels shall be free standing type and fabricated preferably from 2 mm thick cold rolled steel sheet shall be used for front side and all other side shall be 1.6 mm of CRCA.

11..17.23.3. Angle iron frame work shall use a minimum section of 50 x 50 x 4 mm angle.

11..17.23.4. The finish shall include sand blasting, grinding, chemical cleaning, surface finishing by suitable filler and two coats of high grade lacquer with wet sanding between coats. Two coats of paint in panel color shall be given for non-glossy high stain finish.

11..17.23.5. Panel face final color can be any of the following shades as per to IS-5 :

a. Opaline green : ISC No.- 275

b. Light Admiralty Grey : ISC No.- 697

c. Sky blue : ISC No.- 101

11..17.23.6. Panel rear interior surface, frame work and mounting plates shall have a finish color of pale cream to IS-5 ISC No.- 352 or Beige to IS-5 ISC No.-388.

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11..17.23.7. A final coat of paint shall be given at site. Equivalent color shade according to BS/RAL are also acceptable.

11..17.23.8. Control panel shall be open back with each section of typically 2100 mm high, 1200 mm wide and 800 mm deep, when mounted inside the control room on 100 mm channel base covering wall to wall, else these shall be totally enclosed cubicle type. The panel width may be increased if necessary.

11..17.23.9. Enclosed cubicle panels shall have removable hinged doors, generally at the back for easy maintenance and accessibility of the instruments. Doors shall be double leaved type with handle and shall be provided with lock and key. Adequate illumination shall be provided inside the panel. All light fittings shall be suitable for 230 V, 50 Hz AC.

11..17.23.10. No process fluid of any kind, except instrument air shall enter the control panel. Also power supply greater than 230 V shall not enter the local panel.

11..17.23.11. All cable entries to the local panel shall be from panel bottom only using cable glands of adequate size. Cable gland plate thickness shall be a minimum of 3 mm cold rolled cold annealed (CRCA) as a minimum. All unused cable entries must be plugged.

11..17.23.12. Space heater shall be provided where condensation is expected.

11..17.23.13. The design of control panel shall incorporate provision for expansion by installing adequate spare capacity. Each panel shall be designed to accommodate the following additional equipment, as a minimum;

- 20% of panel front/inside mounted instruments including lamps, push buttons, switches, relays etc.
- 20% additional power feeders each provided with switch fuse assembly.
- 20% additional spare windows in alarm annunciators.
- 20% spare cable entry points.

11..17.23.14. Panel layout shall be designed considering ease of operation. No push button or hand switch shall be located below 600 mm. Instrument Mounting heights, in general, shall be as follows:-

- Miniature and subminiature instruments (3 rows) Bottom row 1100 mm
  Middle row 1350 mm
  Top row 1600 mm
- Annunciators -1950 mm
- Electric push buttons/ Switches, lamps etc. -700 mm

11..17.23.15. The internal panel layout shall be designed considering proper approach for instruments, terminals and other accessories for maintenance, easy removal and online calibration. No instrument, terminals, power distribution box etc shall be mounted on the panel side plates inside the panel.

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11..17.23.16. All lamps, status as well as alarm, shall be provided with lamp test facility. One single lamp test push button shall be used for each panel.

11..17.23.17. Color Scheme

1	Status Lamps		
		On/Open/Permissive	Green
		Off/Close/Emergency	Red
2	Alarms		
		Normal/Pre-trip alarms	White
		Shutdown alarms	Red
3	Push/Pull buttons		
		On/Open	Green
		Off/Close	Red
		Emergency shut-down (ESD) (Push-button with cover/ Mushroom push button)	Red

11..17.24. **Panel piping & tubing**

11..17.24.1. Instrument air header shall be adequately sized with brass packless isolation valves and shall be complete with suitable dual filter-cum-air reducing station.

11..17.24.2. Panel tubing from the bulk head to the panel instruments and instrument air supply to the panel instruments shall be of 6 mm x 1 mm polyethylene tubing. The tubing shall be laid in plastic slotted ducts. Panel air header and tube fittings shall be of brass, suitably protected against corrosion.
Shut off valves shall be installed in all branch lines taking off the transmission and output signal. Each tube shall be identified at both the terminating ends.

11..17.25. **Panel Wiring**

11..17.25.1. Open terminals shall generally be avoided. Terminal strips shall be of 'Phoenix/ Wago/ Elmex' or equivalent type and shall preferably be mounted in an enclosure. Fused terminal may be used wherever necessary.

11..17.25.2. A minimum of 1 mm^2 multi stranded PVC insulated copper conductor shall be used in general. All wiring shall be laid in the PVC troughs. No trough shall be more than 70% full.

11..17.25.3. Wires carrying measurement signals associated with thermocouples, resistance thermometers, pH instruments and other low level signals shall be routed in separate troughs/wire ways and not alongwith power cables.

11..17.25.4. Power wiring and control wiring shall be separated by not less than 150 mm. The crossing, if unavoidable, shall be as close to right angles as possible.

11..17.25.5. Extension cables/wires shall be used for all thermocouple inputs.

11..17.25.6. Intrinsically safe wires, non-intrinsically safe and power cables shall be routed in separate wire ways, independently. Intrinsically safe wiring and terminals

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shall be light blue in color and shall be separated from non-intrinsically safe terminals at least by 50 mm.

11..17.25.7. Separate cabinets shall be considered for wiring/ termination of Fieldbus signals.

11..17.25.8. All incoming power feeders shall be terminated on separate terminals suitable for the incoming feeder size. These shall be located at the bottom of the panel and shall be suitably covered for protection against accidental shorting and for human safety.

11..17.25.9. Following design philosophy shall be followed while deciding the internal layout of panels:

1.	Distance between terminal strip and side of the panel upto 50 terminals width	100 mm (min.)± trough
2.	Distance between two adjacent terminal strips	100 mm (min.)±trough
3.	Distance between gland plate and bottom of the strip	300 mm (min.)
4.	Distance of terminal strip from instrument/trough/panel top	100 mm (min.)

11..17.26. LOCAL CONTROL PANELS

11..17.26.1. Local control panel for the package units shall be installed within the battery limit of the package considering operational and maintenance requirements and accessibility.

11..17.26.2. In case of skid mounted packages, panel shall be located away from the skid. In case local control panel is housed outdoor i.e. not in a local control room, it shall be designed to meet IP-55 requirements.

11..17.26.3. In addition, panel must be provided with a rain cum sun shade canopy/shed. Local control panel/panels shall be totally enclosed cubicles. Panel sizing shall be carried out based on equipment being installed keeping in view the maintenance clearances and easiness. Although the panel dimensions shall be guided by the actual requirements, typical dimensions of 2100 mm operational (height) x 1200 mm (width) x 1000 mm (depth) shall be kept in mind while finalising the panel size.

11..17.26.4. Local control panels located in the hazardous area shall be either purged type or flameproof Exd as finalized by the purchaser. In case pressurised panels are finalized the same shall be purged and pressurised as per NFPA-496 requirements to render space within the panel non hazardous. For panels located in IEC Zone 2 hazardous area type Z purging shall be used with a purge fail alarm in central control room. In case, panels are located in Zone1, the power shall be cut-off on pressurisation X-purge requirement of NFPA-496.

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An alarm shall be provided on local panel and a contact shall be provided for remote annunciation, whenever the panel pressurisation falls below 2.5 mm of H2O. A protective device to protect the panel from over pressure must be provided.

Panel pressurisation with start-up panel purging scheme shall be fully automatic however it shall be started manually from a push button. Solenoid valves and differential pressure switch required for panel purging shall be flameproof, however other items like relays, switches/pushbuttons, timers etc. shall be located in a flameproof housing. Other items like valves, restriction orifice plates, dual filter regulators, pressure gauges, variable area flowmeters etc required for pressurisation, shall also be located in the non-pressurised section of the panel

11..17.27. **SOLENOID VALVES**

11..17.27.1. Solenoid valves in classified areas shall be flameproof type and shall be rated for 110 V DC. All solenoid valves shall be certified weatherproof to IP-65 as a minimum, in addition.

11..17.27.2. The solenoid coil design shall be suitable for working continuously with the specified voltage levels.

11..17.27.3. Solenoid valves body material shall be SS 316.
Bidder shall categorically analyze selection with respect to cabling distance, type of cable, before finalizing make/model.

11..17.28. **PRESSURE GAUGES AND DIFFERENTIAL PRESSURE GAUGE**

- Pressure gauges shall be weatherproof to IP 55 as per IEC 60529 / IS 13947, as a minimum, with dial size of 150 mm and shall have screwed bezels.
- Pressure gauge sensing element shall be an elastic element like bourdon tube, bellow, diaphragm etc. of SS316 and movement of Stainless steel, as a minimum.
- The design of pressure gauges shall confirm to IS-3624.
- Case material shall be SS304 and vapor-tight.
- Dial markings and dial colour shall be as per IS 3624. The pointer stops shall be provided at both ends of the scale to restrict the pointer motion beyond 5% above the maximum of scale and less than 5% below the minimum of the scale.
- Pointers shall have external micrometer adjustment for gauge zero adjustment.
- Unless otherwise specified, the accuracy including repeatability and hysteresis shall be ±1% of full scale for Direct pressure gauges, ±2% of

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full scale for Chemical seal type pressure gauges and for Differential pressure gauges.

- Over range protector shall be provided.
- In case of pressure gauges with diaphragm seal, same shall be installed between the seal and the gauge.
- Snubbers/pulsation dampners/gauge sever of SS304 shall be used for all pulsating services. These shall be floating pin type, externally mounted and externally Over range protector and Snubbers, whenever used, shall be same as socket material, as a minimum.
- Where vibrations and pressure fluctuations are expected, Glycerin filled type shall be used. In case of vibrating services like pump outlets, flexible armored hoses shall be used in place of impulse piping and gauges shall be mounted on separate stanchions.
- Bourdon element shall be welded to socket and tip end shall be stress relieved.
- Pressure gauges with range as 0 to 100kg/cm2g and above shall have safety type solid front case.
- The pressure gauges shall have an over-range protection of at least 130% of maximum working pressure, as a minimum.
- Process connection shall normally be 1/2" NPTM bottom.
- Sensing element for Draft gauges shall be suitable to measure the draft ranges such as capsule, bellows.
- All pressure instruments shall be provided with 2-valve manifolds along with
  Prefabricated hook ups made of SS316.
- All Differential pressure gauges shall be provided with 3-way manifold of SS316. It shall be suitable for mounting on 2" pipe. Mounting accessories shall be provided with gauge.
- All differential pressure gauges shall be of magnetic piston type. Alternatively DP transmitter with local indication shall be provided.
- All gauges shall be provided with a blowout device i.e. blow out disc of aperture not less than 25mm for gauges with dial size 100mm and above, while 20mm for gauges with dial size less than 100mm.
- The process connection shall be 1½" flanged for all application except where line size is below 1", chemical seal type pressure gauges with ½"NPT connection are acceptable for 1" below line size.
- Receiver pressure gauges for local transmitter output indication shall have 100 mm dial with stainless steel element and 1/4" NPTM instrument connection.
- The dial cover shall be made out of shatter proof glass sheet of thickness 1.5 to 3mm for gauges with dial size less than 100mm while minimum 3.0mm for gauges with dial size 100mm or greater.
- The gauge socket shall be in one piece without any capillary or tube in between for bourdon tube type element and for others tubing with

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minimum bore of 3 millimetres is acceptable. Socket shall be welded type only.

11..17.29. **PRESSURE SWITCHES**

- Pressure switches shall have elastic element like diaphragm, bellow etc. as pressure sensing element of SS316 material as a minimum.
- Switch type shall be mechanical snap action sealed microtype with silver plated for non IS circuits and gold plated for IS circuitsc.
- Pressure switch with Reed type switches shall not be selected.
- Pressure switches shall be blind type with ½" NPTF process connection and shall be operative in full specified range. Set point shall be field adjustable. An
  indicating scale shall be provided for set point adjustment (with locking mechanism).
- Ranges for process switches shall be selected, in general, such that the set point falls preferably in the middle 30% of full adjustable range i.e. the set point shall fall between 35% and 65% of adjustable range.
- The switch differential shall be selected as per operating conditions, it shall be less than 60% of difference between set value and operating value and shall reset at 10% below the Set pressure.
- Repeatability shall be ± 1% of set range and Scale Accuracy: ± 1% of set value.
- Receiver pressure switches shall have SS316 bellows as measuring element with 1/4" NPTF connection.
- Requirements, design and selection of Over range protection, Over range protector, Snubber/ pulsation damper and, diaphragm seal (chemical seal) for pressure switches shall be same as indicated in pressure gauges.

11..17.30. **Instrument Valves and Manifolds**

a. Bidder shall provide instrument valves (miniature type) and valve manifolds wherever required.

b. Body rating shall be as per piping class or better. All valves and manifolds shall be forged type only.

c. For all valves and manifolds with body material of carbon steel/stainless steel, the valve trim material shall be SS316, as a minimum. For any other body material, trim material should be same as body material as a minimum. Superior trim material shall be selected as required by process conditions. Packing material in general shall be of PTFE. The o-ring materials wherever used shall also be of PTFE.

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d. Instrument Valves (Miniature) shall be of globe pattern needle valves forged/ bar stock with inside screwed bonnet, with back-seated blow out proof system.
e. Instrument Air Isolation Valves (Miniature) shall be full-bore ball type with forged body.
f. Instrument Air Needle Valves (Miniature) shall be globe pattern-needle valves.
g. For all these valves types, Body material shall be SS316.
h. End connection shall be ½"NPTF to ANSI B 1.20.1 for Instrument Valves (Miniature) and Instrument Air Isolation Valves (Miniature) and ¼" NPTF to ANSI

11..17.31. CABLES

11..17.31.1. All cables shall have PVC insulated primary insulation of 85°C PVC as per IS-5831 Type C. Thickness of primary insulation shall be 0.5 mm as a minimum. For PE insulated cables, primary insulation shall be of 70° C Polyethylene. Inner and outer jacket (sheath) shall be made of extruded flame retardant 90°C PVC to IS-5831 Type ST-2 and meeting flame retardant requirements for bunched cables as per IS 10810 (Part 62) category AF or IEC 60332 category A. Minimum Oxygen index of PVC shall be 30% at 27 °C ±2°C, temperature index shall be over 250°C, a rip cord shall be provided for inner sheath, Outer sheath shall be suitable for protecting the cable against rodent and termite attack.

11..17.31.2. All cables shall be fire retardant as per standard IEC 60332-3 Part 3 Cat.A. Fire resistance cables whenever specified shall be as per IEC 60331 Cat. A.

11..17.31.3. Following are the Specific Requirements for fire resistant cable:
a. The cables shall have circuit integrity as per IEC 60331.
b. Primary insulation shall be heat resisting elastomeric which can withstand temperature up to 90°C such as silicon rubber/mica glass tape/EPR (medium grade) as per IS 6380. Insulation thickness shall be 1.0mm minimum and shall confirm to IEC 60092.
c. A wrapping of tape made of PETP (polyethylene terepthalate)/woven glass shall be provided over core insulation.
d. Individual pair triad shall be shielded. The shield shall be aluminum backed by glass
e. Mica/PETP tape with the metallic side down helically applied with 25% overlap on either side and 100% coverage. Minimum shield thickness shall be as per IEC 60092. Drain wire shall be 0.5mm² (7/0.3mm dia), multi-stranded bare tinned annealed copper conductor. Drain wire shall be in continuous contact with aluminum side of the shield.
f. Inner and outer sheath shall be made of low smoke, heat resistant, oil resistant and flame retardant material with oxygen index over 30, temperature index shall be over 250°C. Acid generation shall be

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maximum 20% by weight as per IEC 60754. Smoke density rating not to exceed 60% as per ASTM D 2843.

g. The thickness of the sheath shall be as per IEC 60092. Inner and outer sheath color shall be orange. A rip cord shall be provided for inner sheath.

h. Armour bedding over inner sheath shall be of special high oxygen index, low smoke halogen free fire resisting compound.

11..17.31.4. The insulation grade shall be 600 V/1100 V as a minimum and shall meet insulation resistance, voltage and spark test requirements as per BS-5308 Part-2.

11..17.31.5.

a. All cables shall be armoured. Armour over inner jacket shall be of galvanized steel wire/flat as per IS-1554 part I. Requirement and methods of tests for armour material and uniformity of galvanisation shall be as per IS 3975 and IS 10810 (Part 40) respectively.

b. All the cores of single pair or multipair shall be twisted and numbers of twist shall not be less than 10 per meter.

c. The thickness of the sheath shall be as per IS 1554 part 1.

d. Tolerance in overall diameter of cable shall be within ± 2 mm over offered value.

e. Overall twist of all pair/triads shall be as per vendor's standard.

f. The cables used in installations under the jurisdiction of Director General of Mines and Safety (DGMS) shall meet all requirements of DGMS. The word “Mining Cable” shall be embossed on the cable outer sheath as per IS 1554 (Part 1).

11..17.31.6. For signal and control cables, inner sheath colour shall be black. Outer sheath colour shall be light blue for intrinsically safe application and black for others.

11..17.31.7. Maximum DC resistance of the conductor of the completed cable shall not exceed the
Following:

a. 12.3 O/km at 200C for cables with 1.5 mm2 conductor.

b. 39.7 O/km at 200C for cables with 0.5 mm2 conductor.

11..17.31.8. The mutual capacitance of the pair/ triad or adjacent cores shall not exceed 250 pF/m at a frequency of 1 kHz and between the pairs/ triads for PE Insulated cables shall not exceed 100 pF / metre at a frequency of 1 KHz. The capacitance between any core and screen shall not exceed 400 pF/ m at a frequency of 1 kHz.

11..17.31.9. L/R ratio of adjacent cores shall not exceed 40 µH / O for cables with 1.5 mm2 conductor and 25 µH / O for cables with 0.5 mm2 conductors.

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11..17.31.10. The drain wire resistance including shield shall not exceed 30 O/km. Electrostatic noise rejection ratio shall be over 76 dB.

11..17.31.11. A pair of communication wire shall be provided for multipair/multitriad cables. Each wire shall be 0.5 mm2 of plain annealed single or multi-strand copper conductor with 0.4 mm thick 850C PVC insulation. Insulation shall be green and red colour coded.

11..17.31.12. Bidder shall ensure a minimum of 20% of quantity of each type of cables provided as spare including any special cable. And in each multipair cables 20% pairs shall be kept as spare.

11..17.31.13. Running length of the cable shall be printed at least at every 1-meter interval.

11..17.31.14. For multipair/ multitriad cables, pair identification shall be provided with numbers at interval of not more than 250mm as per bidder's standard. The embossing /engraving shall be legible and indelible.

11..17.31.15. Signal Cables

a. Single pair shielded signal/alarm cables shall be used between field instruments/ switches and junction boxes/local control panels.

b. Multipair individually and overall shielded signal/alarm cables shall be used between junction boxes/local control panels and control room / satellite rack room as the case, in general.

c. The Type-I single pair/triad cables shall be 1.5mm^2 conductor size made of annealed electrolytic copper conductor of 7 strands with each strand of 0.53 mm diameter. Type-II Multipair/ Multi-triad cables with individual pair/ triad shield and overall shield with 1.5mm^2 conductor size shall have 7 strands of annealed electrolytic grade copper conductor with each strand of 0.53 mm diameter. Type-III (Multi-pair / Multi-triad cable with only overall shield) cable shall be same as type-II cable, except that the individual pair/ triad shall not have shielding. Type-IV Multi-pair /Multi-triad cable (with individual pair shield and overall shield) with 1.5 mm^2 conductor shall have 7 strand with each strand of 0.53 mm diameter. Type-V Multi-pair / Multi-triad cable (with overall shield only) shall be same as type IV except that the individual pair/triad shall not have the shielding.

d. Each pair/triad shall be shielded. Shield shall be aluminium backed mylar/polyester tape bonded together with metallic side down helically applied with either side having 25% overlap on either side and 100% coverage. Minimum shield thickness shall be 0.05 mm in case of single pair/ triad and 0.075 mm in case of multipair/ triad cable.

e. Drain wire shall be provided for individual pair and overall shield which shall be 0.5 mm^2 multi stranded bare tinned annealed copper conductor. The drain wire shall be in continuous contact with aluminium side of the shield.

f. All multi pair cables shall have 6 pair/12 pairs only while multitriad cable shall have 6 triads/8 triads only.

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11..17.31.16. CONTROL CABLES

a. Single pair control cables shall be used between field mounted solenoid valves and junction boxes/local control panels and shall meet the requirements specified above.
b. Multipair control cables shall be used between junction boxes/local control panel and control room mounted devices in general. These cables shall have only overall shielding.
c. These control cables shall have 1.5 mm2 conductor size with 7 stranded conductors of annealed electrolytic grade copper, with each strand of 0.53 mm diameter as minimum.

11..17.31.17. POWER SUPPLY AND OTHER CABLES

a. All power supply cables shall be as per IS-1554 Part I and shall have copper/aluminum conductors depending on conductor size.
b. Minimum conductor size shall be 2.5 mm2 of copper conductor.
c. For higher sizes, aluminum conductor can be considered.
d. All these cables shall be PVC insulated and armoured.

11..17.31.18. Cable Glands, Plugs and Reducers/Adaptors

a. All cables glands shall be of nickel-plated brass and they shall be double compression type suitable for armoured cables.
b. Flame proof glands wherever required shall be provided with Exd certification.
c. Bidder shall provide a minimum of 20% of cable glands as spare.
d. All cable glands shall be weather proof to IP-55.
e. Cable glands shall be NPT for all field items and junction boxes where as ET thread with check nuts for control room end.

f. Cable glands shall be provided to suit the cable dimensions along with tolerances. Various components like rubber ring, metallic ring, metallic cone and the outer / inner nuts etc. shall be capable of adjusting to the tolerances of cable dimensions.

g. Reducers / adapters shall be nickel-plated brass, as a minimum. These shall also be weatherproof and / or flame proof wherever specified and certified for the electrical area classification specified.

h. Plugs shall be of nickel-plated brass and shall be certified flameproof when used with flameproof junction boxes.

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11.18. PROGRAMMABLE LOGIC CONTROLLER (PLC)

11..18.1. This specification covers the Design, Manufacture, Assembly, Inspection and Testing at manufacturer's works, proper packing and delivery to site, supervision of erection and commissioning of the PLC Control & Monitoring System comprising PLC Control panel/Remote I/O panel (housing Processors, I/O cards, power supply packs etc.), Operator workstations(OWS), Printers, Annunciation system, UPS, cables and all other equipments and accessories required for completeness of the system as mentioned in different sections of this specification.

11..18.2. **General**

11..18.2.1. The PLC shall perform protection logic, interlock and sequential control functions such as binary logic operation, set/reset operation, timers, counters, logic blocks, math functions, input quality checking engineering unit conversion, Boolean functions & PID control (Analog logic function).

11..18.2.2. The system shall be redundant in processor, power supply and communication interfaces unless otherwise specified. The system shall have self-diagnostic features. The control of all drives and equipment shall be effected through the keyboard/mouse / panel mounted push button / control switches as per Data sheets-A&B.

11..18.2.3. The system shall have facility for connecting to Main Plant's Distributed control system (DCS) using hardware / software interface for two-way transfer of signals.

11..18.2.4. The mimic shall be displayed on the OWS screen and may also be provided on the control desk/panel (as per Data sheets).

11..18.2.5. In case OWS is provided, HMI functions like Trends, Curves, Bar charts, Historical storage of Data, Logs and reports etc. shall be provided in addition to Plantschematics. The necessary catalogue / literature elaborating the features of HMI shall be supplied along with the bid.

11..18.2.6. It shall be possible to use the same OWS as programming station.

11..18.2.7. The PLC system shall be sized to meet process/system requirements as per the approved P&IDs and Control write-up.

11..18.2.8. The PLC system shall be designed to ensure that no single device failure should result in failure of any other device.

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11..18.2.9. Signal multiplication where required shall be done in PLC. Use of relays for multiplication of contacts (for control, monitoring and alarm) is not acceptable. The control/ monitoring components on the control panel/ desk shall be driven through I/O modules.

11..18.3. **Technical Requirements**

Details of various PLC system components shall be inclusive of but not limited to the following:

11..18.3.1. CODES AND STANDARDS

The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, IEC, NEC & IS.
PLC shall conform to IEC: 1131
The offered PLC shall comply with safety standards as per Data sheet-A&B.

11..18.3.2. CONTROL PANEL

PLC control panel shall be freestanding type with provision for mimic display, pushbutton stations, control switches, indicating lamps, metering instruments like Indicators, ammeters etc. and facia windows for critical alarms.

The salient features of construction shall be:

Sheet material: Cold rolled sheet steel
Frame thickness: Not less than 3.0mm
Enclosure thickness: Not less than 2.0 mm for load bearing sections (mounted with instruments) and Not less than 1.6 mm for others
Gland plate thickness: 3.0mm
Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.

Each panel shall be identified by a name plate, which shall be of non-rusting metal or three ply lamicold, with engraved lettering.

25 x 6 mm Copper ground bus to be provided for each panel.

240V AC single phase, thermostatically controlled space heaters shall be provided.
Each free standing panel shall have a door switch operated fluorescent lamp and a 240V AC plug point.

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Painting treatment shall be as per IS: 6005. Two coats of lead oxide primer shall be followed by powder coating. Paint shade shall be as specified in the "Data sheet for PLC system"-Data Sheet-A&B.

The annunciation system shall be facia window type, driven by the PLC. Audible alarm, Acknowledge, Reset and lamp test facility shall be provided as per ISA sequence – S18.1, M.

11..18.3.3. PROCESSORS

The microprocessors shall be 32 bit, and Hot redundant.

Hot redundancy: PLC shall be provided with two processors (Main processing unit and memories) one for normal operation and one as hot standby. In case of failure of working processor, there shall be an appropriate alarm and simultaneously the hot standby processor shall take over the complete operation automatically. This transfer from main processor to standby processor shall be bump less and shall not cause any disturbance whatsoever. In the event of both processors failing, the system shall revert to fail safe mode. It shall be possible to keep any of the processor as master and other as standby.

An authorized forcing facility shall be provided for changing the status of inputs and outputs, timers and flags to facilitate fault finding and other testing requirements.

The standby processor shall be updated automatically in line with the changes made in the working processor.

In the event of any replacement of the processor, synchronization of the replaced processor shall be automatic upon live insertion.

The cycle time for input scanning, execution of logics, overheads and output scan shall not exceed 120 m sec.

The processor & memory shall be loaded up to 50% at normal conditions and maximum up to 60% under worst loading conditions.

The memories shall be field expandable.

11..18.3.4. INPUT / OUTPUT Modules

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Input/output card assignments shall be modular i.e. no single card shall be assigned with more than one drive of a particular sub-system. The maximum number of channels per I/O module shall be as follows.

_ Analog Input Module: 16
_ Analog Output Module: 16
_ Binary Input Module: 32
_ Binary Output Module: 32
_ Analog Input/output combined: 16
_ Binary Input/output combined: 32

On line I/O replacement: All I/O cards shall have quick disconnect terminations allowing for card replacement without disconnection of external wiring and without switching off the power supply.

10% spare capacity shall be ensured in each card channel assignment. Overall minimum 20% spare channels shall be provided.

Output command to MCC/Switchgear shall be through coupling relays. In case coupling relays are located in PLC Panel, the same shall be in PLC vendor's scope of supply.

Status feedback from MCC shall be in the form of potential free contact.

11..18.3.5. DATA BUS/ I/O BUS

The Data bus connecting PLC and HMI work stations shall be TCP/IP on Ethernet.

The Data bus and I/O bus communication medium shall be twisted pair shield copper conductor for indoor locations and those areas not subjected to induced signals. Repeaters/signal amplifiers shall not be used. Copper conductor cable used shall be Category-5 or better. The communication medium shall be Fibre optic cable in the event any portion of communication cable run is in outdoor or where distances are beyond 500 meters.

11..18.3.6. OPERATOR WORK STATION (OWS)

The OWS and Keyboard shall be desktop mounted and shall be used for controlling, monitoring and programming function.

Colour CRT(s) with keyboard and mouse shall be given. CRT shall have graphic display facility.

The OWS shall be with Windows based operating system having necessary

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Engineering/Configuring software.

11..18.3.7. COMMUNICATION WITH PLANT DCS

The PLC system shall be provided with hardwired/serial interface for communication with plant DCS.

Serial communication to / from DCS where provided shall be engineered to ensure that signal communication time from / to DCS shall not exceed 1 seconds for control / feedback.

Serial communication to DCS shall be OPC (Data access 2.0), Ethernet based TCP/IP Protocol. Alternatively the serial communication shall be MODBUS protocol on RS 485 network.

Data transmitted from PLC to DCS shall include all information necessary for the DCS graphic displays to monitor and control the process equipment and PLC. Such data may include pertinent analog and digital status information, interlock, alarms and maintenance conditions. Data transmitted from DCS to the PLC shall include necessary signals to provide operator control interface from DCS for the process/ equipment being controlled by PLC.

Bidder to include 'Light interface units, converters, Ethernet switch, accessories at PLC end for connectivity to other system. The bidder's terminal point shall be Ethernet port in case of copper medium connection to DCS or LIU in case of Fiber optic medium for connectivity with plant DCS. In case distance between PLC & DCS is greater than 1.8 Km, single mode of optical fiber cable with compatible accessories shall be used. For distance less than 1.8 Km multimode optical fiber ports shall be used.

11..18.3.8. POWER SUPPLY Scheme

PLC Panel and I/O Cabinets: PLC system shall be provided with 2x100% UPS fed from Two Nos. redundant 415V, 3-ph feeders, as per the Typical UPS scheme, Drg No. 4-38101-03202. Each UPS shall have 30 minutes back up. Input feeder failure shall be monitored in the PLC system. Necessary redundant power pack and transformers shall be provided (in the PLC panel) to derive the power supply for control desk, PLC panel and input / output cabinets etc.

Remote I/O panels: Similar power supply arrangement as for PLC panels shall be provided if it is not possible to extend the power cable form UPS of PLC panels.

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Each OWS and associated HMI peripherals shall be provided with a feeder from either one of the UPS.

11..18.4. **DRAWING/DOCUMENT AND DATA TO BE FURNISHED AFTER AWARD OF THE CONTRACT:**

- For Approval:
- PLC system configuration drawing along with functional write-up
- Input/Output signal list
- BOM of PLC
- List of PLC controlled devices
- Control panel/control desk GA drawings
- Control desk/panel component layout drawing
- Control panel/control desk Foundation detail and cutout drawings
- Power distribution scheme
- Block logic diagrams
- Annunciation list
- PLC control room layout drawing
- List of soft signal exchange with Plant DCS
- List of mandatory spares
- Quality plan
- CRT display
- Power supply scheme for PLC system, HMI & peripherals, Remote I/O etc

4.2. For Information:

Cable schedule and cable interconnection drawing (in BHEL approved format)

  - Between Field and PLC
  - Between Field and MCC
  - Between MCC and PLC

- Electronic earthing requirements
- Panel Heat dissipation data
- Product/component catalogues
- Operation & Maintenance Manual on CDs
- Softcopy of Final/As-built drawings on CDs
- Calculation for Processor, Memory & Data bus loading

The above list is the minimum requirements. Additional documents/calculations required shall be finalized during contract stage.

11..18.5. **DRAWINGS AND DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID**

- Proposed PLC system configuration drawing with write-up
- Product catalogues and specifications for PLC as well as HMI application.
- Proposed power supply schemes for PLC system, peripherals, and Remote I/O panels.

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11..18.6. **TESTING AND INSPECTION**

The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.

BHEL's standard Quality Plan for PLC is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.

The complete PLC system, including all instrument and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per relevant IS, NEMA, IEEE, IEC.

Factory Acceptance Test-FAT (Functional Tests) shall be performed prior to shipment and Owner/Purchaser shall be notified 15 days before the schedules dates of the test.

The certificates for following type tests, as per IEC Standard, shall be submitted: -

- Surge protection test as per IEC-225-4
- Dry heat test as per IEC-68-2-2
- Damp Heat test as per IEC-68-2-3
- Vibration Heat test as per IEC-68-2-6
- Electrostatic discharge test as per IEC-801-2 or equivalent
- Radio frequency Immunity test as per IEC-801-6 or equivalent
- Electromagnetic Immunity test as per IEC-801-3 or equivalent

11..18.7. **SPARES AND CONSUMABLES**

Commissioning Spares and consumables
The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

Mandatory Spares
The bidder shall offer alongwith main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

Recommended Spares
The bidder shall furnish a list of Recommended Spares indicating the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation alongwith unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

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Special Tools & Tackles
The bidder shall supply all Special Tools & Tackles 'as required' during Start-up and further maintenance of the system, as part of the main equipment supply.

Spares, Service support
Bidder shall provide availability of spares and service support for minimum 10 years after guarantee period.

11..18.8. **MARKING AND PACKING**

Marking:
A stainless steel name-plate shall be permanently fixed on each equipment giving its Tag/serial Number and salient technical specification.

Packing:
All equipment/materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in transit and storage in open.

11..18.9. **PERFORMANCE AND GUARANTEE**
The PLC system shall be guaranteed to meet the performance requirement as specified and also for trouble-free continuous operation for 12 months from the date of commissioning or 18 months from the date of delivery at site whichever is later.

11.19. **PIPING:**
All piping for the WFPS shall be welded type.

11..19.1. PIPE SUPPORTING CRITERIA & GENERAL GUIDELINES

11..19.1.1. All piping shall be adequately supported, guided or anchored so as to prevent undue vibration, deflection/expansion or loads on connected equipment and piping and leakage at joints.

11..19.1.2. Piping at valves requiring periodic maintenance, shall be supported in such a way so that the valves can be removed with a minimum necessity of installing temporary pipe supports.

11..19.1.3. Pipe support pedestal drawing shall be submitted for information and the type of pedestal including load capacity shall be marked on Isometrics. Piping support standard, with load bearing capacity, shall be submitted for purchaser's review.

11..19.1.4. Piping system shall be properly supported taking into account the following:

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a. Sustained Loads
-Weight of Piping (Bare pipe, service fluid, valves, flanges etc)
-Weight of Insulation (if any)
-Weight of online equipments (if any)
-Weight of instruments (if any)
-Pressure relief loads due to safety valve operation
-Dynamic loads due to pulsating flow/two phase with slug flow

b. Occasional Loads
-Seismic loads (as and when required)

c. Thermal Loads
-Thermal loads due to operating/design/steam out/decoking or any other possible abnormal condition.

11..19.1.5. Additional supports, guides, anchors, special supports like spring supports and sway braces shall be provided based upon detailed analysis of piping system to restrict the forces on nozzles of critical equipments like pumps, compressors, turbines, exchangers, Air coolers etc.

11..19.1.6. A permanent support, either resting or spring support shall be provided for lines which do not need any supporting otherwise but require supporting during maintenance.

11..19.1.7. Adequate care shall be taken for small bore (1 1/2 and below) branch from piping. a rule, for all lines in 600# & above classes, lines having two phase flow and lines having Pulsating flow such as discharge of reciprocating compressors & reciprocating pumps, all small bore branches, e.g. vents, drain, orifice taps, pressure tapings, temperature tapings, sample connections, PSV inlet, TSV inlet etc. shall be provided with 2 number stiffeners at 90º to each other from the main pipe to impart adequate stiffness to the branch connection.

11..19.1.8. The stiffeners shall be made of 6mm thick flats of material equivalent to the pipe material. Further, irrespective of line rating, the stiffeners shall be provided for all orifice taps, all small bore tapings from PSV inlet / outlet lines and all small bore tapings from Control Valve manifolds.

11..19.1.9. Pipe support design shall be such that deflection in piping systems due to sustained loads shall not exceed 15mm, between two adjacent supports.

11..19.1.10. All piping shall be laid such that weld seam always lie in the upper quadrant.

11..19.2. **PIPE SIZE**

11..19.2.1. Pipe sizes shall normally be 0.5", 0.75", 1.0", 1.5", 2.0", 3", 4", 6", 8", 10",12",14",16"

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11..19.2.2. Welded pipes shall be acceptable only with longitudinal weld made employing automatic welding.

11..19.2.3. Galvanized Pipes shall be only Hot Dip galv. to ASTM A53.

11..19.3. **FITTINGS**

11..19.3.1. All fittings shall be seamless in construction unless otherwise specified.

11..19.3.2. Thickness of fittings at ends to match pipe thickness for BW fittings.

11..19.3.3. SW fittings shall be 3000#, 6000#or 9000# depending on the pipe thicknesses S80, S160 and above S160 respectively.

11..19.3.4. Upto 600# all branch connections shall be as follows, unless specifically mentioned otherwise in PMS:

a. Up to 1-1/2" NB Half couplings/ Tee

b. 2" and above Tees/ Pipe to pipe with or without reinforcement pad

11..19.3.5. For reducing BW fittings having different wall thickness at each end, the greater one shall be employed and the ends shall be matched to suit respective thickness.

11..19.3.6. All welded fittings shall have maximum negative tolerance equivalent to pipe selected.

11..19.3.7. All welded fittings shall be double welded. Inside weld projection shall not exceed 1.6mm, and the welds shall be ground smooth at least 25mm from the ends.

11..19.3.8. For fittings made out of welded pipe, the pipe itself shall be of double welded type, manufactured with the addition of filler material and made employing automatic welding only.

11..19.3.9. All welded fittings shall be normalized for CS, normalized & tempered for AS; and 100% radiographed by X-ray for all welds made by fitting manufacturer as well as for welds on the parent material.

11..19.3.10. Bevel ends of all BW fittings shall undergo 100% MP/DP test.

11..19.4. **FLANGES**

11..19.4.1. Flanges shall be as follows:

Rating	Size	Type	Remarks
150	Up to 1.50”	SW RF	If used with non-metallic gasket
	Up to 1.50”	WN RF	If metallic/spiral wound gasket is used
	2” & above	WN RF	For CS
300,600	Up to 1.50”	SW RF	
	2” & above	WN RF	

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11..19.4.2. All flange joints on piping system including flanges on the equipments , manholes etc shall be tightened using Hydraulic bolt tensioners per the following table:

Nominal bolt diameter	Condition	Remarks
All	When specified by process licensor/ vendor /project Specifications	
50 mm & over	All joints	
38 mm &above & below 50mm	a)class 600 & above b) joints with leakage potential c)critical joints	
25 mm & above & below 38mm	a) joints with leakage potential b)critical joints with equipments	

11..19.4.3. All the stud bolt length shall be longer by one diameter to facilitate bolt tensioning.

11..19.4.4. Following Joints shall be considered as Joints with leakage potential :

I. Joints involving tapped holes
II. Items not subjected to hydrotest eg. Joints for equipment manholes
III. equipment mounted temp, pressure & level instruments, line mounted temp connections, online instrument joints like control valves and safety valves, compressor volume bottles.
IV. Items involving two sets of gaskets with one set of bolt eg orifice flange joint, joints with spectacle blind, spacer, flangeless wafer check valve, wafer type butterfly valves.

11..19.4.5. Critical joints with equipments shall include inlet & outlet flanges of pumps.

11..19.4.6. For Ring Joint Flanges, Blinds and Spacers, the hardness shall be as follows :

Sl No	Flange Material	Min. Hardness of Groove (BHN)
1	Carbon Steel	140
2	1% Cr to 5% Cr, 1/2 Mo	150
3	Type 304,316,347,321	160
4	Type 304L. 316L	140

11..19.4.7. For RTJ flanges, blinds & spacers, the hardness of the groove shall be specified on the test report. Bore of weld neck flange shall correspond to the inside diameter of pipe for specified schedule/thickness. Ends shall be bevelled to suit the specified schedule / thickness. For RTJ flanges, only octagonal section ring joint flanges shall be used.

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11..19.5. **GASKETS**

11..19.5.1. Asbestos filler for spiral wound gasket shall not be permitted. Al gaskets shall be non-asbestos type.

11..19.5.2. Full face gaskets shall have bolt holes punched out

11..19.5.3. Non-metallic ring gaskets as per ASME/ANSI B16.21 shall match flanges to ASME/ANSI B16.5 upto 24", and ASME/ANSI B16.47 or AWWA for sizes > 24" unless otherwise specified.

11..19.5.4. Spiral wound gaskets as per ASME B16.20 shall match flanges to ASME/ANSI B16.5 upto 24", and ASME B16.47 series 'B' for sizes > 24" unless otherwise specified.

Rating	Material	Temperature	Type	Gasket or strip material + filler material/RTJ gasket material
150	CS& SS (utilities except steam)	Up to 371 °c	Plain	BS 7 531 Gr.X
150	Cs & LTCS (process and steam)	Up to 371 °c	Spiral wound	Ss316 +Grafoil
150	AS(all services)	Up to 371°c	Spiral wound	Ss316 +Grafoil
300 & 600	CS	Up to 472 °c	Spiral wound	Ss316 +Grafoil

11..19.6. **VALVES**

All isolation valves in the fire water network shall be Gate Valve type

11..19.6.1. SW valves –Up to 1½ inch, for 150#, 300#, 600# (except ball & plug valves).

11..19.6.2. Ball & Plug valves shall be flanged for all sizes.

11..19.6.3. Flanged valve- 2" inch above for 150#, 300#, 600#.

11..19.6.4. BW valves -900# and above

11..19.6.5. All flanged valves (except forged) shall have flanges integral with the valve body.

11..19.6.6. Weld-on flanges shall be made by full penetration joints and 100% radiographed.

11..19.6.7. Yoke material shall be at least equal to body material.

11..19.6.8. Forgings are acceptable in place of Castings but not vice-versa.

11..19.6.9. DIMENSIONS: Face-to-Face/End-to-End dimension shall be as per ANSI B16.10. In case the same is not covered under B16.10, the dimension shall be as per BS 2080 / Manufacturer's Std.

Valve type	Class	For sizes ≥
Gate/globe	150	12"
	300	12"
	600	12"

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Gate /globe/y-globe/stop-check	900	6”
	1500	3”
	2500	3”
Ball/plug(other than pressure balance plug)	150	6”
	300	6”
	600	4”
	900	3”
	1500	3”
Butterfly	150	6”
	300	6”

11..19.7. **OPERATION**

Generally the valves are hand wheel or lever operated.

11..19.7.1. Hand wheel diameter shall not exceed 750mm and lever length shall not exceed 500 mm on each side. Effort to operate shall not exceed 35 kgf at hand wheel periphery.

11..19.7.2. However, failing to meet the above requirement, vendor shall offer gear operation.

11..19.7.3. Quarter-turn valves shall have "open" position indicators with limit stops.

Class	Size	qty
150	Upto 24”	5%
300	Upto 16”	10%

11..19.8. RADIOGRAPHY OF CAST VALVES

11..19.8.1. All casting shall be of radiographic quality. This requirement to be ensured by sample radiography before proceeding with the actual production.

11..19.8.2. Radiography procedure, areas of casting to be radiographed, and the acceptance criteria shall be as per ASME/ANSI B16.34.

11..19.8.3. Radiography requirement for casting shall be as follows:

11..19.9. **Ball/Plug/Butterfly Valves**

11..19.9.1. Each valve shall be supplied with a lever/wrench except for gear operated /motor operated valves.

11..19.9.2. Soft-seated Ball, Plug & Butterfly valves shall be supplied with antistatic devices.

11..19.9.3. The ball of Ball valves shall not protrude outside the end flanges.

11..19.9.4. Ball valves shall be floating ball type/ trunion mounted type as per following:

Sl No	Class	Floating Ball	Trunion Mounted

1	150	8 " & below	10" & above
2	300	4" below	6" & above
3	600 & above	1.5 & below	2 " & below

11..19.9.5. Use of soft seated ball/plug/butterfly valves shall be suitably selected based on temperatures handled.

11..19.9.6. Butterfly valves shall be suitable for throttling application.

11..19.10. **STRAINER**

11..19.10.1. Pressure drop calculations shall be furnished during detail engg stage.

11..19.10.2. Type of Strainers:

Y Type	Upto 1½" irrespective of service 2" & above in steam service
T type	2" & above in services other than steam

11..19.10.3. All 2" & higher sized Y type strainers shall be provided with 3/4" threaded tap and solid threaded plug as drain connection on the blind flange. For less than 2", this shall be 1/2" size.

11..19.10.4. Bottom flange of Y-type strainer shall not have tapped hole. Full length standard size studs shall be used for joining blind flange.

11..19.10.5. For fabricated strainers, all BW joints shall be fully radiographed and fillet welds shall be 100% DP/MP checked.

11..19.10.6. All the strainers shall be hydrostatically tested at twice the design pressure.

11..19.11. **STUD, BOLTS, NUTS AND JACK SCREWS**

11..19.11.1. All bolting shall be as per ASME/ANSI B18.2.1 for Studs, M/C Bolts and Jack screws, and ASME/ANSI B18.2.2 for nuts.

11..19.11.2. Threads shall be unified (UNC for .= 1" dia and 8UN for > 1" dia) as per ANSI B1.1 with class 2A fit for Studs, M/C Bolts and jack screws, and class 2B fit for nuts.

11..19.11.3. Stud bolts shall be threaded full length with two heavy hex nuts. Length tolerance shall be in accordance with the requirement of table F2 of Annexure F of ASME B16.5

11..19.11.4. The nuts shall be double chamfered, semi-finished, heavy hexagonal type and shall be made by the hot forged process.

11..19.11.5. The length of the studs/ bolts should be such that minimum two threads should be out of the nut on either side.

11..19.11.6. All the stud/ bolt should have metallurgical certificates in case of alloy/ SS metallurgy with identified colour marking at the stud ends/ bolt side face.

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11..19.11.7. Heads of jack screws and M/C bolts shall be heavy hexagonal type. Jack screw end shall be rounded.

11..19.11.8. Wherever bolt tensioning is specified stud bolt length shall be longer by minimum one diameter to suit bolt tensioner. Excess threads shall be protected by a threaded nut.

11..19.12. **WELDING PROCESSES**

11..19.12.1. Welding of various materials shall be carried out using one or more of the following processes with the approval of the Engineer-in-charge :

- -Shielded Metal Arc Welding process (SMAW)
- -Gas Tungsten Arc Welding process (GTAW).

11..19.12.2. Automatic and semi-automatic welding processes shall be employed only with the express approval of the Engineer-in-charge.

11..19.12.3. The welding procedure adopted and consumables used shall be specifically approved.

11..19.12.4. A combination of different welding processes could be employed for a particular joint only after duly qualifying the welding procedure to be adopted and obtaining the approval of engineer-in-Charge.

11..19.12.5. For additional details "Welding Specification for Fabrication of Piping as mentioned elsewhere shall be referred.

11..19.12.6. Potable water shall be used for testing of Carbon steel & Alloy steel piping. For testing of Stainless Steel piping maximum chlorine content in water shall be 15-20 ppm.

11..19.12.7. All small bore piping and steam tracer lines, size ¾" and below shall be welded by TIG process for all type of joints, e.g. Butt Weld, Socket Weld, tee etc.

11..19.13. **BOLT TENSIONING AND BOLT TORQUES**

11..19.13.1. Bidder shall include Quality checks during plant construction and proper Records /documents should be maintained. Special attention is needed for high-pressure system, handling hazardous material.

11..19.13.2. Mechanical integrity of flange joints in high-pressure systems has to be ensured by the bidder. A standard check list for this activity along with post box-up checks should be developed and practiced.

11..19.13.3. The following guidelines shall be used besides other relevant codes like ASME etc. This checklist should include following points :

a. Ensuring right type of Gasket, fasteners etc., conforming to the specifications as per design and drawing.

b.

i. Alignment of flanges and inspection of threads in case of tapped holes in flanges.

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ii. Inspection of gasket surface
iii. Ensuring that gasket is properly seated.
iv. Checking that fasteners are tightened upto required depth in tapped holes.
v. Ensuring that fasteners are tightened as per tightening procedure and using specific torque value with well-maintained tools and torque wrenches.

c.
i. All critical joints should be boxed up under the supervision of the Purchaser's representative
ii. Each joint shall be boxed up and tightened by only skilled Technician duly approved by competent authority.

d.
i. Checking the individual joint for any leak during system pressure testing by using special tapes, soap solution or as per relevant code.
ii. Inter-face joints should be system pressure tested as per relevant code to ensure their integrity.

e.
i. Differential hardness between RTJ gasket and flange shall be considered.

11..19.13.4. All the points in the checklist, including the names of the persons involved in the execution/inspection of the boxing up of critical and high-pressure joints, should be recorded. Purchaser / / End customer reserve the right to review these records at site.

11..19.13.5. Box-up of interface flange joints which are not subjected to hydrotest, need extra attention. Separate records shall be maintained for such joints.

11..19.14. **HYDRAULIC BOLT TENSIONER**

11..19.14.1. Flange connections with bolting of nominal diameter 25mm (1 in) and over shall have sufficient clearance and access to allow the use of hydraulic tensioning equipment.

11..19.14.2. Hydraulic bolt tensioning shall be used for the following:

NOMINAL BOLT DIAMETER	CONDITION
50mm and over	All joints
38mm and over	Class 600 and over
25mm and over	a. Joints subject to high temperature or cyclic duties. b. Joints with leakage history.

11..19.14.3. Stud bolts shall be longer by one diameter to facilitate the bolt tensioning for all sizes specified in table above. Excess thread shall be protected by a threaded cap. On bolts at ambient temperature duty the cap should have a grease nipple.

11..19.14.4. An applied bolt stress of 30,000 to 40,000 lb/in^2, and typically 35000 lb/in^2 is adequate for most duties. It should not generally exceed 50% of the bolt material yield stress. The applied bolt stresses should be individually calculated for particularly critical or problematic joints.

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12. PAINTING

12.1. **Refer Annexure -II**

13. INSPECTION AND TESTING

13.1. Bidder shall maintain an effective Quality Assurance System, to ensure that all equipment and material supplied as a part of the Water Based Fire Protection System package meet required Quality standards and specifications.

13.2. After award of contract bidder shall submit Quality Plan for approval. The quality plan shall be submitted in BHEL quality plan format.

13.3. Bidder to note that all the cost involved in any of the inspection & testing requirements as per the approved quality plan shall be deemed to be included in the price quoted by the bidder. Bidder shall not be eligible to raise any extra claim on account of any inspection & testing of the complete WFPS as per the approved quality plan.

13.4. **GUIDELINES FOR ITPS / QAPS FOR WFPS**

13.4.1. HYDRANTS & LANDING VALVES

13.4.1.1. Hydrant and Landing valve shall be tested as per requirements of IS 5290

13.4.1.2. Hydrant Valve assembly shall be tested and proved water locked tight under valve closed (including closed pumper connection) condition at a Hydraulic pressure of 18.0 Kg/cm^2(g)

13.4.2. HOSE

13.4.2.1. All tests and inspections for checking material, design and construction , hydraulic performance, workmanship , finish and Hydro testing shall be as per IS :636

13.4.3. HOSE REEL

13.4.3.1. All tests and inspections for checking material, design and construction , hydraulic performance, workmanship , finish and Hydro testing shall be as per IS :884

13.4.4. MONITORS

13.4.4.1. The entire monitor assembly shall be subjected to hydraulic pressure of 23 kg/cm^2 and horizontal rotation shall be carried out 50 times and then vertical rotation up & down for 25 cycles.

13.4.4.2. During the test there shall be no leakage observed in any of the swiveled joints.

13.4.4.3. Monitor shall be hydraulically tested as to the following:
The minimum horizontal ranges for water and foam jets shall be 55m and 50 m respectively at 7.0 kg/cm^2 pressure, 2580 lpm and 45^0 nozzle angle from

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horizontal plane in still weather condition. Monitor shall be tested for minimum two directions at 0 degrees and second readings at opposite direction i.e. 180 degrees apart as specified above and average reading shall be considered as horizontal throw of the monitor.The minimum vertical throw shall be 17 m and foam throw shall be 15 m for the monitor and shall be conducted at 45^0 degree nozzle angle form horizontal plane at 7.0 kg/cm^2 and 2580 lpm flow.

13.4.5. INSPECTION AND TEST REQUIREMENTS FOR WELDED PIPES.

Sl no	Stage/ Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1a.	Raw Material Inspection	Marking and correlation with TC	100%	Inspection Report	-	W	R
1b.	Raw Material Inspection	Chemical composition	One sample per heat	Inspection Report	-	R	R
2	Pipe Rolling	Process Control	As per Internal QA Plan	Inspection Report	-	W	-
3	Manufacturing , Welding	Approved WPS,PQR,WPQ	100%	WPS,PQR,WPQ	-	W	R
4	Manufacturing , Welding	New WPS,PQR,WPQ	100%	WPS,PQR,WPQ	-	H	W
5	Manufacturing , Welding	Welding	100%	Internal Report	-	W	-
6	Heat Treatment (if applicable)	Stress reliving, normalizing, Tempering etc. as applicable	100%	HT chart	-	W	R
7	UT (if applicable)	Surface and Internal Imperfection	Material Specification	Inspection Report/Graphical record	-	W	W (at Random) 100% R
8	RT (if applicable)	Surface and Internal Imperfection	Po, Material Specification	RT Films	-	R	R (100% of films)
9a	Destructive Testing (Note: Special Impact, Hardness, Requirements for H2, sour service	Material Properties	Each heat no/size	Lab Report	-	H	H
9b	Product analysis	Chemical composition	One sample per heat	Inspection Report	-	W	R

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			or As per specification				
10	Destructive Testing (for SS Material)	Corrosion properties	Highest thickness and highest carbon/HT Lot	Lab Report	-	H	H
10 A	Ferrite check of SS pipes (if applicable)	% ferrite check	Random on pipe body/weld	Inspection report	-	W	RW
11	Galvanizing (if applicable)	Integrity of galvanized coating	100%	Inspection/lab report	-	W	RW
12	Hydro testing	Leak check	100% by supplier, At random by PURCHASER / / END CUSTOMER	Inspection Report/Hydro Graph	-	H	H
13	Final inspection	Surface condition, straightness, end finish, Bevel Angle, Root Face, Outer dia. , Thickness, Length, Coating, Marking, color coding, End Caps	100% by supplier, At random by PURCHASER / / END CUSTOMER	Inspection report	-	H	H
14	weight checking	Weight	100%	Inspection report	-	W	-
15	Final inspection (for AS & SS pipes)	PMI check	As per 6-81-0001	Inspection report	-	R	RW
16	Marking	Pipe no , acceptance no. , H No. Size, Grade, Thickness & color code	100%	-Do-	-	W	RW

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13.4.6. INSPECTION AND TEST REQUIREMENTS OF VALVES.

Sl no	Stage/ Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material						
1a	Casting and forging (Body, Bonnet , Disc, Stem ,Body Rings,)	Surface Quality MPT for Hydrogen Service.	As per supplier's Sampling Plan	Inspection Report	P	P	R
1b	-Do-	Diamension	As per supplier's Sampling Plan	Inspection Report	P	P	R
1c	-Do--	Chemical and Mechanical Properties(Not Special Requirements of heat treatment, Hardness, Impact, Bend, Tensile Test etc. for H2 service and NACE)	All Heats	Inspection Report , Supplier's TC	P	R	R
1d	All Castings Materials	Heat Treatment as per Specs	All Lots	HT chart on TC	p	R	R
1e	Casting,forgings for Austenitic StainSteel body and bonnet only.	Inter Granular Corrosion (IGC) Test and Stabilisation Heat Treatment	Per Heat /Per solution Annealed Lot	HT chart on TC	p	R	R
1f	All Castings	Radiography Examination	As per datasheet (if applicable)	Films and report	p	R	R
1g	Bars for Trim Materials	Chemical Analysis	All Heats	Lab Reports	p	R	R
II	**Bought Finished and Sub Contract Items**						
2a	Stems, Gaskets, Gear Unit, Fastener, Gland ,	Surface Defects	As per supplier sampling Plan	Inspection report	p	R	R

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	Packing etc.						
2b	-do-	Diamension	As per supplier sampling Plan	Inspection report	p	R	R
2c	Stems, Gaskets, Gear Unit, Fastener, Gland , Packing etc.	Physical and chemical properties	All heat Lot	Supplier's TC	p	R	R
III	**WPS/PQR/ WPQ**						
3a	Previous qualification for Overlay/Stelliting (body seat ring/wedge)	Thickness of overlay/ stelliting hardness	100% by supplier and PURCHASER / / END CUSTOMER	WPS/PQR/WPQ EIL Specs	-	P	R
3b	New qualification for Overlay/Stelliting (body seat ring/wedge)	Thickness of overlay/ stelliting hardness	100% by supplier and PURCHASER / / END CUSTOMER	WPS/PQR/WPQ EIL Specs	-	P	New H Old R
IV	Product Evaluation and Testing						
4a	Finished Valve	Shell Test Gate/Globe/Check Back Seat-Gate/Globe Seat Test-Gate/Globe/Check	100% by supplier and PURCHASER / / END CUSTOMER as per specs	Test Report	-	P	H
4b	Finished Valve	All Mandatory Test or Supplementary Test, Helium Leak Test (Hydrogen Service)	100% by supplier and PURCHASER / / END CUSTOMER (Helium Leak Test) as per specs	Test Report	-	P	H
4c	-Do-	Functional/Operational Test (For motor Operated /Actuator Operated)	100% by supplier and PURCHASER / / END CUSTOMER as per specs	Test Report	-	P	H
V	Final						

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	Inspection						
5a	Finished Valve (Body, Bonnet,Stem)	PMI Check	100% by supplier and 10% by PURCHASER / / END CUSTOMER		_	P	H
5b	Finished Valve (Body, Bonnet,Stem)	Visual (TC Verification,Sl no Marking, Flange Finish, Tag no) Bevel, Diamension and Special Requirements in PR, Painting of Carbon and Low alloy Steel and provision of bypass arrangement (if applicable)	- Visual 100% by Supplier and PURCHASER / / END CUSTOMER. Diamension- 100% by supplier and at random by PURCHASER / / END CUSTOMER subject to a minimum of 10 %	Inspection Report	-	P	W
VI	Strip Check , Differential Hardness as applicable	Verify component	1 valve per Type/size and order.	Inspection report	-	P	H
VII	Pre qualification Test	Fire safe test (soft seated ball,plug, butterfly and lubricated plug valves) cryogenic test	1 valve per Type/size and order	Acceptance report	-	P	New H Old R
VIII	Packing	-	-	Inspection report	-	P	R
IX	Documentation	Verification of TCs & Compilation of Inspection report	100% by supplier and 100% PURCHASER / / END CUSTOMER	MTC, Inspection release notes	-	P	H

13.4.7. Inspection and Test Requirements for Forged, Seamless and Welded Fittings.

Sl no	Stage/Activity	Characteristics	Quantum of check	Format of Record	Scope of Inspection		
					1	2	3
1.	Review of Procedures (Manufacturing/HT/NDT/DT/WPS/PQR/WPQ)	Adequacy of available procedures to comply with available PR/specs	100% by supplier & PURCHASER / / END CUSTOME	Supplier's in-house Documents	-	H	R/W

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			R				
2	Raw material Identification (billets, rounds, Pipes, Coil, Plates, etc.)	Marking Co-relation with TC, Dimensional/Thickness adequacy(as applicable)	100% by supplier & PURCHASER / / END CUSTOMER	Mill Test Certificate, Supplier Inspection report		H	H
2.1	Check Testing of Raw material, If original Mill TC is not available.	Verification of Mill TC	100% by supplier & PURCHASER / / END CUSTOMER	Mill Test Certificate, Supplier Inspection report		H	H
3	Forming and HT	Forming Temperatures and procedures	100% by supplier	Supplier's Procedures records	-	H	-
4	Sampling of Test Coupons	Heat/HT Lot size, Location, Orientation, No of Test Coupons	100% by supplier & PURCHASER / / END CUSTOMER	Sampling Inspection Report	-	H	H
5	NDT Examination	Approved procedure	100% by supplier & PURCHASER / / END CUSTOMER , RT,Others 10%	NDT Inspection Report	R	W	R&W
6	Selected Coupons Testing	Physical/chemical/corrosion/service/properties	100% by supplier & PURCHASER / / END CUSTOMER	Test Records	R	H	H
7	Cleaning and Finishing	Blast Cleaning,Galvanising,Pickling?passivation, Supplier's standard etc.	100% by supplier & Random by PURCHASER / / END CUSTOMER	Inspection Report	R	H	R or W
8	Final Inspection	Size ,Thickness/schedule,	100% by supplier & Random	Inspection Report	-	H	H

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		dimension, surface quality, marking, color coding etc.	by PURCHASER / / END CUSTOMER -10 % min				
9	Positive Material Identification (Final Inspected Fittings)	Compliance with Stipulated Material	100% by supplier & Random by PURCHASER / / END CUSTOMER -10 % min	PMI Report	-	H	H
10	Final Release and Certification	Final Stamping, Issue of Inspection certificate	100% by supplier & PURCHASER / / END CUSTOMER	Final offer list	-	H	H
11	Packing and dispatch	Protective coating/type of packing/end protection etc.	100% by supplier & Random by PURCHASER / / END CUSTOMER	Supplier records	-	H	-
12	Documentation	Verification of TCs and compilation of Inspection reports	100% by supplier & 100% by PURCHASER / / END CUSTOMER	MTC, Inspection Release Notes	-	H	H

13.4.8. Inspection and Test Requirements of FLANGES, SPECTACLE BLINDS & DRIP RINGS

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material	Heat no, mill Test Certificate, Chemical Composition & Other Applicable Test	100%	Mill TC/Lab report	-	W	R

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2	Heat Treatment as applicable	Cycle(Time Temp)	100%	HT Chart	-	W	R
3	Identification of Heat Treated forging & selection of Test Coupons	Selected of Test Coupons	Each HT Lot/Each heat no/size	Forging Identification Report	-	H	H
4	Testing (Including special Test for H2 service, NACE)	Tensile , hardness, impact, inter granular corrosion, Test, Product chemical analysis (as applicable) , groove hardness	Each HTLot/Each heat no/size	Lab report	-	H	H
5a	Manufacture, welding	Approved WPS/PQR/WPQ	100%	WPS/PQR/ WPQ	-	P	R
5b	Manufacture, welding	New WPS/PQR/WPQ	100%	WPS/PQR/ WPQ	-	P	W
6	NDT (if applicable)	Ultrasonic, magnetic, Dye penetration Test (if applicable)	100% by supplier, random by PURCHASER / / END CUSTOMER	Test report		W	RW
7	Galvanizing (if applicable)	Coating thickness, Embrottlement Adherence	100%	Inspection report, Lab report		W	R
8	Final inspection	PMI check	100% by supplier, random by PURCHASER / / END CUSTOMER	Inspection report	-	W	W
9	Final Inspection	PMI check	100% by supplier	PMI report	-	W	RW

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			random by PURCHASER / / END CUSTOMER				
10	Packing and Despatch	Verification of surface coatings/ type of packing	100% by supplier	Shipping documents	-	W	R

13.4.9. INSPECTION AND TEST REQUIREMENTS OF BOLTING MATERIAL

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1a.	Raw Material Inspection	Marking and correlation with TC	100%	Tc , Inspection Report	-	W	R
1b.	Raw Material Inspection (Check Test)	Chemical composition	One sample per heat	Inspection Report	W	R	-
1c	Raw Material Inspection	Internal soundness	One sample per heat	Inspection Report	W	R	-
1d	Raw Material Inspection	Spectro Analysis	100%	Inspection Report	-	W	R
2	Thread Rolling, hot forging of Nuts,Machining	Process control	As per Internal QA plan	Inspection Report	-	W	-
3	Heat Treatment (Q&T, N&T, SA as applicable)	HT cycle (Time and Temperature)	100%	Inspection Report	-	W	R
4	Selection of Samples	Test piece Marking	Heat of Material, Heat Treatment Charge/Size	Inspection Report	-	H	H
5	NDT (if applicable)	Surface & Internal Imperfection	100 % by supplier, at random by PURCHASER / / END	Inspection Report	-	W	RW

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			CUSTOMER				
6	Destructive Testing	Mechanical properties	Each HT Lot/Each Heat no size	Lab Report	-	H	H
7	Galvanising (if applicable)	Thickness, Embrittlement , Adherence , Finish and Appearance	As listed in A 153	Inspection/Lab Report	-	W	R
8	Final Inspection	Visual Marking,color coding , dimension	100 % by supplier, at random by PURCHASER / / END CUSTOMER	Inspection Report	-	H	H
9	Final Inspection	PMI check		PMI Report	-	W	RW

13.4.10. INSPECTION AND TEST REQUIREMENTS OF GASKETS

Sl no	Stage/ Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	CAF Gaskets						
1.1	Raw Material Inspection	Physical	100% by supplier	Manufacturer's TC	W	R	-
1.2	In process inspection (Punching & Finishings)	Identification, Verification	100% by supplier	Inspection Report	-	W	-
1.3	Final Inspection	Identification, Verification	100% by supplier , at random by PURCHASER / / END CUSTOMER	Inspection Report	-	W	W
2	Spiral Wound						
2.1	Raw Material Inspection	Physical, chemical , visual, dimensional	100% by supplier	Manufacturer's TC , check Test Report	-	W& R	R
2.2	Testing	Compressibility, recovery,	Lot of every	Inspection Report	-	P	W

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		sealability	sizing/rating				
2.3	Final Inspection	Identification, Verification	100% by supplier , at random by PURCHASER / / END CUSTOMER	Inspection Report	-	W	W
3	RTJ Gasket						
3.1	Raw Material Inspection	Physical, chemical , visual, dimensional	100% by supplier	Manufacturer's TC , check Test Report	W	R	R
3.2	Final Inspection	Identification, Verification, visual dimension, hardness	100% by supplier , at random by PURCHASER / / END CUSTOMER	TC , Inspection Report	-	W	W
3.3	PMI non CS	Compliance with stipulated material	100% by supplier , at random by PURCHASER / / END CUSTOMER	PMI Report	-	P	W
4	Jacketed Gasket						
4.1	Raw Material Inspection	Physical, chemical , visual, dimensional	100% by supplier	Manufacturer's TC , check Test Report	-	W	R
4.2	Final Inspection	Identification, Verification,	100% by supplier , at random by PURCHASER / / END CUSTOMER	Inspection Report	-	W	W
5	Packing and Despatch	Separate container marked with size, rating,	100% by supplier	Supplier records	-	P	-

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		material, spec , item code					

13.4.11. Inspection and Test Requirements of SPRAY NOZZLES

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	2
1	Incoming Material (casting, forging, rolled section etc.)	Mechanical and chemical properties	100% verification with MTC/check Test	Inspection Report	-	R	R
2	Material Identification (casting, forging, rolled section etc.)	Check Test for chemical properties	Random selection	Inspection Report	-	P	R
3	Manufacturing/ Machining of spray nozzle	Visual/dimensional and flange finish check for shape of Flute, orifice opening ,Length etc.	100%	WPS/PQR Inspection Report	-	P	R
4	Final Inspection of Spray Nozzle	-Visual inspection for reinforcement, undercut, surface defects. -dimensional check -End connection(As per spec/Drg)	100%	Inspection Report	-	P	H (min 10% witness by EIL)
5	Performance test of Spray Nozzle	Flow, spray angle, spray pattern (As per spec/Drg)	100%	Inspection /Test Report	-	P	H
6	Marking for identification	Marking \identification (As per spec/Drg)	100%	Inspection Report	-	P	R
7	Packing and dispatch	Verification of type of packing (As per spec/Drg)	100%	Shipping documents	-	P	R
8	Documentation for spray nozzle as per VDR	Verification and compilation of Inspection/Test record for submission to	100%	Dossier	-	P	H

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		client					

13.4.12. INSPECTION AND TEST REQUIREMENTS OF **STRAINER**

Sl no	Stage/Activity	Characteristics	Quantum of check	Format of Record	Scope of Inspection		
					1	2	3
A1	Incoming Material (Tees, Castings, Forgings etc..)	Chemical and mechanical properties	All Heats	Test certificates	W	R/W	R
A2	Incoming Material (Tees, Castings, Forgings etc..)	Dimension	As per supplier sampling plan	Report	W	W	R
A3	Incoming Material (wire mesh)	Chemical	Each lot	Lab record	W	R	R
B1	WPS/PQR/ WPQ new qualifications	Visual, radiography, tensile, bend etc..	100% by supplier and PURCHASER / / END CUSTOMER	WPS/PQR/ WPQ	-	R	W
B2	Existing WPS/PQR/ WPQ	Visual, radiography, tensile, bend etc..	100% by supplier and PURCHASER / / END CUSTOMER	WPS/PQR/ WPQ	-	R	R
B3	Welding	Visual and dimensional	100%	Report	-	W	R
B4	Welding	Weld soundness (RT)	100%	Radiograph	-	R	R
B5	Heat Treatment	PWHT	100%	HT Chart	-	W	R
C1	Product evaluation and Testing	Leak tightness of body	100%	Test report	-	H	H
C2	Final inspection	PMI check	100% by supplier, 10% by PURCHASER / / END	Test report	-	W	W

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			CUSTOMER				
C3	Final inspection	Visual, dimensional , Marking	100% by supplier, 10% by PURCHASER / / END CUSTOMER	Dimensional report	-	W	W
C4	Final inspection	Painting/Pickling, Marking , color coding, & passivation for stainless steel components	100%	Painting Report	-	W	R
C5	Packing	-	At random	-	-	W	R
C6	Documentation	MTC/Check Testing Reports/Hydro Test/HT Charts/dimension report/painting report/inspection release note	100%	TC/EIL or TPIA Inspection release note	-	H	H

13.4.13. Inspection and Test Requirements of FLAMEPROOF CONTROL STATION

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material (casting, Terminal , glass , ammeter ,voltmeter switch etc.)	Physical chemical properties. material certificate, accuracy , make etc..	Same as per supplier's standard	Supplier's test record	W	W/R	-
2	Flameproof enclosure without components	Routine pressure test	100% by supplier	Supplier's test record	-	P	R*
3	Flameproof control station	Acceptance Test:- • Visual • Dimensional , thread • Workmanship • Gaps, Flame path, clearances, • Paint shade	100% by supplier and random samples by PURCHA	Inspection witness test records	-	P	H/W

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		• Marking on each piece for suitability to area classification, Tag no etc.. • Terminal size • Compatibility of cable Glands with cable size/entry • Electrical operation Test & BOM • Isolation arrangement of 2 boxes connected together • High voltage test • IR test before and after high voltage	SER / / END CUSTOMER				
4	Submission of certificates:-	• Certificate of statutory testing agency for suitability of area classification • Certificate of statutory approval authority like CCOE/PESO as applicable • Valid BIS license as applicable • Degree of protection certificate as applicable	Each module	Certificates from statutory bodies	-	R	R
5	Flameproof control station	Internal test reports for all items	100%	Supplier's test records	-	-	R

* Pressure Test may be witnessed by PURCHASER / / END CUSTOMER on one or two samples of enclosures during final acceptance stage after removing internal components

13.4.14. Inspection and Test Requirements for Restriction Orifice Plates and Multistage Orifice Assemblies

Sl no	**Stage/Activity**	**Characteristics**	**Quantum of check**	**Record**	**Scope of Inspection**		
					1	**2**	**3**
1	Incoming Material	Material Identification, chemical and Mechanical Properties	100 %	MTC/Test Lab Certificates	P	W/ R/H *	R
2	Machining Plates	Dimension, smoothness verification	100 %	Supplier's Test Records	-	P	-

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3a	Final Inspection	• Certificate of Radiography/ X-Ray for any welded joint and any casting of 600# and above • Hydrostatic test for complete multistage restriction orifice assembly • Dimensional test	100% by supplier	Supplier's record	-	P	R
3b	Final Inspection	• Orifice smoothness verification • Correctness of punching • Physical dimensional verification • Liquid penetrant check for all welds • Hydro test of complete multistage Restriction Orifice assembly	100% by supplier , at random by Purchaser / / End Customer	Supplier's Inspection witness Record	-	P	W, H
		• IBR (if applicable)	100%	IBR stamp and certificate	-	W	R
4	Submission of certificates:-	• Material test certificates • Traceability of records	100%	Supplier record	-	P	R
5	Packing and Painting	• Visual	100%	Packing List	-	W	-

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13.4.15. Inspection and Test Requirements for PRESSURE SWITCHES

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material Like pressure sensors, flanges, housings, capillary, switches etc.	Material Identification, chemical and Mechanical Properties , switch rating	100 %	MTC/Test Lab Certificates	P	P	R/ W*
2	Machining of	Dimension, visual	100 %	Supplier'	-	P	-

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	components			s Test Records			
3a	Final Inspection	• Visual • Correctness of Tag plate • Physical dimensional verification	100%	Inspection witness record	-	P	W
3b	Final Inspection	• Performance test including set point calibration, repeatability, switch differential and over range • I.R. test on switch assembly	100% by supplier , at random by Purchaser / / End Customer	Inspection witness record	-	P	W
		• IBR (if applicable)	100%	IBR stamp and certificate	-	W	R
4	Submission of certificates:-	• Certificate of statutory approval authority like CCOE/PESO as applicable • Degree of protection certificate as applicable • Type test report from testing agency like CIMFR,ERTL, ERDA,ATEX, BASEEFA . FM/UL, PTB etc, if asked	100%	Supplier record	-	P	R
5	Packing and Painting	• Visual , PACKING List	100%	SUPPLIER 'S Test record	-	P	-

13.4.16. INSPECTION AND TEST REQUIREMENTS FOR PRESSURE RELIEF VALVES

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material Like forging and casting for body bonnet and	• Chemical and Mechanical Properties, hardness check, NACE requirements Charpy V-notch impact	100 %	MTC/Test Lab Certificates	P	P/R	R

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	nozzle, springs, Bellows etc.	testing. • Solution annealing/pickling					
		• Radiography of valve castings • Bend test and magnetic particle Inspection of body and bonnet casting	100%	Radiography report/MPI reports	-	P/R	R
2	Accessories like back floe preventer, pilot filter, etc for pilot operated valves	MTC	100%	Sub-supplier's Test certificate	P	P/R	R
3	Machining of components	Dimension, finish	100 %	Supplier's Test Records	-	P	-
4a	Final Inspection on assembled valves	• Visual • Correctness of Tag plate • Verification of required accessories • Helium leak test • Dye penetration test	100%	Inspection witness record	-	P	W
4b	Final Inspection	• Dimensional check • Hydrostatic test • Cold bench set pressure • Seat leakage test • Valve lift test • Blow down/Relosing pressure test	100% by supplier , at random by Purchaser / / End Customer	Supplier's Test record/Inspection witness record	-	P	W
		• IBR (if applicable)	100%	IBR stamp and certificate	-	W	R
4 c		• Post weld heat treatment/Radiography/Magnetic particle Testing og weld joints	100%	PWHT reports/ Radiography Reports/ MPI Reports	-	P/R	R
4d		• Capacity test as per ASME	Sample	Type test reports	-	R	R
5	Packing and	• Visual check on completely	100%	Packing List/supp	-	P	-

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	Painting	assembled valves and accessories • Special cleaning and packing for O2 and Cl service • Suitable protection to prevent entry of foreign material		lier's record			

13.4.17. INSPECTION AND TEST REQUIREMENTS FOR SOLENOID VALVES.

Sl no	Stage/ Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material Like body, conductor material etc.	• Mechanical identification, conductor resistance and insulation of conductors	100 %	MTC/Test Lab Certificates	P	W/R	R
2	Solenoid valve	Visual, dimensional, connection size	100%	Supplier's Test record	-	P	-
3	Final Inspection	• Visual and Dimensional check • HV Test • Seat leakage test by air/N2 • Correctness of Tag plate • Verification of required accessories • Connection size • Insulation resistance Test • Pneumatic Test by Air/N2 • Operational test including verification of pickup and drop voltage	100%	Inspection witness record	-	P	W
4	Submission of certificates:-	• Certificate of statutory approval authority like CCOE/PESO for use in electrically hazardous area. • Degree of protection certificate as applicable	Prototype for each module	Statutory approval certificates/ Type Test certificate	-	R	R

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		• Type test report from testing agency like CIMFR, BASEEFA . FM/UL, PTB etc, for suitability in specified Hazardous area • Valid BIS license for indigenous supply. • Material test report for body and trim. • Traceability of records					
5	Packing and Painting	• Visual • Proper packing to prevent any damage during transportation • Suitable protection to prevent entry of foreign material	100%	Packing List/supplier's record	-	W	-

13.4.18. INSPECTION AND TEST REQUIREMENTS FOR PROGRAMMABLE LOGIC CONTROLLERS (PLC)

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material Like PLC console, power supplies, cabinets, lamps, fans, wires etc	• Mechanical identification • Operational check of components	100 %	Material Test Certificate	P	W/R	R
2	PLC assembly	Visual, dimensional, BOM	100%by supplier	Supplier's record	-	P	R
3	Final Inspection	• Visual and Dimensional check • HV and Insulation Test • Bill of material • Functional Test i. Simulation of each input and output to verify proper system response ii. Complete system configuration loading check	100%	Inspection witness record	-	P	W

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		iii. Demonstration of all PLC systems builder function,generation of graphics, reports etc. iv. Sample checking of logics configured in the PLC by connecting switch/lamp at input/output v. Check scan time vi. Check al PLC console diaplys, keyboard and touch screen operation, printer function vii. System redundancy check as per job specification viii. System diagnostic check for all subsystem, including checking of testing software for I/O module , signal conditioning module if specified. ix. Check output status on processor failure x. Check first-out alarm generation xi. Simulation of power failure and system restart auto boot-up of system configuration and program after poer restoration xii. Moentary power loss of 20 ms					

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		check xiii. Reversibility of polarity test xiv. Fan failure check					
4	Submission of certificates:-	• Test reports of I/O cards, controllers etc • Degree of protection certificate as applicable • Burn-In Test report	Prototype for each module	Statutory approval certificates/ Type Test certificate	-	R	R
5	Packing and Painting	• Visual • Proper packing to prevent any damage during transportation	100%	Packing List/supplier's record	-	W	-

13.4.19. INSPECTION AND TEST REQUIREMENTS FOR JUNCTION BOXES AND CABLE GLANDS.

Sl no	Stage/Activity	Characteristics	Quantum of check	Record	Scope of Inspection		
					1	2	3
1	Incoming Material Like CASTINGS, Terminal etc.	• Mechanical identification, pressure test on castings for hazardous area junction boxes	100 %	Material Test Certificates /Test Lab Certificates	P	W/R	R
2	Machining of components	Visual, dimensional,	100%	Supplier's Test record	-	P	-
3a	Final Inspection	• Visual, Dimensional clearance & Paint shade check for all items • HV and insulation resistance Test • Air leakage test report on pneumatic JBs • Bill of material verification • Warning plate for junction boxes and marking on cable glands, adapters plugs etc. • Pressure test on castings for flame proof junction boxes.	100%	Inspection witness record	-	P	W

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3b	Final Inspection	• Physical dimensional verification and workmanship • HV and insulation resistanceTest • Air leakage test report on pneumatic JBs	100 % by supplier and and on sample basis by PURCHASER / / END CUSTOMER	Supplier's test record and inspection witness report	-	P	W, H
4	Submission of certificates: -	• Certificate of statutory approval authority like CCOE/PESO for use in electrically hazardous area. • Degree of protection certificate for instrument housing • Type test report from testing agency like CIMFR, BASEEFA. FM/UL, ATEX, PTB etc, for suitability in specified Hazardous area • Traceability of records	Prototype for each module	Statutory approval certificates/ Type Test certificate	-	R	R
5	Packing and Painting	• Visual • Suitable protection to prevent entry of foreign material	100%	Packing List/supplier's record	-	W	-

13.4.20. INSPECTION AND TEST REQUIREMENTS FOR LOCAL CONTROL PANEL AND ACCESSORIES (ELECTRONIC/PNEUMATIC).

Sl no	**Stage/Activity**	**Characteristics**	**Quantum of check**	**Record**	**Scope of Inspection**		
					1	**2**	**3**
1	Incoming steel sheet for panel fabrication	• Surface finish, dimensions, chemical treatment	100 %	Material Test Certificates /Test Lab Certificates	P	W/R	R
2	Boughtout components like indicators,	Make , model no, calibration test certificate	100%	Material Test Certificates /Test	-	P/R	R

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	relays, controllers, annunciators, lamps, recorder. Switches, push buttons, zener barriers, Isolators, Power supplies , pressure indicator, pressure switch etc.			Lab Certificates			
3a	Final Inspection	• Dimensional test report • HV and insulation resistanceTest • Calibration test report • Performance test report including wiring scheme checks, airline/tubing check for pneumatic panels, functional check of accessories & shutdown and Interlock logics by simulation • For pneumatic panels, leak test for tubing at 1.5 times the minimum air supply pressure	100% by supplier	Supplier's record	-	P	R
3b	Final Inspection	• Physical dimensional test report • HV and insulation resistanceTest • Visual check including type and size of wire used • Correctness of model no , tag plate , connection size • Performance test report including wiring scheme checks, airline/tubing check for pneumatic panels,	100 % by supplier and and on random basis by PURCHASER / / END CUSTOMER	Supplier's test record and inspection witness report	-	P	W, H

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		functional check of accessories & shutdown and Interlock logics by simulation. • For pneumatic panels, leak test for tubing at 1.5 times the minimum air supply pressure • Component layout arrangement • Easy accessibility for maintenance/replacements of components • Size check and leak test for all airlines/tubings. • HV and insulation resistance Test • Semi graphic check (if applicable) • Paint shade and thickness check • Wiring color code, ferruling & continuity check • Wiring scheme check & functional check of instruments and accessories. • For pressurized panels, required volume change & pressurization check.					
4	Submission of certificates: -	• Certificate of statutory approval authority like CCOE/PESO for use in electrically hazardous area. • Degree of protection certificate for instrument housing • Type test report from testing agency like CIMFR, BASEEFA . FM/UL, PTB etc, for suitability in specified Hazardous area . • BIS approval for instruments manufactured	100 % by supplier and and on random basis by PURCHASER / / END CUSTOMER	Statutory approval certificates/ Type Test certificate	-	R	R

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		indigenously for use in specified hazardous area • Traceability of records					
5	Packing and Painting	• Visual • Suitable protection to prevent entry of foreign material. • Proper packing to prevent any damage during transportation	100%	Packing List/supplier's record	-	W	-

Legends:

CCE or CCOE- Chief Controller of Explosives, DT-Destructive Test, DP or DPT-Dye Penetration Test, HT-Heat Treatment, H-hold(Do not proceed without approval) ID- Inside Diameter, PMI- Positive Material Identification, IBR-Indian Boiler regulation, ITP- Inspection and Test Plan, M- Monitor, NDT Non Destructive Testing, P-Perform, PO-Purchase Order, PR- Purchase Requisition, PQR-Procedure Qualification Record, QAP- Quality Assurance Plan, Random-10% (min 1 no) of each size and type of bulk item, R-review, RT-Radiography Testing, RW-Random Witness, TC-Testing Certificate, TPI or TPIA-Third party Inspection Agency, VDR- Vendor data Requirement, WPS-Welding Procedure Specification, WPQ- Welder's Performance Qualification, W- Witness (Give due notice, work may proceed after schedule date). MT or MPT- Magnetic particle Test, MTC-Manufacturer Test Certificate , UT –Ultrasonic Test, VDR-Vendor Data Requirement,1: Sub- Supplier, 2: Bidder ,3: Purchaser / / End Customer

NOTES:

19 The above guidelines are the minimum requirements. ITP shall be developed by bidder based on this specification requirements / codes and statutory requirements and shall be submitted to Purchaser for approval during detail engineering stage.

20 Bidder at no point of time shall be eligible to raise any extra claim on account of any requirement necessitated as a part of approval of QAPs/ ITPs.

13.5. **INSPECTION**

13.5.1. Bidder, to ensure that the equipment and material supplied, meet all the specifications laid down in the contract

13.5.2. In case bidder find any deviation or non- conformity with respect to the agreed specifications, during manufacturing of the item and where corrective action is not feasible, the bidder shall report the same to Purchaser and / or in the designated "Waiver / Deviation Request" format and seek prior approval from Purchaser / before proceeding with the job.

13.5.3. Bidder shall notify in writing to the Purchase, at least two weeks (Ten working days) in advance of the date and the place at which the items will be ready for witnessing of inspection / testing by Purchaser. In case any postponement

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becomes necessary, the CONTRACTOR shall provide written notification at least 48 hours prior to the original scheduled date.

13.5.4. Bidder after satisfying that all inspection requirements as per approved ITP and applicable specifications / documents have been taken care by TPIA, shall submit copy of the Inspection Certificate and all Quality control records to Purchaser in requisite copies along with Statutory Certificates if any, such as IBR, CCE etc. duly endorsed by their Quality Control Manager.

13.5.5. The bidder shall ensure that all items covered by IBR/CCE regulations are inspected at the manufacturer's works and duly certified by competent authority.

13.5.6. Purchaser and / or End customer reserve the right to carry out surprise checks on all material either at manufacturer's works or at site. In case of any rejection at site, the whole lot will be rejected and bidder shall get the entire lot replaced without any time or delivery implication to the purchaser.

13.5.7. TPIA shall check the calibration status and traceability of all instruments used by the supplier, for testing. In case, TPIA uses their own instruments for testing purposes, similar certification shall be ensured.

13.5.8. Dimensional check up to a minimum of 10% should be done for all pipes and fittings at supplier's shop and witnessed by TPIA. Additionally 1% dimensional check will be carried out at site by the bidder and witnessed by Purchaser.

13.5.9. In case any non-conformity is noticed, 100% of the lot shall be checked by TPIA and all non-conforming material shall be replaced by the bidder.

13.6. **INSPECTION CERTIFICATE**

13.6.1. TPIA shall issue an Inspection Certificate after satisfactory completion of all required 'H', 'W', & 'R' stages of Inspection by all parties concerned as per approved ITP and after ensuring compliance to specified requirements of all relevant applicable documents. The Inspection Certificate shall give reference of the approved documents including ITP referred for inspection and tests carried out and short supplies, if any.

13.6.2. Bidder shall submit, copy of each Inspection Certificate (IC) / Inspection Release Note (IRN) issued by TPIA, along with all attachments mentioned therein.

The IC / IRN shall include the following as minimum:

a. Job No. / Project Title / PO. No. / Purchase Specification No., Date of inspection and
b. Status of the visit - Initial / Intermediate / Final.
c. Item Tag No. / Name / Total quantity ordered / released / offered for inspection and accepted during the visit.
d. Manufacturer's Name
e. Date & Place of Inspection, name of Inspection Agency and Inspection Authority.

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f. Reference of Documents with Revision status.(It shall be clearly indicated in the inspection certificate that "inspection has been carried out based on code 1 drawings and approved ITP".)
g. Verification of calibration documents.
h. Details of Inspection carried out.
   i. Works Certificate with details of Hydrostatic Test and PMI / Leak Tests (if applicable) for Fabricated equipment
   ii. Works Certificate with details of Performance Test, Mechanical Run Test (if specified in PR) and String Test (if applicable) for Rotating Equipment
   iii. Works Certificate with details of acceptance tests witnessed and Certificate of statutory approvals if applicable, for electrical items
   iv. Works Certificate with details of calibration, and Certificates of statutory approvals if applicable, for instruments.
   v. Works Certificate with details of Mechanical tests, PMI and Helium Leak tests if applicable, for all bulk items such as pipes, valves, fittings, fasteners and gaskets.
   vi. Works Certificate accompanied with details of basis for acceptance, for all other items
i. Results of Inspection.
j. Deviations, if any.

13.7. **INSPECTION AGENCY:**

Purchaser / Third Party appointed by purchaser / appointed third party / End Customer / End Customer appointed third party.

The inspection agency shall be indicated in the quality plan and shall be as per the approved quality plan.

13.8. **GUARANTEE:**

The Bidder shall guarantee the performance of the WFPS throughout the year. After completion of the installation, the system shall be balanced and necessary adjustments shall be carried out for all equipment until all guaranteed performance requirements are satisfied.
All instruments and services required for the above tests shall be provided by the bidder.
All the instruments installed and required for conducting acceptance test shall be only calibrated instruments

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14. MARKING , PACKING AND DESPATCH

14.1. MARKING

14.1.1. All items shall be marked (stamped/etched) in accordance with the applicable code/standard/specification. In addition, the item code, if available, shall also be marked.

14.1.2. For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.

14.1.3. Paint or ink for marking shall not contain any harmful metal or metal salts which can cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.

14.2. DESPATCH

14.2.1. All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to the finish. Crates/cases shall have skid bottom for handling.

14.2.2. Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

14.2.3. The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

14.3. The following minimum packing procedures shall be followed :

14.3.1. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kinds.

14.3.2. All items shall be protected from rust, corrosion, and mechanical damage during transportation, shipment and storage.

14.3.3. Rust preventive on machined surfaces to be welded shall not be harmful to welding and shall be easily removable with a petroleum solvent.

14.3.4. Ends shall be suitably protected, and the protectors shall be securely and tightly attached.

14.3.5. Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.

14.3.6. Carbon steel, LTCS and low alloy steel valves shall be painted with one coat of inorganic zinc silicate primer.

14.3.7. Prior to shipment components of the unit shall be completely cleaned, Flange faces and other machined surfaces shall be protected by coating with easily removable rust preventive. All the equipments shall be properly packed to prevent damage during transit damage, loading, unloading and storage.

14.3.8. All electrical, instrumentation etc, shall be properly packed to prevent damage during transit due to vibration, physical contact, moisture ingress, rainwater and pilferage.

14.3.9. All the items which the Bidders considered liable to be damaged during shipment or storage, shall be packaged for separate shipment. If instruments are removed from the panel, they and their connection shall be suitably tagged to ensure simple re installation at the job site. Each instrument shall be sealed in plastic bags containing moisture absorbing dessicants.

14.3.10. It shall be bidder's sole responsibility to protect all the material during period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and including delays in transit. Bidder shall be responsible for any damage to equipment/material due to above reasons.

14.3.11. Spare parts shall be packaged separately and clearly marked as 'Spare Parts'

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15. DOCUMENTATION:

15.1. MASTER DOCUMENT LIST

15.1.1. A master documentation shall be prepared during kick off meeting identifying all the DOCUMENTS / DRAWIGS to be submitted by the bidder as part of documentation.

15.1.2. Bidder shall ensure submission of all documentation as per approved Master Document List.

15.1.3. Bidder to note that the dates of submission of all the documents shall be finalized by him considering the time required for approval of various documents at Purchaser's end. It shall be solely bidder's responsibility to get approval on the entire document from purchaser to meet project schedule.

15.2. DRAWING APPROVAL / REVIEW CATEGORY:

15.2.1. The master document list shall clearly identify the class of review to be performed against each document.

15.2.2. Following classes of review shall be followed for all the documents engineered by the bidder

- APPROVAL (A)
  Approval is mandatory and bidder cannot proceed without obtaining Purchaser's approval.

- INFORMATION / RECORDS (I)
  This type of documents shall be submitted to Purchaser for his information. Bidder can proceed if Purchaser's comments are not received within 14 working days of receipt in Purchaser's office.
  However, if any deviation to contract specification for any design deficiency is detected in the course of review after stipulated period, it shall be the responsibility of the bidder to see that such deviations and deficiencies are corrected to ensure compliance to contract without any cost and time implication to purchaser

15.3. **DRAWINGS REVIEW AND APPROVALS**

15.3.1. Bidder to understand that efficient handling of drawings and documents to be prepared by him under the contract is the key to the timely completion of the WFPS system. By accepting the contract the bidder undertakes to ensure that all drawings and documents to be submitted by him to the Purchaser/End Customer shall be of professional quality and conforming to the contractual requirements.

15.3.2. Bidder to note that the dates of submission of all the documents shall be finalized by him considering the time required for approval of various

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documents at Purchaser's end. It shall be solely bidder's responsibility to get approval on the entire document from purchaser to meet project schedule.

15.3.3. Computer aided design and drafting shall only be used except in exceptional cases where manual drafting may be resorted to, if unavoidable.

15.3.4. All the dimensions should be in metric units.

15.3.5. Each drawing submitted by the bidder shall be clearly marked with the name of the Owner, the unit designation, the specifications, title, the specification number and the name of the Project with revision No. and date. If standards, catalogue pages are submitted the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English.

15.3.6. All documents before forwarding to Purchaser will have to be vetted in detail by bidder. Document received without vetting will be returned without review. Also any inaccuracies/mistakes found will not only be rectified by the bidder but the bidder shall remain liable for bearing charges towards efforts spent by Purchaser for discussing the same. Delay owing to these shall be to the account of bidder

15.3.7. The bidder shall thoroughly review and approve all sub-vendor documents, before forwarding to Purchaser

15.3.8. Only the approved drawings duly stamped and signed by a competent engineer of bidder shall be submitted to purchaser for review.

15.3.9. Documents submitted without meeting pre-requisite requirements will be returned without review.

15.3.10. Review of drawings and documents issued by bidder shall be carried out by Purchaser /End customer.

15.3.11. Approval/ review of the drawings/ documents by the Purchaser /End customer would be only limited to the review of compatibility with basic designs and concepts.

15.3.12. The approval and /or review by the Purchaser /End customer shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

15.3.13. The sole responsibility of the correctness of Design, Engineering & supervision of erection and commissioning shall lie with the bidder, irrespective of the fact that the Drawings/Documents submitted are reviewed or not by the Purchaser /End customer.

15.3.14. The bidder shall correct all faulty designs & supervision of erection and commissioning detected at any stage of work (irrespective of the fact whether drawings related to such faulty designs & or constructions are approved by purchaser), without any cost and time implication to the Purchaser.

15.3.15. The Bidder shall be responsible for and shall pay for any alterations of the Work to be accrued out by other agencies due to any discrepancies, errors or omissions in the Drawings or other Particulars supplied by him whether such drawings or particulars have been approved by the BHEL/ End customer or not.

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15.3.16. Revisions in drawings/documents shall be clearly marked within clouds. No revision without clouding shall be recognized and the same shall not be considered reviewed and approved. All revised drawings / documents shall be associated with comments compliance report,

15.3.17. Normally all drawings / documents shall be reviewed by the purchaser with 14 working days of receipt of drawing at Purchaser's end. 14 days shall be reckoned from the date of receiving the hard copies of the documents at purchaser's center.

15.3.18. However, for all documents where multi-disciplinary activity is involved, the bidder, after submission for Purchaser's review, shall in his own interest, visit Purchaser's office for discussion for expeditious review of documents.

15.3.19. In absence of visit of bidder's engineering team at Purchaser's office approval/review time shall be 15 working days.

15.4. **ENGINEERING COMPLETION:**

15.4.1. The Engineering shall be considered as completed after the following activities are finished:

- Final approval of all the Drawings / Documents which are in 'Approval' Category as per Master Document List (MDL)
- After successful review of drawings/documents which are in 'Information' Category as per Master Document List (MDL)
- Final approval of detailed Bill of Quantity (BOQ).

15.5. **ERECTION & COMMISSIONING DOCUMENTATION:**

15.5.1. **ERECTION DOCUMENTATION:**

15.5.1.1 Erection document List shall be prepared during Engineering review meeting (after award of contract) identifying all the DOCUMENTS / DRAWINGS required for completion of Erection activities of the complete system, to be submitted by the bidder as part of documentation.

15.5.1.2 The Bidder shall submit for Purchaser's approval draft manual for Equipment Delivery and Erection (EDE Manual) covering detailed instructions, write up, technical data, drawings, check-lists, documentation formats for all activities after equipment manufacture upto installation of equipment. This manual shall cover general instructions for all equipment and specific instructions for individual equipment wherever required and shall include at least the following :

- Instructions for packing, shipping, receiving, handling, ware-housing and storage.

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- Part number/Dispatch link-up of all the equipments/items supplied and also their co-relation with system/drawing/approved BOQ.
- Instructions for location and installation of equipment furnished by this specification.
- Installation drawings for field mounted equipment, panels, cubicles and other equipment covered under this specification.
- Instruction relating installation of piping/ tubing, support and routing drawings of impulse pipes/signal tubes and tube/cable trays.
- Check lists and quality assurance hold points.
- Formats for all related documentation.
- The EDE Manual shall conform to the requirements of this specification, all applicable codes and standards, recommendations of equipment manufacturers and accepted good engineering practices and shall be subject to Employer approval during detailed engineering.
- The Bidder shall ensure that all work under this part shall be performed as per the requirements of this specification, Employer approved EDE Manual and drawing/documents approved by the Employer during detailed engg.

15.5.1.3 Erection Manuals

The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum.

- Erection strategy.
- Sequence of erection.
- Erection instructions.
- Critical checks and permissible deviation/tolerances.
- List of tool, tackles, heavy equipments like cranes, dozers, etc.
- Bill of Materials
- Procedure for erection.
- General safety procedures to be followed during erection/installation.
- Procedure for initial checking after erection.
- Procedure for testing and acceptance norms.
- Procedure / Check list for pre-commissioning activities.
- Safety precautions to be followed in erection all equipments and electrical supply distribution during erection

15.5.2. **COMMISSIONING DOCUMENTATION:**

15.5.2.1 The contractor shall submit the commissioning documentation, comprising of Standard checklists, pre-commissioning procedures, testing schedules, commissioning schedules and commissioning networks for various Equipment / systems covered under the contract, for the approval of employer.

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15.5.2.2 Standard checklist, as the name suggests, shall be a fairly general documents, containing the list of all checks required to be carried out for similar and repetitive type of equipment to ensure consistent and thorough checking.

15.5.2.3 The testing schedule is a document, designed for safe and systematic commissioning of individual equipment/sub-system. Commissioning schedule is a document envisaged for commissioning of a system. The testing/Commissioning schedule shall have a standard format in order to maintain consistency of presentation, content and reporting. A brief write up on the contents of the Testing Schedule/Commissioning Schedule is as per the following:

Testing Schedules should be designed to ensure that the plant area, equipment or apparatus are tested and commissioned and will operate as per the employer's specifications and good engineering practices.

Testing Schedule/Commissioning Schedule is required to be of a standard format in order to maintain consistency of presentation, content and reporting.

Testing Schedule/Commissioning Schedule should contain the following sections to make the document a self contained one:

a) Plant Details/Design data
b) Testing Objective/Proposals
c) State of the Plant required prior to commissioning
    - o Erection Status with respect to Mech. Elect and C&I
    - o Services required
    - o Safety requirements

d) Test method including completion/acceptance criteria
e) Results
f) Testing Programme
g) Mech/Elect/C&I –Plant item completing list
h) List of Drawing/documents required for carrying out the testing.

15.5.2.4 The contractor shall submit the list of commissioning documentation to be submitted by him, alongwith their submission schedule for various equipment/systems covered under the contract, with in 6(six) month from the date of award of contract, for the acceptance of employer.

15.5.2.5 The Contractor shall submit the commissioning documentation, for various equipment/covered under the contract, for the approval of employer, at least

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12 months before the scheduled date of commissioning of the equipment/systems.

15.6. FOLLOWING MAY BE NOTED WRT THE DRAWING SUBMISSION SCHEDULE:

SL NO.	DESCRIPTION	NUMBER OF COPIES TO BE SUBMITTED	WHEN TO SUBMIT
1.	Initial drawings/documents under approval and information category.	4	As per approved Master document list
2.	Revised drawings/documents incorporating BHEL's comments.	4	Within 1 week of receipt of commented Drawings from BHEL
3.	Final Drawings/documents	17	Within 2 months of placement of order.
4.	Erection Documentation	8	1 Month before dispatch of equipment, The list of documents identified under master document list for erection to be furnished in 5 nos. of folders.
5.	Draft O & M Manuals with out test certificates	2	2 months before the delivery date of equipment
6.	Revised O & M Manuals with Test Certificates to be submitted to BHEL (Hyderabad)	17	Within one month after dispatch of equipment
7.	Final O&M Manuals in a CD	3	Within one month after dispatch of equipment

15.7. DOCUMENT SUBMISSION PROCEDURE

15.7.1. All Drawings/Datasheet/Design calculation etc. shall be submitted in soft as well as hard copy. Soft submission of all drawings/documents is mandatory.

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15.7.2. All drawings/ shall be submitted in Autocad format & all documents in MS office/PDF

15.7.3. Bidder shall furnish all documents in A4 Size (210 mm x 297 mm) paper or folded in A4 size unless otherwise specified. All drawings and sketches shall be in multiples of A4 size like A3 (297 mm x 420 mm) or A2 (420 mm x 594 mm) etc., but folded to 'A4' size. Final documentation shall be submitted in bound volumes and softcopy shall be furnished in non - writable CD.

15.7.4. It has been observed that at times mails fails to deliver because of problem in sender's /receiver's server .Hence it is recommended that bidder shall intimate concerned BHEL personal about any soft copy submission over phone immediately after any drawing / document is submitted for BHEL's review / approval.

15.7.5. Hard copies of all the documents shall be forwarded to the following address:
Name: (Name will be intimated during detail engineering)
Address: Bharat Heavy Electrical Limited
New Engineering Building
PE&SD
RC Puram Hyderabad- 32

15.7.6. Date of receipt of hard copies shall be considered as date of submission of any document. Soft copy submission shall be considered as advance submission of drawing/document

15.7.7. BHEL's normal working hour is 7.00 AM to 3.15 PM from Monday to Saturday.

15.7.8. Bidder to ensure that all documents are received with in BHEL working hours. Any submission done after normal office hour/ weekly Off/Public Holidays shall be deemed as submitted on next working day.

15.7.9. BHEL shall furnish Approval/Observation of Drawings/Datasheet/Design calculation etc. on Soft Copy only.

15.8. INPUT DRAWINGS

15.8.1. On receipt of order, it shall be solely the bidder's responsibility to spell out the requirement of the base engineering drawings/documents required by him to go ahead with the engineering of the package, and shall not expect the Purchaser to automatically supply the same after order placement – the required base drawings/documents shall be furnished to the Bidder within reasonable period of receipt of such requisition from Bidder. Any ultimate delay arising out of the delay by the successful bidder in putting up such a requisition shall solely be to the bidder's account.

15.8.2. Drawings attached with this specification are preliminary in nature & are not exhaustive. These drawings may get revised and /or new drawings will be furnished to bidder during detail engineering .Bidder to however note that they will not be eligible to raise any extra charges on account of this.

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15.8.3. All relevant input drawings will be made available to the bidder during detail engineering stage as when they are revised or prepared.

15.8.4. Bidder to note that they shall not be eligible to raise any extra claim on account of furnishing of new drawings or revised drawings by purchaser during offer execution stage.

15.9. REVIEW MEETINGS & KICK OFF MEETING:

15.9.1. As and when required, the bidder will be called upon to attend design co-ordination meeting / review meeting with the end customer/BHEL during the period of the Contract. The Contractor shall attend such meetings at his own cost at venues decided by BHEL.

15.9.2. Bidder in his own interest may visit Purchaser's office to expedite the approval of critical drawings, which may affect the progress of project.

15.9.3. A kick off meeting shall be held at Purchaser's office, preferably within 2 weeks of order.

An agenda shall be prepared for this meeting and would include the following points related to technical aspects.

a. Any clarifications required by the Bidder on purchaser's order.
b. Bidder Data Index & Schedule.
c. Bidder Data Review/approval modalities.
d. Sub-Bidder lists proposed by Bidder.
e. Utility requirements.
f. List of input drawings required from BHEL
g. Preliminary General Arrangement & layout drawings

15.9.4. As and when required, the bidder will be called upon to attend design co-ordination meeting / review meeting with the end customer/BHEL during the period of the Contract. The Contractor shall attend such meetings at his own cost at venues decided by BHEL

15.10. The following minimum documentation shall be submitted by the vendor during detail engineering stage:

a. Billing Breakup
b. P & ID of the WFPS system
c. Equipment layout for Fire water pump house
d. Equipment layout for Booster pump house(if any)
e. WFPS layout
f. List of equipments

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g. All equipment GA drgs
h. All equipment data sheets
i. Foundation drawing for all the equipment supplied by the bidder
j. Civil interface details
k. Field alignment diagram
l. Piping specifications
m. Valve Material specification
n. Line schedule and line list
o. Hydrant Piping layout
p. Spray system piping layout
q. Isometrics of all piping layouts. All isometrics shall have support markings and bill of materials
r. Piping support details
s. Control / annunciation panel drawings
t. Instrument data sheets with hook up drgs
u. Instrument Index
v. Instrument sizing calculation
w. Logic diagram
x. Instrument loop diagram
y. Instrument cable schedule.
z. Wiring drawing
aa. Cable schedule
bb. Utility list
cc. Motor load list
dd. Operation & Control philosophy
ee. Welding specification charts
ff. Nondestructive Testing specifications
gg. Shut down and start up sequence
hh. List of consumables
ii. Operation write up
jj. Quality plan
kk. Painting schedule & procedure (shop painting & site painting)
ll. Packing procedure
mm. Erection drawings
nn. Site storage procedure
oo. Erection procedure
pp. Testing procedure
qq. Pre commissioning procedure
rr. Commissioning procedure
ss. Field quality plan
tt. Supply quality plan
uu. List of major vendors along with Proven Track Record (wherever applicable)
vv. O & M Manuals

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ww. Any other document, as deemed necessary by Purchaser, at any stage of contract execution.

15.11. AS BUILT DRAWINGS

15.11.1. As built drawings and documents will be generated within one month of completion of activities on respective items of work.

15.11.2. Bidder shall furnish reproducible and electronic files of all the drawings under their scope to Owner/ certified as "As Built Issue."

15.11.3. Upon completion of identifiable units or components of the fabrication, construction and installation phase of the project, the bidder will complete all the related plans to the "as built" stage including all Sub-Vendor drawings and furnish Purchaser with the following :

a. 6 complete sets of full size prints of the drawings and 4 sets of reduced size prints.
b. 6 complete bound sets of Manufacturer's specifications including design calculations.
c. As Built drawings generated specifically for this job in electronic media (AutoCAD 10 or above).
d. All vendor drawings & documents either in AutoCAD or in scanned images stored in electronic media.
e. 6 complete sets of all operating & maintenance instructions in electronic media or in scanned images converted in electronic media.
f. 6 complete sets in hard binders of the Manufacturer's data book including certified prints and data for all items including test reports. Data Book shall be complete with index as tag numbers associated with Manufacturer's data shown. Equipment data shall include as a minimum requirement the principal and description of operation, drawings and dimensions, spare parts lists and unpriced purchase orders and bill of materials.
g. 6 bound copies each of the Spare Parts data book and the Lubricants inventory schedule.
h. 6 complete sets of field records shall be signed by the CONTRACTOR'S and Owner's representatives at the site.
i. Original approvals and related drawings and documents from the statutory authority.
j. 3 Copies of correspondence with the statutory authorities.

15.12. Drawings/documents with following titles shall contain as a minimum the following Information:

15.12.1. Drawing and Document Schedule
This document lists out drawings and documents prepared and/or submitted by bidder to purchaser either during engineering or as a part of final

documentation. This document shall be submitted as first document of submission for review after award of contract. Following information shall be available in this document:

a) Name , Category of approval and number of each drawing and document listed.

b) The schedule for the document submission considering the project schedule.

15.12.2. Utility Requirements

This document lists out the following information regarding utilities required by the bidder

a. List of utilities required i.e. Power (UPS, Non UPS), Instrument air, Cooling water, Steam for tracing, Nitrogen etc.
b. Location and estimated/actual requirement at each location. The requirement shall be listed as minimum/normal/maximum.
c. In case of AC power, the In-rush current with duration and power factor shall also be indicated for each location.

15.12.3. General Arrangement Drawing

A general arrangement drawing shall indicate:

a. Outline dimensions (minimum three views) (All principal dimensions).
b. Allowable forces and moments on suction and discharge nozzles.
c. Location (in all three planes), size, type, rating and identification of all purchaser's interface connections including those of vents, drains lubricating oil, sealing fluid, cooling water, steam & Electrical Instrumentation.
d. Direction of rotation viewing from the driving end.
e. Weight of each assembly/component.
f. The weight & location of center of gravity of the heaviest assembly/components that must be handled for erection.
g. Identification and weight, dimensions of the heaviest assembly / subassembly / component required to be handled for maintenance.
h. Maintenance clearances and dismantling clearances.
i. Speeds of Driven Equipment and driver and driver rating. Location of driver terminal box (in case of Electric Driver)
j. Layout of auxiliary equipment and operating platform.
k. Make, Type and Size of couplings and the location of guards and their coverage.
l. A list of reference drawings if any.
m. A list of any special weather-protection and climatic features.

15.12.4. Foundation Drawings

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A foundation drawing shall indicate complete information required for foundation design by purchase including the following:

a. Foundation bolt sizes, pipe sleeve details, pocket sizes and locations and also distance between the first/ nearest anchor bolt and pump suction and discharge nozzle centerlines.
b. Grouting thickness and other necessary technical details.
c. Static weight of each skid/independently grouted item and location of center of gravity of each of such skid/items in all three planes.
d. Weight distribution for each bolt/sub sole plate location and total static weight.
e. Dynamic loading caused due to various items grouted independently.
f. The direction and magnitude of unbalance forces and moments generated by each such item at the worst operating condition and short circuit moments of motor drivers at the C.G. of the pump-motor base plate.
g. GD2 value of each item resolved to driver speed.
h. Maximum permissible amplitude of vibration on the foundation at base level.
i. Total mass of rotating parts.
j. Total mass of reciprocating parts.
k. Suggested dynamic factor and ratio of foundation weight to weight of skid/equipment as per vendor experience.

15.12.5. Layout Drawing

This drawing shall include at least the following:

a. Layout of all skid/equipment and their auxiliaries, vessels, control panels, exchangers etc. Vendor shall furnish an optimized layout (considering the space allocated, site wind conditions, area classification, the type of equipment located in the vicinity etc.) indicating elevation and dimension of skids/equipment.
b. Minimum spacing required between the various skids/equipment and between the skids and the walls/columns/roof for an easy accessibility and maintenance.
c. Recommended Horizontal clearances:
Equipment spacing
- Small pumps (3.7 kw & less) : Mounted on common foundations with suitable centre to centre distance.
- Medium pumps (22.5 kw & less) : 900 mm clear aisle

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d. Layout for water piping, trenches for water piping, cable tray/trenches layout.

e. Piping arrangement and piping support arrangement/ location for Layout for auxiliary equipment and operating platform details.

f. Erection & Construction schedule: Erection scheme and schedule of all equipments must be considered during equipment layout to have smooth erection

g. Platforms with ladder access shall be provided for Items that require occasional operating access including valves, spectacle blind and motor operated valves, sampling points etc.

h. Constructability, Operation & Maintenance Requirement:

- Overhead and side clearance for exchangers and pumps
- Provision of Heat Exchanger tube bundle pulling area
- Clearances for easy movement of working personnel
- Provision of monorails for pumps and exchangers

i. Pumps:

- Pumps shall be arranged in rows with the center line of the discharge nozzle on a common straight line wherever practicable.
- Gap between each pump foundation/ and foundation of technical structure should be sufficient for easy removal of equipment after piping.
- Clearance between two adjacent pumps shall be such that clear 900 mm aisle is available.
- All pumps not open to sky with motor rating >=75 KW shall be provided with monorail.
- No monorail should normally be provided for pumps open to sky and sufficient space below rack shall be available for pump maintenance.

j. Pumps Piping:

- Pump drives shall have clear access.
- Pump suction piping shall be as short as possible and shall be arranged to avoid vapour pockets.
- Reducers immediately connected to the pump suction shall be eccentric type with flat side up to avoid the accumulation of gas pocket.
- For end suction pumps elbows shall not be directly connected to the suction flange. A straight piece minimum 3 times the line size shall be provided at the
- suction nozzle.

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- Pump discharge check valve if installed in vertical lines shall be fitted with a drain connection as close as possible downstream of the valve.
- Unless otherwise specified, T-type strainers shall be used on pump suction piping for sizes 2" and above.
- Y-type strainers shall be used for all sizes in steam services and for pump suction lines below 2".
- All small bore piping connected to pump (drain to OWS & CBD, seat and gland leak drain) shall have break up flanges for removal of pumps.
- Piping shall be so arranged that the forces and moments imposed on the pump nozzle do not exceed allowable values of API610/manufacture recommended values.
- Pump discharge should be preferably routed away from the pump rather than towards the motor side.
- Pump cooling water connection shall be taken from the top of circulating cooling water header.
- Suction & discharge valves shall be located at operable height.

15.12.6. Field Alignment Diagram

The diagram shall indicate the relative displacement to be kept between the centerlines of various equipments at the time of installation, so that under normal running conditions the equipments get fully aligned. This relative displacement should be decided on the basis of centerline temperature rise data of driver, gear box/transmission system, driven equipment.

15.12.7. Heat Exchanger Drawings

Heat exchanger drawing and data shall include heat and mass balance data, details of provisions for separating and withdrawing the condensate, construction details, cross sections & general arrangement drawings of heat exchangers, bidders recommendations regarding provision for support and piping expansion.

15.12.8. P&I Diagrams (with Bill of Materials)

a. Bidder shall supply P&I Diagrams along with Bill of Materials of each system in the bidder's scope of supply or specified in the order.

b. P&I Diagram shall indicate the system details, location of various auxiliaries, instruments, controls and safety devices as required.

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Line sizes, piping class, valve sizes and class shall be clearly marked on the P&ID.

c. Bidder's scope and purchaser's scope shall be clearly demarcated.

d. Each item shall be identified by an item No./item tag no., which shall correspond to the item no. shown on the bill of materials.

e. The bill of materials shall include items number, normal value, set value, range, quantity per unit, make and other specifications as applicable.

f. Legends adopted shall be indicated either at the bottom of drawing or on a separate drawing.

g. The legends shall be as per ISA.

15.12.9. Cross-sectional Drawing (with Bill of Materials)

a. The bidder shall supply cross-sectional or assembly type drawings for all equipment furnished showing all parts, design assembly and running clearances, and balancing data required for erection and maintenance.

b. Each part shall be numbered which shall correspond to the part number on the bill of materials.

c. The bill of materials shall include the part no., name of component, materials quantity installed per unit & sizes where applicable (say for bolts, nuts, rings, gaskets etc.).

d. All boughtout items shall also be indicated with make and brief specifications.

e. A separate cross-sectional drawing showing installation and setting dimensions for the seals shall be furnished.

15.12.10. Performance Characteristic Curves

a. Bidder shall provide complete performance curves to encompass the map of operations, with any limitations indicated thereon.

b. All curves submitted prior to final performance testing shall be marked "PREDICTED". Any set of curves resulting from a test shall be marked "TESTED".

c. Certified test curves and data shall be submitted within 15 days after testing and shall include head, power recalculated to the proper specific gravity and efficiency plotted against capacity. If applicable, viscosity corrections shall be indicated. If NPSHR test is specified, the water NPSHR curve (drawn upto minimum continuous flow) shall also be included.

d. The curve sheet shall include the maximum and minimum diameters of the impeller design supplied the eye area of the first

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stage impeller, the identification number of the impeller or impellers and the pump serial number.

15.12.11. Data Sheet

Bidder shall provide completely filled in data sheets, first for "as purchased" and then for "as built". This shall be done by the bidder correcting and filling out the data sheets and submitting copies to the purchaser.

15.12.12. Piping Layouts

a. All piping layouts shall have clearances, loops, equipment foundations, columns, beams, technological structures, platforms, gratings, hand rails, anchors, sections, guides, supports, connections to equipments, orientation, coordinates etc.
b. Blow up details wherever required for clarity shall be made.
c. All dimensions shall be in millimeters whereas all levels and coordinates shall be in meters.
d. Vital installations and battery limits shall be marked with coordinates.
e. Dimensioning shall be done with equipment centerlines or main structural columns as reference grids.
f. GADs shall be printed in 1:33 1/3 scale for unit piping
g. All the information regarding instruments, equipments and line identification, direction of flow for lines, Insulation Type and Thickness, elevations and locating dimensions shall be clearly marked on piping plans. Information including operating platforms, ladders, staircase, and monorails with capacity shall also be marked wherever applicable.
h. Davit drop out areas, maintenance areas shall be clearly marked on the GADs.
i. Electrical cable and instrument trays etc. shall be shown in piping plans to avoid reference to other drawings.
j. Nozzles on equipments shall be shown in double line thin and firm. Actuators, valves hand wheels shall be drawn to scale for valves 2" and larger.
k. Piping plans shall show all lines indicated in P&ID's and also lines generally not covered in P&ID.
l. Nozzle schedule table giving nozzle number, size, rating, facing, projection, elevation and orientation shall be inserted in the GADs.
m. Isometric shall be drawn on A3 size sheets. System Isometrics, if required by IBR authorities shall be prepared on AO size. BOM and all support requirements shall be shown on the Isometric by using symbols and designations in accordance with Piping Support Standard.
n. All vessel mounted instruments, items i.e. trims shall be detailed in isometrics.

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o. Each line on the piping GADs and isometrics shall be clearly marked to denote the complete line designation as marked in P&ID's.

p. Following symbols shall be used in Piping drawing:-

- Bottom of the pipe level: BOP.
  (Above Grade/ Platform/ Floor etc. shall be 500mm minimum for un-insulated lines and to be suitably raised for insulated lines to maintain clearance of min. 500mm from bottom of insulation.)
- Center of the Pipe Level: C/L EL.
- Top of Steel/Top of Rod: T.O.S./T.O.R.
- Platform Elevation/Highest Paved Point Elevation: TOG EL/HPP EL

15.12.13. Instrument work Specifications

This document details out the procedures and methodologies adopted by the bidder to carry out complete instrumentation work. The document apart from others shall include:

- Agencies involved for carrying out design, detailing, engineering, procurement, installation, loop checking and commissioning of Instrumentation with specific reference to various systems.
- Scope of work and responsibilities of various agencies involved.
- Interface requirement and co-ordination between various agencies.
- Co-ordination between various engineering disciplines viz. Electrical, Mechanical Equipment, Piping, Process/Operations etc.
- Experience of various agencies in carrying out respective jobs.
- Inspection and testing requirements and co-ordination procedures for the same.
- Co-ordination requirements and procedures for co-ordination with outside/statutory authorities.
- Quality control and assurance procedures to ensure proper quality.

15.12.14. Instrument Index

Instrument Index lists out all instruments those appear on the P&ID without any exception.

It is a basic instrument document, which is necessary for the smooth execution of a job and is also a reference document after the completion of job. Instrument Index shall be prepared. JOB STANDARD

record. In addition to this, all field bus instruments shall be registered with Foundation

fieldbus and clearance of ITK latest version test for device test and DD/CFF test.

15.12.15. Instrument sizing calculations, selection requirements

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Instrument sizing calculations provide information regarding sizing (as per standards specified elsewhere in this document), type, selection and other related information.

15.12.16. Functional Schematics (FS)

Functional Schematics details out the functionality of all the loops shown on the P&ID including their correlation. The schematic shows all the hardware necessary to configure a loop including their physical location, their interconnection and important software/ functional blocks with location of execution as applicable to make a loop complete. Similar loops may be combined under the same functional schematic.

15.12.17. Logic Diagrams

Logic diagram is a logic representation of process interlock and shutdown system and details out the functionality, in a schematic form, based on either process cause and effect table shown on the P&ID or in a separate write-up. The schematic shall be prepared based on ISA S5.2 – "Binary Logic Diagrams for Process Operations" and shall show the physical location of Input/output devices, their interconnection with functional blocks,
bench status of all electrical devices etc. The schematic shall also be supplemented with operational requirements like startup and process bypasses, reset and shut down push buttons, selector switches, status lamp etc.

15.12.18. Instrument Loop drawings

Each loop shall have a separate Instrument Loop drawing which shall show each component from field device to final receiver including physical location, initiating device, its terminal number, junction box with its terminal number, cable number with pair number/polarity, receiver instrument terminals/cabinet terminals, system functional blocks of loop in simplified manner (without configuration details).

15.12.19. Panel Front Arrangement

This drawing shall show the arrangement of Panel mounted instruments like indicating instruments, alarm annunciator, indicating lamps, push buttons/switches etc. including their approximate sizes and their mounting locations.

15.12.20. Configuration Diagram

This drawing is a graphical representation of all major hardwares required in a configurable control system which are necessary to meet all the expected functional requirements.

15.12.21. Dynamic Graphic Display Drawings

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These drawings provide a graphic representation of P&ID's arranged in a sequence which when displayed on the TFT, shall provide easy and logical operational views.

15.12.22. Input/Output Assignment

This document indicates the physical assignment of various I/O modules and their respective channels to various physical inputs and outputs.

15.12.23. Instrument Duct/Tray/Trench Layout

Instrument duct/tray layout drawing shows the routing of main instrument duct/tray layout in the unit/plant. The drawing shall be prepared on plot-plan and shall show the size, cross-section at various locations, general notes, symbols, reference drawings and the control room entry.

15.12.24. Instrument Cable Schedule (For conventional loops)

a. The instrument cable schedule shall show all instrument and power cables required for instrumentation. The document shall show, tag number, cable number, type, length and size of cables, type of junction box, identity of local panel, control room panel/cabinet location etc.

b. Fieldbus Instrument Cable Schedule (For Fieldbus loops)

c. The Fieldbus instrument cable schedule shall show all instrument cables required for complete instrumentation in segment wise. The document shall show, tag number, spur number, segment number, cable type, cable length and size of cables, identity of wiring/ terminal block/ junction box, type of power supply, control room panel/cabinet location etc.

15.12.25. Technical Data Manual/Mechanical Catalogues

a. Technical Data Manual/Mechanical Catalogue is a compilation of "as built" drawings and data, manufacturing and test records, installation, operating and maintenance instructions.

b. Not later than two weeks after successful completion of all specified tests, bidder shall furnish the required number of Technical Data Manual/Mechanical Catalogues for the equipment, any auxiliaries and instruments that the vendor is providing. The Technical Data Manual/Mechanical Catalogue shall include the following documents as a minimum:

- All drawings and data as listed in the bidder data index & schedule. (For drawings, where purchaser's approval is required, the final certified drawings shall be attached.) Sections shall be organized in a

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manner that data & drawings related to one subject is grouped together such as Mechanical, Electrical, Instrumentation etc.

- All manufacturing, inspection and test data and records.

15.12.26. Installation and Instruction Manual :

a. Bidder shall provide sufficient written instructions, including a cross-reference list of all drawings for correctly installing the equipment and prepare the equipment for start-up.
b. It shall include any special information required for proper installation that is not on the drawings, special alignment or grouting procedures, utility specifications (including quantity) and all installation data.
c. It shall also contain the following information:

- Instructions for erecting, piping, aligning (including the expected thermally induced shaft centerline shift between normal site ambient temperature position and that at normal equipment operating temperature).

- A description of rigging procedures, including the lifting of the assembled equipment, and methods of disassembly, repair, adjustment, inspection and reassembly of the equipment and auxiliaries.

- Pre-commissioning/commissioning/functional test procedures and acceptance criterion.

15.12.27. Operation and Maintenance Manual

1. Bidder shall prepare and submit draft maintenance manual to Purchaser for review at least three months prior to the mechanical completion.
2. Final maintenance manual incorporating all comments shall be submitted by bidder within one month after issue of comments.
3. This manual shall provide sufficient written instructions and data to enable purchaser to correctly operate and maintain the equipment ordered.
4. It shall include a section to cover special instructions for operation at extreme environmental and/or extreme operating conditions.

5. Maintenance manual shall contain the following chapters as a minimum:

i) Introduction to the system/unit maintenance

ii) Equipment/facilities register

iii) Location and list of all system/unit equipment.

iv) Equipment record card

- Equipment No. and name.
- Equipment serial No. and manufacturer details
- Brief description including details of parameters.

v) Maintenance guidelines

- Maintenance philosophy.
- Maintenance procedures of individual equipment and system.
- Preventive and predictive maintenance schedules.
- Procedures and precautions to be taken for handing over of equipment for shutdown maintenance, viz., vessels, exchangers, boilers, heaters, compressors, blowers, turbines, pumps, agitators, dryers, centrifuges, filters, etc.
- Details of preventive maintenance and predictive maintenance.
- Gasket details with respect to pressure ratings and temperature.
- Coupling details, like, type of coupling and coupling bolts with make, serial No. and dimensional details.

vi) Method for alignment including optical, if required.

- Tightening torque with respect to critical services and sizing of bolts/studs.

vii) Exchanger maintenance

- Tube extraction/tube bundle pull out procedures.

viii) Reciprocating compressors (if applicable)

- CE/HE clearances
- Cross-head clearances.
- Web deflection of crank shaft.
- Gland packing assembly - type, material and dimensional details.
- Permissible piston rod run out.
- Permissible ovality of cylinder.
- Permissible values of drop of piston.
- End gap and side clearance of piston rings.
- Lift of cylinder valves.
- Details of unloading system of cylinder.

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ix) Centrifugal compressors (if applicable).

- Alignment details
- Rotor assembly - Dimensions and weights and handling procedure.
- End float dimensions.
- Axial displacement.
- Thrust/tilting pad bearing alignment details.

x) Centrifugal/screw/gear pumps

- Shaft dimensions
- End float dimensions and checking procedure.
- Diametrical clearances.
- Clearance checking in screw pumps.
- Setting of timing gears in screw compressors.
- Mechanical seal maintenance
- Dimensional details including manufacturer catalogue.
- Methods to evaluate the surface finish of the mating surfaces of mechanical seals.

xi) Vibration

- Normal and critical values.
- Trip conditions including values.
- Lubrication schedule
- System/unit item
- System/unit number
- Location
- Points of lubrication
- Methods of application
- Recommended applications types and grades.
- Frequency of application
- Frequency of sampling and oil change.
- Valves types/specifications / materials for different service.
- Recommended inspection frequencies and items requiring inspection.
- Inspection details and activities.
- Work planning and execution techniques.
- Inspection recording systems.

xii) Maintenance trouble shooting

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- Trouble shooting guide for critical equipment like compressors, turbines, blowers, screw pumps, heaters, boilers, centrifuges, conveyors, filters etc.

xiii) Maintenance store

- Identification and classification of spares and consumables.
- Stock levels to be maintained
- Spare parts requirement for at least 2 years of trouble free operation and insurance spares.
- General tools and tackles including special tools, if any.
- Inspection gadgets including tension device for bolts tightening requirement.

xiv) Information storage and retrieval system

- Pressure vessels records including as built drawings, data sheets, licenses, approvals etc.
- Piping - as built drawings, test records etc.
- Details of piping support system including type, size, specification and make of spring supports clearly shown on the drawings.
- Lifting tackles/equipment details.
- Lifting equipment - test programme and schedule.
- Safety relief valve - test records & schedule including set values.

xv) Maintenance training

- Training needs and areas identified.
- Instructions covering start-up, normal shutdown, emergency shutdown, operating limits and routine operational procedures.

xvi) A description of equipment construction features and the functioning of component parts or systems (such as control, lubrication, sealing systems etc.

xvii) Outline and sectional drawings, schematics and illustrative sketches in sufficient 'details to identify all parts and clearly show the operation of all equipment and components and the methods of inspection and repair. Standardized sectional drawings are acceptable only if they represent the actual construction of the equipment.

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xviii) The following maintenance information:

- Maximum and minimum bearing, labyrinth and seal clearances including any other clearance between moving and stationary parts of the equipment affecting proper running and maintenance of the equipment.
- Instructions for measuring and adjusting cold clearances, shaft runout, concentricity etc.
- Rotor float allowance.
- Interference fits on parts that are required to be removed or replaced for maintenance of normally consumable spares.
- Balancing data with permissible tolerances.
- Lubricating schedules indicating recommended grades of oil, their properties, replacement period etc.
- Normal maintenance procedure.
- Preventive maintenance schedules and criterion for replacement of parts.
- Trouble - shooting procedures.

xix) The following reassembly information:

- Bolting sequence and torque values for all bolts affecting equipment performance/integrity/safety.
- Reassembly sequences together with required inspection checks.
- Adjustment procedures to achieve required positions, clearances, float and so forth.
- Detailed procedures for pre-operational checks, including settings and adjustments.
- Seals and coupling installation procedures.
- Parts list indicating cross-sectional drawings of various assemblies and sub-assemblies, part numbers, materials of construction (ASTM) etc. to facilitate identification of parts and for procurement of spares.

xx) Following information shall also be included In the Technical Data Manual / Mechanical Catalogue:

- Storage instructions for storing and preserving the equipment (including driver and all the auxiliary

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units) at the plant site before installation of the same.

- Instructions for preserving the equipment after it has been installed. This is particularly required in cases where a long time gap is expected between equipment installations and commissioning.

- Field performance test procedures and acceptance criterion.

xxi) Technical Data Manual/Mechanical Catalogue shall be in hard board folder(s) of size 265 mm x 315 mm (10.5'' x 12.5'') and shall not be more than 90 mm thickness; it may be of several volumes and each volume shall have a volume number, index of volumes & index of contents of that particular volume.

15.13. REPORTING

15.13.1. The bidder shall submit the following reports on regular basis for Purchaser's information / review.

15.13.1.1. Monthly Progress Report
The report shall be submitted on monthly basis within 5 calendar days from cut-off date covering overall scenario of the project

15.13.1.2. Weekly Progress Report (Overall)
This report shall be prepared by bidder and issued on weekly basis to Purchaser. The report shall include the following:

- Executive Summary
- Project highlights with dates of achievements
- Project exception (work programmed but not achieved with reasons for non- achievement) and work programmed for next week
- Critical areas
- Actions taken/to be taken for slippages
- Progress statistics

This shall cover both for Bidder's Home/Design office activities and construction activities at site.

15.14. Expediting Report
Bidder shall submit fortnightly expediting report based on his representative's visit to vendor's work for orders where delivery of materials is critical to project completion.

A list of such critical items/vendors shall be specified by OWNER/CONSULTANT during the kick-off meeting or at a later date.

In addition to the above, OWENR/CONSULTANT may request expediting report based on visit of bidder's representative in case of orders which were though not critical at the time of order placement become subsequently critical during project execution due to any reason.

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16. SUB VENDOR LIST

16.1. All the equipment shall be sourced from recommended Bidders only as specified in this specification.

16.2. Further the supplied model shall be under regular manufacturing range and have proven track record (Bidder / sub-Bidder shall have supplied minimum 2 no. in last 7 years, out of which at least one shall be in satisfactory operation for minimum 8000 hours).

16.3. Supply items for which no definite "make/brand" is indicated, shall be procured only from makes & models having proven track records and requires purchaser approval.

16.4. Sub vendor list for the bought out items applicable for the project:

Refer **ANNEXURE-1.**

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17. PRICE BID FORMAT

17.1. Water Based Fire Protection System as envisaged in this bid document shall be executed by the bidder on Lump Sum Turnkey (LSTK) basis.

17.2. All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.

17.3. The equipment supplied shall be complete in all respects. The bidder shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures and accessories if required for the safe and reliable operation of the equipment. Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be in bidder scope Only.

17.4. It will be the bidders sole responsibility to specifically highlight any of the missing equipments / items required for the proper & intended use of the Water Based Fire Protection System as a part of their offer. In case nothing is highlighted by the bidder, it will be assumed that all the major items are included in the bidder's scope of supply and supervision E&C for the desired operation of the WFPS system.

17.5. All hardware/software/item/ etc. required as per tender specification or subsequent tender correspondences or for desired satisfactory operation of package or due to good-engineering practice or as prescribed by relevant/applicable code/standard, but not listed exclusively in this specification, shall be deemed to be included in the basic price quoted by the bidder. Also, all mounting hardware / accessories /fittings/conduits/etc. required for above the package shall be included in the basic price of respective item. Bidder, at no point of time, shall be eligible to raise any extra claim in this regard.

17.6. Drawings attached with this specification are preliminary & are not exhaustive in nature. These drawings may get revised during detail engineering. All other inputs required for engineering of the Water Based Fire Protection System will be furnished to the bidder during detail engineering stage, as and when the same is available with BHEL. Bidder to note that they shall not be eligible to raise any extra claim on account of revision of input drawings or any other input drawings during detail engineering stage.

17.7. Only main items shall be considered for price bid evaluation. Optional items (RO – rate only)shall not be considered for price bid evaluation

17.8. Prices quoted by the bidder shall remain firm till the successful handing over of the Fire Protection plant to end customer. Any request for upward revision of

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price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL.

17.9. Bidder to quote only base rates for all the items, Applicable taxes and duties shall be indicated separately.

17.10. The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing "Price Bid –Do not Open" This shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction.

17.11. Bidder shall confirm to the unpriced bid as part of their offer.

17.12. **Billing Breakup Methodology:**

17.12.1. Billing break-up (BBU) shall be submitted to BHEL in following methodology:

17.12.1.1. The BBU shall be prepared only for the pro-rata billing purpose.

17.12.1.2. BBU will contain complete list of items required for the completion of the project as per specification and shall be dispatched by bidder irrespective of the items/quantities are indicated in the document or not.

17.12.1.3. Any additional requirement of the item already indicated in the document will be updated in the subsequent revision of this document. All such item will be dispatched as "free item" term to BHEL.

17.12.1.4. Inspection & Testing of all items shall be as per approved quality plan. The entire item shall be dispatched to site only after the completion of Inspection and testing requirement as per approved quality plan. Non-inclusion of any item does not absolve the vendor from meeting the requirement.

17.12.1.5. Vendor shall obtain prior permission from BHEL after submitting all the documents before ensuring dispatch of all main items applicable for project.

17.12.1.6. Inspection & quality: All the items applicable for this project shall be inspected as per approved quality plan. It may be noted that any item shall be dispatched to site only after complying with the Inspection requirements as per approved quality plan.

17.12.1.7. As separate document indicating the details of all the items having SHELF LIFE shall be furnished. Prior permission from BHEL shall be taken before dispatch of any of the item having shelf life.

17.12.1.8. Applicable taxes & duties shall be extra.

17.12.2. BBU shall be a comprehensive document having details of all the items applicable for this project .**There should not be any Non-Billable item to be supplied at site**.

17.12.3. BBU shall be submitted as per "Payment Terms of Annexure-BB"

17.12.4. Wherever Lot items are indicated, same shall be quantified in details in a separate annexure. Similarly all Accessories/ Instruments/ items are to be defined with comprehensive details
It is to be ensured that all fittings, accessories (including Bolts, fittings etc.), Instrument and other items, if any, shall be listed in separate line items or in a separate annexure.

17.12.5. In case requirement of any such item / additional item is detected at any stage of the contract execution, BBU will be revised to reflect the same. However all the additional items will be supplied as a 'Zero Value Item', without any commercial implication to BHEL. All the contractual requirements shall be valid for these additional items also.

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18. DEVIATIONS TO SPECIFICATIONS:

18.1. Bidders are advised to quote strictly as per BHEL's specification requirements. In case bidder excludes some components of scope of supply or some features of specification requirements, the bidder will be required to include the same in the scope during offer evaluation stage /contract execution stage without any additional commercial and price implications on account of the same. Bidder to note that they won't be entitled for any price impact on account of withdrawal of deviation taken from BHEL spec during technical scrutiny stage. Price impact will be allowed by BHEL only to the extent of change of specification during tender evaluation stage, if any, from BHEL end.

18.2. In case bidder feels that it is necessary to exclude some components of scope of supply & some features of specification requirements, due to genuine constraints if any, bidder has to clearly bring out the same to the notice of BHEL and take their prior approval before submission of bid. Bidders are requested to bring out only those deviations which are impractical to meet (or) not technically advisable as per the experience of bidder, for BHEL's review before the submission of bid. **All such clarifications required by the bidder shall be intimated to BHEL together as a single notice within a week of receipt of enquiry by bidder.**

18.3. All such deviation or variation from the scope, requirement and/or intent of this specification shall be clearly defined under relevant attachment of the Bid forms irrespective of the fact that such deviations/ variations may be standard practice or a possible interpretation of the specification by the Bidder. Except for those deviations/ variations covered as a part of pre bid clarification, it will be the responsibility of the bidder to fully meet the intent and the requirements of the specification within the quoted price. No other deviation whatsoever from this specification, except for the have been specifically agreed by purchaser as a part of pre-bid clarification shall be considered.

18.4. Bidder to note that all such applicable deviations /clarification shall be listed separately in the format attached with this specification and submitted to BHEL as a part of pre-bid query. All such applicable deviations /clarification shall have cross reference to page number /section / clause /para etc. of this specification or its annexure with proper reasons for the deviations for purchaser's consideration. Any such applicable deviations /clarification not listed under the above section, even if reflected in any other portion of the bidder's proposal shall not be considered applicable.

18.5. In case the bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, he shall recommend the same

along with reasons in a separate section as a part of pre-bid query to enable purchaser take a suitable decision on the requirement of the same.

18.6. Information like Bill of materials (BOM), Instrument list, datasheets, and typical specifications enclosed by the bidder as a part of their bid, shall be retained for information only and shall not be referred by contractor as contractual agreement. No implication shall be admissible on the basis of these documents during any stage of contract execution. System wise BOQ shall be finalized based on approved drawings during detail engineering stage.

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19. DEFINITIONS

19.1. BIDDER: Bidder means the party supplying Water Based Fire Protection system for this project.

19.2. SUB VENDOR : Sub vendor means any party on whom bidder suborders materials and items (like tubes, forgings etc)

19.3. QUALITY ASSURANCE PLAN (QAP) / INSPECTION AND TEST PLAN (ITP) :

It is a document generated by the supplier with complete listing of various inspection stages, tests, material certification requirements and parties involved with their respective roles in inspection; indicating the requirements of Hold (H),Witness (W) Inspection, and Review (R) of Quality control documents / records for an item. QAP and ITP are considered synonymous.

19.4. HOLD POINT: A Hold Point is a stage designated in the ITP/QAP, which requires Witness Inspection by TPIA and / or OWNER before supplier can proceed with further processing, except where prior written permission for further processing or waiver of Witness Inspection by / OWNER is obtained.

19.5. WITNESS POINT A Witness point is a stage designated in the ITP/QAP, which requires witness inspection by TPIA and / or Owner. EPCC/LSTK CONTRACTOR / Supplier shall perform the activity after proper notification has been given to TPIA and OWNER for witnessing the activity. The CONTRACTOR/ Supplier is not obliged to hold further processing, if TPIA and / or OWNER are not available to witness the activity or does not provide the comments before the date notified with proper notification period.

19.6. REVIEW POINT A review point is a stage designated in the ITP/QAP which requires the concerned agencies i.e. CONTRACTOR / TPIA /OWNER, to verify the documents for their correctness and to confirm that the said documents meet the requirements laid down.

19.7. THIRD PARTY INSPECTION AGENCY (TPIA) Third Party Inspection Agency means an inspection agency appointed by the EPCC/LSTK CONTRACTOR for carrying out Inspection and witness of tests of equipment and material being procured by the CONTRACTOR for the Project.

19.8. INSPECTION CATEGORY Inspection category determines the scope of Inspection for the Supplier, TPIA / OWNER for various equipment and material depending upon their use, serviceability, safety criteria and complexity.

19.9. MECHANICAL COMPLETION: Mechanical Completion of systems shall mean that all installation works of the system have been completed and hydro tested in accordance with approved construction drawings, approved specification, applicable code as defined in the document, accepted international good engineering practices and all the activities have been completed in a comprehensive manner by the bidder.

19.10. PRE-COMMISSIONING Activities: Pre commissioning activities are defined as those activities, which are required to be performed after completion/ installation, inspection, hydro testing etc. of an equipment/ system to make it ready for commissioning.

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20. LIST OF ANNEXURES:

LIST OF ANNEXURES		
Sl No	**Drawings/Documents**	**Drg/Doc no**
1.	Sub-Vendor List	Annexure-I
2.	Painting	Annexure-II
3.	Price Bid	Annexure-III
4.	Master Document List format	Annexure-IV
5.	Guidelines for QA QC plan	Annexure-V
6.	Manufacturer quality Plan	Annexure-VI
7.	Bill of Material Format	Annexure-VII
8.	Pre Bid Query Format	Annexure-VIII
	Power House Building	
9.	Main Plant Equipment Layout	PE-DG-374-100-M002-R6
10.	TG Hall Equipment layout at EL. (+) 0.0 M	PE-DG-374-100-M003-R6
11.	TG Hall Equipment layout at EL. (+) 8.5 M	PE-DG-374-100-M004-R6
12.	TG Hall Equipment layout at EL. (+) 13.5 M	PE-DG-374-100-M005-R6
13.	Equipment Plan at 13.5M, 19.0M & 25.5M Floor	PE-DG-374-100-M006-R5
14.	Main Plant Cross section	PE-DG-374-100-M007-R5
15.	Plot Plan	PE-DG-374-100-M001-R6
16.	Control Room Layout	PE-DG-374-100-I401-R1
17.	GA of Vacuum Pump cum Compressor House Unit-8	MB-C-1160-080866-1-R5
18.	GA of Vacuum Pump cum Compressor House Unit-9	MB-C-1160-082747-1-R2
19.	GA of Fly Ash Silo	033_IS-3-GA-660-302-M033-R04
20.	GA of Slurry cum Water Pump House	MB-C-1160-081158-1-R4
21.	Electrical Eq room location plan of HT switchgear, LT MCC and Control room at Ash Slurry Pump House	IS-3-EE-660-305-E314-R01
22.	Electrical Eq room location plan LT MCC room at vacuum Pump House	IS-3-EE-660-308-E322-R00
23.	Electrical Eq Plan HT switchgear, LT MCC-1 & Control Room near Crusher House	IS-3-EE-660-119-E138-R01
24.	Electrical Eq Plan LT MCC-2 near TP-3	IS-3-EE-660-121-E139-R00
25.	Electrical Eq Plan LT MCC-3 near Wagon Tippler	IS-3-EE-660-121-E140-R00
26.	Gen. Arrgt. Of Wagon Tippler- Hopper Complex No.(WTHC) 1 & 2	IS-1-GA-660-103-M014-R4
27.	GA & Load Data for TP-2A	IS-1-GA-660-103-M015-R2
28.	GA & Load Data for TP-1	IS-1-GA-660-104-M016-R4
29.	GA & Load Data Of TP-2	IS-1-GA-660-104-M017-R5
30.	GA & Load Data Of TP-3	IS-1-GA-660-104-M020-R6
31.	GA & Load Data Of Crusher House(R-5)	IS-1-GA-660-104-M018-R5
32.	Mechanical GA of ERH	IS-1-GA-660-109-M174-R4
33.	GA & Load Data Of Conv. BCN-1A	IS-1-GA-660-101-M005-R4
34.	GA & Load Data Of Conv. BCN-1B	IS-1-GA-660-101-M006-R4
35.	GA & Load Data Of Conv. BCN-2A/B with PH-1	IS-1-GA-660-101-M007-R2
36.	GA of Conv. 3A & 3B	IS-1-GA-660-101-M008-R5
37.	GA and Load Data of Conv BCN-4	IS-1-GA-660-101-M010-R4
38.	GA and Load Data of Conv BCN-5 and Pent house	IS-1-GA-660-101-M011-R2
39.	GA and Load Data of Conv 6A/B	IS-1-GA-660-101-M012-R3
40.	GA & Load Data Of BCN-7A/B	IS-1-GA-660-101-M013-R3
41.	GA & Load Data of RBF-1 & 2 (In Crusher House)	IS1-GA-660-101-M009-R5

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42.	Typical Cross Section Of Conveyor Gallery & Tunnel	IS-1-GA-660-100-M003-R4
43.	GA of Generator Transformer	34590000632-R0
44.	GA of Station Transformer	0 458 00 50 130-R0
45.	GA of Unit Auxiliary Transformer	1 456 00 50 818-R2
46.	Layout of cabling interconnection between main plant and auxiliary plant areas	PE-DG-374-100-E013-R1
47.	Transformer yard Layout (Civil)	PE-DG-374-622-C003-R0
48.	Transformer yard & Bus Dust Layout	PE-DG-374-100-E001-R2
49.	Fire Water Pump House	1-38101-05622-R1
50.	Typ. UPS scheme for PLC	4-38101-03202-R00
51.	Layout of Yard Piping along C-D Bay	PE-DG-374-100-M031-R0
52.	Layout of Yard Piping (Up to Fire Water Pump House)	PE-DG-374-100-M032-R0
53.	Layout of Yard Piping DM Tank to Clarified water Pump House	PE-DG-374-100-M033-R0
54.	Layout of Yard Piping (from Chemical Lab to Unloading Pump House)	PE-DG-374-100-M034-R0
55.	GA of Sectional Plan of Boiler	0-00-022-75924-R3
56.	GA of Air pre-heater	1-52-220-02423-R0
57.	GA of ESP	1-00-111-22073-R01
58.	Arch Elevation Details of Canteen-Elevation	PE-DG-374-610-C002-R1
59.	Arch Plan Details of Canteen-PLAN	PE-DG-374-610-C001-R1
60.	Chemical Lab_Arch Elevation	PE-DG-374-663-C001-R0
61.	Service Building Architectural Elevations	PE-DG-374-640-C003-R1
62.	Architectural Roof Plan, Sections & Finishing Schedule of Service Building	PE-DG-374-640-C002-R1
63.	Arch Plan Details of Service Building at 9.0 m and 13.5 m-Model	PE-DG-374-640-C001 (2 sheets)-R2
64.	Interface diagram for various packages for Fire Protection system	PEMC-03892
65.	Administrative Bldg Arch Plan	PE-DG-374-641-C001-(3 sheets)-R1
66.	Administrative Bldg Arch Sections	PE-DG-374-641-C002-R0
67.	DG Building Arch Plan & Sections	PE-DG-374-642-R0
68.	ESP Archt Plan	PE-DG-374-619-C001(2 sheets)-R1
69.	ESP Archt Elevation	PE-DG-374-619-C002-R1
70.	Raw Water Pump House Arch Plan at 0.0M&5.2M	PE-DG-374-654-C005-R1
71.	Raw Water Pump House Arch Plan at 13.4M	PE-DG-374-654-C006-R1
72.	Raw Water Pump House Arch Elevations	PE-DG-374-654-C007-R1
73.	Security Gate Building	PE-DG-374-668-C004-R1

NOTES:

15 Bidder to note that the above annexures are preliminary in nature .These drawings may get revised and /or new drawings will be furnished to bidder during detail engineering .Bidder to however note that they will not be eligible to raise any extra charges on account of this.

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RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Prepared By	Revised By	Approved By
00	06.05.13	ORIGINAL ISSUE	--SD---	--SD---	---SD---

ANNEXURE-1

SUB-VENDOR LIST

SL. NO.	ITEMS	MAKES	REMARKS
1.	BATTERY CHARGER	AMARA RAJA POWER SYSTEMS LTD	
		HBL POWER SYSTEMS LTD	
		KERALA STATE ELECTRONICS	
		DUBAS ENGINEERING PVT LTD.	
		CHHABI ELECTRICALS P LTD.	
		STATCON POWER CONTROLS LTD.	
2.	SEALED MAINTENANCE FREE BATTERY	AMARA RAJA POWER SYSTEMS LTD	
		EXIDE INDUSTRIES LIMITED	
		HBL POWER SYSTEMS LTD	
3.	LEAD ACID STORAGE BATTERY	EXIDE INDUSTRIES LIMITED	
		HBL POWER SYSTEMS LTD	
4.	NICKEL-CADMIUM BATTERY	HBL POWER SYSTEMS LTD	
		AMCO SAFT INDIA LTD.	
5.	LT MOTORS (SAFE AREA)	SIEMENS INDIA LTD SECBAD.	
		ALSTOM T&D INDIA LIMITED	
		ABB LIMITED, HYD	
		KIRLOSKAR ELEC.CO.LTD	
		BHARAT BIJLEE LTD, MUMBAI	
		CROMPTON GREAVES	
6.	H.T. MOTORS (SAFE/HAZARDOUS AREA)	SIEMENS INDIA LTD SECBAD.	
		ABB LIMITED, HYD	
		BHARAT HEAVY ELECTRICALS LTD	
		JYOTHI LIMITED.	
		KIRLOSKAR ELEC.CO.LTD	
		CROMPTON GREAVES	
7.	DIRECT ON LINE STARTERS	CROMPTON GREAVES LTD. SECBAD	
		LARSEN & TOUBRO LIMITED, HYD	
		C AND S ELECTRIC LIMITED	
		SIEMENS INDIA LIMITED	
8.	DIRECT ON LINE STARTERS (EXPLOSION PROOF)	FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
		BALIGA LIGHTING EQUIPMENT PVT. LTD.	
9.	HT CABLE JOINTING / TERMINATING KITS	YAMUNA POWER & INFRASTRUCTURE LTD.	
		BIRLA 3 M LTD	
		RAYCHEM RPG LIMITED	
10.	CABLE LUGS & CRIMPING TOOLS	DOWELLS ELEKTRO WERKE	
		POWER ENGG. CO.	
		ELECTROMAC INDUSTRIES	
11.	LIGHTING FIXTURES, LUMINIAIRS (FOR SAFE AREA APPLICATIONS)	SQUARE A ENTERPRISES	
		BAJAJ ELECTRICALS LTD., HYD.	
		CROMPTON GREAVES	
12.	LIGHTING FIXTURES & LUMINIAIRS (EXPLOSION PROOF AREA APPLICATIONS)	SQUARE A ENTERPRISES	
		BAJAJ ELECTRICALS LTD., HYD.	
		SAFEX FLAMEPROOF CONTROLS (P) LTD	
		PROMPT ENGINEERING WORKS, MUMBAI	

SL. NO.	ITEMS	MAKES	REMARKS
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		CROMPTON GREAVES	
		FCG FLAMEPROOF CONTROL GEARS	
13.	LT.MOTOR CONTROL CENTRES, POWER CONTROL CENTRES, A C & D C DISTRIBUTION BOARDS.	SCHNEIDER ELECTRIC INDIA	
		BCH ELECTRIC LTD.	
		LARSEN & TOUBRO LIMITED, HYD	
		C AND S ELECTRIC LIMITED	
		SPACEAGE SWITCHGEARS LIMITED	
		GE INDIA INDUSTRIAL PRIVATE LTD,	
		ABB LIMITED	
14.	UPS SYSTEM	EMERSON NETWORK POWER	
		HITACHI HI-REL POWER	
		KERALA STATE ELECTRONICS	
		EMERSON NETWORK POWER	
		GUTOR ELECTRONICS LTD., SWITZERLAN	
		CHLORIDE POWER PROTECTION	
15.	TELECOMMUNICATION SYSTEM (LSTB / PAGING / EPABX & PA SYSTEM)	LARAON ENGINEERS AND-	
		INDUSTRONIC INDUSTRIE-ELECTRONIC	
		FEDERAL SIGNAL CORPORATION,	
		BNA TECHNOLOGY CONSULTING LTD	
		ELIXIR ELECTRONICS	
16.	ELECTRICAL CONTOLS PANELS	ELECTRONICS CORPORATION OF INDIA LT	
		PANAM CONTROLS,	
		C AND S ELECTRIC LIMITED	
		INDUSTRIAL CONTROLS &	
		BHARAT HEAVY ELECTRICALS LTD	
		SHIBSHA INSTRUMENTS (I) PVT. LTD	
17.	ELECTRICAL CONTROL SYSTEM (ECS) / POWER MANAGEMENT / ENERGY MANAGEMENT SYSTEM	SCHNEIDER ELECTRIC INDIA	
		ALSTOM T&D INDIA LIMITED	
		ABB LIMITED, HYD	
		WESTING HOUSE ELECTRIC PVT.LTD.	
		BHARAT HEAVY ELECTRICALS	
		HONEYWELL PTE LTD., SINGAPORE	
		SIEMENS INDIA LIMITED	
		SCHWEITZER ENGINEERING	
18.	RUBBER MAT	SRIDHAR ENGINEERING AND RUBBER	
		THE RUBBER PRODUCTS LTD.	
		INDIAN RUBBER PRODUCTS	
		PREMIER POLYFILM LTD.	
19.	EARTHING AND LIGHTENING PROTECTION MATERIALS	PATNY SYSTEMS PVT. LTD	
		JAMNA METAL COMPANY	
		VINFAB ENGINEERS	
		PREMIER POWER PRODUCTS	
		INDIA ELECTRICALS SYNDICATE	
20.	FLEXIBLE WIRE FOR LIGHTING	THERMO CABLES LIMITED	
		RADIANT CABLES PVT. LTD HYD	
		TECHNO CABLES PVT. LTD.	
		UNIFLEX CABLES LTD.	
		FINOLEX CABLES LTD.	
21.	CURRENT LIMITING REACTOR	CROMPTON GREAVES LTD. SECBAD	

SL. NO.	ITEMS	MAKES	REMARKS
		SUDHIR INTRA VIDYUT LIMITED	
		SHRIHANS ELECTRICALS PVT LTD.	
		BHARAT BIJLEE LIMITED	
		M/S.PS ELECTRICALS PVT. LTD.	
22.	DC STARTER CUBICLES	BCH ELECTRIC LTD.	
		LARSEN & TOUBRO LIMITED, HYD	
		C AND S ELECTRIC LIMITED	
		INDUSTRIAL CONTROLS &	
23.	LOCAL CONTROL STATIONS (SAFE / HAZARDOUS AREA)	FLEXPRO ELECTRICALS PVT. LTD.,	
		PROMPT ENGINEERING WORKS, MUMBAI	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
24.	LT POWER CABLES	UNIVERSAL CABLES LTD	
		THERMO CABLES LIMITED	
		KEC INTERNATIONAL LIMITED	
		RADIANT CABLES PVT. LTD HYD	
		NICCO CORPORATION LTD HYD	
		POLYCAB INDUSTRIES PVT.LTD.	
		CORDS CABLE INDUSTRIES LTD.	
		KEI INDUSTRIES LIMITED	
		DELTON CABLES LIMITED NEW DELHI	
		SPECIAL CABLES PVT. LTD.	
		SRIRAM CABLES PVT. LTD.	
		TORRENT CABLES LTD	
		SUYOG ELECTRICALS LTD	
		UNIFLEX CABLES LTD.	
		RAVIN CABLES LTD	
25.	CONTROL CABLES	UNIVERSAL CABLES LTD	
		THERMO CABLES LIMITED	
		KEC INTERNATIONAL LIMITED	
		RADIANT CABLES PVT. LTD HYD	
		NICCO CORPORATION LTD HYD	
		POLYCAB INDUSTRIES PVT.LTD.	
		CORDS CABLE INDUSTRIES LTD.	
		KEI INDUSTRIES LIMITED	
		DELTON CABLES LIMITED NEW DELHI	
		SPECIAL CABLES PVT. LTD.	
		SRIRAM CABLES PVT. LTD.	
		SUYOG ELECTRICALS LTD	
		RAVIN CABLES LTD	
26.	HT POWER CABLES	UNIVERSAL CABLES LTD	
		KEC INTERNATIONAL LIMITED	
		RADIANT CABLES PVT. LTD HYD	
		NICCO CORPORATION LTD HYD	
		KEI INDUSTRIES LIMITED	
		SRIRAM CABLES PVT. LTD.	
		POLYCAB WIRES PVT.LTD	
		TORRENT CABLES LTD	
		UNIFLEX CABLES LTD.	
		RAVIN CABLES LTD	

SL. NO.	ITEMS	MAKES	REMARKS
27.	CABLE TRAYS	PATNY SYSTEMS PVT. LTD	
		JAMNA METAL COMPANY	
		PARMAR METALS PVT. LTD	
		METALEMMS BOMBAY PVT. LTD.	
		VINFAB ENGINEERS	
		PREMIER POWER PRODUCTS	
		INDIA ELECTRICALS SYNDICATE	
28.	JUNCTION BOXES FOR WEATHER PROOF AND EXPLOSION PROOF FOR LIGHTING AND OTHER APPLICATION	PANAM CONTROLS,	
		FLEXPRO ELECTRICALS PVT. LTD.,	
		PROMPT ENGINEERING WORKS, MUMBAI	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
		ELECTROMAC INDUSTRIES	
29.	CABLE GLANDS (WEATHER PROOF/EX.PROOF)	UNITED AGRO ENGINEERING PVT. LTD.	
		FLEXPRO ELECTRICALS PVT. LTD.,	
		FCG POWER INDUSTRIES.,	
		PROMPT ENGINEERING WORKS, MUMBAI	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
		ELECTROMAC INDUSTRIES	
30.	SIGNAL CABLE, THERMOCOUPLE, EXTN. COMP. CABLES	THERMO CABLES LIMITED	
		RADIANT CABLES PVT. LTD HYD	
		CORDS CABLE INDUSTRIES LTD.	
		KEI INDUSTRIES LIMITED	
		DELTON CABLES LIMITED NEW DELHI	
		PARAMOUNT COMMUNICATIONS LTD	
		SPECIAL CABLES PVT. LTD.	
		SUYOG ELECTRICALS LTD	
31.	JBS FOR LIGHTING (EXPLOSION PROOF)	SAFEX FLAMEPROOF CONTROLS (P) LTD	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
32.	AC VARIABLE SPEED DRIVES	SCHNEIDER ELECTRIC INDIA	
		ALSTOM T&D INDIA LIMITED	
		LARSEN & TOUBRO LIMITED, HYD	
		HITACHI HI-REL POWER	
		BHARAT HEAVY ELECTRICALSLTD.	
		SIEMENS INDIA LIMITED	
		ROCKWELL AUTOMATION INDIA LTD.,	
33.	LIGHTING TRS. DRY TYPE (AIR NATURAL) UP TO 150 KVA	SOUTH EASTERN EQUIPMENT CO.	
		SUDHIR INTRA VIDYUT LIMITED	
		CHHABI ELECTRICALS P LTD.	
		AUTOMATIC ELECTRIC LTD.	
		RAYCHEM RPG LIMITED.,	
		M/S.PS ELECTRICALS PVT. LTD.	
34.	LIGHTING PANELS HAZARDOUS AREA	SAFEX FLAMEPROOF CONTROLS (P) LTD	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
35.	ELECTRICAL RELAY PANELS	ALSTOM T&D INDIA LIMITED	

SL. NO.	ITEMS	MAKES	REMARKS
		ABB LIMITED, HYD	
		EASUN REY ROLLE LTD.	
36.	ELECTRIC ACTUATORS	LIMITORQUE INDIA LTD,	
		AUMA (INDIA) LTD;	
		ROTORK CONTROLS INDIA LTD.	
37.	L.T MOTORS (FLAME PROOF)	ALSTOM T&D INDIA LIMITED	
		KIRLOSKAR ELEC.CO.LTD	
		ABG MOTORS LIMITED	
		BHARAT BIJLEE LTD, MUMBAI	
		CROMPTON GREAVES	
38.	ILLUMINATION ITEMS PACKAGE	SQUARE A ENTERPRISES	
		BAJAJ ELECTRICALS LTD., HYD.	
		SPACEAGE SWITCHGEARS LIMITED	
		CROMPTON GREAVES	
		WIPRO LIMITED	
39.	FIRE PROOF SEALING SYSTEM FOR CABLE PENETRATIONS & FIRE BREAK COATING FOR ELECTRICAL CABLES	LLOYD INSULATIONS (INDIA) LTD.,	
		MULTI KILFIRE PVT. LTD	
		VIJAY SYSTEMS ENGINEERS PVT. LTD.	
		AGP PASSIVE FIRE SAFETY (P) LTD	
40.	FRP CABLE TRAYS AND ACCESSORIES	PATNY SYSTEMS PVT. LTD	
		SUMIP COMPOSITES PVT. LTD.	
		GENERAL COMPOSITES PVT. LTD.	
		ERCON COMPOSITES	
41.	CLOSED CIRCIUT TV (CCTV)	ELECTRONICS CORPORATION OF INDIA LT	
42.	OPTICAL FIBRE CABLES & ACCESSORIES	UNIFLEX CABLES LTD.	
		RPG CABLES LIMITED,	
		FINOLEX CABLES LTD.	
		BIRLA ELRICSSON OPTICAL LTD.	
		OPTEL COMMUNICATIONS LTD.	
43.	FIELD BUS CABLES	LAPP INDIA PVT. LTD.	
		UL ELECTRODEVICES PVT. LTD.	
44.	DIFFERENTIAL PRESSURE INDICATOR / GAUGES	WALCHANDNAGAR INDUSTRIES LIMITED	
		BAUMER TECHNOLOGIES	
		HIRLEKAR PRECISION ENGG. PVT. LTD.	
		SAMSON CONTROLS PVT LTD.,	
		SWITZER INSTRUMENT LTD.,	
		GENERAL INSTRUMENTS CONSORTIUM	
		A.N. INSTRUMENTS PVT. LTD.,	
45.	FLOW ORIFICES	MICRO PRECISION PRODUCTS (P) LTD.	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		GENERAL INSTRUMENTS CONSORTIUM	
		ASIAN INDUSTRIAL VALVES AND	
46.	FLOW SWITCHES	V AUTOMAT AND INSTRUMENTS PVT LTD	
		SWITZER INSTRUMENT LTD.,	
		LEVCON INSTRUMENTS(P) LTD	
		D.K.INSTRUMENTS (P) LTD.,	
47.	JUNCTION BOXES (WEATHER PROOF)	PANAM CONTROLS,	
		FLEXPRO ELECTRICALS PVT. LTD.,	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	

SL. NO.	ITEMS	MAKES	REMARKS
		FCG FLAMEPROOF CONTROL GEARS	
48.	JUNCTION BOXES (EXPLOSION PROOF)	FLEXPRO ELECTRICALS PVT. LTD.,	
		SAFEX FLAMEPROOF CONTROLS (P) LTD	
		FLAMEPROOF EQUIPMENTS PVT.LTD.	
		FCG FLAMEPROOF CONTROL GEARS	
49.	LEVEL GUAGES (MAGNETIC TYPE)	V AUTOMAT AND INSTRUMENTS PVT LTD	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		J.N.MARSHALL LTD	
		D.K.INSTRUMENTS (P) LTD.,	
50.	LIQUID LEVEL FLOAT SWITCH	MAGNETROL INTERNATIONAL, INC.	
		V AUTOMAT AND INSTRUMENTS PVT LTD	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		CHEMTROLS INDUSTRIES LTD.,	
		PUNE TECHTROL PVT LTD	
		LEVCON INSTRUMENTS(P) LTD	
		D.K.INSTRUMENTS (P) LTD.,	
51.	LIQUID LEVEL GAUGES	V AUTOMAT AND INSTRUMENTS PVT LTD	
		BLISS ANAND PVT. LTD.,	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		TECNOMATIC (INDIA) PRIVATE LIMITED,	
		PRATOLINA INSTRUMENTS PVT.LTD.	
		CHEMTROLS INDUSTRIES LTD.,	
		PUNE TECHTROL PVT LTD	
		LEVCON INSTRUMENTS(P) LTD	
		D.K.INSTRUMENTS (P) LTD.,	
52.	LEVEL TRANSMITTER (ELECTRONIC - SMART)	V AUTOMAT AND INSTRUMENTS PVT LTD	
		CHEMTROLS INDUSTRIES LTD.,	
		DRESSER VALVE INDIA PVT.LTD.	
53.	PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES	INDFOS INDUSTRIES LIMITED,	
		BAUMER TECHNOLOGIES	
		HIRLEKAR PRECISION ENGG. PVT. LTD.	
		KAUSTUBHA UDYOG	
		SWITZER INSTRUMENT LTD.,	
		TRAFAG CONTROLS INDIA PVT. LTD.	
54.	PROGRAMMABALE LOGIC CONTROLLERS (PLC - TRIPLE MODULAR REDUNDANT)	FANUC INDIA LIMITED	
		TRICONEX SINGAPORE PTE LTD.,	
		AUGUST SYSTEMS LTD.	
		INDUSTRIAL CONTROL SERVICES	
55.	PRESSURE GAUGES	FORBES MARSHALL (HYD) PVT LIMITED,	
		H.GURU INSTRUMENTS(S.I)PVT.LTD	
		WALCHANDNAGAR INDUSTRIES LIMITED	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		BAUMER TECHNOLOGIES	
		GENERAL INSTRUMENTS CONSORTIUM	
		A.N. INSTRUMENTS PVT. LTD.,	
		PROTECH CONTROL INSTRUMENTS	
56.	PROGRAMMABLE LOGIC CONTROLLERS (PLC - SIMPLEX / DUAL REDUNDANT)	SCHNEIDER ELECTRIC INDIA	
		SIEMENS INDIA LTD SECBAD.	
		FANUC INDIA LIMITED	

SL. NO.	ITEMS	MAKES	REMARKS
		HONEYWELL AUTOMATION INDIA LIMITED	
		ROCKWELL AUTOMATION INDIA LTD.,	
57.	PR. & DIFF. PR. TRANSMITTERS (ELECTRONIC - SMART)	EMERSON PROCESS MGT (I) PVT LTD	
		ABB LIMITED, HYD	
		YOKOGAWA INDIA LIMITED	
		ENDRESS + HAUSER (INDIA) PVT. LTD.,	
		HONEYWELL AUTOMATION INDIA LIMITED	
58.	SAFETY RELIEF VALVES (NOT COVERED IN BHEL (T) RANGE)	FORBES MARSHALL LTD.,	
		TYCO SANMAR LIMITED.	
59.	SAFETY RELIEF VALVES	BHARAT HEAVY ELECTRICALS LTD	
60.	THERMOMETERS	FORBES MARSHALL (HYD) PVT LIMITED,	
		GOA INSTRUMENTS INDUSTRIES	
		H.GURU INSTRUMENTS(S.I)PVT.LTD	
		WALCHANDNAGAR INDUSTRIES LIMITED	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		BAUMER TECHNOLOGIES	
		GENERAL INSTRUMENTS CONSORTIUM	
		A.N. INSTRUMENTS PVT. LTD.,	
		PROTECH CONTROL INSTRUMENTS	
61.	THERMOWELLS	VALUE TREK ENGINEERS,	
		CARLO DYNATECH INDUSTRIES,	
		GOA INSTRUMENTS INDUSTRIES	
		MICRO PRECISION PRODUCTS (P) LTD.	
		H.GURU INSTRUMENTS(S.I)PVT.LTD	
		WALCHANDNAGAR INDUSTRIES LIMITED	
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		BAUMER TECHNOLOGIES	
		PRECISION ENGINEERING INDS.,	
		TEMPSENS INSTRUMENTS (I) PVT.LTD.	
		GENERAL INSTRUMENTS CONSORTIUM	
		PROTECH CONTROL INSTRUMENTS	
62.	TEMPERATURE TRANSMITTER	EMERSON PROCESS MGT (I) PVT LTD	
		ABB LIMITED, HYD	
		YOKOGAWA INDIA LIMITED	
		HONEYWELL AUTOMATION INDIA LIMITED	
63.	INSTRUMENT HOOK UP MATERIAL PACKAGE	S.S.PIPE FITTINGS & FORGINGS	
		KWALITY FORGED FITTINGS	
		UNIQUE ENGINEERING ENTPS. P. LTD.	
		PRESHZINGER ENGINEERING	
		FLASH FORGE PVT LTD	
		VALUE TREK ENGINEERS,	
		CARLO DYNATECH INDUSTRIES,	
		U I PIPE FITTINGS PVT. LTD.	
		TRUE FORGE PVT.LTD.,	
		TRUE FAB ENGINEER (P) LTD.	
		P.K. TUBES & FITTINGS PVT. LTD.	
		PANAM ENGINEERS PVT. LTD.	
		PRECISION ENGINEERING INDS.,	
64.	FIELD INSTRUMENTATION PACKAGE	EMERSON PROCESS MGT (I) PVT LTD	

SL. NO.	ITEMS	MAKES	REMARKS
		ABB LIMITED, HYD	
		YOKOGAWA INDIA LIMITED	
		ENDRESS + HAUSER (INDIA) PVT. LTD.,	
		HONEYWELL AUTOMATION INDIA LIMITED	
65.	ATMOSPHERIC FIXED/FLOATING ROOF STORAGE TANKS FOR LIQUID FUELS AND DM WATER, CAPACITY OF 1000M3 AND ABOVE	THERMOSYSTEMS PRIVATE LIMITED.	
		RUKSAN ENGINEERS PVT.LTD.	
		TECHNOFAB ENGINEERING LIMITED	
		INDIA TUBE MILLS & METAL INDS LTD	
		BRIDGE AND ROOF CO.(INDIA)LTD	
66.	RAW WATER, CONDENSOR /AUXILLARY COOLING WATER PUMPS (HORIZONTAL)	KIRLOSKAR BROTHERS LTD,	
		KSB PUMPS LIMITED,	
		SULZER PUMPS INDIA LTD.,	
		MATHER & PLATT PUMPS LTD.	
		JYOTHI LIMITED.	
		FLOWMORE LIMITED	
		BHARAT PUMPS & COMPRESSORS LTD.	
67.	HORIZONTAL CENTRIFUGAL PUMPS, (NON API) FOR DM WATER, CONDENSATE, SERVICE WATER, POTABLE WATER, COOLING WATER ETC.	GRUNDFOS PUMPS INDIA PVT. LTD.	
		KIRLOSKAR BROTHERS LTD,	
		KSB PUMPS LIMITED,	
		SULZER PUMPS INDIA LTD.,	
		MATHER & PLATT PUMPS LTD.	
		FLOWMORE LIMITED	
		KISHOR PUMPS PRIVATE LTD	
68.	HORIZONTAL CENTRIFUGAL PUMPS (API)- FOR DM WATER, CONDENSATE, SREVICE WATER, POTABLE WATER, COOLING WATER ETC	KSB PUMPS LIMITED,	
		SULZER PUMPS INDIA LTD.,	
		KIRLOSKAR EBARA PUMPS LIMITED,	
		FLOWSERVE INDIA CONTROLS	
		BHARAT PUMPS & COMPRESSORS LTD.	
69.	FIRE PROTECTION, FIRE DETECTION AND ALARAM SYSTEM PACKAGE	THERMOSYSTEMS PRIVATE LIMITED.	
		FIREPRO SYSTEMS PVT. LTD.	
		TYCO FIRE & SECURITY INDIA	
		NEW FIRE ENGRS. PVT. LTD.	
		UTC FIRE & SECURITY INDIA LIMITED.	
		AGNICE FIRE PROTECTION LTD	
		DE S TECHNICO PRIVATE LIMITED	
70.	SURGE/PRESSURE VESSELS	EXCEL INDUSTRIES,	
		RUKSAN ENGINEERS PVT.LTD.	
		INDCON PROJECTS & EQUIPMENT -	
		P S A NITROGEN LIMITED.	
		INOX AIR PRODUCTS LIMITED.	
		FABTECH PROJECTS & ENGINEERS	
		RAVI INDUSTRIES	
71.	SILENCERS	INDIRA INDUSTRIES	
		BHARAT HEAVY ELECTRICALS LTD	
		ACOUSTICS INDIA PVT LTD.,	
		P.R. ACOUSTICAL AND ENGG WORKS P LT	

SL. NO.	ITEMS	MAKES	REMARKS
72.	FLOOR GRATINGS	PERFECT ENGINEERING WORKS,	
		GEI GODAVARI ENGINEERING LTD.	
		EXCEL INDUSTRIES,	
		ASTRO ENGG. PVT. LIMITED	
		INDIANA ENGINEERING WORKS	
		PMS GRATE FLOORINGS PVT.LTD.	
73.	ACCUMULATORS	EPE PROCESS FILTERS &	
		PARKER HANNIFIN INDIA PVT.LTD.	
		HYDAC (INDIA) PVT. LTD.,	
		FAWCETT CHRISTIE-	
74.	GASKETS	JYOTHI INDUSTRIES ,	
		STARFLEX SEALING INDIA	
		JAMES WALKER INMARCO	
		SPENTA GASKETS & SEAL	
		UNIQUE INDUSTRIAL PACKINGS	
		I G P ENGINEERS LIMITED,	
		MADRAS INDUSTRIAL PRODUCTS,	
		PACKINGS & JOINTINGS GASKETS	
		SPIRASEAL GASKETS PVT.LTD.	
75.	FLANGES	PRESHZINGER ENGINEERING	
		THE PUNJAB STEEL WORKS,	
		J.K.FORGINGS,	
		METAL FORGINGS P. LTD.	
		TUBE PRODUCTS INCORPORATE,	
		CHW FORGE PRIVATE LIMITED	
		KISAAN STEELS (PVT) LTD.,	
76.	HANGER AND SUPPORT PACKAGE FOR MULTIPLE UNITS STG & GTG PROJECTS	SARATHI ENGINEERING	
		BHARAT HEAVY ELECTRICALS	
		PIPE HANGERS & SUPPORTS PVT LTD	
		PIPE SUPPORTS ASIA LIMITED	
		SPRING SUPPORTS	
77.	FLEXI GLASS RINGS	PRECISE ENGINEERING PLASTICS,	
		PETER KUMPEL & SOHN	
78.	METTALIC BELLOWS	ATHULYA BELLOWS & ENGINEERING	
		THE ANUP ENGINEERING LTD.	
		FLEXICAN BELLOWS&HOSES PVT.LTD	
		B D ENGINEERS	
		LONESTAR INDUSTRIES,	
		FLUIDYNE ENGINEERS(I) LTD	
		MADRAS HUDRAULIC HOSE (P.) LTD	
		MB METALLIC BELLOWS PVT. LTD.	
		SUR INDUSTRIES PRIVATE LIMITED	
79.	RUBBER EXPANSION JOINTS	SIMPLEX RUBBER PRODUCTS PVT. LTD.	
		CORI ENGINEERS PRIVATE LTD.	
		D.WREN INDUSTRIES PVT LTD.	
80.	BALL VALVES (CS.SS)	BOTELI VALVE GROUP COMPANY LTD.	
		FLOW CHEM INDUSTRIES,	
		AKAY INDUSTRIES PVT LTD	
		MICRO FINISH VALVES PVT.LTD.,	

SL. NO.	ITEMS	MAKES	REMARKS
		WEIR BDK VALVES	
		MICON VALVES (I) PVT. LTD.	
		LEADER VALVES LIMITED	
		ASIAN INDUSTRIAL VALVES AND	
		UNIFLOW	
81.	Y- TYPE STRAINER- (OPEN LOOP & CIRCULATING CW SYSTEMS)	SCIENTIFIC DEVICES (BOMBAY) PVT. LT	
		JAY-EESH ENGINEERING COMPANY	
		SKILT FABRICATORS PVT.LTD,	
		SPIRAX MARSHALL LIMITED	
		NISAN SCIENTIFIC PROCESS	
		ASIAN INDUSTRIAL VALVES AND	
		SUNGOV ENGINEERING PVT LTD,	
82.	SLUICE GATE VALVE	DURGA ENGINEERING COMPANY	
		JASH ENGINEERING (PVT)LIMITED.	
		BHARATMATA ENGINEERING WORKS	
		JUPITER ENGINEERING CO	
		KAMALA VALVES & ENGINEERING	
83.	AIR RELEASE VALVE	DURGA ENGINEERING COMPANY	
		BHARATMATA ENGINEERING WORKS	
		JUPITER ENGINEERING CO	
		KAMALA VALVES & ENGINEERING	
84.	VALVES- GATE/GLOBE/REG.GLOBE/NON-RETURN; PR.CL.:#150 & #300; MAT.CS/AS/SS; FL/BW ENDS-FOR SIZES-2" & ABOVE & SW ENDS:#800 CLASS	FOURESS ENGINEERING (I)PVT.LTD	
		FLOSTEER ENGINEERS PVT. LTD.,	
		WEIR BDK VALVES	
		NSSL LIMITED	
		MICON VALVES (I) PVT. LTD.	
		NITON VALVE INDUSTRIES LTD	
		SKILT FABRICATORS PVT.LTD,	
		LEADER VALVES LIMITED	
		K.S.B PUMPS LTD.	
		BHARAT HEAVY ELECTRICALS LTD	
85.	VALVES- GATE/GLOBE/REG.GLOBE/NON-RETURN; PR.CL.:#600; MAT.CS/AS/SS;FL/BW ENDS-FOR ALL SIZES-2" & ABOVE	FOURESS ENGINEERING (I)PVT.LTD	
		WEIR BDK VALVES	
		NSSL LIMITED	
		MICON VALVES (I) PVT. LTD.	
		NITON VALVE INDUSTRIES LTD	
		SKILT FABRICATORS PVT.LTD,	
		LEADER VALVES LIMITED	
		K.S.B PUMPS LTD.	
		BHARAT HEAVY ELECTRICALS LTD	
86.	VALVES- GATE/GLOBE/REG.GLOBE/NON-RETURN; PR.CL.:#900; MAT.CS/AS/SS, FL/BW ENDS-FOR ALL SIZES-2" & ABOVE	FOURESS ENGINEERING (I)PVT.LTD	
		WEIR BDK VALVES	
		NSSL LIMITED	
		MICON VALVES (I) PVT. LTD.	
		NITON VALVE INDUSTRIES LTD	
		LEADER VALVES LIMITED	

SL. NO.	ITEMS	MAKES	REMARKS
		K.S.B PUMPS LTD.	
		BHARAT HEAVY ELECTRICALS LTD	
87.	VALVES-GATE/GLOBE/REG.CLOBE/NON-RETURN; PR.CL.:#1500; MAT.CS/AS/SS, SW ENDS-FOR SIZES1/2" TO 1-1/2"; FL ENDS - FOR SIZES 2-1/2"	FOURESS ENGINEERING (I)PVT.LTD	
		WEIR BDK VALVES	
		NSSL LIMITED	
		MICON VALVES (I) PVT. LTD.	
		NITON VALVE INDUSTRIES LTD	
		LEADER VALVES LIMITED	
		K.S.B PUMPS LTD.	
		BHARAT HEAVY ELECTRICALS LTD	
88.	VALVES-GATE/GLOBE/REG.GLOBE/NON-RETURN; PR.CL.:#2500:MAT.CS/AS/SS;SW ENDS - FOR SIZES 1/2" TO 1-1/2"; FL. ENDS-FOR SIZES 2-1/2"	FOURESS ENGINEERING (I)PVT.LTD	
		WEIR BDK VALVES	
		NSSL LIMITED	
		MICON VALVES (I) PVT. LTD.	
		NITON VALVE INDUSTRIES LTD	
		LEADER VALVES LIMITED	
		K.S.B PUMPS LTD.	
		BHARAT HEAVY ELECTRICALS LTD	
89.	VALVE-BUTTERFLY; ;S-#150-WITH SOFT SEAT- FLANGED/WAFER TYPE-FOR ALL SIZES	DURGA ENGINEERING COMPANY	
		BOTELI VALVE GROUP COMPANY LTD.	
		INSTRUMENTATION LTD	
		FOURESS ENGINEERS (INDIA)	
		WEIR BDK VALVES	
		UNIQUE VALVES LIMITED,	
		INTER VALVE (INDIA) PVT.LTD.	
		LEADER VALVES LIMITED	
		GALAXY CONTROLS PVT LTD.,	
		ADVANCE VALVES PVT.LTD.	
		KAMALA VALVES & ENGINEERING	
90.	PIPE FITTINGS	FLASH FORGE PVT LTD	
		U I PIPE FITTINGS PVT. LTD.	
		TUBE PRODUCTS INCORPORATE,	
		GUJARAT INFRAPIPES PVT.LTD.,	
		SAWAN ENGINEERS PVT. LTD.	
		TOPAZ PIPING INDUSTRIES	
		TRUE FORGE PVT.LTD.,	
		DEE DEVELOPMENT ENGINEERS LTD.,	
		TRUE FAB ENGINEER (P) LTD.	
		P.K. TUBES & FITTINGS PVT. LTD.	
		K. S. PIPE FITTINGS PVT. LTD.	
		TUBE TURN (INDIA) P. LTD.	
91.	BOLTING MATERIAL	JAI FASTENERS (P) LIMITED	
		ATLAS FASTENERS	
		RATNESH METAL INDUSTRIES	
		BOLTMASTER (INDIA)PVT.LTD.	

SL. NO.	ITEMS	MAKES	REMARKS
		PRESIDENT ENGINEERING WORKS	
		MEGA ENGINEERING PVT. LTD.	
		PIONEER NUTS AND BOLTS PVT.LTD	
		MORNING STAR INDUSTRIES,	
		UDEHRA FASTENERS LIMITED	
		SREE PAVITHRA INDUSTRIES,	
92.	PASSENGER ELEVATOR	CITY LIFTS (INDIA) LTD.	
		OTIS ELEVATOR CO.(INDIA) LTD.	
93.	FIRE PROTECTION SYSTEM FOR TRANSFORMER AND ELECTRICAL EQUIPMENT	THERMOSYSTEMS PRIVATE LIMITED.	
		FIREPRO SYSTEMS PVT. LTD.	
		TYCO FIRE & SECURITY INDIA	
		NEW FIRE ENGRS. PVT. LTD.	
		UTC FIRE & SECURITY INDIA LIMITED.	
		AGNICE FIRE PROTECTION LTD	
		SAFETY CONTROLS & DEVICES	
		DE S TECHNICO PRIVATE LIMITED	
94.	SPRING HANGER	SARATHI ENGINEERING	
		BHARAT HEAVY ELECTRICALS	
		PIPE HANGERS & SUPPORTS PVT LTD	
		SPRING SUPPORTS	
95.	HOSE RUBBER (STEAM/GAS/AIR/WATER/CHEMICAL)	DEWAS HYDROQUIP PVT LTD	
		GAYTRI INDUSTRIAL CORPORATION	
		PIX TRANSMISSIONS LIMITED	
		SONI RUBBER PRODUCTS LTD	
		SRIDHAR ENGG. & RUBER PRODUCTS PVT LTD.	INDIA/USA
		SWAGELOK CO.	INDIA / USA
96.	HOSE METALLIC FLEXIBLE SS	AEROFLEX INDUSTRIES PVT LTD	
		BENGAL INDUSTRIES PVT LTD	
		DEWAS HYDROQUIP PVT LTD	
		GAYTRI INDUSTRIAL CORPORATION	
		INSAP FLEXIBLES & ENGINEERS PVT. LTD.	
		SENIOR PRIVATE LIMITED	
		SWAGELOK CO.	INDIA / USA
97.	FASTNERS	AEP COMPANY	
		BEA SRL	ITALY
		BOLTMASTER PVT LTD	
		DEEPAK FASTENERS LIMITED	
		FASTENERS & ALLIED PRODUCTS PVT LTD.	
		FIX FIT FASTENERS MFG. PVT.LTD.	
		HARDWIN FASTENERS PVT LTD.	
		INDUSTRIAL ENGINEERING CORPORATION	
		J.J.INDUSTRIES	
		KUNDAN INDUSTRIES LTD.	
		MEGA ENGINEERING PVT. LTD.	
		MULTI FASTENERS PVT LTD	
		MULTI THREAD FASTENERS	
		NEXO INDUSTRIES	
		OME METALLURGICA ERBESE S.r.l.	ITALY

SL. NO.	ITEMS	MAKES	REMARKS
		PACIFIC FORGING & FASTENERS PVT LTD	
		PIONEER NUTS & BOLTS PVT LTD	
		PRECISION AUTO ENGINEERS	
		PRECISION ENGG. INDUSTRIES	
		PRESIDENT ENGINEERING WORKS	
		SANDEEP ENGINEERING WORKS	
		SYNDICATE ENGINEERING INDUSTRIES	
		UDEHRA FASTNERS LTD	
98.	PIPES	A.S.T. PIPES PVT. LTD.(AST GROUP)	
		ADVANCE STEEL TUBE LTD.	
		ASIAN MILLS PVT LTD	
		ASRANI TUBES LIMITED	
		BIHAR TUBES LIMITED	
		DADU PIPES (P) LTD	
		GAURANG PRODUCTS PVT LTD (AST GROUP)	
		GOODLUCK STEEL TUBES LTD	
		HAZIRA PIPE MILL LTD	
		HI-TECH PIPES LIMITED	
		INDUS TUBE LIMITED	
		JINDAL INDUSTRIES LTD	
		JINDAL PIPES LTD	
		JINDAL SAW LTD (KOSI WORKS)	
		JOTINDRA STEEL & TUBES LTD	
		LALIT PIPES AND PIPES LTD.	
		LLOYDS METALS & ENGINEERS LTD	
		MAHARASHTRA SEAMLESS LTD	
		MAN INDUSTRIES (I) LTD	
		MUKAT PIPES LTD	
		MUKAT TANKS & VESSELS LTD	
		NEZONE TUBES LIMITED	
		NORTH EASTERN TUBES LIMITED	
		PRATIBHA INDUSTRIES LIMITED	
		PRATIBHA PIPES & STRUCTURAL LTD	
		PSL LIMITED (NANI CHIRAI)	
		PSL LIMITED- (CHENNAI)	
		RAMA STEEL TUBES LTD.	
		RATNAMANI METALS AND TUBES LTD	
		RAVINDRA TUBES LIMITED	
		SAMSHI PIPE INDUSTRIES LIMITED	
		SRI SARBATI STEEL TUBES LTD	
		STEEL AUTHORITY OF LTD	
		SURINDRA ENGINEERING CO LTD	
		SURINDRA ENGINEERING CO LTD	
		SURINDRA ENGINEERING CO LTD	
		SURYA ROSHNI LTD	
		SWASTIK PIPES LTD	
		THE TATA IRON & STEEL CO LTD	
		UTKARSH TUBES & PIPES LTD (FORMLY. BMW)	
		WELSPUN GUJARAT STAHL ROHREN LTD	

SL. NO.	ITEMS	MAKES	REMARKS
		ZENITH BIRLA () LIMITED	
99.	PIPE-CARBON STEEL(WELDED)TO ASTM STDS	JINDAL SAW LTD (KOSI WORKS)	
		LALIT PIPES AND PIPES LTD	
		MAN INDUSTRIES (I) LTD	
		MUKAT PIPES LTD	
		MUKAT TANKS & VESSELS LTD	
		RATNAMANI METALS AND TUBES LTD	
		RATNAMANI METALS AND TUBES LTD	
		SURINDRA ENGINEERING CO LTD	
100.	CABLES – FIRE ALARM AND COMMN.	CMI LIMITED	
		CORDS CABLE INDUSTRIES LTD	
		DELTON CABLES LIMITED	
		ELKAY TELELINKS LTD.	
		K E I INDUSTRIES LIMITED	
101.	PUSH BUTTONS & INDICATING LAMPS	BCH ELECTRIC LTD	
		C & S ELECTRIC LTD	
		ESSEN DEINKI	
		HOTLINE SWITCHGEAR & CONTROLS	
		LARSEN & TOUBRO LTD	
		PRECIFINE PRODUCTS PVT. LTD.	
		SCHNEIDER ELECTRIC PVT LTD	
		SHRI TULSI SWITCHGEARS PVT LTD	
		SIEMENS LIMITED	
		TEKNIC CONTROLS	
102.	MCBs	DATAR SWITCHGEAR PVT LTD.	
		HAVELL'S LTD	
		NA CURRENT CONTROL LTD	
		INDO ASIAN FUSEGEAR LTD	
		LEGRAND () PVT. LTD	
		SCHNEIDER ELECTRIC PVT LTD	
		STANDARD ELECTRICALS LTD	
103.	SOLENOID VALVES	ALCON ALEXANDER CONTROLS LIMITED	UK
		ASCO () LIMITED	
		ASCO JOUCOMATIC LTD	INDIA / UK
		ASCO JOUCOMATIC SA	FRANCE
		AVCON CONTROLS PVT. LTD.	
		HERION WERKE	GERMANY
		PRECISION INSTRUMENT COMPANY	
		ROTEX AUTOMATION LTD.	
		SCHRADER DUNCAN LIMITED	
		THOMPSON VALVES LTD	UK
		VERSA BV	NETHERLANDS
104.	FIRE EXTINGISHERS (PORTABLE)	BHARAT ENGG. WORKS	
		BRIJBASI HI-TECH UDYOG	
		GUNNEBO LIMITED	
		KANADIA FYR FYTER PVT. LTD.	
		MINIMAX GmbH & Co.KG	
		NITIN FIRE PROTECTION INDUSTRIES LTD	
		SAFEX FIRE SERVICES LTD.	
		SUPREMEX EQUIPMENTS	

SL. NO.	ITEMS	MAKES	REMARKS
		VIMAL FIRE CONTROLS PVT LTD	
		ZENITH FIRE SERVICES () PVT. LTD	
105.	FOAM MONITOR	AKRON BRASS COMPANY	
		BRIJBASI HI-TECH UDYOG	
		FIRETECH EQUIPMENTS & SYSTEM PVT. LTD.	
		SHAH BHOGILAL JETHALAL & BROTHERS	
106.	FOAM NOZZLE	AKRON BRASS COMPANY	
		BRIJBASI HI-TECH UDYOG	
		SHAH BHOGILAL JETHALAL & BROTHERS	
		ZENITH FIRE SERVICES (INDIA) PVT. LTD	
107.	WATER MONITOR	AKRON BRASS COMPANY	
		BRIJBASI HI-TECH UDYOG	
		FIRETECH EQUIPMENTS & SYSTEM PVT. LTD.	
		GUNNEBO INDIA LIMITED	
		HD FIREPROTECT PVT. LTD	
		MINIMAX GmbH & Co.KG	
		NEW AGE INDUSTRIES	
		SHAH BHOGILAL JETHALAL & BROTHERS	
		SUPREMEX EQUIPMENTS	
		VIMAL FIRE CONTROLS PVT LTD	
108.	WATER CUM FOAM MONITOR	AKRON BRASS COMPANY	
		FIRETECH EQUIPMENTS & SYSTEM PVT. LTD.	
		NEW AGE INDUSTRIES	
		VIMAL FIRE CONTROLS PVT LTD	
109.	HV/MV SPRAY SYSTEMS	NEW FIRE ENGINEERS (P) LTD	
110.	FIRE HOSE ACCESSORIES	ASCO STRUMECH PVT.LTD.	
		BRIJBASI HI-TECH UDYOG	
		GUNNEBO INDIA LIMITED	
		SHAH BHOGILAL JETHALAL & BROTHERS	
		VIMAL FIRE CONTROLS PVT LTD	
111.	SPRAY NOZZLE - FIRE FIGHTING	AKRON BRASS COMPANY	
		ELKHART BRASS MANUFACTURING INC.	
		FIRETECH EQUIPMENTS & SYSTEM PVT. LTD.	
		FLOW CONTROL TECHNOLOGIES	
		HD FIREPROTECT PVT. LTD.	
		KIDDE INDIA LTD (FMLY VIJAY FIRE-IND)	
		SPRAYING SYSTEMS CO.	
		STRAHMAN VALVES INC	
112.	LONG RANGE MONITOR	AKRON BRASS COMPANY	
		VIMAL FIRE CONTROLS PVT LTD	
		VISHAL FIRE PROTECTION EQUIPMENT	
113.	HOSE DELIVERY	CHHATARYA RUBBER & CHEMICAL INDUSTRIES	
		DEWAS HYDROQUIP PVT LTD	
		NITIN FIRE PROTECTION INDUSTRIES LTD	
114.	WATER SPRINKLER	HD FIREPROTECT PVT. LTD.	
		MATHER & PLATT PUMPS LTD.	
		MINIMAX GmbH & Co.KG	
		TYCO FIRE & SECURITY INDIA PVT. LTD	
115.	BRANCH PIPES	BRIJBASI HI-TECH UDYOG	

SL. NO.	ITEMS	MAKES	REMARKS
		GUNNEBO INDIA LIMITED	
		NITIN FIRE PROTECTION INDUSTRIES LTD	
		SHAH BHOGILAL JETHALAL & BROTHERS	
		SUPREMEX EQUIP	
		VIMAL FIRE CONTROLS PVT LTD	
		ZENITH FIRE SERVICES (INDIA) PVT. LTD.	
116.	SELF OSCILLATING FIRE MONITOR	VIMAL FIRE CONTROLS PVT LTD	
		VISHAL FIRE PROTECTION EQUIPMENT INDIA	
117.	HOSE DELIVERY	CHHATARYA RUBBER & CHEMICAL INDUSTRIES	
		DEWAS HYDROQUIP PVT LTD	
		NITIN FIRE PROTECTION INDUSTRIES LTD	
118.	WATER SPRINKLER	HD FIREPROTECT PVT. LTD.	
		MATHER & PLATT PUMPS LTD.	
		MINIMAX GmbH & Co.KG	GERMANY
		TYCO FIRE & SECURITY INDIA PVT. LTD	
119.	BRANCH PIPES	BRIJBASI HI-TECH UDYOG	
		GUNNEBO INDIA LIMITED	
		NITIN FIRE PROTECTION INDUSTRIES LTD	
		SHAH BHOGILAL JETHALAL & BROTHERS	
		SUPREMEX EQUIP	
		VIMAL FIRE CONTROLS PVT LTD	
		ZENITH FIRE SERVICES (INDIA) PVT. LTD.	
120.	SELF OSCILLATING FIRE MONITOR	VIMAL FIRE CONTROLS PVT LTD	
121.	LONG RANGE MONITOR	AKRON BRASS COMPANY	USA
		VIMAL FIRE CONTROLS PVT LTD	
122.	SYNTHETIC ENAMEL PAINT	ASIAN PAINT/BERGER OR EQUIVALENT	
123.	A3 LASER JET PRINTER	HP	
124.	SOFTWARE AND HARDWARE FOR THE SCADA SYSTEM	CIMCON SOFTWARE (INDIA) PVT. LTD. (AHMADABAD)	
		RAYCHEM RPG LTD., MUMBAI,	
		SIEMENS,	
		ALLEN-BRADLEY,	
		SIEMENS,	
		SCHNEIDER ELECTRIC,	
		KRISTRON SYSTEMS MUMBAI OR EQUIVALENT	
125.	MIXED METAL OXIDE ANODES (WIRE ANODES)	MATCOR (USA)	
		COVALENCE (USA)	
		TYCO ADHESIVES	USA OR EQUIVALENT
126.	TUBULAR ANODES	TITANOR COMPONENTS LTD., GOA, INDIA	
		ORANZIO DE NORA,	ITALY
		MAGNETOCHEMIE,	HOLLAND
		ACTEL LTD.,	U.K.
		ELTECH SYSTEMS CORPORATION	USA
		CERANODE TECHNOLOGIES,	USA
		MATCOR	USA
127.	AIR COMPRESSOR	ELGI EQUIPMENTS LIMITED	
		ATLAS CAPCO INDIA LTD.	

SL. NO.	ITEMS	MAKES	REMARKS
		INDCON PROJECTS & EQUIPMENT -	
		P S A NITROGEN LIMITED.	
		CONSOLIDATED PNEUMATIC	
		INOX AIR PRODUCTS LIMITED.	
		INGERSOLL-RAND (INDIA) LIMITED	

VOLUME – III

ANNEXURE- II

PAINTING SCHEDULE

1.0 GENERAL PAINTING REQUIREMENTS

1.1 Painting of equipment shall be carried out as per the specifications indicated below and attached annexures and shall conform to the relevant IS specification/ international standards for the material and workmanship.

1.2 The following Indian Standards may be referred to for carrying out the painting job :

IS:5	:	Colours for ready mixed paints and enamels
IS:1303	:	Glossary of terms relating to paints
IS:2379	:	Colour code for identification of piplines
IS:1477	:	Code of practice for painting of ferrous metals in buildings (Parts I & II)
IS:2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS:2395	:	Code of practice for painting of concrete, masonry and plaster surfaces (Parts I & II)
IS:2338	:	Code of practice for finishing of wood and wood based materials (Parts I & II)
IS:6278	:	Code of practice for white washing and colour Washing
IS:158	:	Ready mixed paint, brushing, bituminous, black, leadfree, acid, alkali, water and heat resisting
IS:2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS:104	:	Ready mixed paint, brushing, Zinc Chrome, priming
IS: 2932	:	Enamel , synthetic, exterior (a) undercoating (b) Finishing

1.3 **Preparation of Surfaces**

All surfaces to be painted shall be thoroughly cleaned of all grease , oil, loose mill scale , dust , rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out sand scrapping may be permitted with steel wire brushes and /or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER/OWNER RESPRESENTATIVE. The sheet steel of electrical and instrumentation panels shall be pre-treated through chemical cleaning (7 tank) process of rinsing, degreasing, rinsing, derusting, rinsing, phosphating and rinsing. However, in case mechanical cleaning is also required the Contractor shall carry out the same to get a smooth finish.

1.4 **Primer Paint**

After the surface is prepared one coat of Zinc Phosphate primer conforming to IS 2074 shall be applied. After this first coat is dried up completely, second coat of primer shall be applied. Primer shall be applied by brushing, spray, roller as per manufacture recommendation to ensure a continuous film. The dry film thickness of each coat shall be as indicated in Ann-I & II enclosed. Insulated surfaces will have only primer coating and no finish painting.

1.5 **Finish Paint**

Synthetic enamel paint conforming to IS 2932 shall be used for finish coats. The colour /shade shall be as approved by the OWNER. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.

1.6 **Painting and Corrosion Protection for Pipes & Fittings**

1.6.1 All uninsulated piping systems, hangers and supports shall have two coats of Zinc Phosphate Primer (conforming to IS 2074) and finish paint using synthetic enamel paint to give a finish coat. Shades shall be as per IS 5 or as indicated by PURCHASER/OWNER. Service of the pipeline designations shall be painted on all pipes at visible locations.

1.6.2 Before application of paint, Contractor shall clean the pipes of all mill scale, dirt dust, soot grease, rust etc.,

1.6.3 All pipe lines, piping components shall be adequately protected against corrosion during manufacture, fabrication, shipment and storage by appropriate protective paint.

1.6.4 Shop fabricated equipment/items shall be dispatched with final paint. Necessary touch up shall be done at site. Site fabricated equipment/items shall be dispatched with primer painting only and final painting shall be applied at site.

1.7 **Painting and Corrosion Protection for Valves & Specialties**

Two coats of primer of thickness as indicated in Ann-It shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion before dispatch. The use of grease or oil, other than light grade mineral oil, for corrosion protection is prohibited. Bores of all vales shall be covered immediately after testing, draining and drying with suitable plastic end covers to avoid ingress of foreign materials.

1.8 **Suggested Colour Codes for Painting**

Suggested colour codes shall be furnished by the successful bidder after award of contract. Colour codes for piping shall be as per IS 2379 with necessary modifications. Where band colour is specified for piping, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

1.9 **Approved Paint Makes**

i) Asian Paints (I) Ltd.
ii) Berger Paints India Ltd
iii) Goodlass Nerolac
iv) Jenson & Nicholson (I) Ltd
v) CDC carboline (I) Ltd.
vi) Shalimar Paints Ltd.
vii) Addison Paints Ltd.
viii) Grand Polycoat
ix) Bombay Paints

2.0 **PAINTING SCHEDULES**

2.1 Painting schedules for various systems/ items are furnished as per enclosed Annexures-I and II . Vendors of different packages/ items will furnish detailed painting schedule for customer approval during detail engineering as per this guide specification.

PAINTING SCHEDULE

2X250 MW BARAUNI TPS

Annexure-I

Paint Reference Scheme	Surface Preparation Grade / Surface Profile	Primer Coat			Intermediate Coat			Finish Coat			Total DFT in microns
		Premier Paint	No. of Coats	DFT in Microns	Intermediate Paint	No. of Coats	DFT in Microns	Finish Paint (See Note)	No. of Coats	DFT in Microns	
Various type of equipment/valve, etc. (Temp. upto 90°C)	Degreasing and Mech. Cleaning with wire brushing/hand tool (Sa1/St2/St3 as applicable)	HB Zinc Phosphate (alkyd Medium) as per IS:2074	2	35-45 per coat	- NA	-	-	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 - 140
LP Piping/structurals/ Vessels, etc. (Temp. upto 90°)	- do -	HB Zinc Phosphate as per IS:2074 (alkyd medium)	2	35 – 45 per coat	- NA	-	-	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110-140
Equipment with (Temp. upto 250°)	- do -	Heat resistant Al – paint	2	20 per coat	- NA	-	-	NA	Insulated	NA	40
Equipment in corrosive areas like CPU (regeneration) Dosing skid, etc.	Blast clean to Sa $2^1/2$	HB Epoxy resin based zinc phosphate primer	1	50 per coat	Epoxy based MIO pigmented paint	1	50 per coat	Polyamide cured Epoxy finish coat	2	25 – 35 per coat	150 - 170
Elect. / Control Panels, etc.	Seven tank process	HB Zinc phosphate (alkyd Medium) as per IS:2074	2	35 – 45 per coat	-NA	-	-	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 - 140

Notes:

1. Surface preparation shown is as per Swedish Standards SIS 05-5900 or equivalent Indian std. Degreasing will be as per Standard SSPC-SP1.
2. Incase of insulated surfaces, only primer coats shall be applied.
3. GM/SS items with piping and G.I. pipes will not be painted. However these items carrying under Fire Fighting System shall be painted Fire Red as per TAC guidelines. Further SS/GI piping shall be given necessary colour banding for identification as per colour scheme.
4. All instruments shall be painted as per manufacturer standard practice.
5. All structural steel items shall be painted at site. Piping shall go with primer coating & finish paint shall be applied at site. Equipment shall be finish painted at shop.
6. Method of painting application shall be as per paint manufacturer's recommendation.
7. Based on above painting schedule, detailed painting schedule will be prepared by respective package supplier and these be submitted to Customer for their approval.
8. This painting schedule is applicable for bought out equipment/packages of PEM. Painting specification for various piping/ equipment in scope of various other BHEL units like Power cycle piping, CW piping, LP piping, R.E. joints, Butterfly valves, Power cycle valve etc., shall be furnished by unit separately.

ANNEXURE –II

Condensate/DM Water Storage Tank			
	Internal	**External**	**Underneath**
Surface preparation	Blast clean to SA 2.5	Hand/Power tool cleaning/ wire brushing to ST-2	Blast clean to SA 2.5
Primer	1 coat of epoxy resin based zinc phosphate high build primer (2 pack), DFT : 50 – 70 microns	2 coats of red oxide zinc chromate primer (IS 2074) of 30 - 35 microns DFT each	1 coat of high build coal tar epoxy suitably pigmented, DFT : 80 – 100 microns
Finish	2 coats of solvent free epoxy paint, DFT – 35 microns each	2 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns DFT each	N.A
Total DFT	120 – 140 microns	100 – 120 microns	80 – 100 microns

NaOH Breather and Seal Pot			
	Internal	**External**	**Underneath**
Surface preparation	Blast clean to SA 2.5	Blast clean to SA 2.5	N.A.
Primer	1 coat of epoxy resin based zinc phosphate high build primer (2 pack), DFT : 50 – 70 microns	2 coats of epoxy resin based zinc phosphate primer of 35-50 microns.	N.A.
Finish	2 coats of solvent free epoxy paint, DFT – 35 microns each	2 coats of polyamide cured epoxy finish paint of 30-35 microns each	N.A.
Total DFT	120 – 140 microns	130 – 170 microns	

ANNEXURE –II

LDO/HFO Storage Tank			
	Internal	**External**	**Underneath**
Surface preparation	Wire bushing	ST2 (Wire Brushing/ Hand tool cleaning)	Blast clean to SA 2.5
Primer	NA	2 coats of red oxide zinc chromate primer (IS 2074) of 30 - 35 microns DFT each	1 coat of high build coal tar epoxy suitably pigmented, DFT : 80 – 100 microns
Finish	2 coats of double boiled linseed oil	2 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns (DFT) each	N.A
Total DFT		100 – 120 microns	80 – 100 microns

ANNEXURE-III

SUGGESTED COLOUR CODES FOR PAINTING

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admirality Grey	632	-	-
2.0	Fans, pumps, motors, compressors, Blowers	Light Grey	631	-	-
3.0	Tanks (without insulation and cladding)				
3.1	Outdoor, Stand pipes, vent pipes	Aluminum	-	-	-
3.2	Indoor	Aluminum	-	-	-
4.0	Vessels & all other proprietary equip-ment (without insulation & cladding)	Light grey	631	-	-
5.0	Switchgear	Light grey	631	-	-
6.0	Control & relay panels	Light grey	631/7078 of IS 1650	-	-
7.0	Transformers	Dark Admiralty Grey	632	-	-
8.0	Machinery guards	Signal red	537	-	-
9.0	Piping (without insulation and cladding)				

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
9.1	Water System				
a)	Boiler feed	Sea green	217	-	-
b)	Condensate	Sea green	217	Light brown	410
c)	D M Water	Sea Green	217	Light orange	557
d)	Soft water	Sea green	217	French blue	166
e)	Bearing cooling water	Sea green	217	French blue	166
f)	Potable & filtered water	Sea green	217	French blue	166
g)	Service & clarified water	Sea green	217	French blue	166
h)	Raw water	Sea green	217	White	-
i)	Cooling water	Sea green	217	French blue	166
9.2	Compressed Air System				
a)	Service air	Sky Blue	101	-	-
b)	Instrument air	blue	101	White	-
9.3	Oil system				
a)	Fuel oil	Light brown	410	French	166
b)	Light oil	Dark Brown	412	Brilliant green	221
c)	Lubricating oil	Light brown	410	Light grey	631
d)	Control oil	Light brown	410	Light orange	557

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
e)	Transformer oil	Light brown	410	Light orange	557
9.4	Gas system				
a)	Carbon dioxide	Canary yellow	309	Light grey	631
9.5	Fire services	Fire red	536	-	-
9.6	Ash slurry pipes	Black	-	-	-
9.7	Vacuum pipes	Sky blue	101	Black	-
9.8	Fuel pipes (lignite)	Light brown	410	-	-
9.9	Drainage	Black	-	-	-
9.10	Stand pipes and all Vent pipes	Aluminum	-	-	-
9.11	Bottom Ash system	Light Grey	631	-	-

Notes :

1. This colour code basically refers to IS:2379 for piping with necessary modifications.
2. Where band colour is specified, same shall be provided at 10 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

PRICE BID FORMAT FOR
WATER BASED FIRE PROTECTION SYSTEM
PROJECT- 2 x 250 MW UNIT # 8 & 9, BARAUNI-TPS, BEGUSARAI
SPEC NO: PEMC 03842 Rev 00

Sl. No.	Description	Qty.	Unit	PRICE in INR or US $ (Refer notes below)	
				Unit Price (INR or US $)	Total Price (INR or US $)
1.	Lump sum price for complete Water based Fire Protection System (WFPS) as per BHEL Specification.	1	Lot		
2.	Per diem rate for the supervision of erection, testing, commissioning & performance testing for the supplied system shall be offered.	200	Days		
3.	Travel expenses (inclusive of all other charges like visa fee (if applicable), insurance etc) from / to vendor works to site for Engineer per visit for supervision of erection & commissioning of WFPS system.	13	Visits		
		Grand Total			

Notes:
1. Bidder to quote strictly as per BHEL's specification requirements.
2. Bidder to note that the complete supply of the package (Refer Sl. No. 1) is a LUMP SUM Turn-Key Order. Any additional claim on any account, after placement of order will not be entertained under any circumstances.
3. For the purpose of tender total no of 200 man days to be covered in 13 visits have been considered. However, either or both of the number of man days or number of visits may change on either side based on the actual site requirement. Bidder to note that payment against Sl. No.2 & 3 above shall be made as per the total number of visits and man days required for the supervision of the complete E&C activities.
4. Offer will be evaluated based on total price for Sl. No. 1, 2 & 3 of price format.
5. Bidder to quote the base rates only. Applicable taxes and duties to be indicated separately. (As per Split Value format Vol IIIB of price formats). Indian bidders to quote in Indian Rupees & Foreign bidders to quote in US $.

BIDDER'S SIGNATURE
NAME:
DATE
COMPANY SEAL

Prepared by	Checked By	Approved by	Date
Amit Kumar	K Gunjan	P. Sudhir Babu	20.04.13

ANNEXURE-IV

MASTER DOCUMENT LIST (MDL)

System Name:	Supplier:	PROJECT:			Supplier Doc. No.:			
		Supplier Job No.:	BHEL P.O. No.		Rev. No.		Sh.	of
			Date		Date		1	

System: Mech./Elec. Instrum./Civil	Drg./ Doc. Name	Drg./Doc. Number	No. of sht	Rev. No.	Cat A/I	Sumission status to BHEL Rev.0 Date	Rev.1 Date	Rev.2 Date	Final Rev.(R---) Date	BHEL Response status	Remarks
Mechanical											
M.01											
M.02											
M.03											
….											
….											
….											
Electrical											
E.01											
E.02											
E.03											
….											
….											
Instrumentation											
I.01											
I.02											
I.03											
Civil											
C.01											
Quality Q,01											
Q.01											
Erection											
E.01											
E.02											
E.03											
Procedures-P.01											
P.01											
B.O.M											

A-Approval I-Information	Prepared By:		Approved By:		Supplier Doc. No.:
	Sign :		Sign :		
	Date :		Date :		

ANNEXURE-V

GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.
2. Each page of QAP shall contain the following information.

   a) Vendor's name & address.
   b) Customer: BHEL, Hyderabad.
   c) Project.
   d) BHEL Product Standard Number/revision number as referred in P.O.
   e) BHEL Purchase Order Number & Date.
   f) Product as per P.O. description.
   g) QAP Number (unique and shall not repeat)/revision number/date.
   h) Page number and number of pages
   i) Vendor signature & stamp

3. QAP shall contain four parts / stages as follows.

A) Raw materials and bought out items.
B) Inprocess Control / Inspection.
C) Final assembly, Inspection & Testing.
D) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).
5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc), Hydrostatic test, calibration check etc.)
6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.
7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)
8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)
9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drg references etc should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practise etc". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.
10. Under 'Format of record', indicate appropriately supplier's Test certificate, calibration certificate, lab report, inspection report etc.
11. Please refer 'Agency' in QAP format.
    "Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR
    2: (Vendor / Sub vendor)
    Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code1
12. Under 'D' please put (✓Tick) against each characteristic where vendor proposes to submit test certificate/report etc OR as required as per BHEL Spec.
13. Vendor's signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drgs.

15. The following operations/characteristics/check points may be included (**AS APPROPRIATE)**

a) Visual check
b) Dimensional check
c) Mechanical and Chemical properties.
d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc as the case may be.)
e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peeloff test etc.
f) Check for correctness for all components mounted as per General arrangement Drg, Bill Of Materials (BOM), etc for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
g) Verification of test certificate for protection class for the enclosures.
h) Mechanical functioning of switches.
i) Continuity of earthing and provision of earth points.
j) Colour coding of wiring, size, tightness & dressing of wiring.
k) Review of test certificates of assembled items, raw materials, internal test reports etc.
l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.
m) PQR, WPS, Welder Qualification Record, welding records (fitup, DP) etc.
n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc)
o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests.
p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Preece Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
r) Packing and Preservation.

ANNEXURE-VI

VENDOR'S NAME & ADDRESS:	**MANUFACTURING QUALITY PLAN**		QP. NO.:	
	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:	BHEL P.O.NO.: P.O.DATE: BHEL SPEC: REV:	REV NO:	DATE:
			PAGE 1 OF 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY VENDOR'S SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP

ANNEXURE-VII

BILL OF MATERIALS

(SUB-VENDOR PACKAGES)

(NOTE: ASSEMBLED UNITS AND ALL LOOSE DESPATCHABLE ITEMS IDENTIFIED IN THIS BOM)

System Name		**Supplier:**	**Project:**			**Supplier Doc. No.**			
			Supplied Job No.	**BHEL P.O.No.**		**Rev. No.**		**sh. 1**	**of**
				Date		Date			
Item Despatch Tag-No.	Ref. Drg. No.	Item No.	Item Description	Qty. (Nos./mts)	Wt (Kg)	Despatch Details			Remarks
						Packing box No.	LR No.	Date	
	Rev.	Rev.	Prepared By:		Approved By: (xxx)			**Supplier Doc. No.:**	
			Sign :		Sign :				
			Date :		Date :				

ANNEXURE-VIII

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It must not be used directly or indirectly in any way detrimental to the interest of the company.

PRE-BID QUERRIES FROM SPECIFICATION

If the proposal submitted has got any Queries from the technical stipulations in the bidding document, the Bidder shall tabulate below the full particulars of such Queries and shall sign below. Additional sheets may be enclosed, if necessary. Queries are to be furnished with mention of specific clause numbers. Technical and commercial Queries to scope of supply and services shall be indicated separately.

SL.No.	Clause No.	Description as per specification	Queries by Bidder

We confirm that all the Pre-Bid Queries to the Technical Specification, Job Specification and enclosures including reference documents attached are listed in this Annexure only. No other Pre-Bid Queries even if mentioned elsewhere shall be considered for any technical/ commercial evaluation or for ordering.

Bidder's Signature…….

Date:……

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DRAWING No. PE-DG-374-100-M002

CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM

PIPE RACK

N=79328.765 E 100658.750

N 79303.100 E 100630.293

N 79292.370 E100637.758

79172.5 N 100642.0 E

7.5M WIDE ROAD

E=100652.0

N=79161.0

7.5M WIDE ROAD

ANNUBAR E=100603.0

LAST ROW OF ESP COLUMN

FIRST ROW OF ESP COLUMN

COAL CONVEYOR

24000 18246 44754 22930 15000 39600

N 79376.0 E 100617.283

N 79376.0 E 100620.30

VACUUM PUMP MOTOR ROOM

ESP - B

UNIT NO.-08

ESP - A

UNIT NO.-09

ESP - B

ESP - A

N 79366.734 E 100617.431

N 79366.734 E 100613.431

N 79376.0 E 100613.0

N 79376.0 E 100620.30

N 79366.734 E 100617.431

N 79366.734 E 100613.431

N 79376.0 E 100613.0

N 79376.0 E 100620.30

C OF CHIMNEY

100535.583 E 79420.530 N

44000

51500

31000

44000

7.5M WIDE ROAD N-79476.50

N-79386.284 5.0M WIDE ROAD

N-79314.6

C OF ROAD

BCN-7B

BCN-7A

E=100446.597 N=79463.302

E=100443.997 N=79328.765

PIPE RACK

7.5M WIDE ROAD E-100436.30

N-79314.6 5.0M WIDE ROAD

N-79286.577 E-100436.3

N-79259.127 E-100409.30

7.5M WIDE ROAD E-100409.30

CRITICAL PIPING BAY

UNLOADING BAY

CRANE GALLERY AT EL.58

CRANE GALLERY AT EL.58

DRAWING NO. PE-DG-374-100-M003

CUSTOMER'S DRAWING NO.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

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NORTH

FIRST ROW BOILER COL.

CABLE GALLERY AT 0.0M
(FOR DETAIL,REFER DWG NO.PE-DG-374-100-E005)
SWITCHGEAR ROOM AT 3.5M
(FOR DETAIL, REFER DWG. NO. PE-DG-374-100-E002)

INTERCONNECTION BETWEEN SERVICE BUILDING TO TG BLDG AT EL 0.0M, 9.0M ,13.5M

100617.083 E
79206.0 N

UNLOADING BAY

CRITICAL PIPING BAY

SERVICE BUILDING

6.0M WIDE ROAD

7.0M WIDE ROAD

DMCW(SG) PUMPS

DMCW (TG) PUMPS

PHOSPHATE DOSING SKID

HYDRAZINE DOSING SKID

AMMONIA DOSING SKID

BFP FOUNDATION

L.O. COOLERS

W.O. COOLERS

SEAL OIL UNIT

G.T.G. SET

HPDFT

CONDENSER

MAIN STEAM CONDENSER CNE 1450X

CONDENSER WATER BOX OPENING

DRAIN COOLER EL 1.0M

TUBE WITH DRAIN SAPCE 4500

PIPE TRENCH INVERT LEVEL (-)1.1M

PIPE HATCH

ROLLING SHUTTER (7000WX7500H)

ROLLING SHUTTER (8000WX7500H)

STAIRCASE UPTO EL.13.5M

STAIRCASE UP TO EL.2.5M

STAIRCASE UP TO EL.13.5M

STAIRCASE UPTO EL.3.5M

DOOR AT 0.0M

SPACE FOR TOILET

LIFT WELL

WALL WITH DOOR AT GRID NO. 23

MAINTENANCE AREA

STORAGE FOR CO_2 CYLINDER (100 NOs.)

STORAGE FOR H_2 CYLINDER (180 NOs.)

GAS UNIT

GAS ANALYSER CABINET

HOLD

LOADING OF BUSDUCT SHALL BE CONSIDERED WHILE DESIGNING OF GAS ROOM ROOF.

RCC PADS FOR STATOR HANDLING BY STRAND JACK

SUMP PUMP

OIL PURIFIER

CENTRAL LUB OIL PURIFIER

CLEAN OIL TANK 5Mx4.5Mx3M

DIRTY OIL TANK 5Mx4.5Mx3M

EL 13.5M MAIN OIL TANK

EL 9.0M MAIN OIL TANK

EL 4.5M MAIN OIL TANK

EL 0.0M MAIN OIL TANK

WASTE OIL TANK AT EL 0.0M

OIL COOLERS

UNIT OIL CHARGING

EMERGENCY DRAIN TANK

EMBEDDED PIPE NB 50 OIL ROOM FLOOR DRAIN

4" DIA PVC PIPE FLUSH OIL FLOW

4" DIA PVC PIPE DIRTY OIL FLOW

4X600W CABLE TRAY RISERS 1500X1000MM CUTOUT 0.7M TO 12.5M EL.

4X600W CABLE TRAY RISERS 1500X1000MM CUTOUT 0.7M TO 19.0M EL.

4X600W CABLE TRAY RISERS 1500X1000MM CUTOUT 0.7M TO 25.5M EL.

4X600W CABLE TRAY RISERS 1500X1000MM CUTOUT 0.7M TO 32.5M EL.

ROLLING SHUTTER (6000WX7500H)

FROM 4.5M

UP TO 0.0M

STAIRCASE UP TO EL.13.5M

FOR CONTI. REFER CW PIPING OUTSIDE TO HALL DWG. NO PE-DG-374-165-M002

WALL TO BE DEPOSITO LAITAS MIN.PAINTING OF FLANGES

ACW_A

ACW_B

ACW_C

ACW-STRAINER-A

ACW-STRAINER-B

PUMP DISCHARGE

PUMP SUCTION

PHE-SG

PHE-TG

MONORAIL BOG-6.0M CAPACITY=3.0T

MONORAIL BOG-4.0M CAPACITY=3.0T

BRACING UPTO 8.5M

BRACING UPTO 8.0M

HPSU FOR 2"DIA VALVE

EL.(-)1.25M

EL.(-)2.15M

EL.(-)3.05M

EL.(-)4.45M

EL.(-)5.35M

EL.(-)6.25M

EL.(-)7.15M

EL.(-)8.05M

EL.(-)8.95M

EL.(-)9.85M

EL.(-)10.75M

EL.(-)11.65M

EL.(-)12.55M

EL.(-)13.45M

EL.(-)14.35M

EL.(-)15.25M

EL.(-)16.15M

EL.(-)17.05M

EL.(-)17.95M

EL.(-)18.85M

EL.(-)19.75M

EL.(-)20.65M

EL.(-)21.55M

EL.(-)22.45M

EL.(-)23.35M

EL.(-)24.25M

EL.(-)25.15M

EL.(-)26.05M

EL.(-)26.95M

EL.(-)27.85M

EL.(-)28.75M

EL.(-)29.65M

EL.(-)30.55M

EL.(-)31.45M

EL.(-)32.35M

EL.(-)33.25M

EL.(-)34.15M

EL.(-)35.05M

EL.(-)35.95M

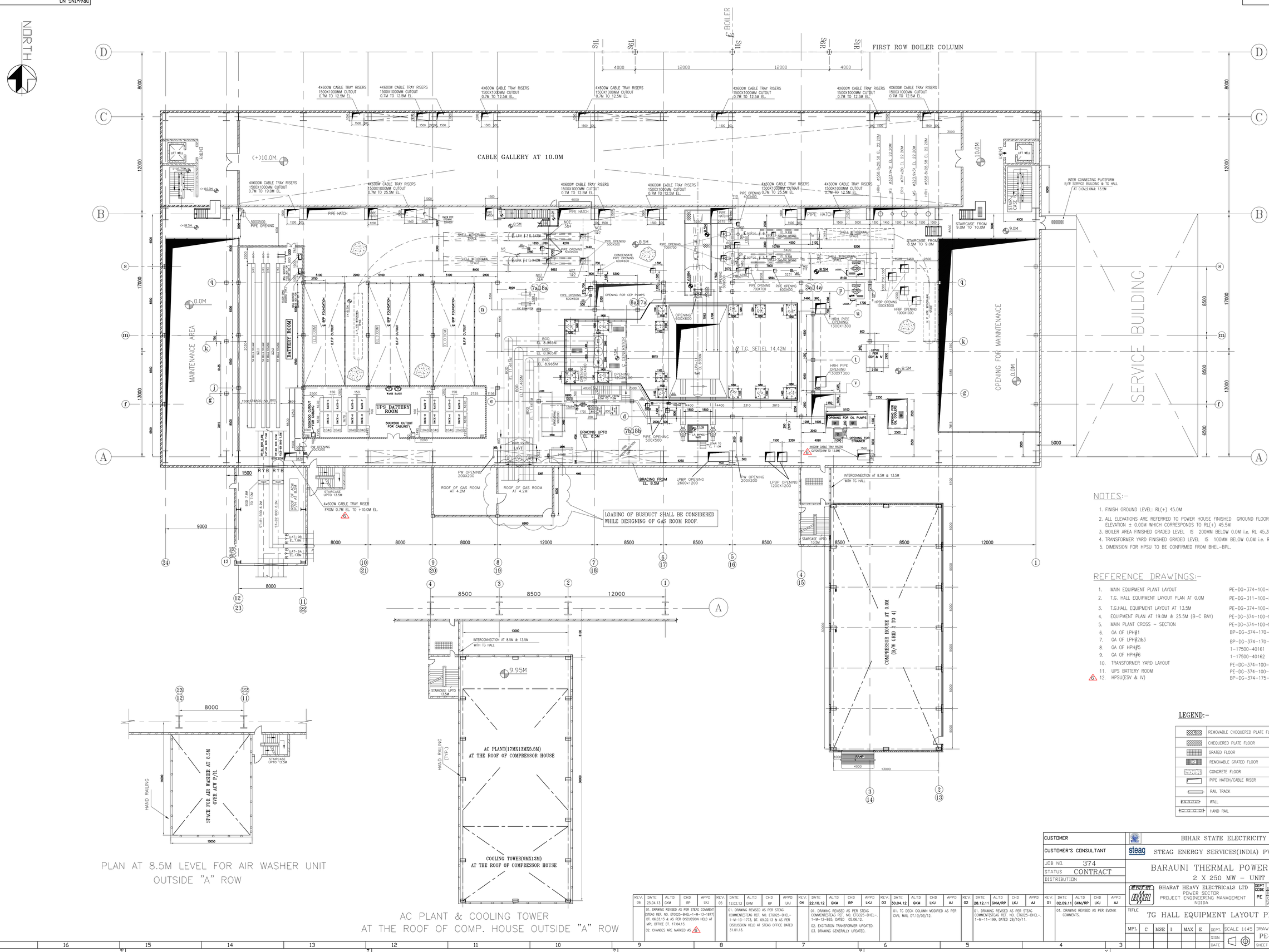
EL.(-)36.85M

EL.(-)37.75M

EL.(-)38.65M

EL.(-)39.55M

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PLAN AT 8.5M LEVEL FOR AIR WASHER UNIT OUTSIDE "A" ROW

AC PLANT & COOLING TOWER AT THE ROOF OF COMP. HOUSE OUTSIDE "A" ROW

NOTES:-

1. FINISH GROUND LEVEL: RL(+) 45.0M
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
3. BOILER AREA FINISHED GRADED LEVEL IS 200MM BELOW 0.0M i.e. RL 45.3M
4. TRANSFORMER YARD FINISHED GRADED LEVEL IS 100MM BELOW 0.0M i.e. RL 45.4M
5. DIMENSION FOR HPSU TO BE CONFIRMED FROM BHEL-BPL.

REFERENCE DRAWINGS:-

1.	MAIN EQUIPMENT PLANT LAYOUT	PE-DG-374-100-M002
2.	T.G. HALL EQUIPMENT LAYOUT PLAN AT 0.0M	PE-DG-311-100-M003
3.	T.G.HALL EQUIPMENT LAYOUT AT 13.5M	PE-DG-374-100-M005
4.	EQUIPMENT PLAN AT 19.0M & 25.5M (B-C BAY)	PE-DG-374-100-M006
5.	MAIN PLANT CROSS - SECTION	PE-DG-374-100-M007
6.	GA OF LPH#1	BP-DG-374-170-0005
7.	GA OF LPH#2&3	BP-DG-374-170-0006
8.	GA OF HPH#5	1-17500-40161
9.	GA OF HPH#6	1-17500-40162
10.	TRANSFORMER YARD LAYOUT	PE-DG-374-100-E001
11.	UPS BATTERY ROOM	PE-DG-374-100-E004
6 12.	HPSU(ESV & IV)	BP-DG-374-175-0022

LEGEND:-

	REMOVABLE CHEQUERED PLATE FLOOR
	CHEQUERED PLATE FLOOR
	GRATED FLOOR
	REMOVABLE GRATED FLOOR
	CONCRETE FLOOR
	PIPE HATCH/CABLE RISER
	RAIL TRACK
	WALL
	HAND RAIL

REV.	DATE	ALTD	CHD	APPD	DESCRIPTION
06	25.04.13	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-13-1877) DT. 06.03.13 & AS PER DISCUSSION HELD AT MPL OFFICE DT. 17.04.13. 02. CHANGES ARE MARKED AS 6
05	12.02.13	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-13-1773, DT. 09.02.13 & AS PER DISCUSSION HELD AT STEAG OFFICE DATED 31.01.13.
04	22.10.12	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-12-865, DATED 05.06.12. 02. EXCITATION TRANSFORMER UPDATED. 03. DRAWING GENERALLY UPDATED.
03	30.04.12	GKM	LKJ	AJ	01. TG DECK COLUMN MODIFIED AS PER CIVIL MAIL DT.13/03/12.
02	28.12.11	GKM/RP	LKJ	AJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-11-199, DATED 28/10/11.
01	02.09.11	GKM/RP	LKJ	AJ	01. DRAWING REVISED AS PER EVONIK COMMENTS.

CUSTOMER: BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB NO. 374
STATUS CONTRACT
DISTRIBUTION

BARAUNI THERMAL POWER STATION
2 X 250 MW - UNIT 8 & 9

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE	NAME	SIGN	DATE
DRN.	GKM		01.07.11
DESN	SK		01.07.11
CHD	LKJ		01.07.11
APPD	AJ		01.07.11

TITLE: TG HALL EQUIPMENT LAYOUT PLAN AT (+) 8.5M

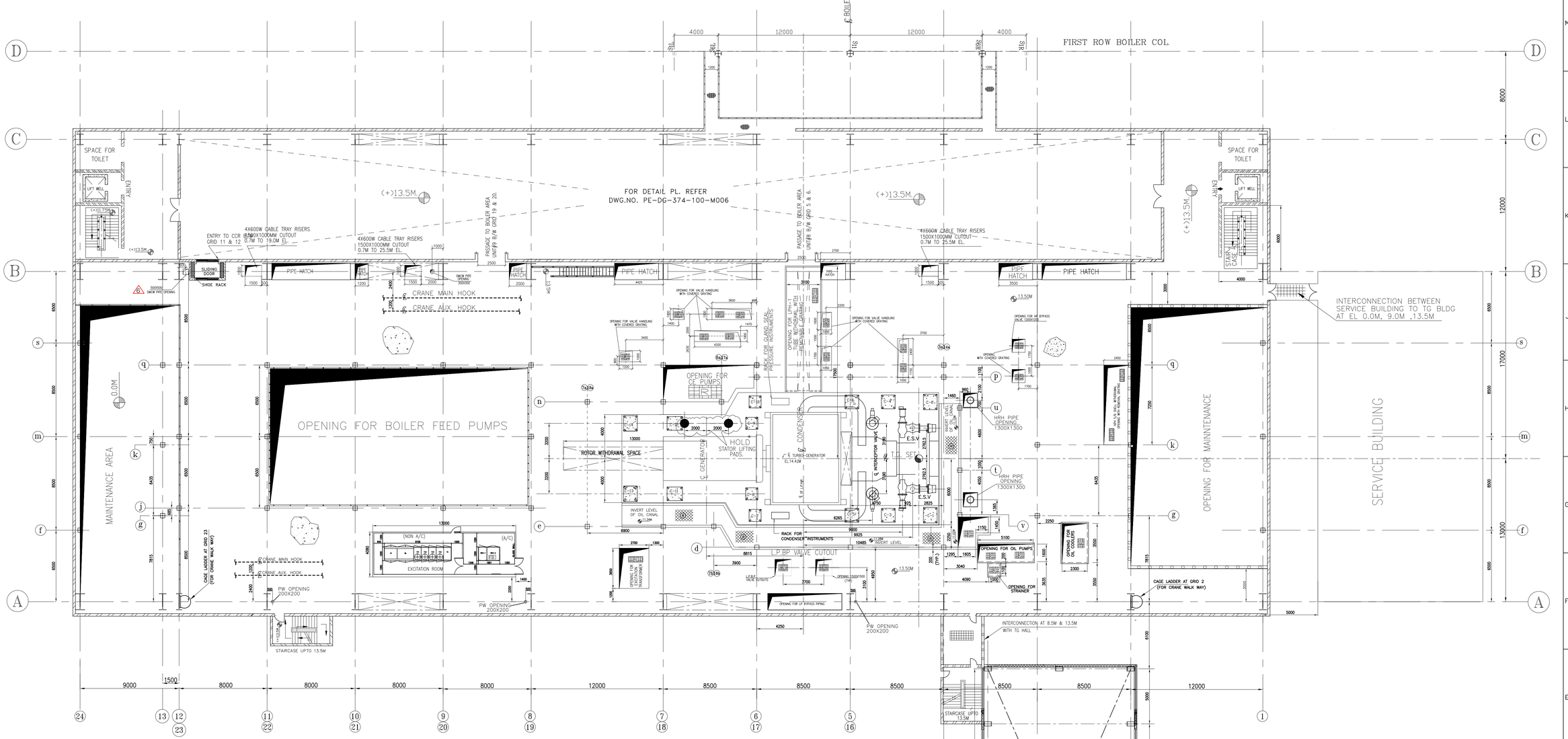
MPL C MSE I MAX E DEPT SIGN DATE

SCALE 1:145 DRAWING NO. PE-DG-374-100-M004

SHEET 1 OF 1 REV. 06

SIZE A0

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NOTES:-

1. FINISH GROUND LEVEL: RL(+) 45.0M
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
3. BOILER AREA FINISHED GRADED LEVEL IS 200MM BELOW 0.0M i.e. RL 45.3M
4. TRANSFORMER YARD FINISHED GRADED LEVEL IS 100MM BELOW 0.0M i.e. RL 45.4M
6. 5. LAYDOWN SPACE FOR STG COMPONENT SHOWN IN DWG. NO. PE-DG-374-100-MSK02.

HOLD:*-

01. STATOR LIFTING PADS.
02. PSER TO CONFIRM THE FOUNDATION AND DETAIL OF STATOR LIFTING PADS.

LEGEND:-

	REMOVABLE CHEQUERED PLATE FLOOR
	CHEQUERED PLATE FLOOR
	GRATED FLOOR
	REMOVABLE GRATED FLOOR
	CONCRETE FLOOR
	PIPE HATCH/CABLE RISER
	RAIL TRACK
	WALL
	HAND RAIL

REFERENCE DRGS:-

1.	MAIN EQUIPMENT PLANT LAYOUT	PE-DG-374-100-M002
2.	T.G. HALL EQUIPMENT LAYOUT PLAN AT 0.0M	PE-DG-311-100-M003
3.	T.G. HALL EQUIPMENT LAYOUT PLAN AT 8.5M	PE-DG-311-100-M004
4.	EQUIPMENT PLAN AT 19.0M & 25.5M (B-C BAY)	PE-DG-374-100-M006
5.	MAIN PLANT CROSS SECTION	PE-DG-374-100-M007
6.	OIL CANAL DETAIL	0-13100-Z5001
7.	TG DECK FOUNDATION DRAWING	PE-DG-374-613-C002 & C003
8.	CRANE CLEARANCE DIAGRAM(125T/25T)	PE-DG-374-501-A001

REV.	DATE	ALTD	CHD	APPD	DESCRIPTION
06	25.04.13	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT (STEAG REF. NO. ETG025-BHEL-1-M-13-1877) DT. 06.03.13 & AS PER DISCUSSION HELD AT MPL OFFICE DT. 17.04.13. 02. CHANGES ARE MARKED AS 6
05	12.02.13	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-13-1773, DT. 09.02.13 & AS PER DISCUSSION HELD AT STEAG OFFICE DATED 31.01.13.
04	02.11.12	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-12-865 , DATED 05/06/2012. 02.DRAWING GENERALLY UPDATED.
03	30.04.12	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. PEY02-374-BBHR-IPS-105 , DATED 21/0212.
02	28.12.11	GKM/RP	LKJ	AJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-11-199, DATED 28/10/11.
01	02.09.11	GKM	RP	AJ	1. DRAWING REVISED AS PER CUSTOMER COMMENT.

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB NO.	374
STATUS	CONTRACT
DISTRIBUTION	

BARAUNI THERMAL POWER STATION
2 X 250 MW – UNIT 8 & 9

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE	NAME	SIGN	DATE
DRN	GKM		01.07.11
DESN	RP		01.07.11
CHD	LKJ		01.07.11
APPD	AJ		03.07.11

TITLE: TG HALL EQUIPMENT LAYOUT PLAN AT (+) 13.5M

MPL	C	MSE	I	MAX	E	DEPT.	SCALE: 1:145	DRAWING NO.
						SIGN		PE-DG-374-100-M005
						DATE		SHEET 1 OF 1 REV. 06

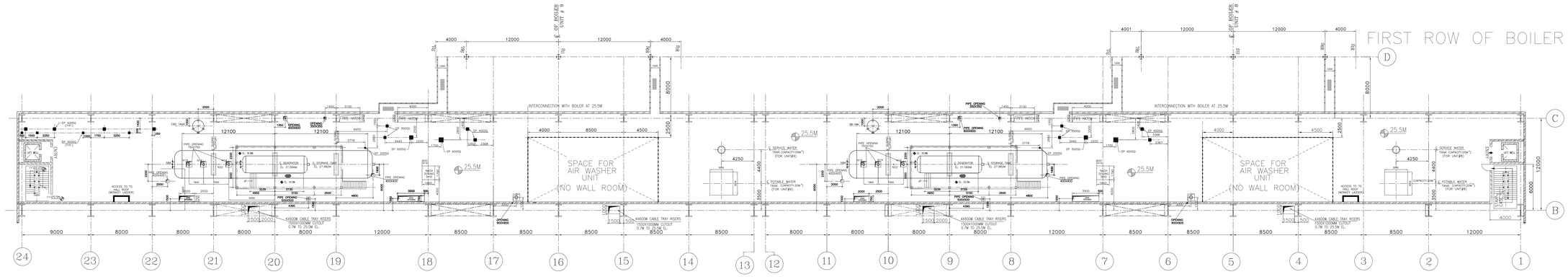
SIZE A0

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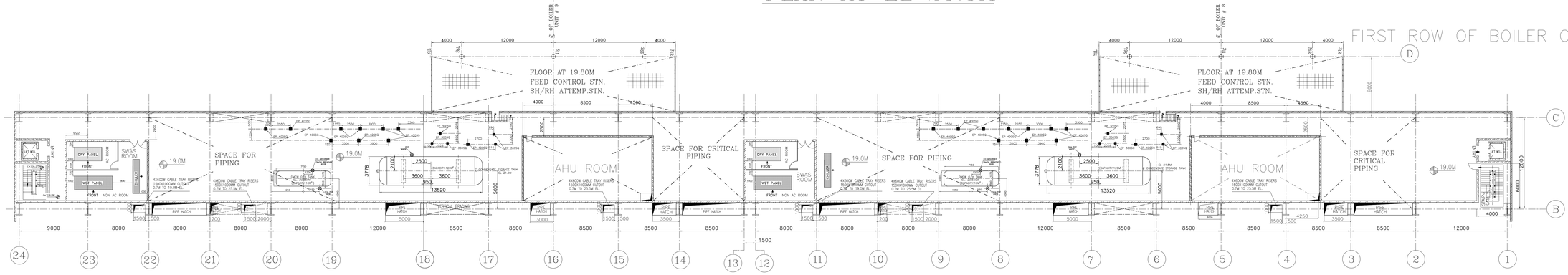
DRAWING No. PE-DG-374-100-M006

CUSTOMER'S DRAWING No.

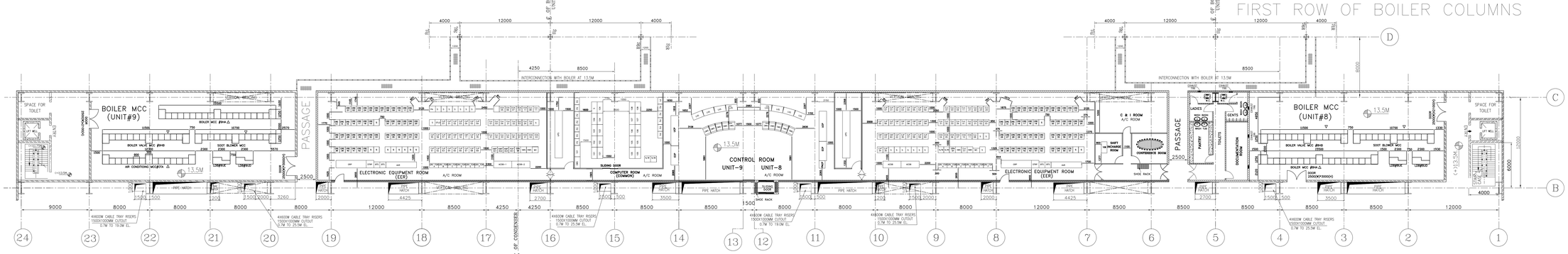
NORTH



PLAN AT EL 25.5M



PLAN AT EL 19.0M



PLAN AT EL 13.5M

NOTES:–

1. FINISH GROUND LEVEL: RL(+) 45.0M
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
3. BOILER AREA FINISHED GRADED LEVEL IS 200MM BELOW 0.0M i.e. RL 45.3M
4. TRANSFORMER YARD FINISHED GRADED LEVEL IS 100MM BELOW 0.0M i.e. RL 45.4M

LEGEND:–

	REMOVABLE CHEQUERED PLATE FLOOR
	CHEQUERED PLATE FLOOR
	GRATED FLOOR
	REMOVABLE GRATED FLOOR
	CONCRETE FLOOR
	PIPE HATCH/CABLE RISER
	RAIL TRACK
	WALL
	HAND RAIL

REFERENCE DRGS:–

1.	MAIN EQUIPMENT PLANT LAYOUT	PE-DG-374-100-M002
2.	T.G. HALL EQUIPMENT LAYOUT PLAN AT 0.0M	PE-DG-311-100-M003
3.	T.G.HALL EQUIPMENT LAYOUT AT 8.5M	PE-DG-374-100-M004
4.	T.G.HALL EQUIPMENT LAYOUT AT 13.5M	PE-DG-374-100-M005
5.	GA OF DEAERATOR	1-163-10-11402
6.	GA OF O/H CST	0-17052-40233
7.	GA OF DMCW O/H TANK	1-17052-40479
8.	CCR & EER ROMM LAYOUT	PE-DG-374-100-I401
9.	SWAS ROOM LAYOUT	PE-DG-374-145-I403
10.	LAYOUT OF BOILER SWITCHGEAR ROOM	PE-DG-374-100-E003

REV	DATE	ALTD	CHD	APPD
05	12.02.13	GKM	RP	UKJ

01. DRAWING REVISED AS PER STEAG COMMENTS(STEAG REF. NO. ET0225-BHEL-1-M-13-1773, DT. 09.02.13 & AS PER DISCUSSION HELD AT STEAG OFFICE DATED 31.01.13.

REV	DATE	ALTD	CHD	APPD
04	01.11.12	GKM	RP	UKJ

01. DRAWING REVISED AS PER STEAG COMMENTS(STEAG REF. NO. ET0225-BHEL-1-M-12-1165, DATED 05/06/12.)

02.COMMON CONTROL ROOM(CCR) UPDATED.
03. SWAS ROOM LAYOUT UPDATED.
04. DRAWING GENERALLY UPDATED.

REV	DATE	ALTD	CHD	APPD
03	30.04.12	GKM	RP	UKJ

01. DRAWING REVISED AS PER STEAG COMMENTS(STEAG REF. NO. ET0225-BHEL-1-M-12-590, DATED 12/03/12.)

REV	DATE	ALTD	CHD	APPD
02	28.12.11	GKM	RP	UKJ

01. CABLE RISER ADDED. AT DIFFERENT FLOOR.
02. DRAWING REVISED AS PER STEAG COMMENTS(STEAG REF. NO. ET0225-BHEL-1-M-11-199, DATED 28/10/11.)

REV	DATE	ALTD	CHD	APPD
01	02.09.11	GKM	RP	AJ

01. DRAWING REVISED AS PER CUSTOMER COMMENT.
02. TWO AIR WASHER UNIT PLACED AT ROOF OF A-B BAY.

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB No. 374	BARAUNI THERMAL POWER STATION 2 X 250 MW – UNIT 8 & 9
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.OFT	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT	NAME	SIGN	DATE
CODE			
DRN	GKM		01.07.2011
DESN	RP		01.07.2011
M CHD	UKJ		01.07.2011
APPD	AJ		01.07.2011

TITLE EQUIPMENT PLAN AT 13.5M,19.0M & 25.5M FLOOR (B–C BAY)

MPL	C	MSE	I	MAX	E

DEPT.
SIGN
DATE

SCALE 1:200

DRAWING No. PE-DG-374-100-M006

SHEET 1 OF 1 REV 05

SIZE-A0

COMPUTER FILE NAME-M006.Dwg

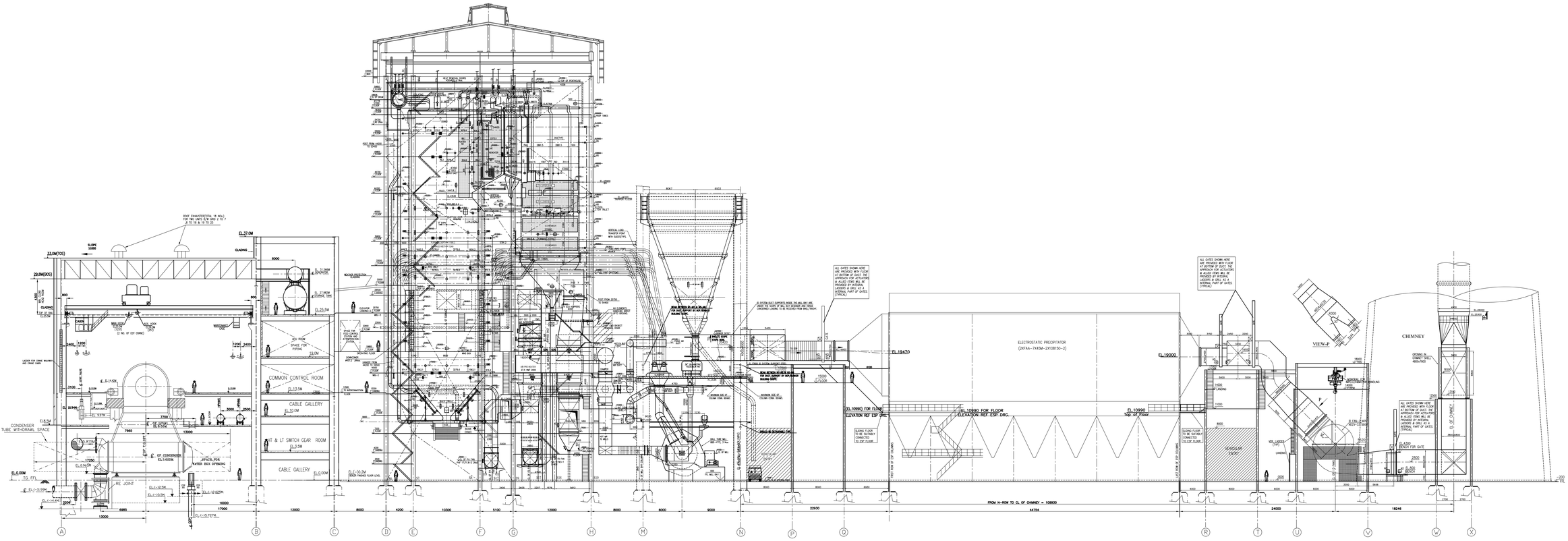
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM

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DRAWING NO. PE-DG-374-100-M007

CUSTOMER'S DRAWING NO.

NORTH



NOTES

1. ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METRE UNLESS OTHERWISE STATED.
2. FINISH GROUND LEVEL: RL(+) 45.0M
3. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
4. **EOT CRANES SHALL NOT BE USED AS TANDEM OPERATION FOR STATOR LIFTING.**

REFERENCE DRAWINGS:

1.	EQUIPMENT LAYOUT AT 0.0M R05	PE-DG-374-100-M003
2.	EQUIPMENT LAYOUT AT 8.5M R05	PE-DG-374-100-M004
3.	EQUIPMENT LAYOUT AT 13.5M R05	PE-DG-374-100-M005
4.	CW PIPING INSIDE TG HALL R00	PE-DG-374-165-M001
5.	CRANE CLEARANCE DIAGRAM(CCD) R02	PE-DG-374-501-A001
6.	GA & FOUNDATION DETAIL OF CEP R03	HY-DG-1-18100-57193
7.	LAYOUT OF ID SYSTEM(ELEVATION) R02	0-00-020-75926
8.	GA OF BOILER SECTION SIDE ELEVATION R06	0-00-022-75923

COMPUTER FILE NAME: 311-100-M007.Dwg

REV	DATE	ALTD	CHD	APPD	DESCRIPTION
05	04.02.13	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-3-M-12-1568, DATED 12/12/2012) & AS PER DISCUSSION HELD AT STEAG OFFICE B/W BHEL & STEAG DT.31.01.13. 02. BOILER AREA AND ID SYSTEM UPDATED AS PER THEIR LATEST REV.
04	06.11.12	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-12-865, DATED 05/06/12.) 02. A-ROW TO CHIMNEY UPDATED.
03	30.04.12	GKM	RP	LKJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-3-M-12-590, DATED 12/03/12.)
02	28.12.11	GKM/RP	CHD	AJ	01. DRAWING REVISED AS PER STEAG COMMENT(STEAG REF. NO. ETG025-BHEL-1-M-11-199, DATED 28/10/11.)
01	03.09.11	GKM	RP	AJ	01. DRAWING REVISED AS PER CUSTOMER COMMENT.

CUSTOMER

CUSTOMER'S CONSULTANT

JOB NO. 374

STATUS CONTRACT

DISTRIBUTION

TO

No.OFF

BIHAR STATE ELECTRICITY BOARD

STEAG ENERGY SERVICES(INDIA) PVT. LTD.

BARAUNI THERMAL POWER STATION
2 X 250 MW - UNIT # 8& 9

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
M	DRN	GKM		01.07.2011
	DESN	RP		01.07.2011
	CHD	LKJ		01.07.2011
	APPD	AJ		01.07.2011

TITLE

MAIN PLANT CROSS - SECTION (FROM A- ROW TO CHIMNEY)

DEPT.

SIGN

DATE

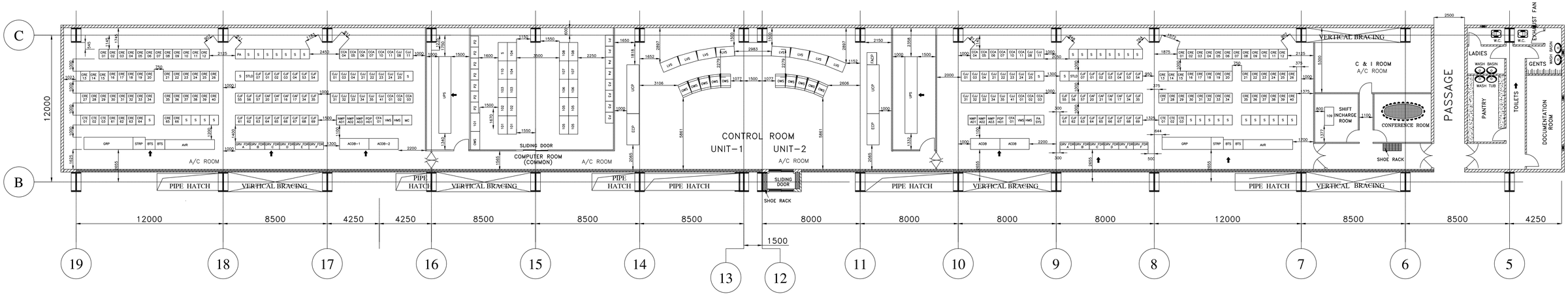
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DRAWING NO. PE-DG-374-100-M007

SHEET 1 OF 1

REV 05

SIZE-A0



EL.+13.5M

ELECTRONIC EQUIPMENT ROOM (EER)

SL NO.	DESCRIPTION	SIZE (WxDxH)	QTY (PER UNIT)	SCOPE
1	SG PANELS – (CJF01–04,CJF07,51–57,61–69 CAF16,17,20,21,34,35)	750 x 800 x 2415	25	EDN
2	TG PANELS – (CJJ01,03,04,08,11,21–25,31–35 CCA01–07,10,11)	750 x 800 x 2415	24	EDN
3	STATION C&I PANELS – (CRE01–40,CTE01,02,03,CFA01) CRE61–66 ARE COMMON FOR BOTH UNITS)	750 x 800 x 2415	40 (6 COMMON)	EDN
4	NETWORK PANELS (NWPA01,A02.A03 & PDPH01)	750 x 750 x 2415	4	EDN
5	VMS PANELS–CJJ41.	750 x 800 x 2415	1	EDN
6	HART PANEL (HMS)	1200 x 800 x 2415	1	EDN
7	MASTER CLOCK PANEL (COMMON FOR BOTH UNITS)	800 x 800 x 2415	1	EDN
8	AVR PANEL	4056 x 800 x 2295	1	EDN
9	GRP (GENERATOR RELAY PANEL) (4 PANELS)	4000 x 1000 x 2295	1 SET	BPL
10	GRAVIMETRIC FEEDER PANELS	1200 x 600 x 2315	6	TRY
11	ACDB FOR UPS	2400 x900 x 2135	2	EDN
12	UPS PANEL	6280 x 1000 x 2110	1 SET	EDN
13	STRP ELECTRICALS PANEL	1000 x 1000 x 2295	1	BPL
14	BTS (BUS TRANSFER PANEL)	800 x 800 x 2355	2	BPL
15	BHEL SONIC (STLD)	800 x 800 x 2315	1	TRY
16	PA SYS PANEL (COMMON FOR BOTH UNITS)	800 x 800 x 2415	1	EDN

CONTROL ROOM

SL NO.	DESCRIPTION	SIZE	QTY/UNIT	COMMON	SCOPE
LVS	LARGE VIDEO SCREEN (1 SET OF 4 LVS)	6000 x 800	1 SET		EDN
OWS	OPERATOR WORK STATION (FOR 5 OWS)	4800 x 1195	1 SET	1	EDN
ECP	ELECTRICAL CONTROL PANEL	2552 x 1000	1		EDN
UCP	UNIT CONTROL PANEL (TENTATIVE)	4000 x 1000	1		EDN
FACP	FIRE ALARM PANEL (TENTATIVE)	1000 x 800		1	PEM
109	SHIFT INCHARGE PC	1500 x 750		1	EDN

COMPUTER ROOM

SL NO.	DESCRIPTION	SIZE	QTY/UNIT	COMMON	SCOPE
1.	101 (ENGGR. WORK STN)	1500 x 750	1	1	EDN
2.	102 (MAXSTORION)	1500 x 750	1		EDN
3.	103 (TSC PC)	1500 x 750	1		EDN
4.	104 (maxLINKS PC)	1500 x 750	1		EDN
5.	105 (TSI / VMS PC)	1500 x 750	2		EDN
6.	106 (HART PC)	1500 x 750	1		EDN
7.	107 UTILITY PC	1500 x 750	1		EDN
8.	108 PERFORMANCE CALCULATION	1500 x 750	1		EDN
9.	110 MIS	1500 x 750		1	EDN
10.	P1 (COLOUR LASER PRINTER–A3)	900 x 650	1		EDN
11.	P2 (B/W LASER PRINTER–A4)	900 x 650	3	1	EDN
12.	P3 (DOT MATRIX PRINTER)	900 x 600	2		EDN
13.	P4 (A4 COLOUR LASER PRINTER)	900 x 650	1		EDN

REFERENCE DRG.

1 EQUIPMENT PLAN 13.5M, 19M, 25.5M PE–DG–374–100–M006
2 OGA FOR DCS PANELS
3 BOM FOR MMIPIS (HMI SYSTEM)
4 SCHEDULE OF CONTROL PANELS

ALL DIMENSION & NUMBER OF PANELS/WORK STATIONS ARE TENTATIVE.

NOTES:-

BRICK WALL
UPTO 1MTR BRICK, ONWARDS GLASS
GLASS

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
01	17.07.12	RC	SK	ABS
1.	REVISED IN LINE WITH			

CUSTOMER: BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB NO. 374
STATUS CONTRACT
DISTRIBUTION

BARAUNI THERMAL POWER STATION
2 X 250 MW – UNIT 8 & 9

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

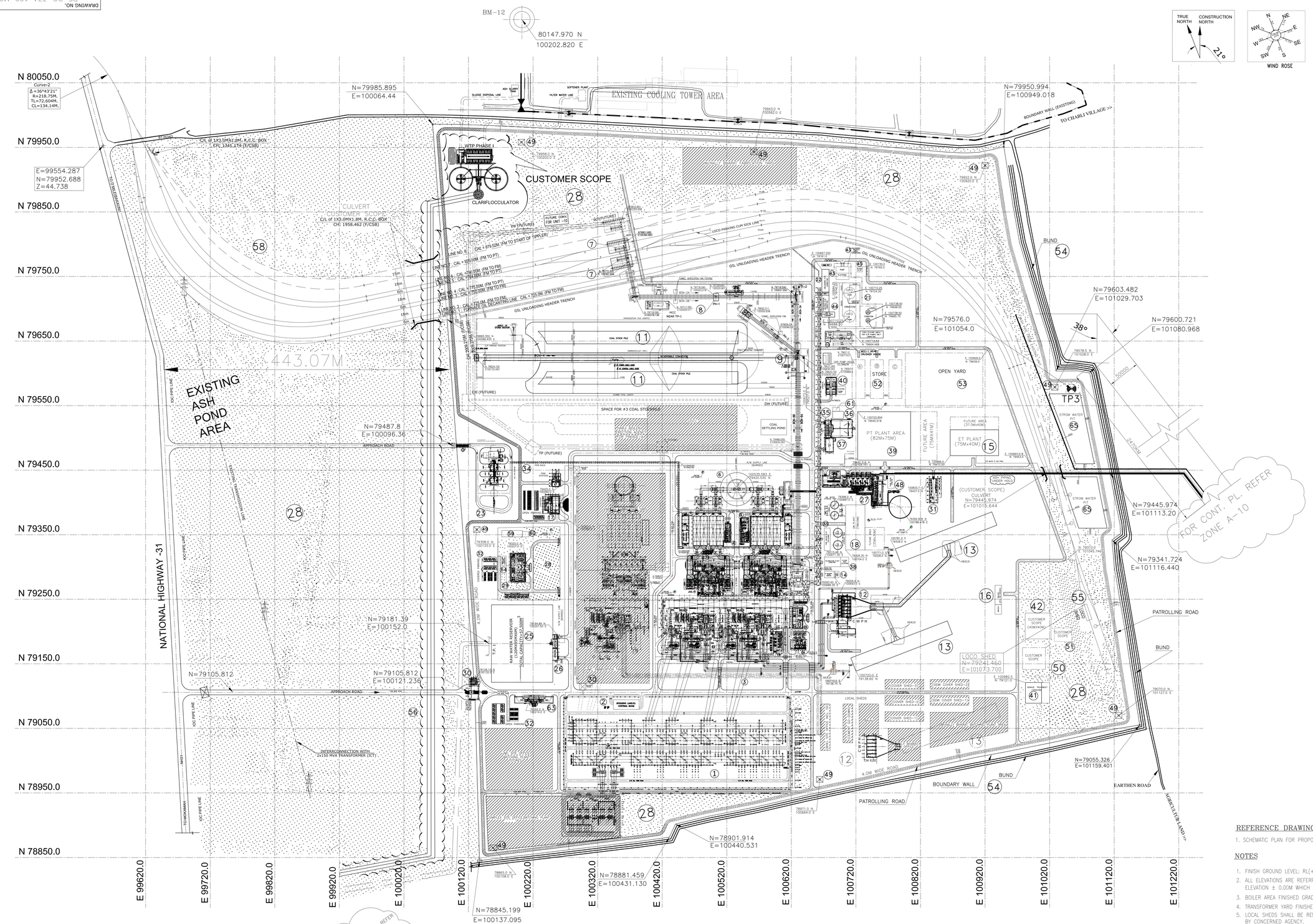
DEPT CODE		NAME	SIGN	DATE
PE	DRN	VS		23..03.12
	DESN	RC		23..03.12
	CHD	SHK		23..03.12
	APPD	ABS		23..03.12

TITLE: CCR & EER ROOM LAYOUT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE	DRAWING NO.
						SIGN		PE–DG–374–100–I401
						DATE		SHEET 1 OF 1 REV. 01

DRAWING NO. PE-DG-374-100-M001

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM



BUILDING & STRUCTURE:-

1	220 KV. SWITCHYARD
2	SWITCH YARD CONTROL ROOM
3	C.W. PIPE CORRIDOR
4	VACUUM PUMP CUM COMPRESSOR HOUSE
5	E.S.P CONTROL ROOM
6	CHIMNEY
7	WAGON TIPPLER
8	PENT HOUSE
9	CRUSHER HOUSE
10	CHP MCC-1
11	COAL STOCK PILE
12	C.W. PUMP HOUSE
13	COOLING TOWER
14	CW TREATMENT PLANT
15	EFFLUENT TREATMENT PLANT(E.T.P.)
16	HYDROGEN GENERATION PLANT
17	CANTEEN (20M x 20M x 5M)
18	D.M.PLANT
19	COMPRESSOR HOUSE
20	SERVICE BUILDING (30M X 15M)
21	FUEL OIL DYKE AREA
22	UNLOADING PUMP HOUSE
23	ASH SILOS & AHP MCC ROOM
24	DG ROOM
25	RAW WATER RESERVOIR
26	RAW WATER PUMP HOUSE
27	ASH SLURRY P/H CUM MCC CONTROL ROOM
28	GREEN VERGE (CUSTOMER SCOPE)
29	ADMINSTRATIVE BUILDING (40Mx20M)
30	TIME OFFICE & SECURITY (10Mx10M)
31	WORK SHOP
32	CAR PARKING SHED & OPEN AREA(50Mx20M+50Mx20M)
33	FIRE WATER PUMP HOUSE & TANK
34	FIRE STATION
35	CLARIFIED WATER P/H
36	FILTER WATER TANK
37	CLARIFIED STORAGE TANK
38	CHLORINATION PLANT
39	PRE- TREATMENT PLANT
40	CHEMICAL LAB
41	SEWAGE TREATMENT PLANT
42	DIESEL PUMP HOUSE(CUSTOMER SCOPE)
43	FUEL OIL TRUCK UNLOADING AREA
44	FUEL OIL PRESSURISING & HEATING PUMP HOUSE
45	FOAM PUMP HOUSE
46	ACW PUMP HOUSE
47	BUFFER HOPPER
48	AHP CLARIFIER & CHEMICAL HOUSE
49	WATCH TOWER (STANDARD)
50	RAIN WATER HARVESTING SUMP (CUSTOMER SCOPE)
51	HEAVY VEHICLE MAINTENANCE WORKSHOP & GARAGE (CUSTOMER SCOPE)
52	STORE (60M X 20M X 3)
53	OPEN YARD (120M X 84M)
54	BUND (CUSTOMER SCOPE)
55	LOCO SHED (CUSTOMER SCOPE)
56	GANGA RIVER WATER SCHEME (CUSTOMER SCOPE)
57	ASH DYKE AREA (CUSTOMER SCOPE)
58	MARSHALLING YARD (CUSTOMER SCOPE)
59	TRAINING CENTRE (CUSTOMER SCOPE)
60	HEALTH/FIRST AID CENTRE (CUSTOMER SCOPE)
61	POTABLE WATER CHLORINATION SYSTEM
62	TRANSFORMER YARD
63	WEIGH BRIDGE
64	SWITCH GEAR BUILDING (15MX7M)
65	STROM WATER PIT

REFEERENCE DRAWING

1. SCHEMATIC PLAN FOR PROPOSED RAILWAY SIDING AT BARAUNI --- DRAWING NO. KOL_BARSYL_909_SM_01

NOTES

1. FINISH GROUND LEVEL: RL(+) 45.0M
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
3. BOILER AREA FINISHED GRADED LEVEL IS 200MM BELOW 0.0M i.e. RL 45.3M
4. TRANSFORMER YARD FINISHED GRADED LEVEL IS 100MM BELOW 0.0M i.e. RL 45.4M
5. LOCAL SHEDS SHALL BE REMOVED AND AREA CLEARED AFTER VACATION OF SHEDS BY CONCERNED AGENCY.

LEGEND:-

1. PROPOSED BUND	
2. PROPOSED PLANT BOUNDARY WALL	
3. PROPOSED PLANT BOUNDARY WALL(FUTURE)	
4. PATROLLING ROAD	
5. PLANT ROAD	
6. PIPE RACK	
7. FENCING	
8. LOCAL SHEDS	

TERMINAL POINT DETAIL(T.P)

TP.No.	LINE DESCRIPTION	COORDINATES NORTH(N)	COORDINATES EAST(E)	ELEVATION
01	RAW WATER T.P.	N=79173.5	E=100153.0	
02	ASH PIPING T.P.			
03	PLANT DRAINAGE WATER T.P.	N=79576.0	E=101054.0	

REV.	DATE	ALTD	CHD	APPD
06	09.04.13	GKM	RP	UKJ

1. DRAWING REVISED AS PER CUSTOMER COMMENTS, REF. NO. ETG025-BHEL-S-C-12-1441 DATED 08.11.12.
2. CHP AREA UPDATED.
3. LOCATION OF STP & STP SUMP PIT SHOWN(TENTATIVE).
4. ROAD MODIFIED NEAR FUTURE TP.
5. FUEL OIL AREA UPDATED AS PER INPUT RECEIVED FROM M/s DE, SERVICE BLDG. AND ASH SLURRY P/H & COMPRESSOR HOUSE MOVED ACCORDINGLY.
6. WEST SIDE BOUNDARY WALL UPDATED.
7. SYMBOL OF LOCAL SHEDS SHOWN IN LEGENDS.

REV.	DATE	ALTD	CHD	APPD
05	18.10.12	GKM	RP	UKJ

1. DRAWING REVISED AS PER CUSTOMER COMMENTS, REF. NO. ETG025-BHEL-S-C-12-931 DATED 20.04.12.
2. CHP AREA UPDATED.
3. LOCAL SHEDS SHOWN.
4. LOCATION OF MAIN GATE MODIFIED.
5. TP OF RAW WATER PIPE INLET TO RAW WATER RESERVOIR MODIFIED.

REV.	DATE	ALTD	CHD	APPD
04	28.05.12	GKM	RP/UKJ	AJ

1. PLOT PLAN UPDATED WITH SWITCH YARD LAYOUT.
2. PLOT PLAN MODIFIED AS PER MOM DT.14/03/2012.
3. PLOT PLAN UPDATED AS PER BARSYL DRAWING DATED 25.05.12.

REV.	DATE	ALTD	CHD	APPD
03	02.12.11	GKM	RP/UKJ	AJ

1. DRAWING REVISED AS PER CUSTOMER COMMENTS, REF. NO. ETG025-BHEL-S-W-11-238 DATED 11.11.11.
2. CHP AREA UPDATED AS PER INPUT FURNISHED BY ISG.

REV.	DATE	ALTD	CHD	APPD
02	04.11.11	GKM	RP/UKJ	AJ

1. RAILWAY TRACK PROFILE MODIFIED AS PER BARSYL DRAWING.
2. PLANT BOUNDARY COORDINATE MODIFIED AS PER SURVEY DRAWING OF BHELA RIVER DATED 15/09/2011.
3. NH-31 & BT ROAD JUNCTION COORDINATE CHEK AS PER MOM AMONG BHEL-PSS(UTSAV) & RIVER DATED 28.9.11.

REV.	DATE	ALTD	CHD	APPD
01	19.08.11	GKM/RP	RP/UKJ	AJ

1. MARSHALLING YARD UPDATED AS PER BARSYL DRAWING RECEIVED ON 18.08.2011.
2. BOILER PLAN UPDATED AS PER TRICHY DWG.
3. DWG UPDATED IN LINE WITH DISCUSSION DURING MEETING ON 09.08.2011.
4. CHP & AHP AREA UPDATED AS PER INPUT DWG FURNISHED BY ISG.

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB NO.	374
STATUS	CONTRACT
DISTRIBUTION	

2X250MW BARAUNI THERMAL POWER STATION UNIT 8&9

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
M	DRN	GKM	-sd-	10.06.11
	DESN	GKM	-sd-	10.06.11
	CHD	UKJ	-sd-	10.06.11
	APPD	AJ	-sd-	10.06.11

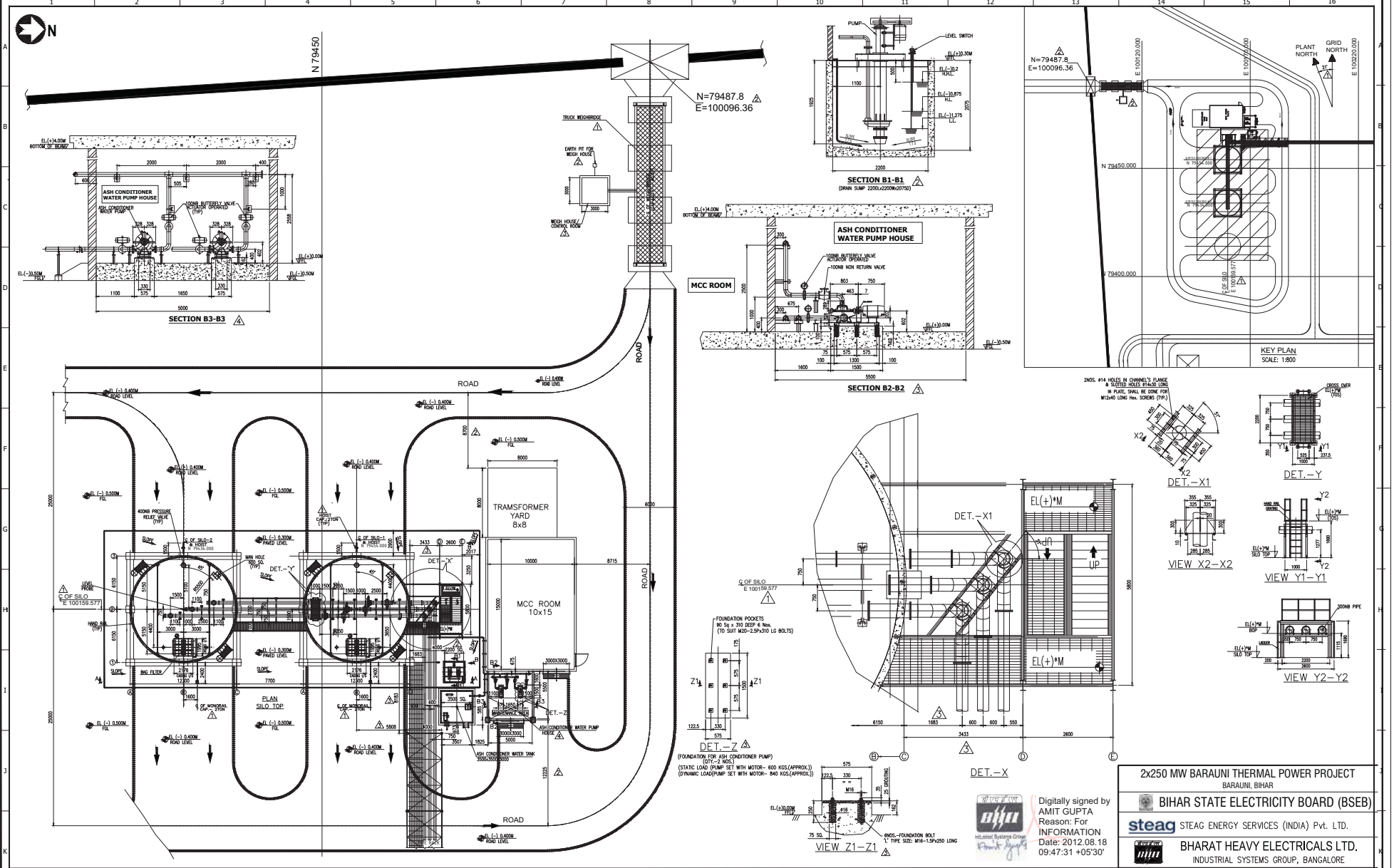
TITLE: PLOT PLAN

DEPT. | SCALE 1:2080 | DRAWING NO. PE-DG-374-100-M001
SIGN
DATE
SHEET 1 OF 1 | REV. 06

FORMAT SIZE A0

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ELECTRONIC FILE NAME



NOTES

1. ALL DIMENSIONS ARE IN mm. AND ELEVATIONS ARE I
2. THE FINISHED FLOOR LEVEL OF POWER HOUSE GROUI WHICH CORRESPONDS TO RL. (+)45.50M
3. FINISH GROUND LEVEL: RL(+) 45.0M

STEAG Energy Services (India) Pvt. Ltd. steag
DRAWING/DOCUMENT REVIEW STATUS
APPROVED AS SUBMITTED — A
APPROVED AS WITH COMMENTS — B
NOT APPROVED — C
INFORMATION NOTED — H
Transmittal No. ... Name ... Signature ... Date ...

DRG. NO.	R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
	4	16.08.2012	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
	3	01.08.2012	REVISED AS PER STEAG COMMENT'S DATED 25.07.2012	RAVI	SK	MDM
	2	17.05.2012	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
	1	17.03.2012	REVISED AS PER STEAG COMMENT'S DATED 13.03.2012	RAVI	SK	MDM

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RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR HAVI / CONST. — CIVIL/STR.		
FOR HAVI / CONST. — MECH.		
FOR HAVI / CONST. — ELECT.		

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. ... DT. ...

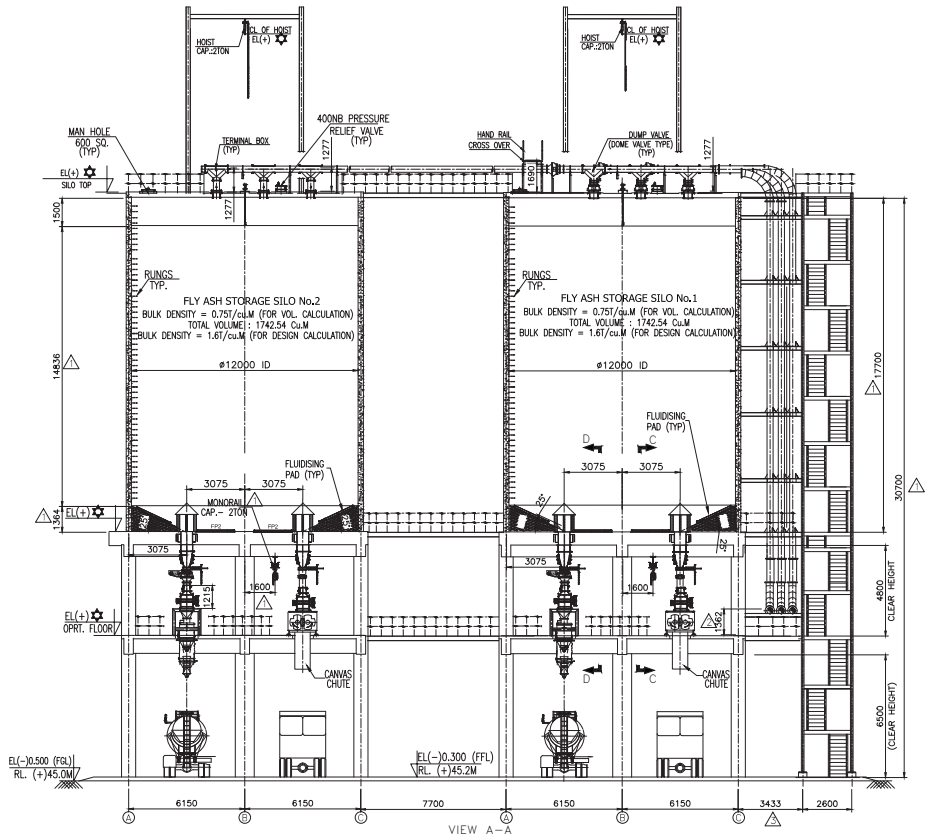
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Reason: For INFORMATION
Date: 2012.08.18 09:47:31 +05'30'

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR
BIHAR STATE ELECTRICITY BOARD (BSEB)
steag STEAG ENERGY SERVICES (INDIA) Pvt. LTD.
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

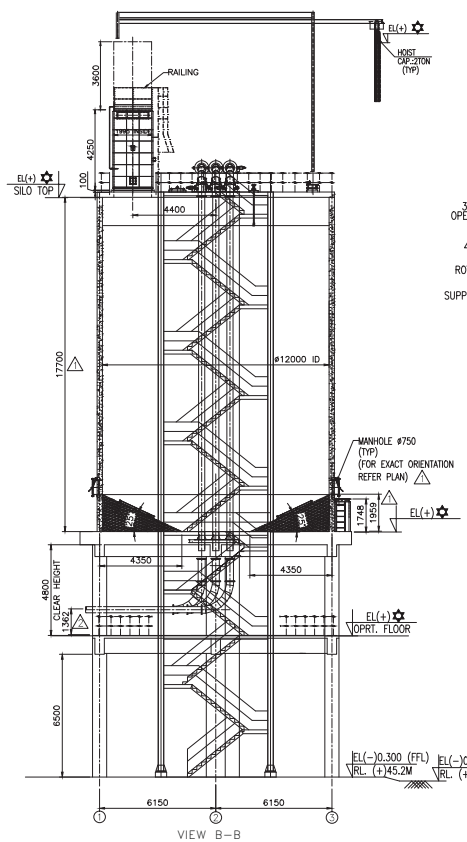
BHEL DRAWING NO. **IS-3-GA-660-302-M033**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI
COLLABORATOR: CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

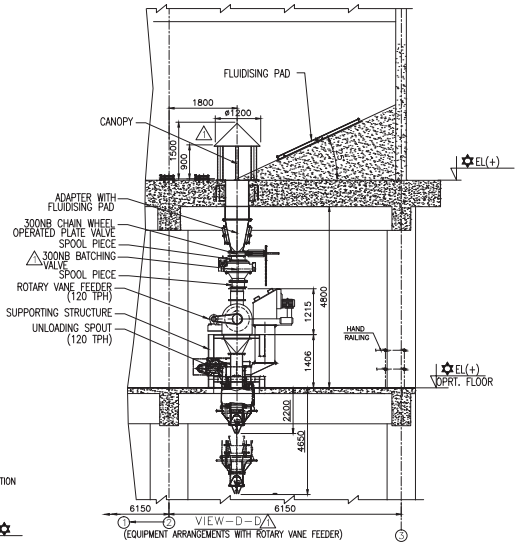
DESIGNED	RKG	G.A. OF FLY ASH SILO
DRAWN	RAVI	
CHECKED	SANJAY KR	
APPROVED	MDM	SCALE 1:200
DATE	12.01.2012	DRG. No. MB/C-1160/080797
		SHEET 1 OF 6 REV. 4



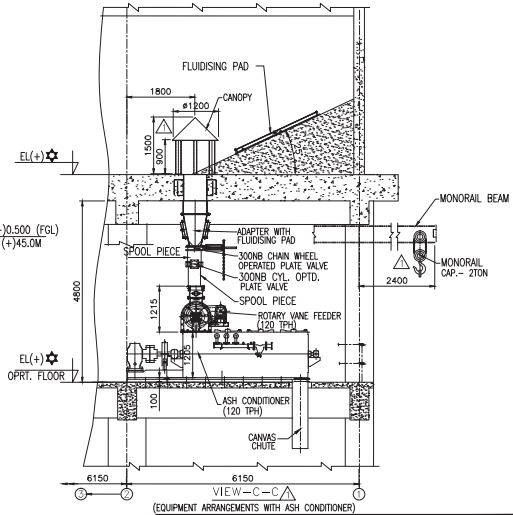
VIEW A–A
(REFER SHEET–1)
(FOR EXACT LOCATION OF EQPT. REFER PLAN)
(ELEVATION)



VIEW B–B
(REFER SHEET–1)
(FOR EXACT LOCATION
OF EQPT. REFER PLAN)



(EQUIPMENT ARRANGEMENTS WITH ROTARY VANE FEEDER)



(EQUIPMENT ARRANGEMENTS WITH ASH CONDITIONER)

WEIGHT OF EQUIPMENT ON EACH SILO:-

SILO OPERATING FLOOR

SL.No	DESCRIPTION	QTY.	UNIT WT. OF EQPT WITH MATERIAL	TOTAL WT. OF EQPT WITH MATERIAL.
1.	ADOPTER	4	200 KGS.	800 KGS.
2.	PLATE VALVE-300NB (CHAIN WHEEL OPTD.)	4	125 KG.	500 KG.
3.	PLATE VALVE-300NB (CYL. OPTD.)	2	105 KG.	210 KG.
4.	ROTARY VANE FEEDER WITH ASH.	1	1000 KGS.	1000KGS.
5.	ASH CONDITIONER WITH ASH.	1	8500 KGS.	8500 KGS.
6.	UNLOADING SPOUT	1	1200 KGS.	1200KGS.
7.	SPOOL PIECE	2	25 KGS.	50KGS.
8.	SUPPORTING STRUCTURE	1	150KGS.	150KGS.
9.	HOIST+BEAM	1	800KGS.	800KGS.
	TOTAL WEIGHT OF EQUIPMENT AT SILO BOTTOM			13210KGS.

SILO TOP

1.	300NB DUMP VALVE DOME TYPE	3	1130 KG.	3390 KG.
2.	400NB PRESSURE RELIEF VALVE	1	95 KG.	95 KG.
3.	LEVEL PROBE	1	25 KG.	25 KG.
4.	VENT FILTER	1	5500 KG.	5500 KG.
5.	MAN HOLE	1	60 KG.	60 KG.
6.	HOIST+BEAM	1	1300KGS.	1300KGS.
	TOTAL WEIGHT OF EQUIPMENT AT SILO TOP			10370 KGS.

Digitally signed by AMIT GUPTA
Reason: For INFORMATION
Date: 2012.08.18 09:47:54 +05'30'

NOTES

1. ALL DIMENSIONS ARE IN mm. AND ELEVATIONS ARE IN METER UNLESS OTHERWISE SPECIFIED.
2. THE FINISHED FLOOR LEVEL OF POWER HOUSE GROUND FLOOR EL. 0.000M WHICH CORRESPONDS TO RL. (+)45.50M
3. FINISH GROUND LEVEL: RL(+) 45.0M
4. ✡ MARKED ELEVATION SHALL BE FURNISHED AFTER CIVIL DESIGN.

S.No.	DESCRIPTION	DRG. NO.

REFERENCES

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	16.08.2012	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
3	01.08.2012	REVISED AS PER STEAG COMMENT'S DATED 25.07.2012	RAVI	SK	MDM
2	17.05.2012	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
1	17.03.2012	REVISED AS PER STEAG COMMENT'S DATED 13.03.2012	RAVI	SK	MDM

REVISIONS

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RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR HAVE / CONST.	CIVIL/STR.	
	MECH.	
	ELECT.	

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

steag STEAG ENERGY SERVICES (INDIA) Pvt. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BHEL DRAWING NO. **IS-3-GA-660-302-M033**

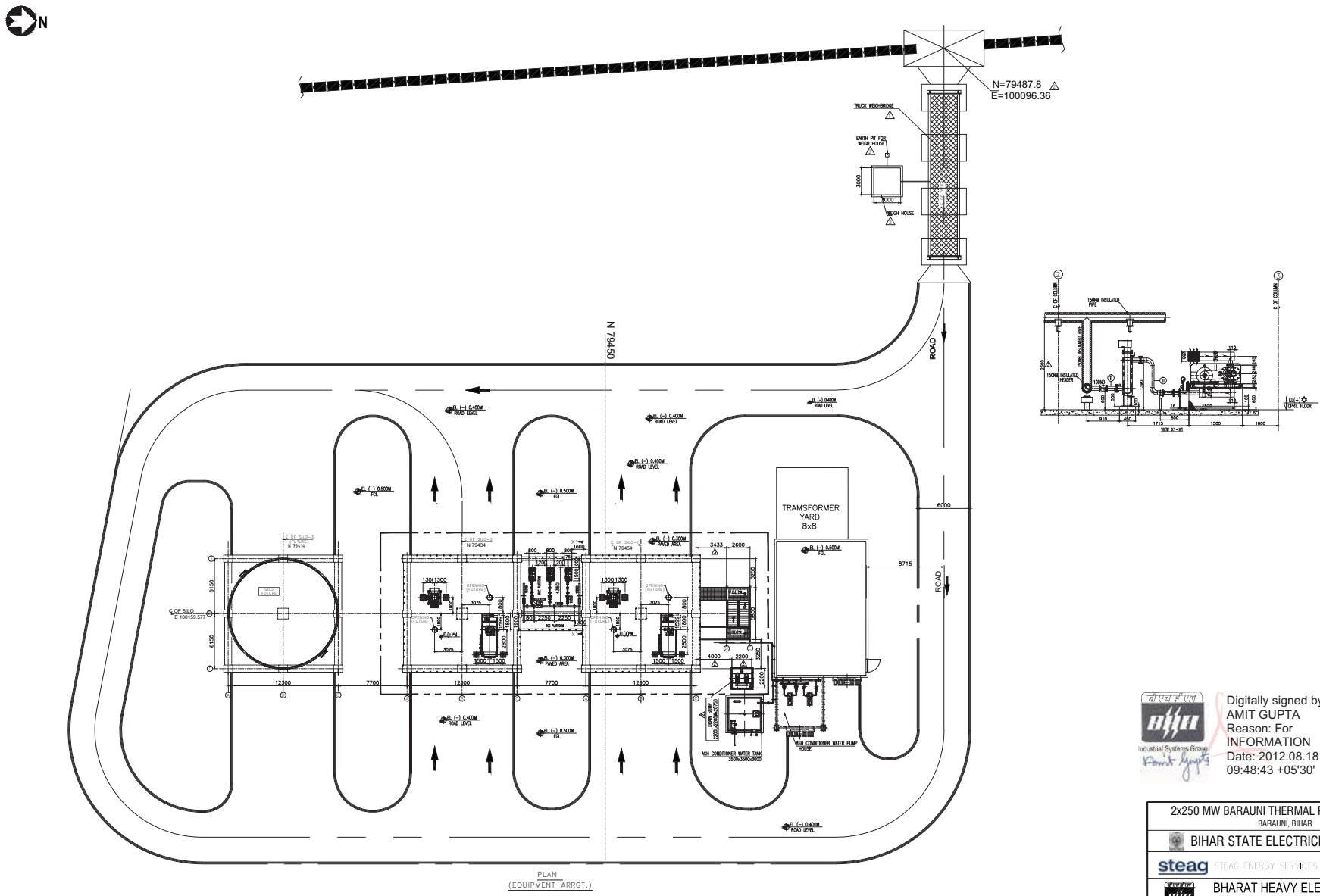
MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

COLLABORATOR: **CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.**

DESIGNED	RKG
DRAWN	RAVI
CHECKED	SANJAY KR
APPROVED	MDM
DATE	06.01.2012

G.A. OF FLY ASH SILO

SCALE 1:100 | DRG. No. **MB/C-1160/080797** | SHEET 2 OF 6 | REV. **4**



Digitally signed by AMIT GUPTA
Reason: For INFORMATION
Date: 2012.08.18 09:48:43 +05'30'

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

STEAG ENERGY SERVICES (INDIA) Pvt. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

NOTES

1. FOR NOTES REFER SHEET-1

REFERENCES

S.No.	DESCRIPTION	DRG. NO.

REVISIONS

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	16.08.2012	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
3	01.08.2012	REVISED AS PER STEAG COMMENT'S DATED 25.07.2012	RAVI	SK	MDM
2	17.05.2012	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
1	17.03.2012	REVISED AS PER STEAG COMMENT'S DATED 13.03.2012	RAVI	SK	MDM

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RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR IFA/IFC	CIVIL/STR.	
	MECH.	
	ELECT.	

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

BHEL DRAWING NO. **IS-3-GA-660-302-M033**

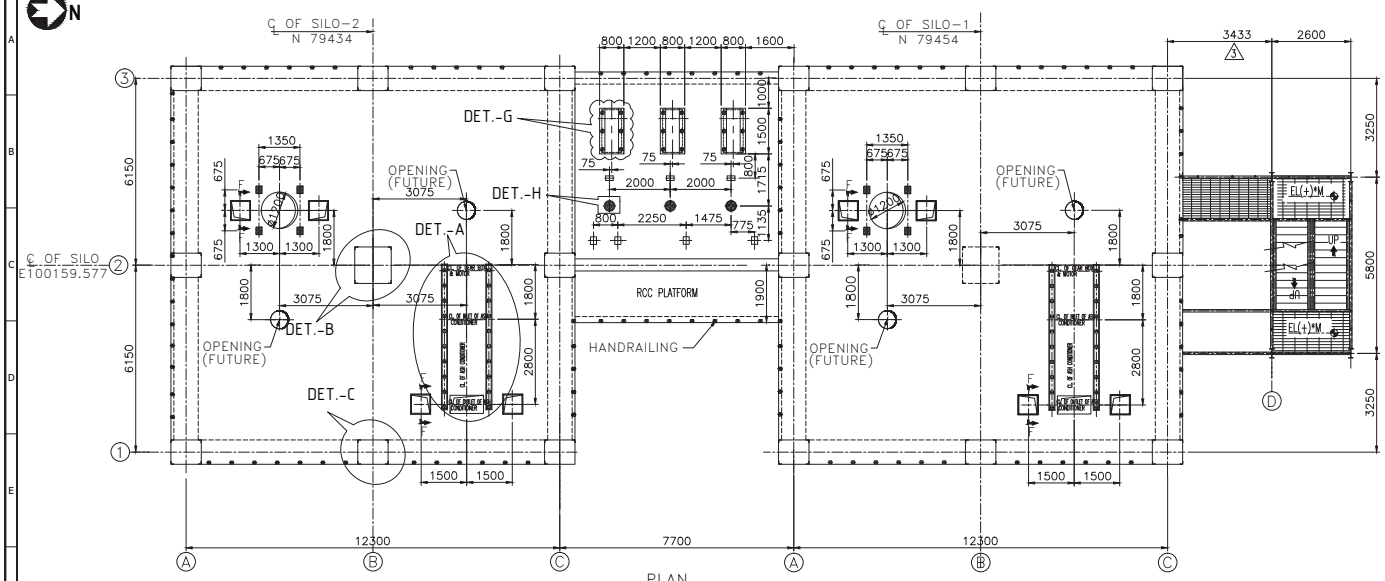
MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

COLLABORATOR: **CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.**

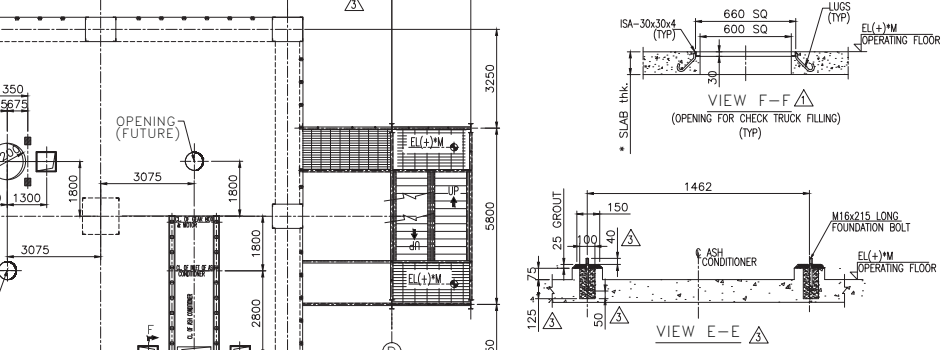
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DRAWN	RAVI
CHECKED	SANJAY KR
APPROVED	MDM
DATE	06.01.2012

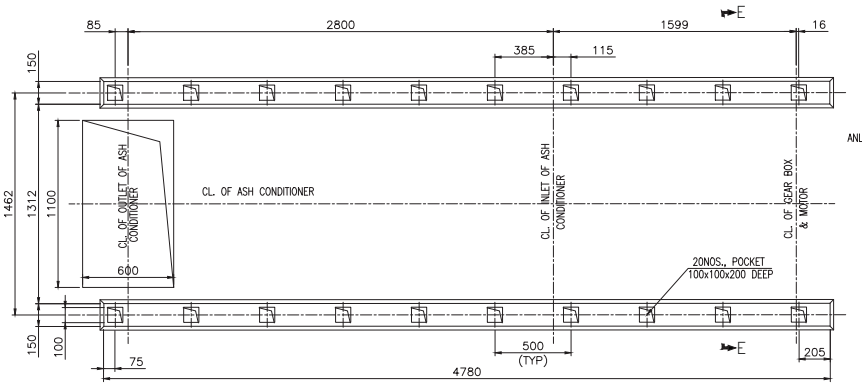
G.A. OF FLY ASH SILO

SCALE 1:200 | DRG. No. **MB/C-1160/080797** | SHEET 3 OF 6 | REV. **4**

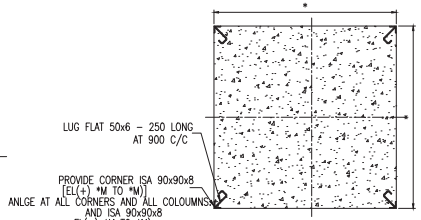


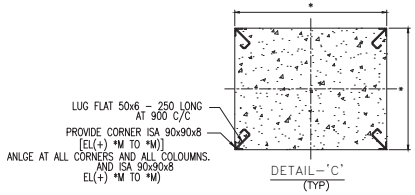
PLAN
(OPENING DETAIL OPERATING FLOOR)

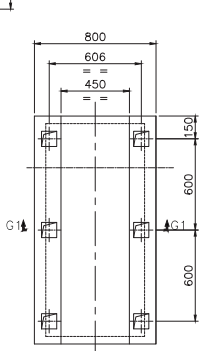


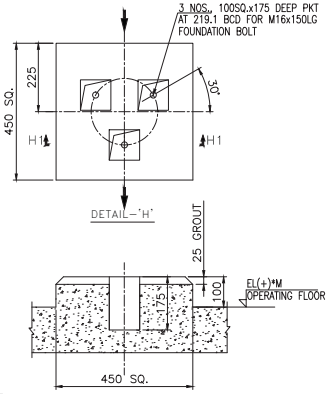


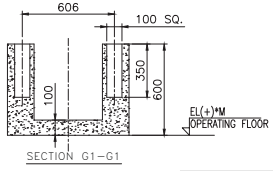
DETAIL-'A'
MOUNTING DETAIL OF
ASH CONDITIONER (120 TPH)AT EL(+)*M 2
WEIGHT OF EMPTY EQUIPMENT- 4500 KGS.











Digitally signed by AMIT GUPTA
Reason: For INFORMATION
Date: 2012.08.18 09:49:01 +05'30'

4	16.08.2012	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
3	01.08.2012	REVISED AS PER STEAG COMMENT'S DATED 25.07.2012	RAVI	SK	MDM
2	17.05.2012	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
1	17.03.2012	REVISED AS PER STEAG COMMENT'S DATED 13.03.2012	RAVI	SK	MDM

S.No.	DESCRIPTION	DRG. NO.

REFERENCES

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.

REVISIONS

NOTES
1. FOR NOTES REFER SHEET-1

"NO REPRODUCTION OR PUBLICATION OF THIS DRAWING BE MADE IN ANY FORM, INCLUDING 3-DIMENSIONAL OR 2-DIMENSIONAL REPRODUCTION, AND NO ARTICLE BE MANUFACTURED OR ASSEMBLED IN ACCORDANCE WITH THIS DRAWING, USING ITS SALIENT OR DISTINGUISHING FEATURES, WITHOUT PRIOR WRITTEN CONSENT. THIS PROHIBITION IS A TERM OF ANY CONTRACT RELATING TO THIS DRAWING. THIS DRAWING SHALL ALWAYS REMAIN OUR PROPERTY ONLY. UNAUTHORIZED USERS WILL BE PROSECUTED UNDER THE COPYRIGHT ACT 1957 AND THE DESIGN ACT 1911"

RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR WAVE / CONDR	CIVIL/STR.	
	MECH.	
	ELECT.	

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR
BIHAR STATE ELECTRICITY BOARD (BSEB)
steag STEAG ENERGY SERVICES (INDIA) Pvt. LTD.
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

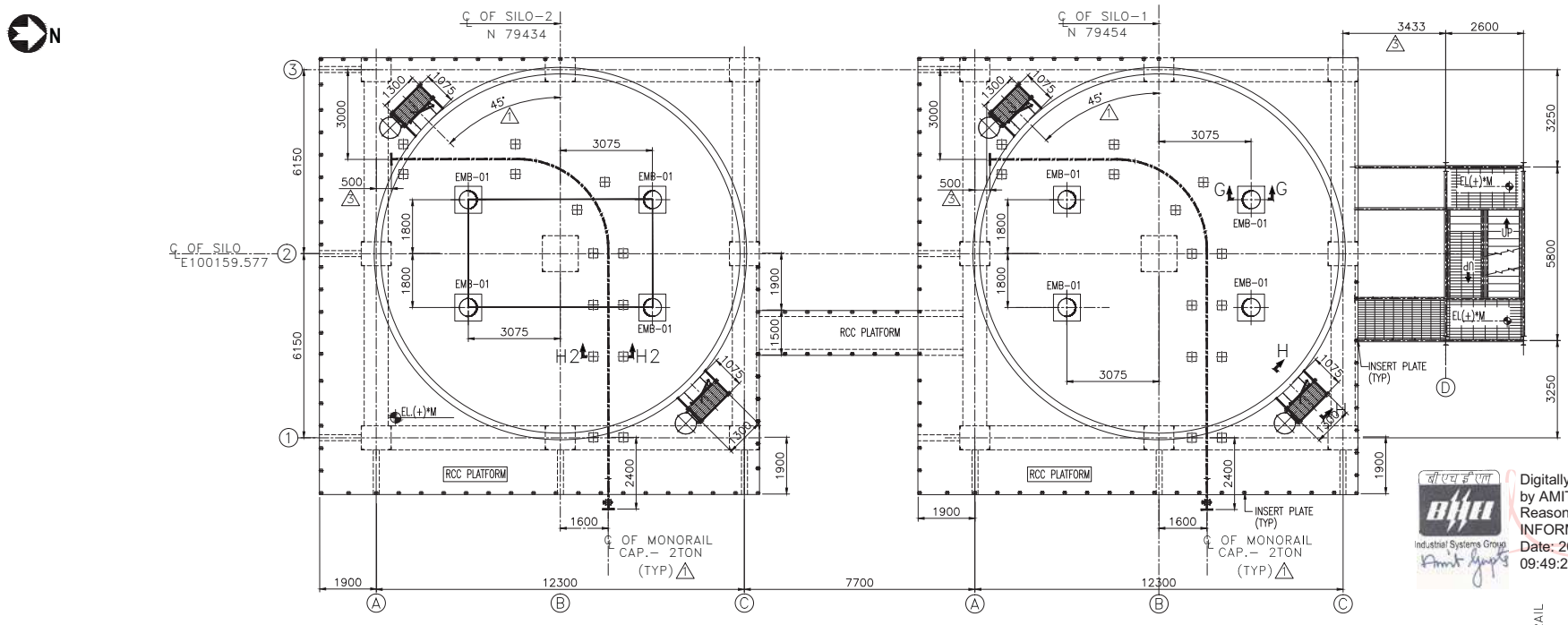
BHEL DRAWING NO. IS-3-GA-660-302-M033

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI
COLLABORATOR CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

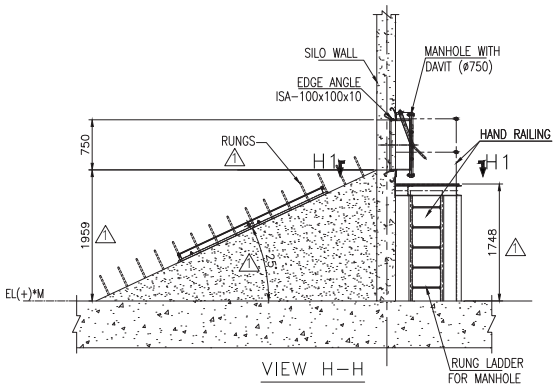
DESIGNED	RKG
DRAWN	RAVI
CHECKED	SANJAY KR
APPROVED	MDM
DATE	06.01.2012

G.A. OF FLY ASH SILO
(OPENING DETAIL AT OPERATING FLOOR)

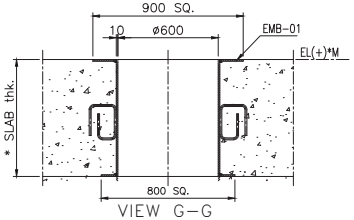
SCALE 1:100 | DRG. No. MB/C-1160/080797 | SHEET 4 OF 6 | REV. 4



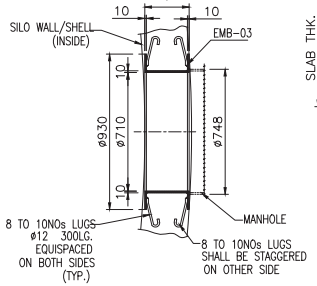
PLAN
(OPENING DETAIL AT SILO OUTLET)



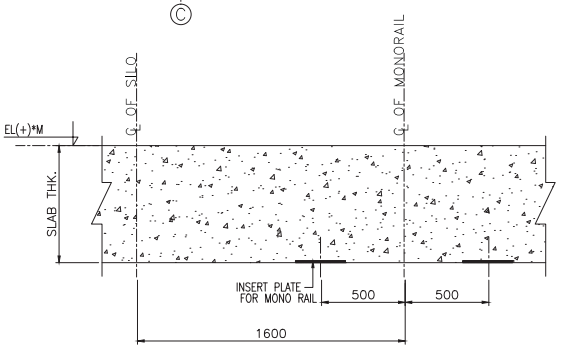
VIEW H-H



VIEW G-G
(OPENING DETAIL FOR DISCHARGE NOZZLES)



VIEW H1-H1
(INSERT DETAIL FOR MANHOLE ON SILO WALL/SHELL)



VIEW H2-H2

Digitally signed by AMIT GUPTA
Reason: For INFORMATION
Date: 2012.08.18 09:49:29 +05'30'

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

STEAG ENERGY SERVICES (INDIA) Pvt. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

NOTES
1. FOR NOTES REFER SHEET-1

S.No.	DESCRIPTION	DRG. NO.

REFERENCES

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	16.08.2012	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
3	01.08.2012	REVISED AS PER STEAG COMMENT'S DATED 25.07.2012	RAVI	SK	MDM
2	17.05.2012	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
1	17.03.2012	REVISED AS PER STEAG COMMENT'S DATED 13.03.2012	RAVI	SK	MDM

REVISIONS

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RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR WHITE / COPY: CIVIL/STR.		
MECH.		
ELECT.		

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

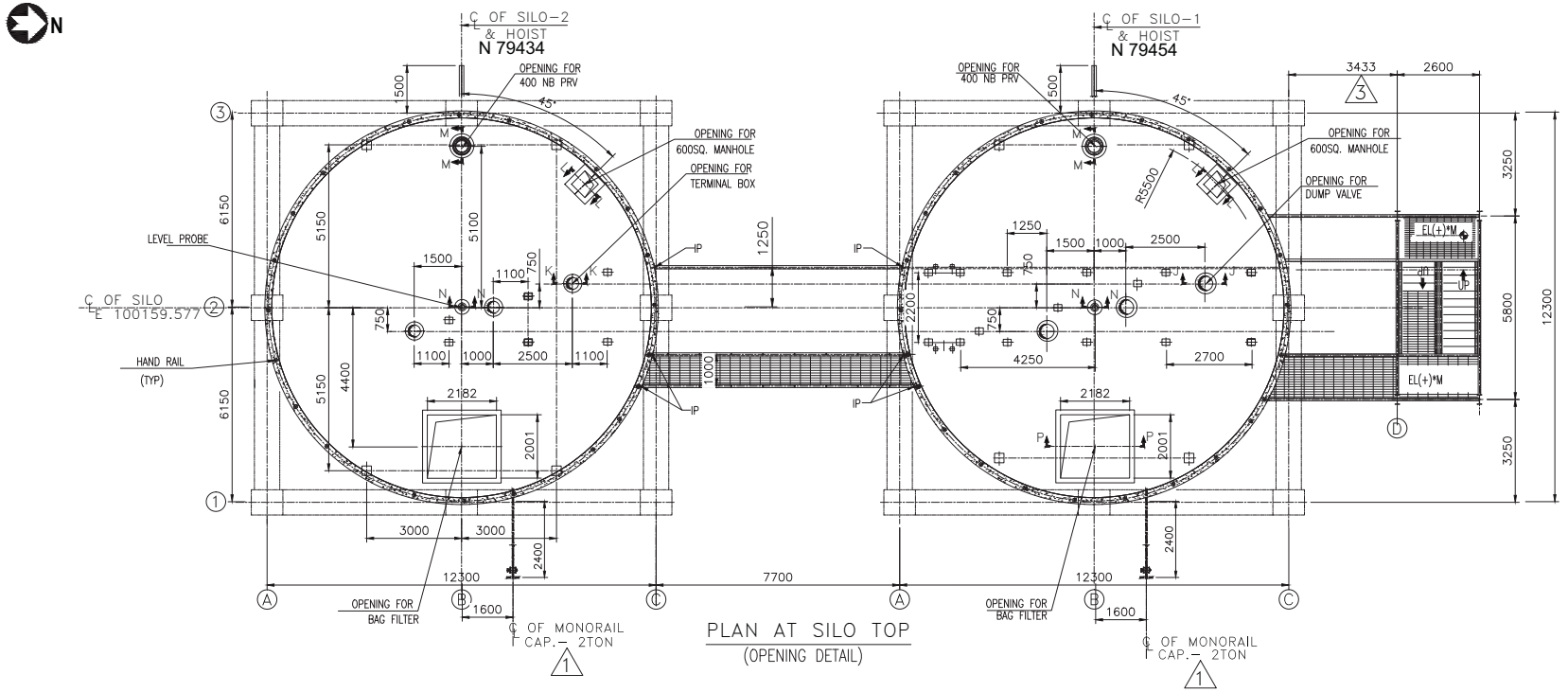
BHEL DRAWING NO. **IS-3-GA-660-302-M033**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

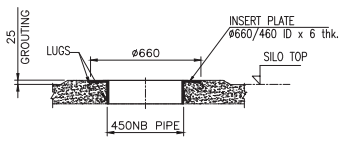
COLLABORATOR: CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

DESIGNED	RKG	G.A. OF FLY ASH SILO
DRAWN	RAVI	
CHECKED	SANJAY KR	
APPROVED	MDM	SCALE 1:100
DATE	06.01.2012	DRG. No. MB/C-1160/080797

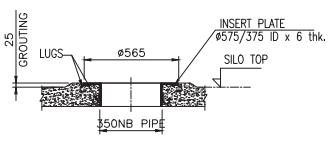
SHEET 5 OF 6 REV. 4



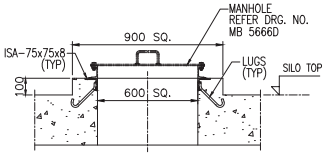
PLAN AT SILO TOP
(OPENING DETAIL)



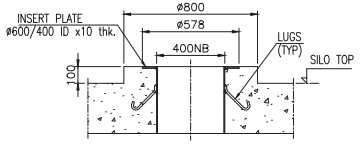
VIEW J–J
(OPENING DETAIL FOR DUMP VALVE)



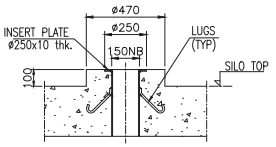
VIEW K–K
(OPENING DETAIL FOR TERMINAL BOX)



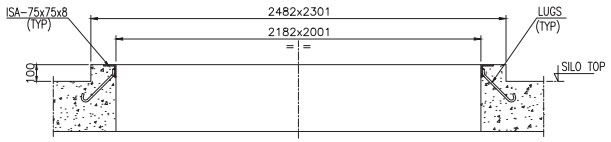
VIEW L–L
(OPENING DETAIL FOR MANHOLE)



VIEW M–M
(400 NB PRV)



VIEW N–N
(FOR LEVEL PROBE)



VIEW P–P
(OPENING DETAIL FOR BAG FILTER)

Digitally signed by AMIT GUPTA
Reason: For INFORMATION
Date: 2012.08.18 09:49:45 +05'30'

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR
BIHAR STATE ELECTRICITY BOARD (BSEB)
steag STEAG ENERGY SERVICES (INDIA) Pvt. LTD.
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

NOTES

1. FOR NOTES REFER SHEET-1

S.No.	DESCRIPTION	DRG. NO.

REFERENCES

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	16.08.2012	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
3	01.08.2012	REVISED AS PER STEAG COMMENT'S DATED 25.07.2012	RAVI	SK	MDM
2	17.05.2012	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
1	17.03.2012	REVISED AS PER STEAG COMMENT'S DATED 13.03.2012	RAVI	SK	MDM

REVISIONS

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RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR IFA/IFC	CIVIL/STR.	
	MECH.	
	ELECT.	

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

BHEL DRAWING NO. **IS-3-GA-660-302-M033**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI
COLLABORATOR: CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

DESIGNED	RKG
DRAWN	RAVI
CHECKED	SANJAY KR
APPROVED	MDM
DATE	06.01.2012

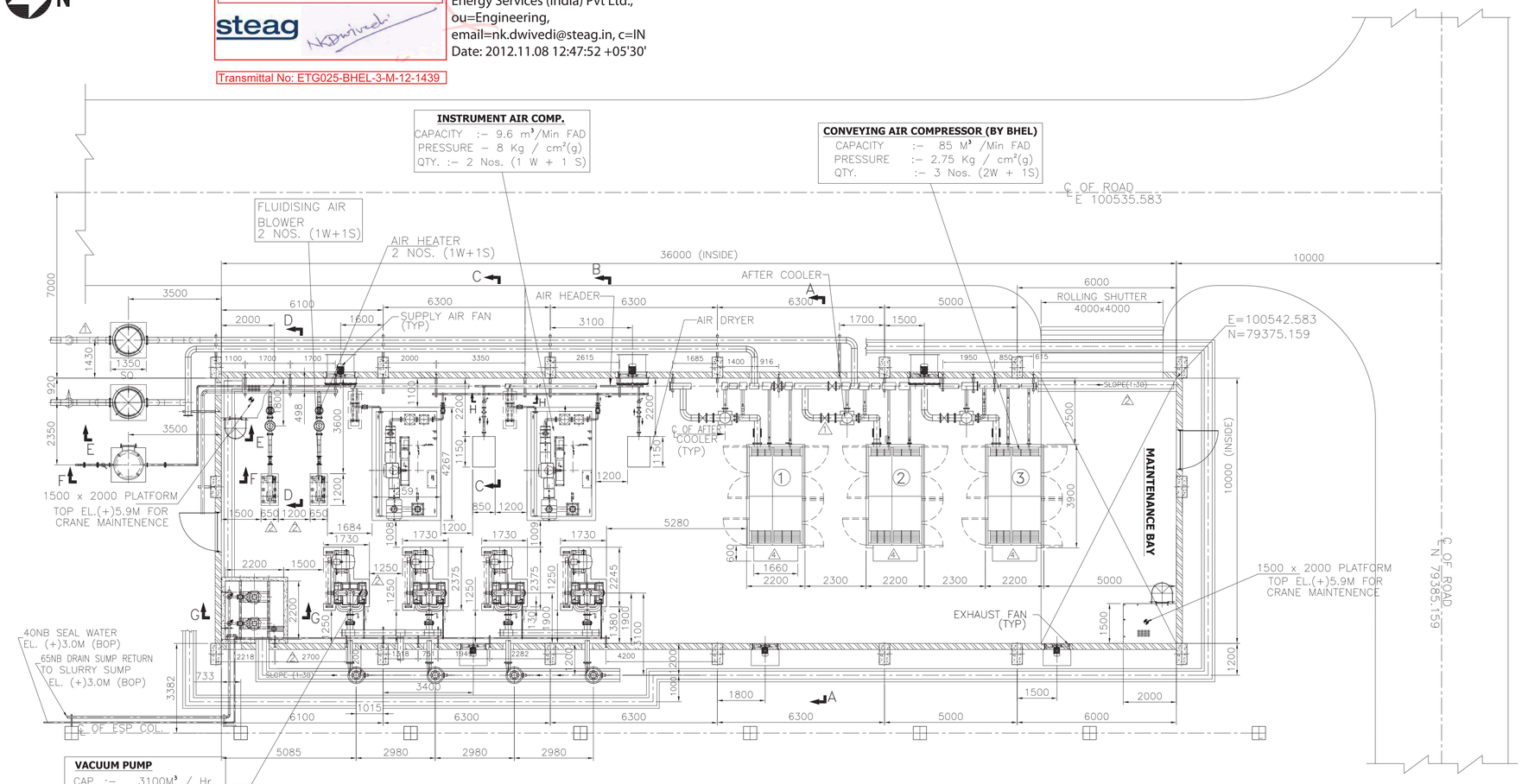
G.A. OF FLY ASH SILO
(PLAN AT EL(+)

SCALE 1:100 | DRG. No. MB/C-1160/080797 | SHEET 6 OF 6 | REV. 4

APPROVED
Release distribution prints.
steag

Digitally signed by Neeraj Dwivedi
DN: cn=Neeraj Dwivedi, o=STEAG Energy Services (India) Pvt Ltd., ou=Engineering, email=nk.dwivedi@steag.in, c=IN
Date: 2012.11.08 12:47:52 +05'30'

Transmittal No: ETG025-BHEL-3-M-12-1439





CRANE WHEEL LOAD DATA A

Digitally signed by Rakesh Kumar
Reason: For Approval
Date: 2012.11.07 14:25:45 +05'30'

NOTES

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METER UNLESS OTHERWISE SPECIFIED.
2. THE FINISHED FLOOR LEVEL OF POWER HOUSE GROUND FLOOR EL. 0.000M WHICH CORRESPONDS TO RL. (+)45.50M
3. FINISH GROUND LEVEL: RL(+) 45.0M
4. ✡ MARKED DIMENSIONS WILL BE CONFIRMED LATER.

REFERENCES

S.No.	DESCRIPTION	DRG. NO.
6	GA DWG. OF 7.5T SG EOT CRANE,SPAN-9.4M	400217 -7.5T_9.4M SPAN_S/G_ GA
5	AIR HEATING UNIT 18KW	HEA3-2488-A
4	G.A. AND F.P. DRAWING FOR MODEL 67 AC T.L. COMPRESSOR	K-GA-0067AH235A3
3	LAYOUT OF KAKATI LIQUID RING VACUUM PUMP (MODEL:KVL600)	KKI/KV600/22 030 02 12
2	GA OF AIR RECEIVER FOR INSTRUMENT AIR	MB/C-1160/080337
1	GA OF AIR RECEIVER CUM MOISTURE SEPRATOR	MB/C-1160/080341

REVISIONS

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
5	07.11.12	REVISED AS PER STEAG COMMENT'S DATED 07.11.2012	RAVI	SK	MDM
4	23.08.12	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
3	01.08.12	REVISED AS PER STEAG COMMENT'S DATED 17.07.2012	RAVI	SK	MDM
2	29.06.12	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
1	27.03.12	REVISED AS PER STEAG COMMENT'S DATED 19.03.2012	RAVI	SK	MDM

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PURPOSE		DATE	SIGNATURE
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FOR TENDER ONLY			
FOR MANF./CONST	CIVIL/STR.		
	MECH.		
	ELECT.		

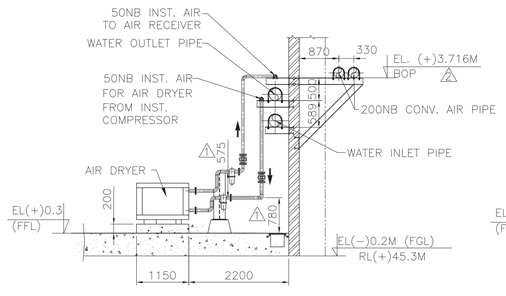
THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR
BIHAR STATE ELECTRICITY BOARD (BSEB)
steag STEAG ENERGY SERVICES (INDIA) Pvt. LTD.
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

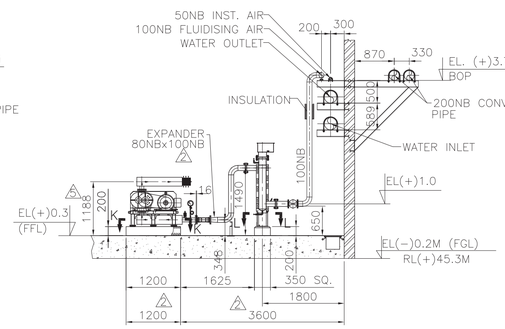
BHEL DRAWING NO. **IS-1-GA-660-308-M007**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI
COLLABORATOR
CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

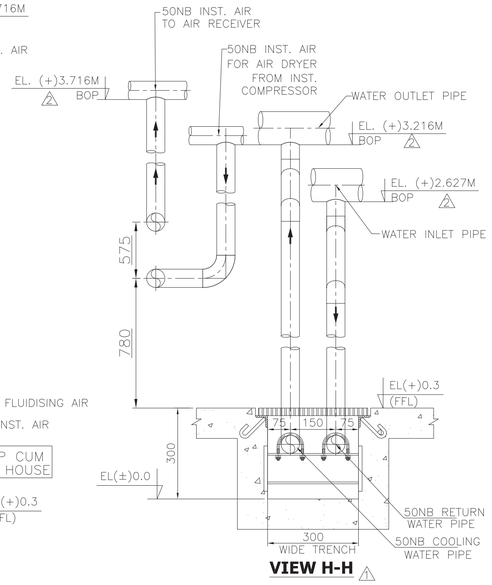
DESIGNED	RKG	GA OF VACUUM PUMP CUM COMPRESSOR HOUSE (UNIT#8)
DRAWN	RAVI	
CHECKED	SANJAY KR.	
APPROVED	MDM	SCALE 1:100
DATE	12.01.2012	DRG. No. MB/C-1160/080866
		SHEET 1 OF 2
		REV. 5



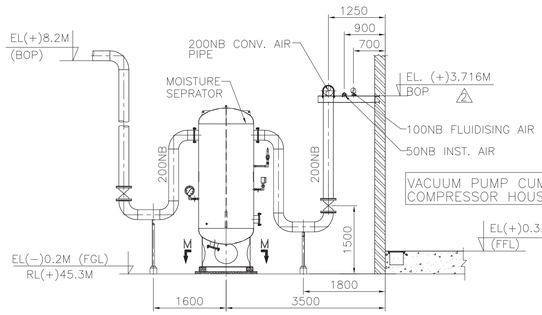
SECTION "C-C" 5



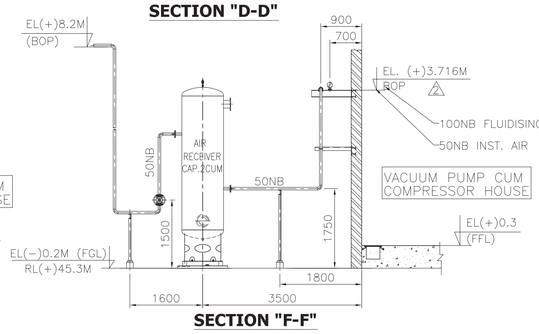
SECTION "D-D"



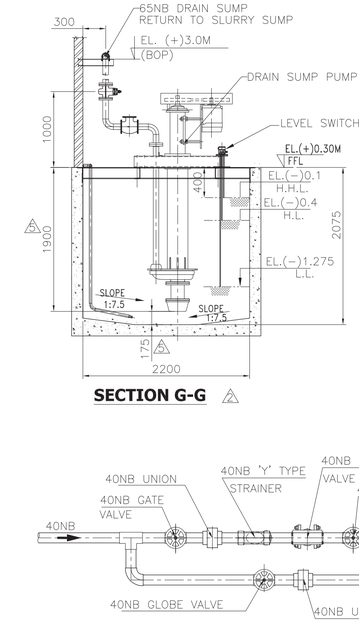
VIEW H-H 1



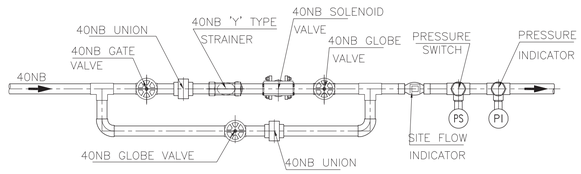
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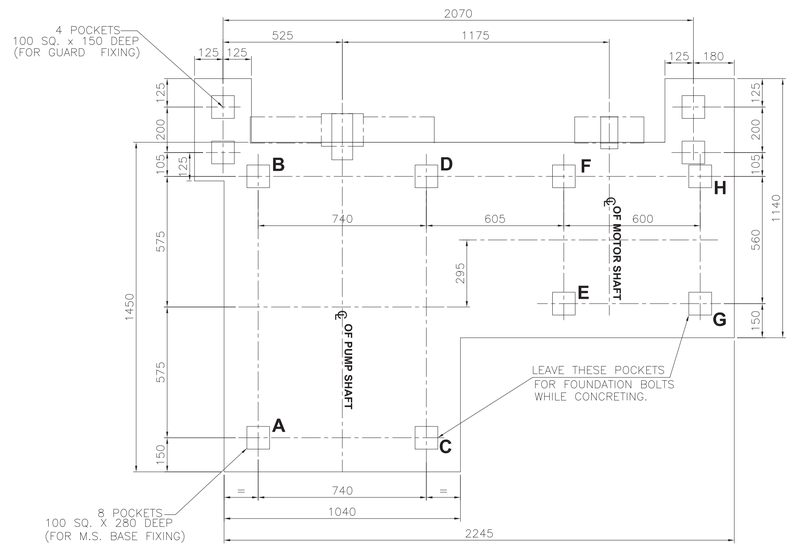
SECTION "F-F"



SECTION G-G 2



DETAIL-A 2

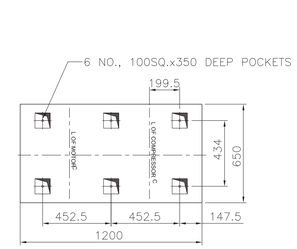


SECTION "J-J" 4

(FOUNDATION PLAN FOR VACUUM PUMP)

LOAD ON FOUNDATION OF VACUUM PUMP

LOCATION	A	B	C	D	E	F	G	H
STATIC in kg.	475	475	475	475	250	250	250	250
DYNAMIC in kg.	+592	+592	-592	-592	-245	-245	+245	+245
TOTAL	1067	1067	-117	-117	5	5	495	495

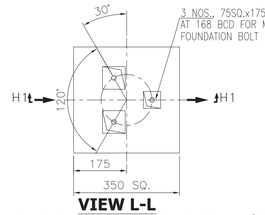


VIEW K-K

(FOUNDATION PLAN FOR TL COMPRESSOR)

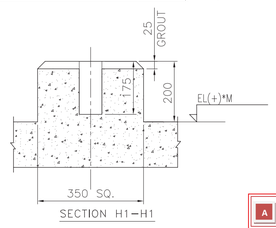
(LOAD DATA FOR TL COMPRESSOR)

1	GD SQ. VALUE	1.190 Kg m2
2	DYNAMIC LOAD	1.5 x STATIC LOAD
3	STATIC LOAD	330 Kg. APPROX. (WITH ALL ACCESSORIES EXCLUDING MOTOR)



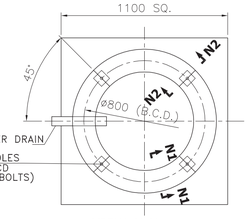
VIEW L-L

(FOUNDATION PLAN FOR AIR HEATER)



SECTION H1−H1

(NORMALLY CLOSED)

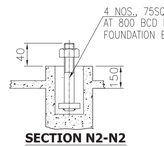


VIEW N-N

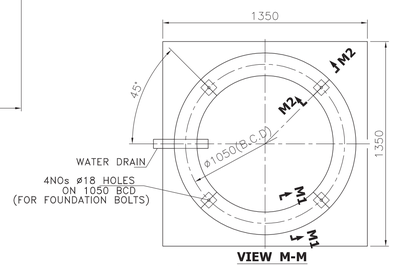
(FOUNDATION PLAN FOR AIR RECEIVER FOR INSTRUMENT AIR)
(TOTAL WEIGHT:−830 KGS.)



SECTION N1-N1

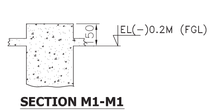


SECTION N2-N2
(FOUND. POCKET 75 SQ. x 375 DEEP)

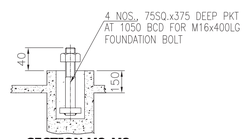


VIEW M-M

(FOUNDATION PLAN FOR AIR RECEIVER
CUM MOISTURE SEPARATOR)
(TOTAL WEIGHT:−950 KGS.)



SECTION M1-M1



SECTION M2-M2
(FOUND. POCKET 75 SQ. x 375 DEEP)

APPROVED
Release distribution prints.
steag

Digitally signed by Neeraj Dwivedi
DN: cn=Neeraj Dwivedi, o=STEAG Energy Services (India) Pvt Ltd., ou=Engineering, email=nk.dwivedi@steag.in, c=IN
Date: 2012.11.08 12:48:19 +05'30'

Transmittal No: ETG025-BHEL-3-M-12-1439

Industrial Systems Group

Digitally signed by Rakesh Kumar
Reason: For Approval
Date: 2012.11.07 14:25:56 +05'30'

NOTES

1. FOR NOTES REFER SHEET 1

S.No.	DESCRIPTION	DRG. NO.	R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
			5	07.11.12	REVISED AS PER STEAG COMMENT'S DATED 07.11.2012	RAVI	SK	MDM
			4	23.08.12	REVISED AS PER STEAG COMMENT'S DATED 16.08.2012	RAVI	SK	MDM
			3	01.08.12	REVISED AS PER STEAG COMMENT'S DATED 17.07.2012	RAVI	SK	MDM
			2	29.06.12	REVISED AS PER STEAG COMMENT'S DATED 16.05.2012	RAVI	SK	MDM
			1	27.03.12	REVISED AS PER STEAG COMMENT'S DATED 19.03.2012	RAVI	SK	MDM

REFERENCES — REVISIONS

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RELEASE STATUS

PURPOSE	DATE	SIGNATURE
FOR APPROVAL		
FOR TENDER ONLY		
FOR M&P / CONST — CIVIL/STR.		
FOR M&P / CONST — MECH.		
FOR M&P / CONST — ELECT.		

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

STEAG ENERGY SERVICES (INDIA) Pvt. LTD.

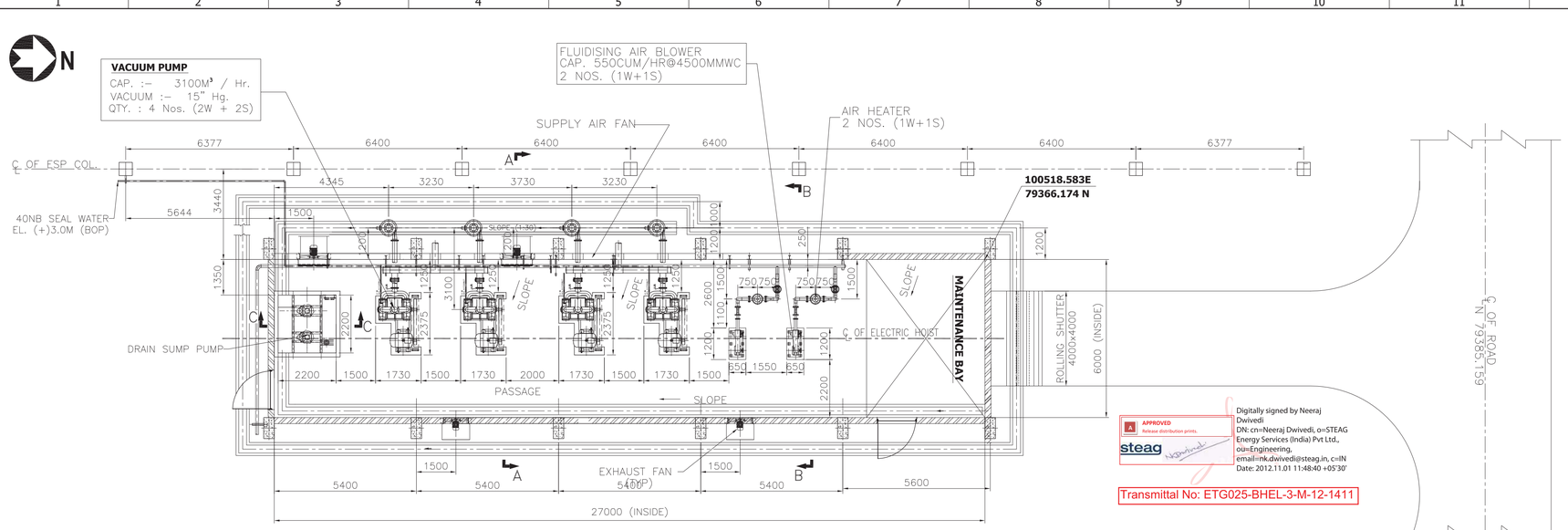
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

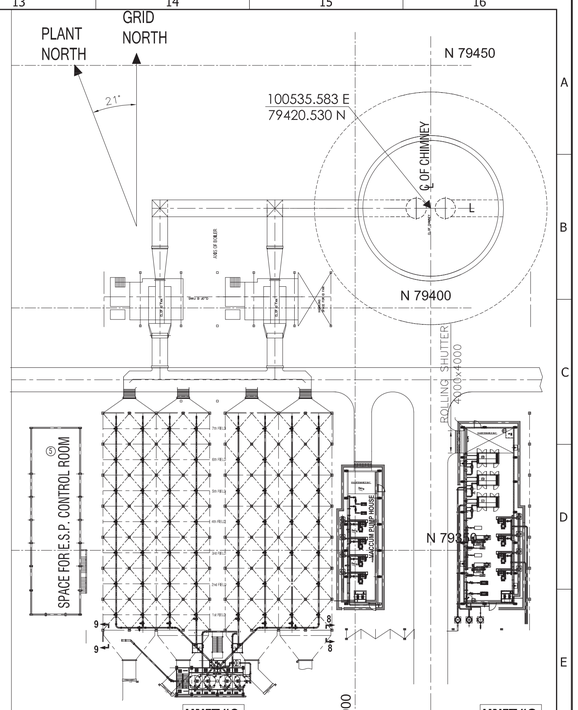
BHEL DRAWING NO. **IS-1-GA-660-308-M007**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

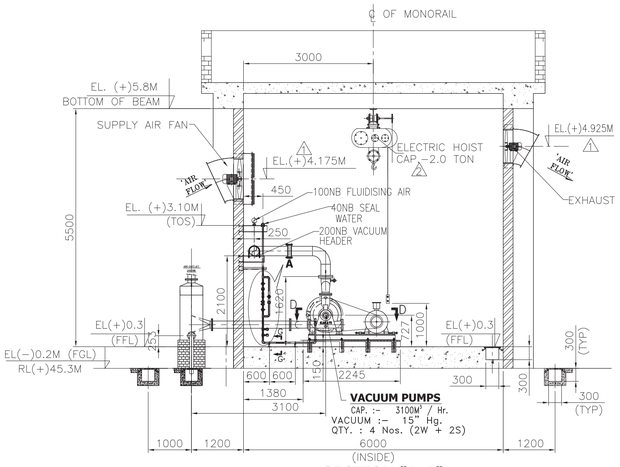
MACAWBER COLLABORATOR — CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

DESIGNED	RKG	GA OF VACUUM PUMP CUM COMPRESSOR HOUSE (UNIT#8)	
DRAWN	RAVI		
CHECKED	SANJAY KR.		
APPROVED	MDM	SCALE 1:100	DRG. No. MB/C-1160/080866 SHEET 2 OF 2 REV. 5
DATE	30.01.2012		

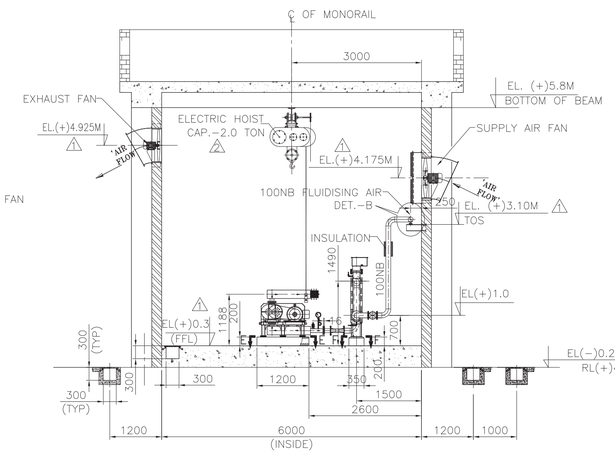




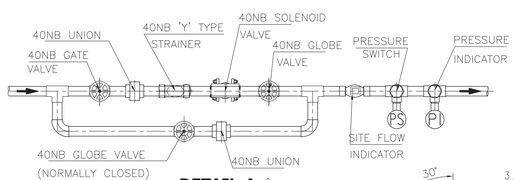
KEY PLAN
(SCALE: 1:625)



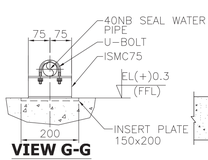
SECTION "A-A"



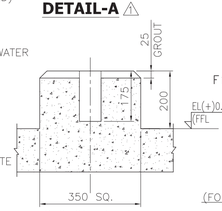
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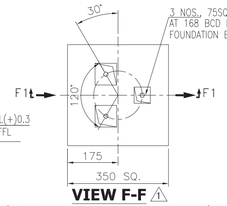


DETAIL-A ⚠1

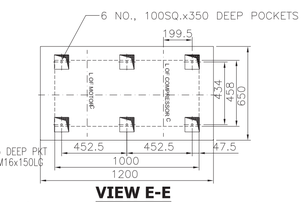


VIEW G-G





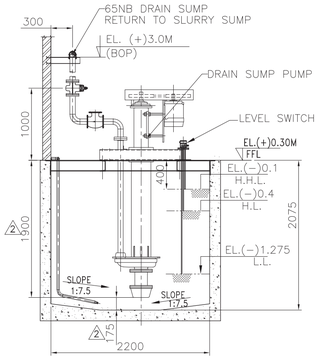
VIEW F-F ⚠1
(FOUNDATION PLAN FOR AIR HEATER)



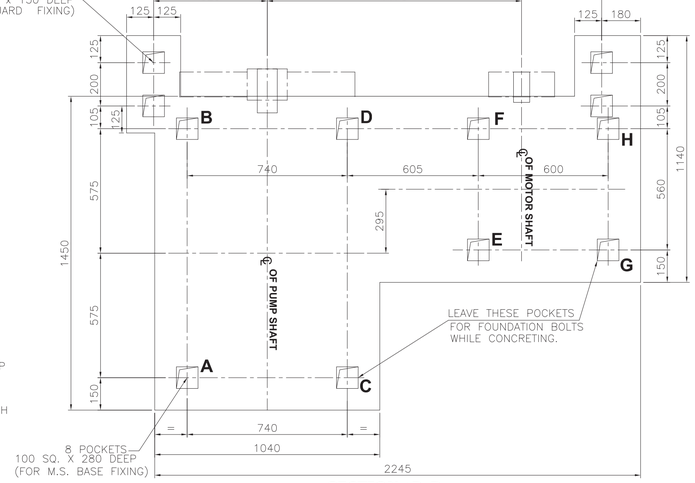
VIEW E-E
(FOUNDATION PLAN FOR TL COMPRESSOR)

(LOAD DATA FOR TL COMPRESSOR)

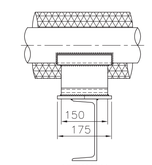
1	GD SQ. VALUE	1.190 Kg m2
2	DYNAMIC LOAD	1.5 x STATIC LOAD
3	STATIC LOAD	495 Kg. APPROX. ⚠1



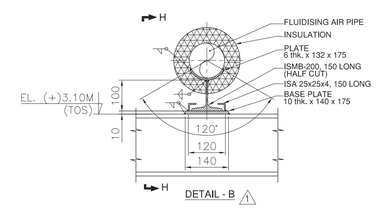
SECTION C-C



SECTION "D-D"
(FOUNDATION PLAN FOR VACUUM PUMP)



VIEW H-H



DETAIL - B ⚠1

LOAD ON FOUNDATION OF VACUUM PUMP

LOCATION	A	B	C	D	E	F	G	H
STATIC in kg.	475	475	475	475	250	250	250	250
DYNAMIC in kg.	+592	+592	-592	-592	-245	-245	+245	+245
TOTAL	1067	1067	-117	-117	5	5	495	495

Digitally signed by Satyaki Dey
Reason: For APPROVAL
Date: 2012.10.31 16:32:55 +05'30'

APPROVED
Release distribution prints.
steag
Digitally signed by Neeraj Dwivedi
DN: cn=Neeraj Dwivedi, o=STEAG Energy Services (India) Pvt Ltd., ou=Engineering, email=nk.dwivedi@steag.in, c=IN
Date: 2012.11.01 11:48:40 +05'30'

Transmittal No: ETG025-BHEL-3-M-12-1411

NOTES

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METER UNLESS OTHERWISE SPECIFIED.
2. THE FINISHED FLOOR LEVEL OF POWER HOUSE GROUND FLOOR EL. 0.000M WHICH CORRESPONDS TO RL. (+)45.50M
3. FINISH GROUND LEVEL: RL(+) 45.3M ⚠1

REFERENCES

S.No.	DESCRIPTION	DRG. NO.
5	AIR HEATING UNIT 18KW	HEA3–2488–A
4	G.A. AND F.P. DRAWING FOR MODEL 67 AC T.L. COMPRESSOR	K–GA–0067AH235A3
3	LAYOUT OF KAKATI LIQUID RING VACUUM PUMP (MODEL:KVL600)	KKI/KVL600/22 030 02 12
2	FLOW DIAGRAM FOR DRY FLY ASH (VACUUM) CONVEYING SYSTEM	MB/C–1160/079404
1	OVERALL LAYOUT PLAN FOR ASH HANDLING SYSTEM	MB/C–1160/082098

REVISIONS

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
2	31.10.12	REVISED AS STEAG COMMENT'S DATED 25.09.2012	RAVI	SK	MDM
1	24.09.12	REVISED AS STEAG COMMENT'S DATED 21.09.2012	RAVI	SK	MDM

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RELEASE STATUS

PURPOSE		DATE	SIGNATURE
FOR APPROVAL			
FOR TENDER ONLY			
FOR MANF./CONST.	CIVIL/STR.		
	MECH.		
	ELECT.		

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR
BIHAR STATE ELECTRICITY BOARD (BSEB)
steag STEAG ENERGY SERVICES (INDIA) Pvt. LTD.
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BHEL DRAWING NO. **IS-1-GA-660-305-M-019**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI
COLLABORATOR
CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.

DESIGNED	RKG
DRAWN	RAVI
CHECKED	SANJAY KR.
APPROVED	MDM
DATE	23.08.2012

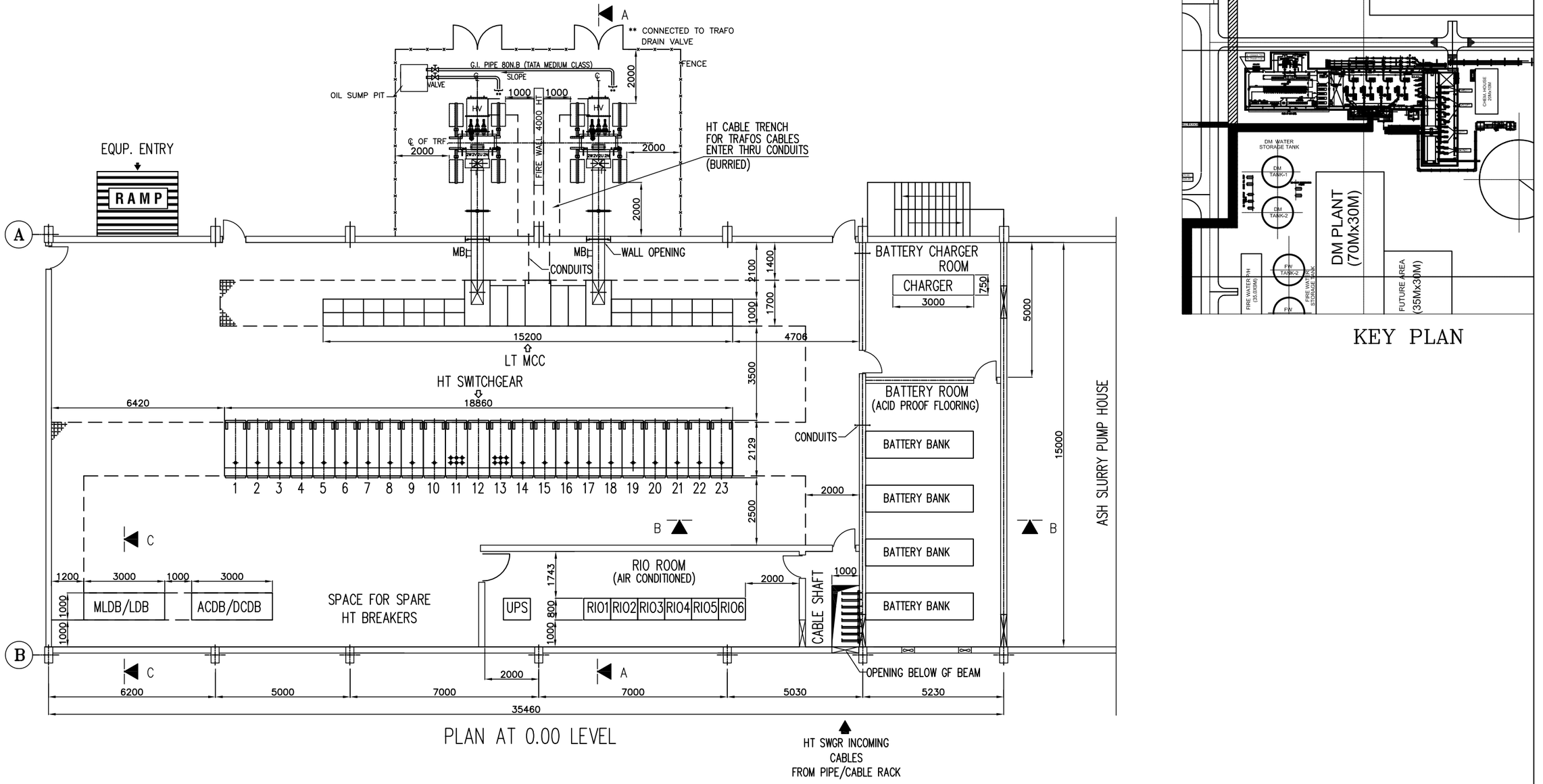
GA OF VACUUM PUMP CUM COMPRESSOR HOUSE (UNIT#9)

SCALE 1:100 | DRG. No. **MB/C-1160/082747** | SHEET 1 OF 1 | REV. **2**

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FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM.

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PLAN AT 0.00 LEVEL

KEY PLAN

DRG. NO. IS-3-EE-660-305-E314

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01	18.10.12	REVISED IN LINE WITH STEAG COMMENTS DT. 06.10.12	BSS	SVL

	NAME	SIGN.	DATE
DESIGNED	BSS		12.09.12
DRAWN	NS		12.09.12
CHECKED	SVL		12.09.12
APPROVED	SVL		12.09.12

CAD — DIR : — FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
ASH HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHEL SUB CONTRACTOR: MACAWBER BEEKAY PRIVATE LIMITED, NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
HT SWITCHGEAR, LT MCC & CONTROL ROOM
AT ASH SLURRY PUMP HOUSE

NO. OF SHEETS: 03
SHEET. NO.: 01

SCALE 1:125 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-305-E314 | REV. 01

FORM 66-301 A

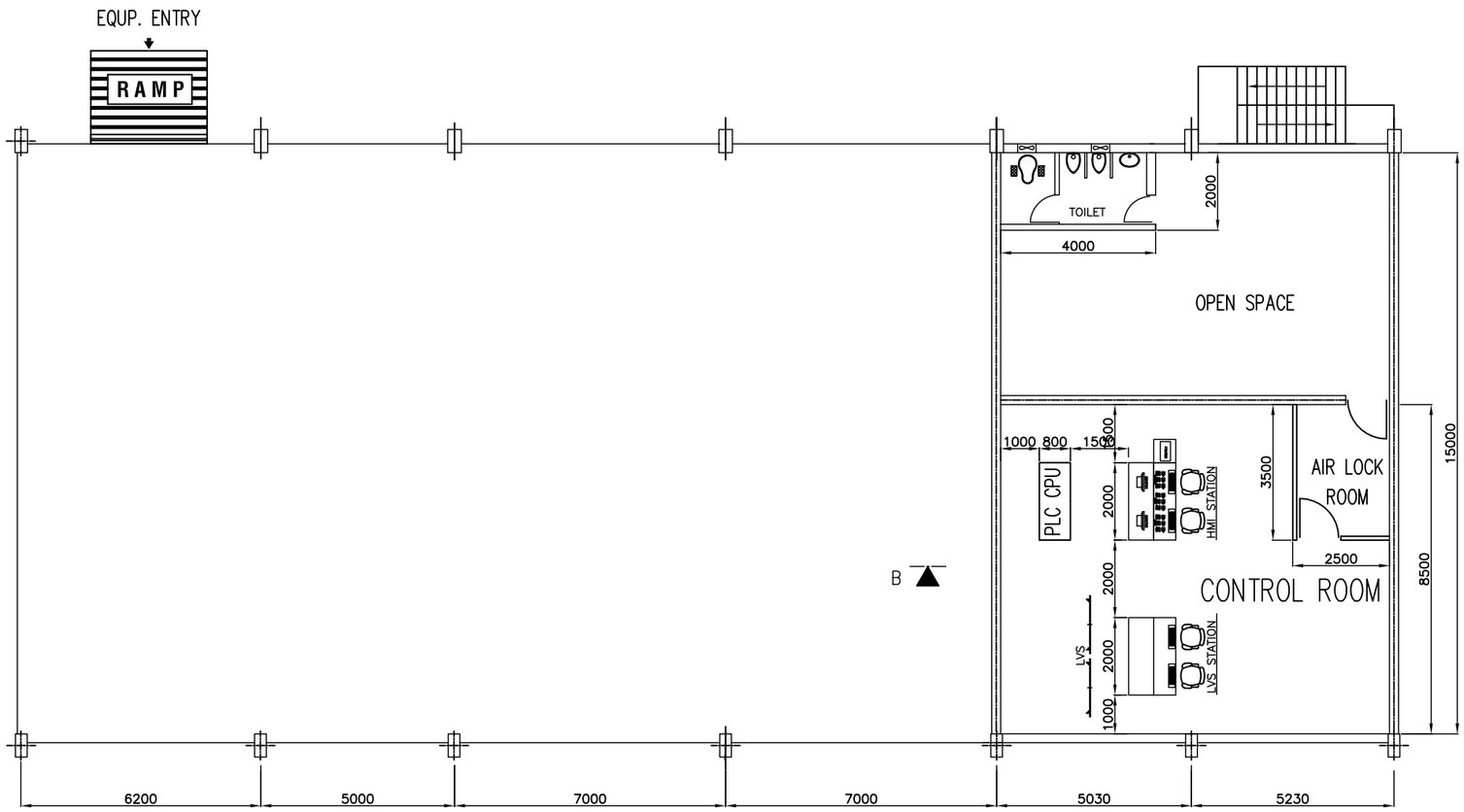
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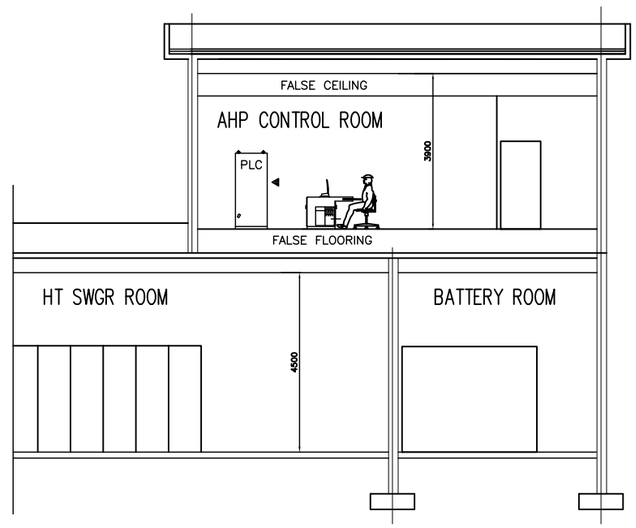
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PLAN AT 4.5M LEVEL



VIEW B–B

DRG. NO. IS-3-EE-660-305-E314

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	BSS		12.09.12
DRAWN	NS		12.09.12
CHECKED	SVL		12.09.12
APPROVED	SVL		12.09.12

CAD — DIR : — FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
ASH HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHEL SUB CONTRACTOR: MACAWBER BEEKAY PRIVATE LIMITED, NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
HT SWITCHGEAR, LT MCC & CONTROL ROOM
AT ASH SLURRY PUMP HOUSE

NO. OF SHEETS 03 | SHEET. NO. 02

SCALE 1:125 | JOB NO. IS–1–10–2013 | DRG. NO. IS-3-EE-660-305-E314 | REV. 00

FORM 66–301 A

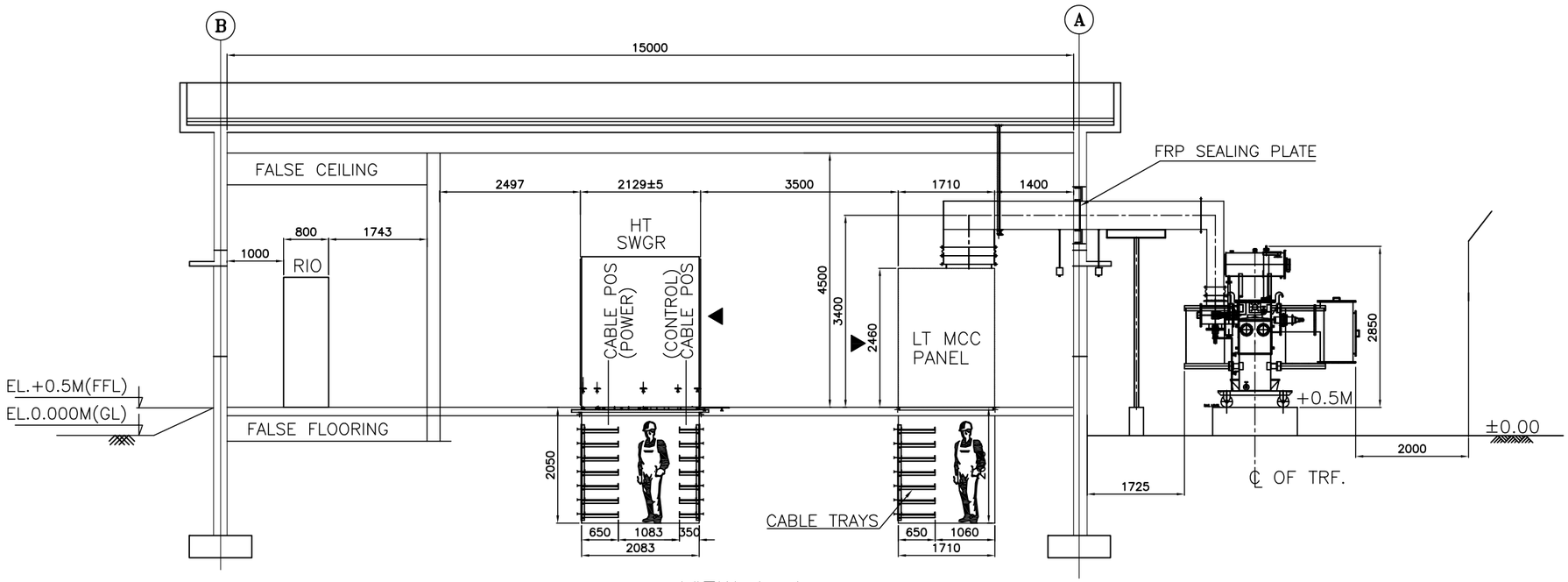
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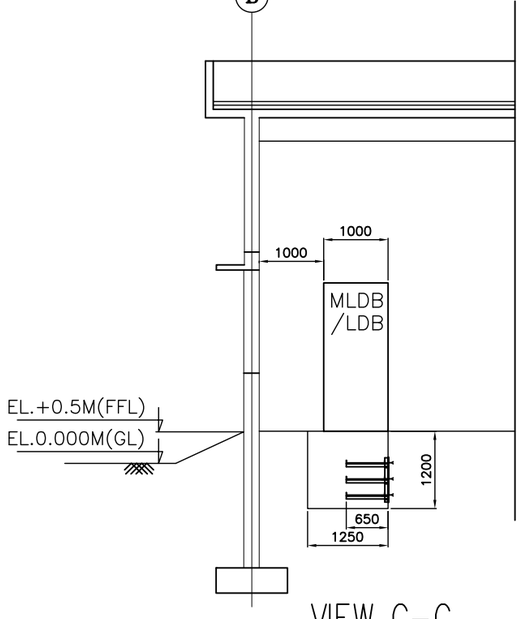
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VIEW A–A



VIEW C–C

DRG. NO. IS-3-EE-660-305-E314

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01				

	NAME	SIGN.	DATE
DESIGNED	BSS		12.09.12
DRAWN	NS		12.09.12
CHECKED	SVL		12.09.12
APPROVED	SVL		12.09.12

CAD — DIR : — FILE NO.:

CUSTOMER/PROJECT : BIHAR STATE ELECTRICITY BOARD
2x250MW BARAUNI THERMAL POWER PROJECT
ASH HANDLING PLANT

CUSTOMER CONSULTANT: steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHEL SUB CONTRACTOR: MACAWBER BEEKAY PRIVATE LIMITED, NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
HT SWITCHGEAR, LT MCC & CONTROL ROOM
AT ASH SLURRY PUMP HOUSE

NO. OF SHEETS 03 | SHEET. NO. 03

SCALE 1:75 | JOB NO. IS–1–10–2013 | DRG. NO. IS-3-EE-660-305-E314 | REV. 00

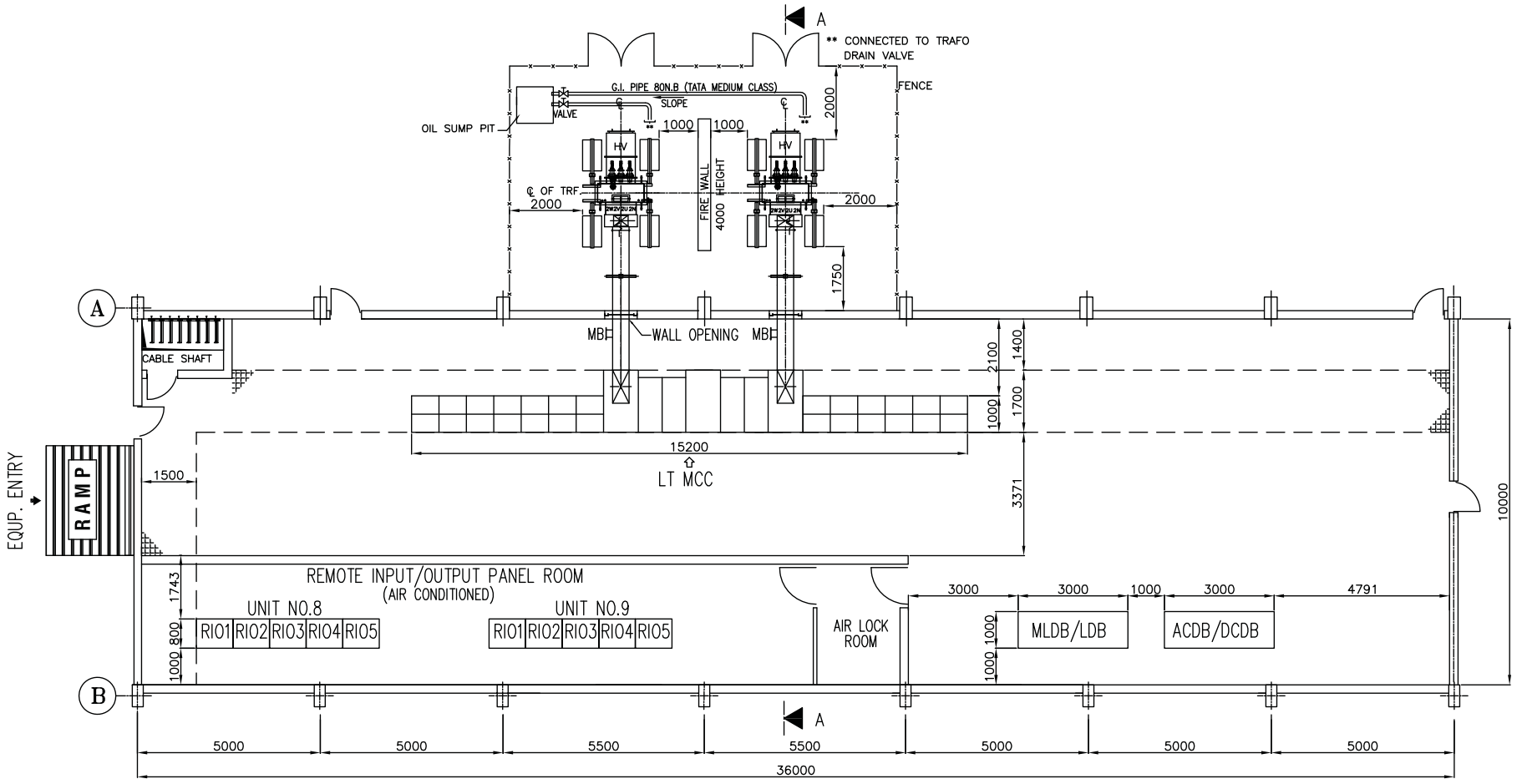
FORM 66–301 A

SIZE–A3

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PLAN AT 0.00 LEVEL

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
ASH HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHEL SUB CONTRACTOR:
MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
LT MCC ROOM
AT VACUUM PUMP HOUSE

NO. OF SHEETS: 02
SHEET. NO.: 01

SCALE 1:125 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-308-E322 | REV. 00

DRG. NO. IS-3-EE-660-308-E322

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
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	05				
	04				
	03				
	02				
	01				

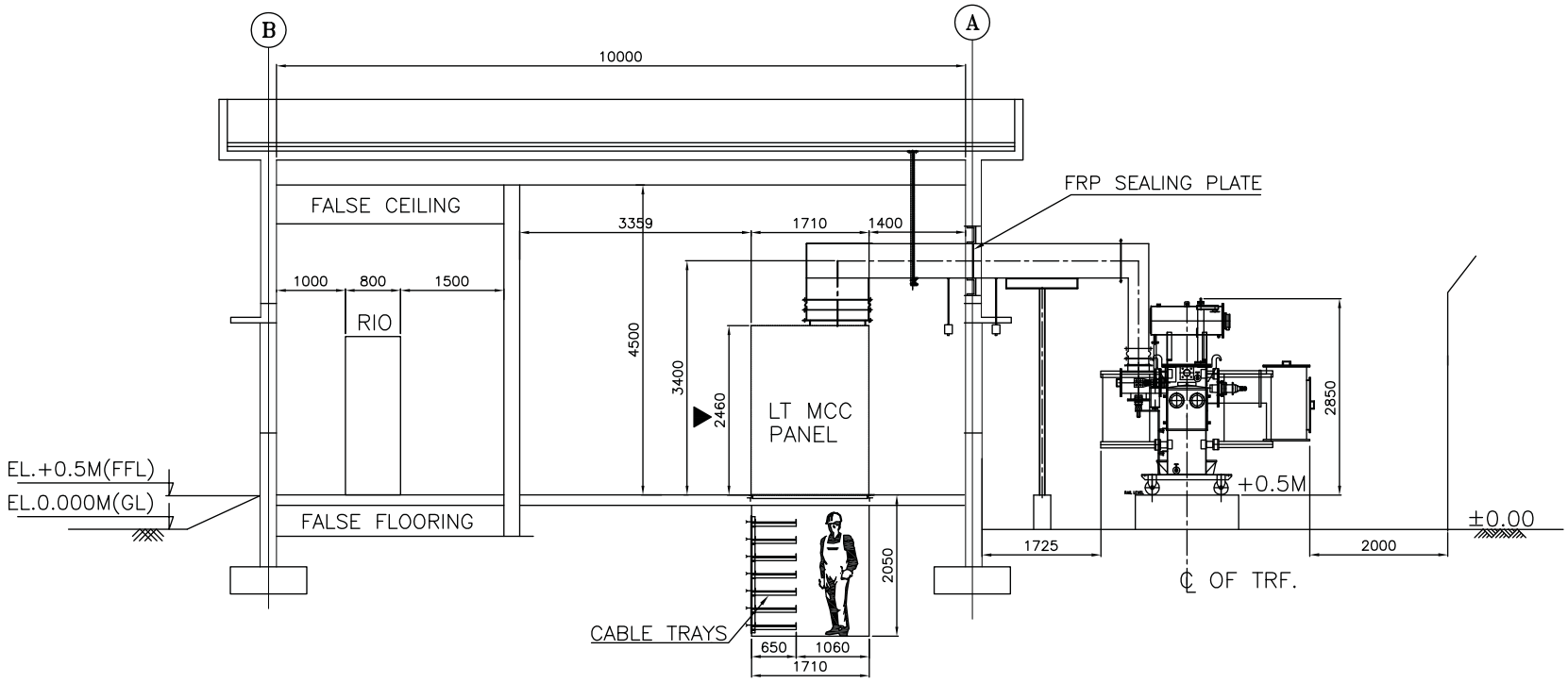
	NAME	SIGN.	DATE
DESIGNED	BSS		12.09.12
DRAWN	NS		12.09.12
CHECKED	SVL		12.09.12
APPROVED	SVL		12.09.12

CAD DIR :
FILE NO.:

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VIEW A-A

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

DRG. NO. IS-3-EE-660-308-E322

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
ASH HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHEL SUB CONTRACTOR:
MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
LT MCC ROOM
AT VACUUM PUMP HOUSE

NO. OF SHEETS 02
SHEET. NO. 02

SCALE 1:125 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-308-E322 | REV. 00

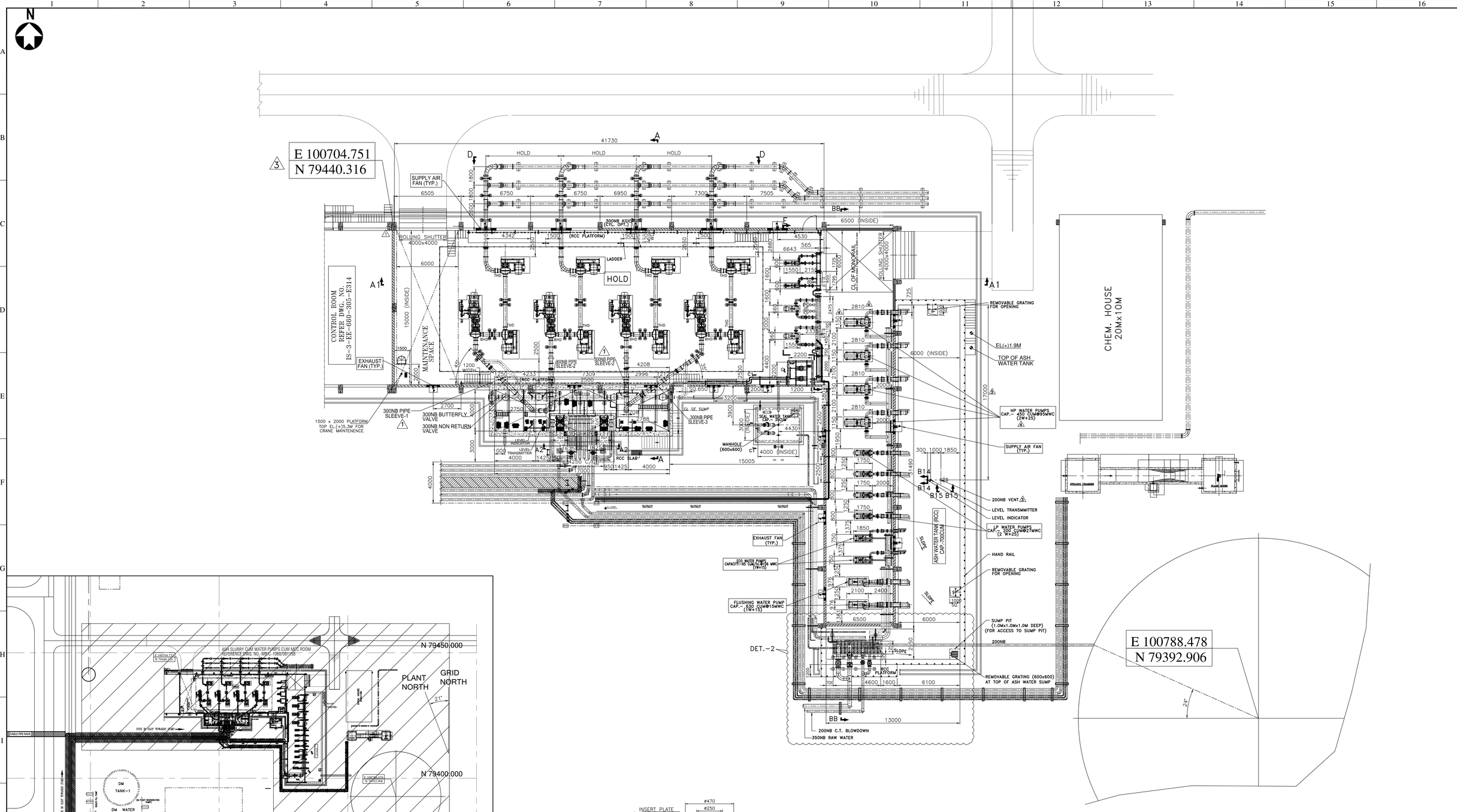
	NAME	SIGN.	DATE
DESIGNED	BSS		12.09.12
DRAWN	NS		12.09.12
CHECKED	SVL		12.09.12
APPROVED	SVL		12.09.12

CAD DIR : FILE NO.:

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT



NOTES

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METER UNLESS OTHERWISE SPECIFIED.
2. THE FINISHED FLOOR LEVEL OF POWER HOUSE GROUND FLOOR EL. 0.000M WHICH CORRESPONDS TO RL. (+)45.50M
3. FINISH GROUND LEVEL: RL(+) 45.0M
4. 25NB AND BELOW INSTRUMENT PIPE SHALL BE ROUTED AS PER SITE CONDITION

S.No.	DESCRIPTION	DRG. NO.
1	PLOT PLAN	PE-DG-374-100-M001

REFERENCES

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	12.02.13	REVISED AS PER STEAG COMMENT'S DATED 21.01.2013	RAVI	SK	MDM
3	14.12.12	REVISED AS PER STEAG COMMENT'S DATED 12.12.2012	RAVI	SK	MDM
2	20.11.12	REVISED AS PER STEAG COMMENT'S DATED 17.10.2012	RAVI	SK	MDM
1	23.08.12	REVISED AS PER STEAG COMMENT'S DATED 18.06.2012	RAVI	SK	MDM

REVISIONS

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RELEASE STATUS

PURPOSE		DATE	SIGNATURE
FOR APPROVAL			
FOR TENDER ONLY			
FOR MANF./ CONST	CIVIL/STR.		
	MECH.		
	ELECT.		

THIS DRG. HAS BEEN APPROVED BY CONSULTANTS/PURCHASERS LETTER NO. DT.

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

STEAG ENERGY SERVICES (INDIA) Pvt. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BHEL DRAWING NO. **IS-1-GA-660-308-M008**

MACAWBER BEEKAY PRIVATE LIMITED
NEW DELHI

COLLABORATOR: **CLYDE BERGEMANN MATERIALS HANDLING LTD., U.K.**

DESIGNED	RKG	GA OF SLURRY CUM WATER PUMP HOUSE	
DRAWN	RAVI		
CHECKED	SANJAY KR		
APPROVED	MDM	SCALE 1:175	DRG. No. MB/ C-1160/ 081158
DATE	02.02.2012		SHEET 1 OF 6 / REV. 4

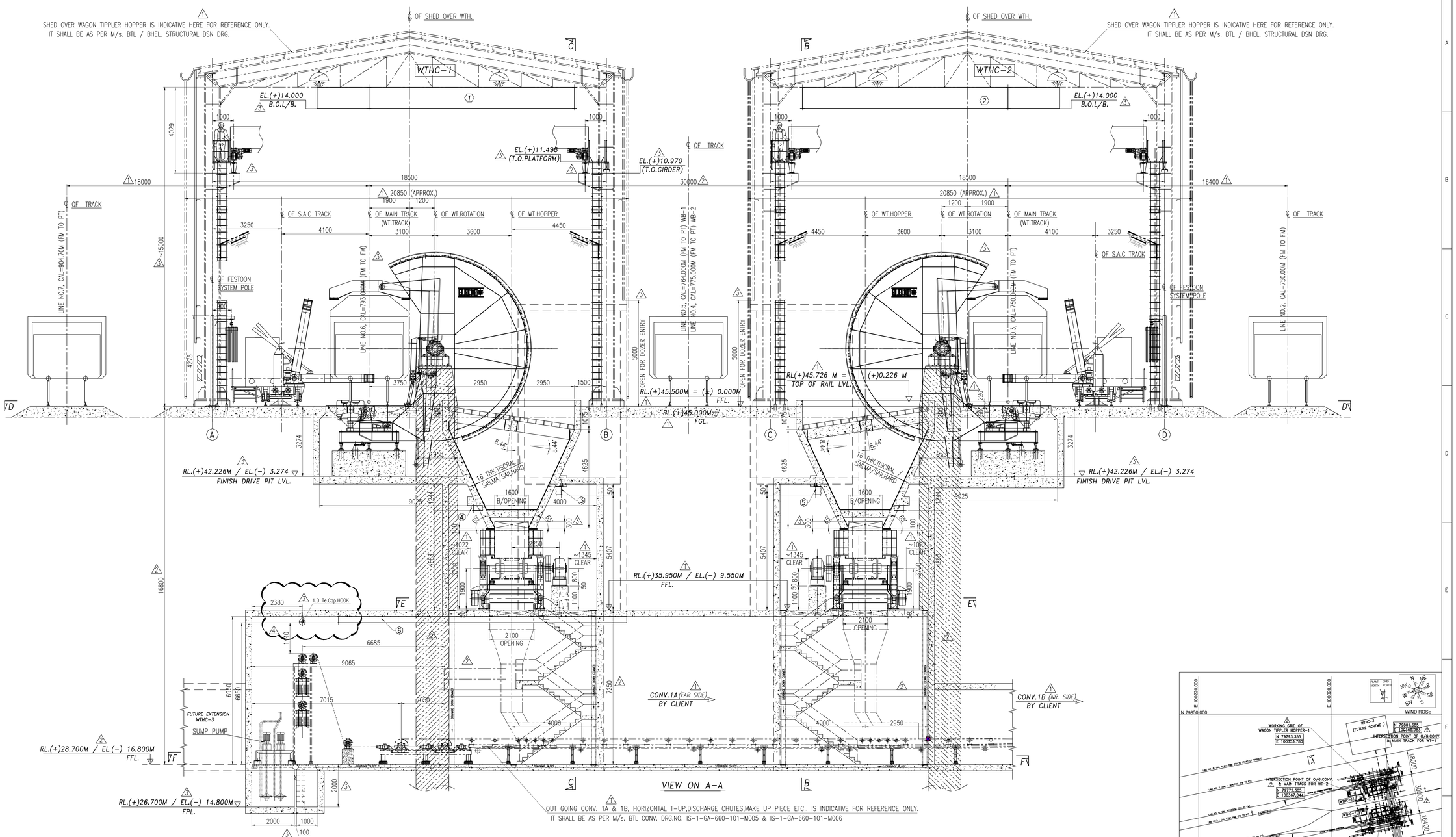
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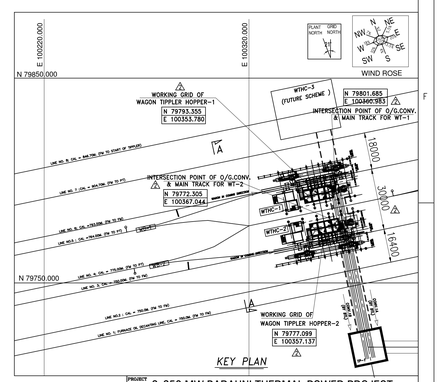
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING NO. IS-1-GA-660-103-M014

DO NOT SCALE. IF IN DOUBT, ASK.





GENERAL NOTE & REFERENCE :-

- ALL DIMENSIONS ARE IN MM AND ALL LEVELS ARE IN METERS.
- 3 TOP OF TIPPLER RAIL IS CORRESPONDENCE AS RL(+)45.726 M = (±)0.226 M(AT TIPPLER TABLE)
- FGL (+) 45.0 M CORRESPONDS TO EL (−) 0.5 M
- 3 'BHEL' KEY PLAN (PLANT LAYOUT) DRAWING NO. IS-0-PL-660-100-M001.
- G.A. OF WAGON TIPPLER WITH SIDE ARM CHARGER REF. ELECON DRG.NO.TP9561/0S. / 'BHEL' DRG. NO. IS-0-GA-660-103-M067.
- G.A. OF SIDE DISCHARGE WAGON TIPPLER REF. ELECON DRG.NO. TP9562/0. / 'BHEL' DRG. NO. IS-0-GA-660-103-M63.
- FOUNDn. DTLS. FOR SIDE DISCHARGE WAGON TIPPLER REF. ELECON DRG.NO. TP9564/0S. / DRG. NO. IS-0-GA-660-103-M68.
- G.A. OF SIDE ARM CHARGER REF. ELECON DRG.NO. TP9563/0. / 'BHEL'DRG NO. IS-0-GA-660-103-M062.
- FOUNDn. DTLS. OF SIDE ARM CHARGER REF. ELECON DRG. NO. TP565/0. / 'BHEL' DRG.NO. IS-0-GA-660-103-M069.
- ARGT.OF LOAD CELL TYPE WEIGH BRIDGE FOR W.T REF.ELECON DRG.NO.TP9566/0. / 'BHEL'DRG.NO. IS-0-GA-660-103-M060.
- ARGT.& FOUNDATION DTLS. FOR MECH.STOPPER(TRACK STOP)REF. ELECON DRG.NO. TP9567/0. / 'BHEL'DRG.NO. IS-0-GA-660-103-M071.
- G.A.& FOUNDn. LOAD DTLS. OF APRON FEEDER REF. ELECON DRG.NO. M16534/1. / 'BHEL'DRG.NO. IS-1-GA-660-103-M038.
- FOR FOUNDATION LOAD DATA OF WTHC REFER SEPARATE DRG.
- SHED OVER WTHC IS INDICATIVE FOR REFERENCE ONLY.

HOIST/CRAIN SCHEDULE

ITEM NO.	MONO RAIL SECTION	HOIST CRAIN TYPE	CAPACITY	LIFTING HT.	OPERATING HT.	L/B.RADIUS	QTY.	LOCATING AT	HANDLING EQUPT.
1	FABRICATED	ELECTRICAL	15.0 T	20.550 MTRS.	11.0 MTRS.	N.A	01 NO.	BELOW SHED OVER WTHC−1	EQUIPMENTS UNDER THE WTHC & ACCESS SHAFT (WTHC−1)
2	FABRICATED	ELECTRICAL	15.0 T	20.550 MTRS.	11.0 MTRS.	N.A	01 NO.	BELOW SHED OVER WTHC−2	EQUIPMENTS UNDER THE WTHC & ACCESS SHAFT (WTHC−2)
3	ISMB 400	MANUAL	5.0 T	11.5 MTRS.	5.5 MTRS.	3 MTR.	01 NO.	AT APRON FEEDER FLOOR OF WTHC−1	AF. & DC. DRIVES FOR WTHC−1, T−PULLEY,CWB,SUMP PUMP ETC. (DUE TO SPACE CONSTRAIN)
4	ISMB 250	MANUAL	1.5 T	4.5 MTRS.	4.5 MTRS.	1.5 MTR.	01 NO.	AT APRON FEEDER FLOOR OF WTHC−1	DRIBBLE CONV. DRIVE (WTHC−1)
5	ISMB 400	MANUAL	5.0 T	5.5 MTRS.	5.5 MTRS.	3 MTR.	01 NO.	AT APRON FEEDER FLOOR OF WTHC−2	AF. & DC. DRIVES FOR WTHC−2
6	ISMB 300	ELECTRICAL	2.0 T	6.0 MTRS.	6.6 MTRS.	1.5 MTR.	01 NO.	AT TUNNEL	T−PULLEY,CWB,SUMP PUMP,ETC.
7	ISMB 250	MANUAL	1.5 T	6.0 MTRS.	6.6 MTRS.	N.A	01 NO.	AT TUNNEL	SUMP PUMP

3 VENTILATION DUCTING DRG. WILL BE FURNISHED SEPARETLY

REV.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	21.11.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 15.11.12	Y.S.GOSI	K.J.P	K.S.K
3	17.07.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 03.07.12	Y.S.GOSI	K.J.P	K.S.K
2	12.06.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 16.05.12	Y.S.GOSI	K.J.P	K.S.K
1	03.05.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 12.04.12	Y.S.GOSI	K.J.P	K.S.K

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

	NAME	SIGN	DATE
DRN.	Y.S.GOSAI		29.01.2011
CHD.	K.J.PRAJAPATI		29.01.2011
APPD.	K.S.KODIA		29.01.2011

DIRECTORY :
FILE NO. :
SCALE 1:80
BHEL DRAWING NO. IS-1-GA-660-103-M014 REV. 4
SHEET NO. 01 OF 05 NO.OF SHTS.

PROJECT: 2x250 MW BARAUNI THERMAL POWER PROJECT, BARAUNI, BIHAR
CUSTOMER: BIHAR STATE ELECTRICITY BOARD (BSEB)
CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.
BHEL
BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE
BHEL'S SUB CONTRACTOR: ELECON ENGINEERING CO.LTD. VALLABH VIDYANAGAR, GUJARAT
A/C NO.
JOB No. CO/2211
HEAD DRG.No. F24809/0
REV.NO. 4

FORM-66.101

DRAWING NO IS-1-GA-660-103-M014

ALL DIMENSIONS ARE IN MM

WTHC-2

EL.(+)14.000 B.O.L/B.

3000 2000

7000 7000 6000 6000 6000

12 11 10 9 8 7

℄ OF TIPPLER & HOPPER

34600 BUFFER ENDS

7700 22000 NORMAL TRAVEL 4900

11000 11000

℄ OF WAITING POSITION OF S.A.C. ℄ OF NORMAL RETURN POSITION OF S.A.C.

16200

1800 1100 8100 8100 1100 1800

℄ OF WT BRG. 18400 ℄ OF WT BRG.

END OF BUFFER END OF BUFFER

RUNG LADDER

14000

200 MAX. 200 MAX.

WAGON IN COMING DIRECTION

WAGON OUT GOING DIRECTION

4275

RL.(+)45.726 M = (+)0.226 M TOP OF RAIL LVL.

RL.(+)45.500M = (±) 0.000M FFL.

RL.(+)45.000M FGL.

226 300

S1

Hopper Storage Capacity : 215.000 T (Approx.)
Valley Angle : 60°

13000 AF.SPROCKET CRS.

'Zz'

HAND RAIL 32 NB CLASS-B AS PER IS:1239

ACCESS SHAFT

10634

HEAD SPROCKET

1.0 Te.Cap.HOOK

5317 5317

RCC-SHEAR BEAM

800 1100 AF.ABSORBER PLATE

2892 2425 2425 300 2892

Y2 Y2

'Y1'

TAIL SPROCKET

FLOW DIRECTION

9550 4850 1800 3700 1900 400

5950 4100 5900 9050

3875 FROM T.O.RAIL

16800

RL.(+)35.950M / EL.(-) 9.550M FFL.

10712

S1

4550 700 13400 DRIBBLE CONVEYOR SHAFT CRS

5000 16175 30700

VIEW ON B-B

8738 1626 1010 2535 OPENING 3575 5950

1975 3200 1975

℄ OF CONV.BCN-1B ℄ OF CONV.BCN-1A

RL.(+)28.700M / EL.(-) 16.800M FFL.

1200 U/S BELT

3575 3575 3575 7150 2375 9525

7200

RL.(+)45.500M FFL.

RL.(+)45.000M FGL.

9550

757

4500 750

VIEW ON S1-S1

WORKING GRID OF WAGON TIPPLER HOPPER-2
N 79793.355
E 100353.780

5317 5317

1600 H.B.O.

100 x 200 RECT. TICK WOOD PACKING (BHEL SCOPE)

1600X300 NOTCH

10634 HOPPER BOTTOM OPENING

PLAN ON Y2-Y2

300 RCC WALL

HOPPER WALL

100 200

100 x 200 RECT. TICK WOOD PACKING (BHEL SCOPE)

AF.FRAME

ENLG.DTLS.'Y1'

16THK. TISCRAL/SAILMA/SAILHARD LINER PLT.

500 x 500 SQ.

Z1

HOPPER WALL

MS.65x65x6THKx300 LG.

5 16 5 5

500 20 500 100 480 10 10 480 100 300 300 10 600 500 300 10 100 100 100 600 600 10 THK MS PLT./FLAT

VIEW ON Z1-Z1

ENLG.DTLS.'Zz'

[TYP.INSERT & LINER PLT.DTLS FOR HOPPER IN SIDE WALL PROTECTION]

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	21.11.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 15.11.12	Y.S.Gosai	K.J.P	K.S.K
3	17.07.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 03.07.12	Y.S.Gosai	K.J.P	K.S.K
2	12.06.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 16.05.12	Y.S.Gosai	K.J.P	K.S.K
1	03.05.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 12.04.12	Y.S.Gosai	K.J.P	K.S.K

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

PROJECT: 2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

CUSTOMER: BIHAR STATE ELECTRICITY BOARD (BSEB)

CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BHEL'S SUB CONTRACTOR: ELECON ENGINEERING CO.LTD. VALLABH VIDYANAGAR, GUJARAT

W/C NO.	JOB No:	VEND ORG.No:	REV.NO.
	CO/2211	F24810/1	4

	NAME	SIGN	DATE
DRN.	Y.S.GOSAI		29.01.2011
CHD.	K.J.PRAJAPATI		29.01.2011
APPD.	K.S.KODIA		29.01.2011

DIRECTORY : FILE NO. : SCALE 1:80

TITLE : GEN. ARRGT. OF WAGON TIPPLER-HOPPER COMPLEX NO.(WTHC) 1 & 2

BHEL DRAWING NO. IS-1-GA-660-103-M014 REV. 4

SHEET NO. 02 OF 05 NO.OF SHTS.

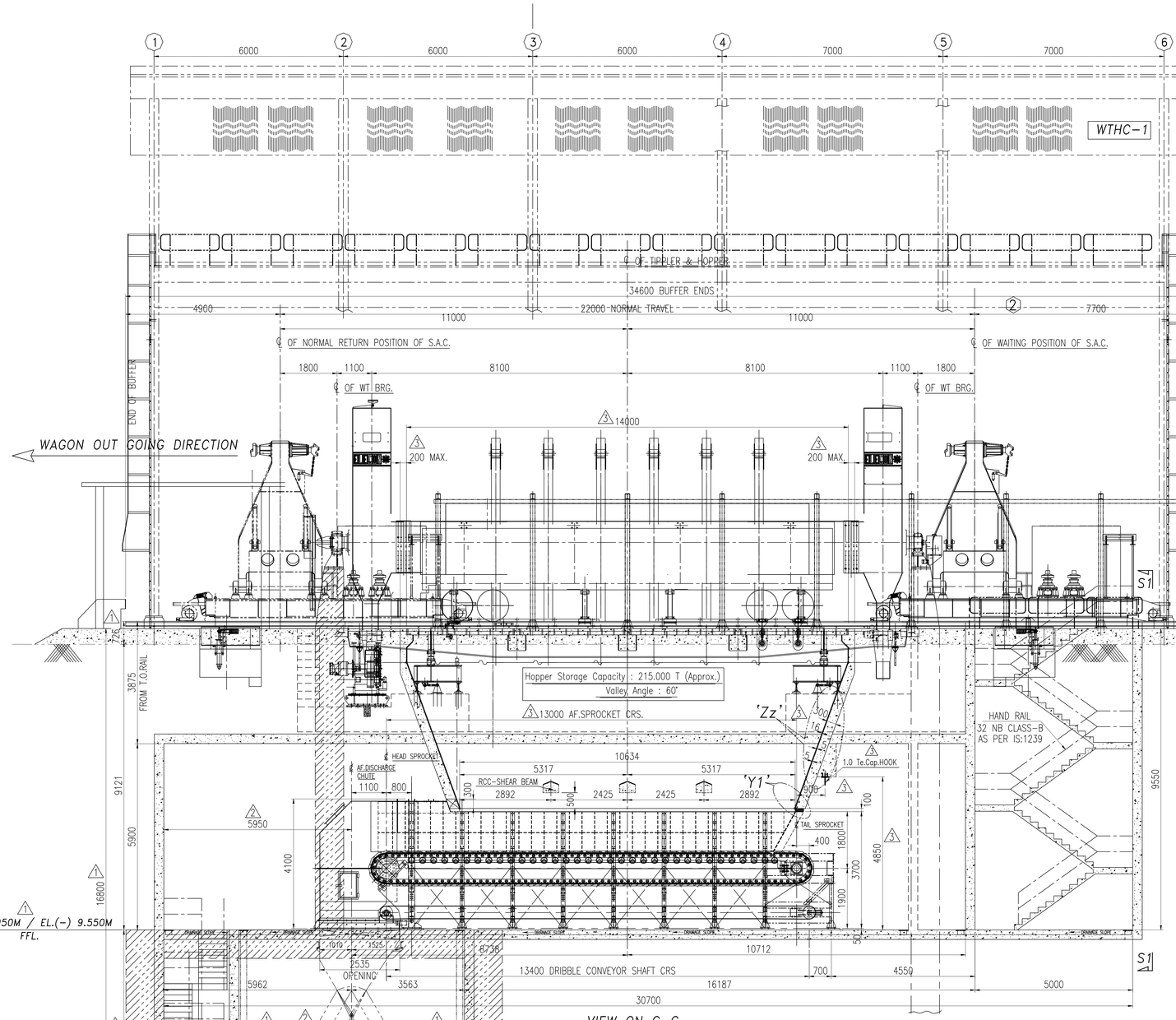
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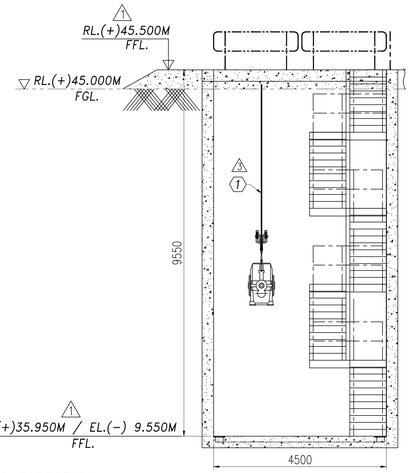
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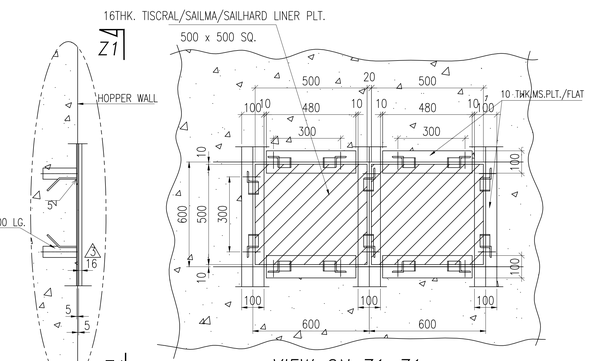
DRAWING NO IS-1-GA-660-103-M014

ALL DIMENSIONS ARE IN MM





VIEW ON S1-S1

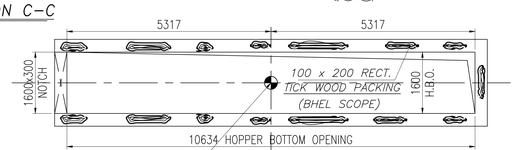


ENLG.DTLS.'Zz'

[TYP.INSERT & LINER PLT.DTLS FOR HOPPER IN SIDE WALL PROTECTION]

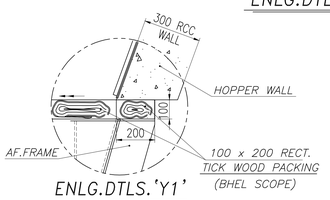
3

VIEW ON C-C



PLAN ON Y2-Y2

3



ENLG.DTLS.'Y1'

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	21.11.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 15.11.12	Y.S.Gosai	K.J.P	K.S.K
3	17.07.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 03.07.12	Y.S.Gosai	K.J.P	K.S.K
2	12.06.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 16.05.12	Y.S.Gosai	K.J.P	K.S.K
1	03.05.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 12.04.12	Y.S.Gosai	K.J.P	K.S.K

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV. | NAME | SIGN | DATE
ALTERED
CHECKED
APPROVED

ZONE

PROJECT: 2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

CUSTOMER: BIHAR STATE ELECTRICITY BOARD (BSEB)

CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BHEL'S SUB CONTRACTOR: ELECON ENGINEERING CO.LTD.
VALLABH VIDYANAGAR, GUJARAT

M/C NO.	JOB No.	VEND DRG.No:	REV.NO.
	CO/2211	F24811/1	4

	NAME	SIGN	DATE
DRN.	Y.S.GOSAI		29.01.2011
CHD.	K.J.PRAJAPATI		29.01.2011
APPD.	K.S.KODIA		29.01.2011

DIRECTORY :
FILE NO. :
SCALE 1:80

TITLE : GEN. ARRGT. OF WAGON TIPPLER-HOPPER COMPLEX NO.(WTHC) 1 & 2

BHEL DRAWING NO. IS-1-GA-660-103-M014 REV. 4

SHEET NO. 03 OF 05 NO.OF SHTS.

FORMAT SIZE A1

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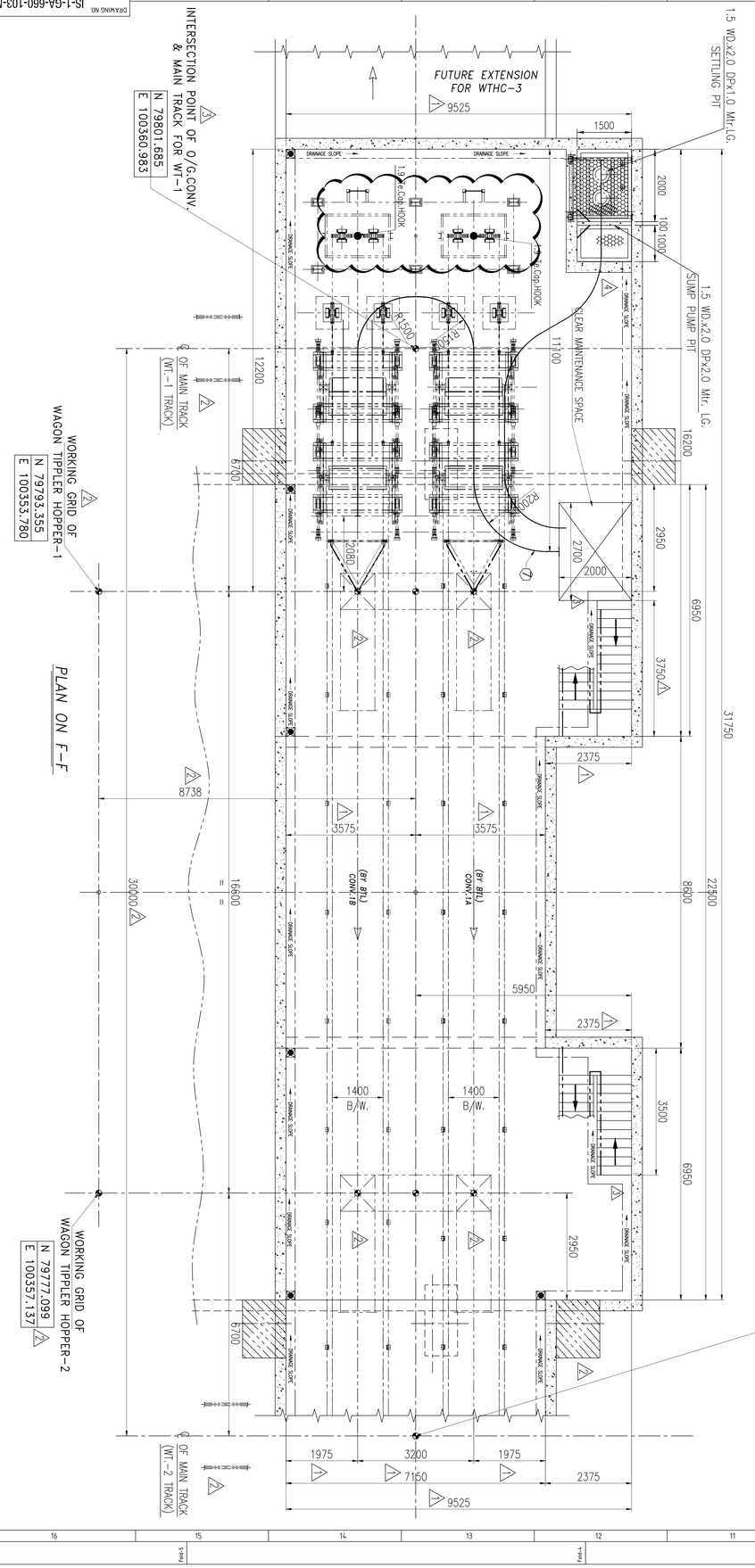
DRAWING NO IS-1-GA-660-103-M014

ALL DIMENSIONS ARE IN MM

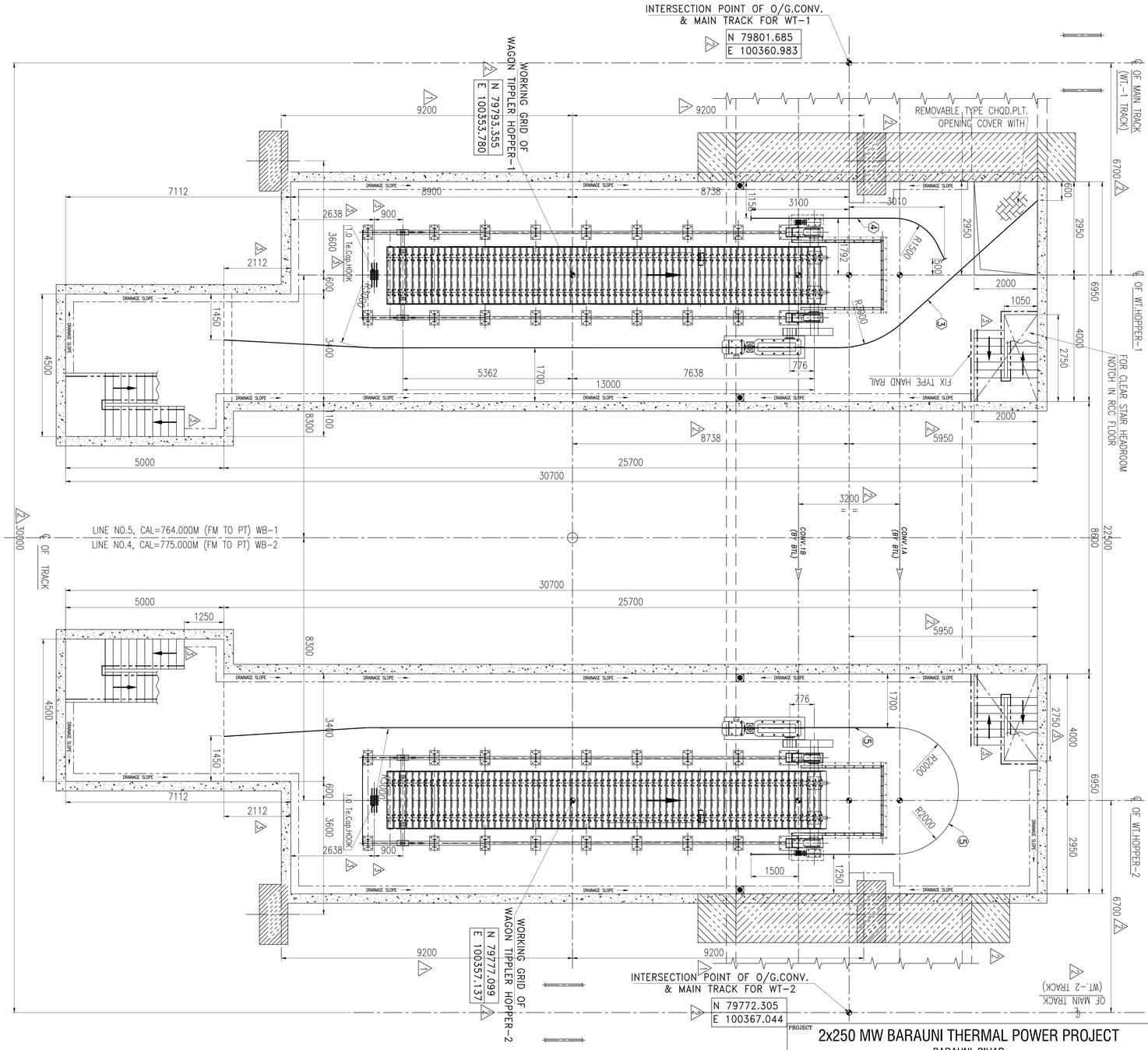
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ELECTRONIC FILE NAME

PLAN ON F-F



PLAN ON E-E



ONLY INPUT & INFORMATION TO CIVIL

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3	21.11.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 15.11.12	Y.S.Gosai	K.J.P	K.S.K
3	17.07.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 03.07.12	Y.S.Gosai	K.J.P	K.S.K
2	12.06.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 16.05.12	Y.S.Gosai	K.J.P	K.S.K
1	03.05.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 12.04.12	Y.S.Gosai	K.J.P	K.S.K

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

PROJECT
2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

CUSTOMER
BIHAR STATE ELECTRICITY BOARD (BSEB)

CUSTOMER'S CONSULTANT
STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BHEL'S SUB CONTRACTOR: ELECON ENGINEERING CO.LTD. VALLABH VIDYANAGAR, GUJARAT

W/C NO.	JOB No:	VEND DRG.No:	REV.NO.
CO/2211	F24812/1		4

	NAME	SIGN	DATE
DRN.	Y.S.GOSAI		29.01.2011
CHD.	K.J.PRAJAPATI		29.01.2011
APPD.	K.S.KODIA		29.01.2011

DIRECTORY :
FILE NO. :
SCALE 1:80

TITLE : GEN. ARRGT. OF WAGON TIPPLER-HOPPER COMPLEX NO.(WTHC) 1 & 2

BHEL DRAWING NO. IS-1-GA-660-103-M014 REV. 4

SHEET NO. 04 OF 05 NO.OF SHTS.

FORMAT SIZE A1

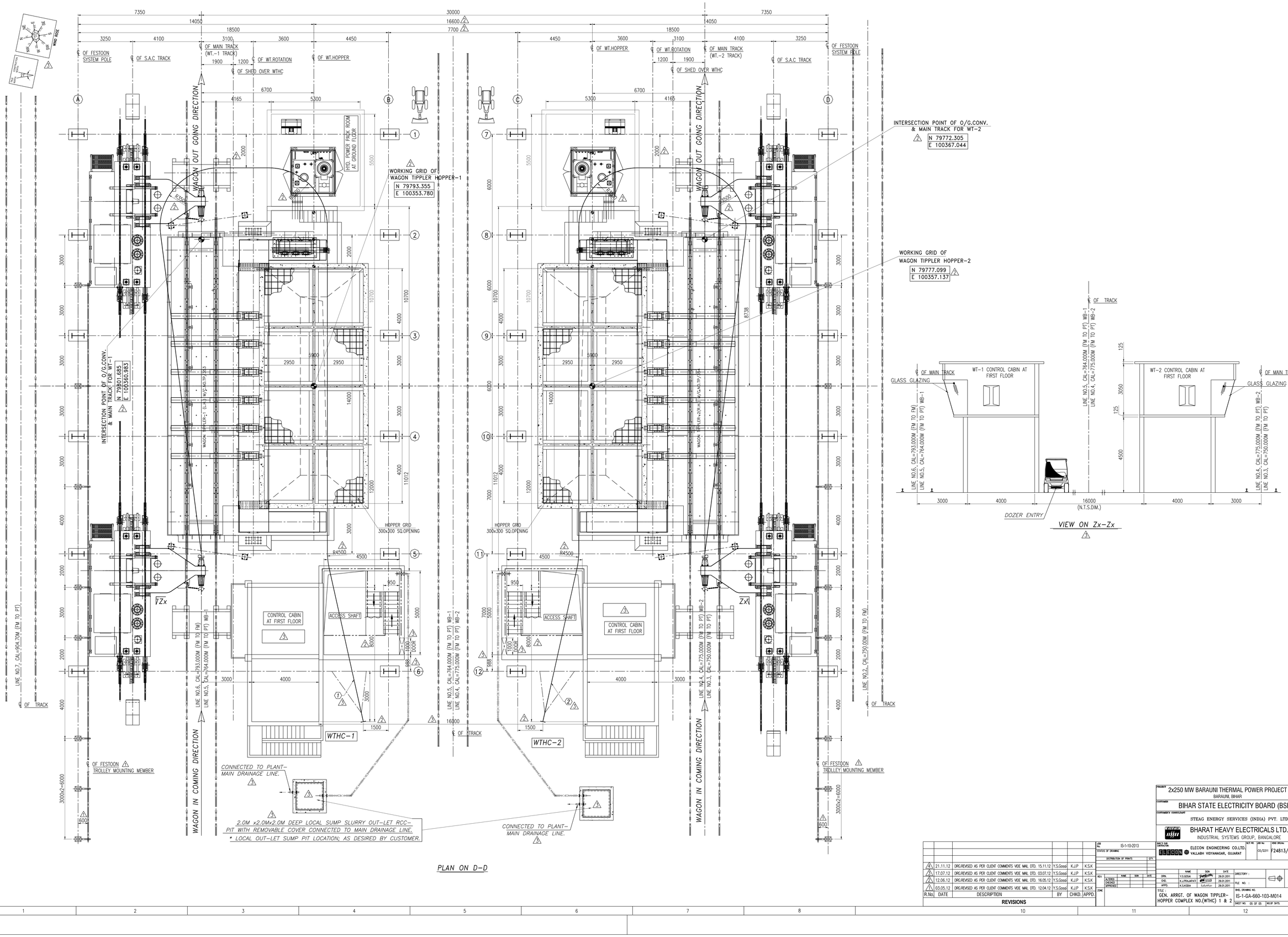
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING NO. IS-1-GA-660-103-M014

DO NOT SCALE. IF IN DOUBT, ASK.

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PLAN ON D-D

VIEW ON Zx-Zx

4	21.11.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 15.11.12	Y.S.Gosa	K.J.P	K.S.K	
3	17.07.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 03.07.12	Y.S.Gosa	K.J.P	K.S.K	
2	12.06.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 16.05.12	Y.S.Gosa	K.J.P	K.S.K	
1	03.05.12	DRG.REVISED AS PER CLIENT COMMENTS VIDE MAIL DTD. 12.04.12	Y.S.Gosa	K.J.P	K.S.K	
R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.	

REVISIONS

JOB NO. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.	NAME	SIGN.	DATE
ALTERED			
SUPERSEDED			
APPROVED			

ZONE

PROJECT: 2x250 MW BARAUNI THERMAL POWER PROJECT, BARAUNI, BIHAR

CUSTOMER: BIHAR STATE ELECTRICITY BOARD (BSEB)

CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD., INDUSTRIAL SYSTEMS GROUP, BANGALORE

SHOP/L.SUB CONTRACTOR		BHEL WO.	JOB No.	BOM DRG.No.	REV.NO.
ELECON	ELECON ENGINEERING CO.LTD., VALLABH VIDYANAGAR, GUJARAT		CO/2211	F24813/0	4

	NAME	SIGN	DATE
DRN.	Y.S.GOSA		26.01.2011
CHD.	K.J.PRAJAPATI		29.01.2011
APPD.	K.S.KODIA		29.01.2011

DIRECTORY :

FILE NO. :

SCALE: 1:90

TITLE: GEN. ARRGT. OF WAGON TIPPLER-HOPPER COMPLEX NO.(WTHC) 1 & 2

BHEL DRAWING NO.: IS-1-GA-660-103-M014

REV.: 4

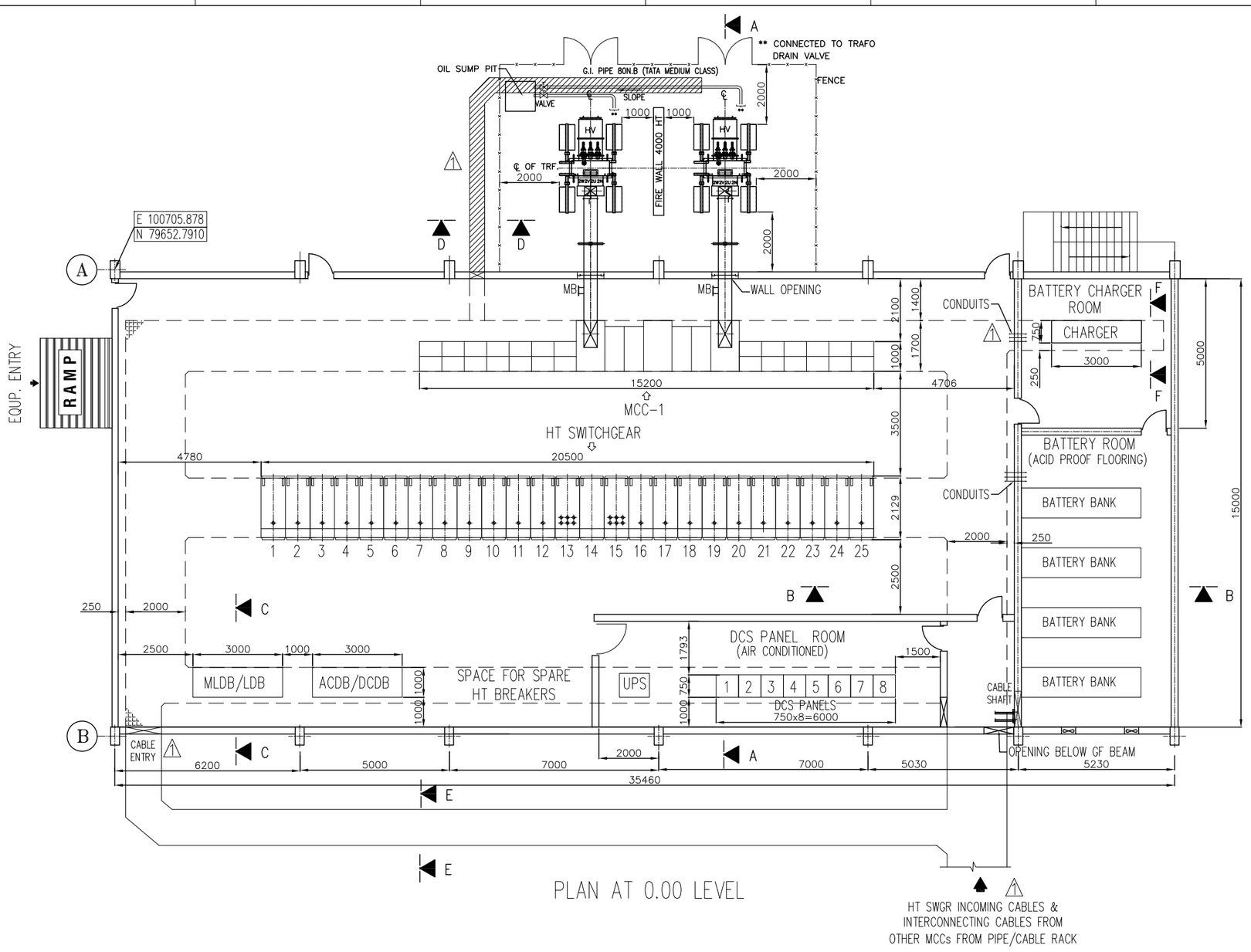
SHEET NO. 05 OF 05 NO.OF SHTS.

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

FORM-66.101

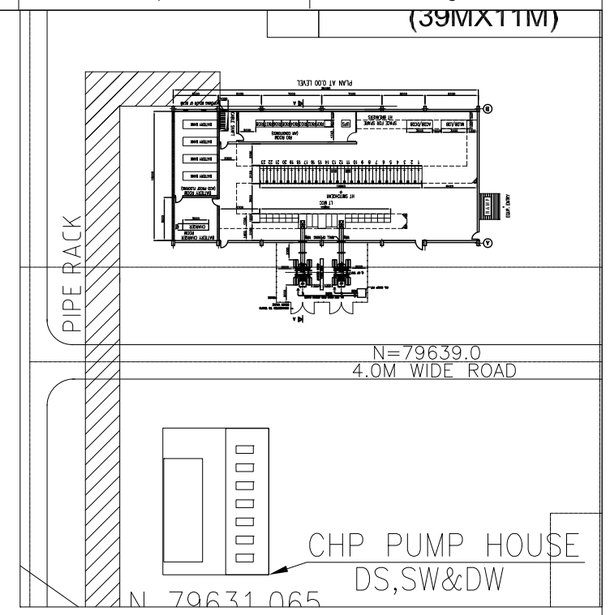
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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It must not be used directly or indirectly in any way detrimental to the interest of the company



PLAN AT 0.00 LEVEL

HT SWGR INCOMING CABLES & INTERCONNECTING CABLES FROM OTHER MCCs FROM PIPE/CABLE RACK



LIST OF EQUIPMENT

SL NO.	EQUIPMENT DESCRIPTION	QTY
1	2000KVA TRANSFORMERS	2NOS.
2	HT SWITCHGEAR	
	-INCOMER FEEDERS	2NOS.
	-BUSCOUPLER	1NOS.
	-2000KVA MCC-1 TRAFO FEEDERS	2NOS.
	-1000KVA MCC-2 TRAFO FEEDERS	2NOS.
	-2000KVA MCC-3(WT) TRAFO FEEDERS	2NOS.
	-500KVA STAKER RECLIMER FEEDERS	1NOS.
	-BCN2A/2B 270KW HT MOTOR FEEDERS	2NOS.
	-CRUSHER1&2 800KW HT MOTOR FEEDERS	2NOS.
	-BCN 225KW HT MOTOR FEEDERS	2NOS.
	-BCN6A/6B 370KW HT MOTOR FEEDERS	2NOS.
	-SPARE FEEDER SUITABLE FOR 2000KVA	1NOS.
	-SPARE FEEDER SUITABLE FOR 800KW	1NOS.
	-SPARE FEEDER SUITABLE FOR 370KW	1NOS.
	-LINE PT	2NOS.
	-BUS PT	2NOS.
3	MCC-1	
4	DCS PANELS	
5	UPS	
6	BATTERY CHARGER	
7	BATTERY BANK	
8	MLDB	

DRG. NO. IS-3-EE-660-119-E138

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	06.02.13	REVISED AS PER STEAG/BSEB COMMENTS DTD 04.01.13		

	NAME	SIGN.	DATE
DESIGNED	BSS		26.10.12
DRAWN	NS		26.10.12
CHECKED	SVL		26.10.12
APPROVED	SVL		26.10.12

CAD | DIR : | FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
HT SWITCHGEAR, MCC-1 & CONTROL
ROOM NEAR CRUSHER HOUSE

NO. OF SHEETS 03
SHEET. NO. 01

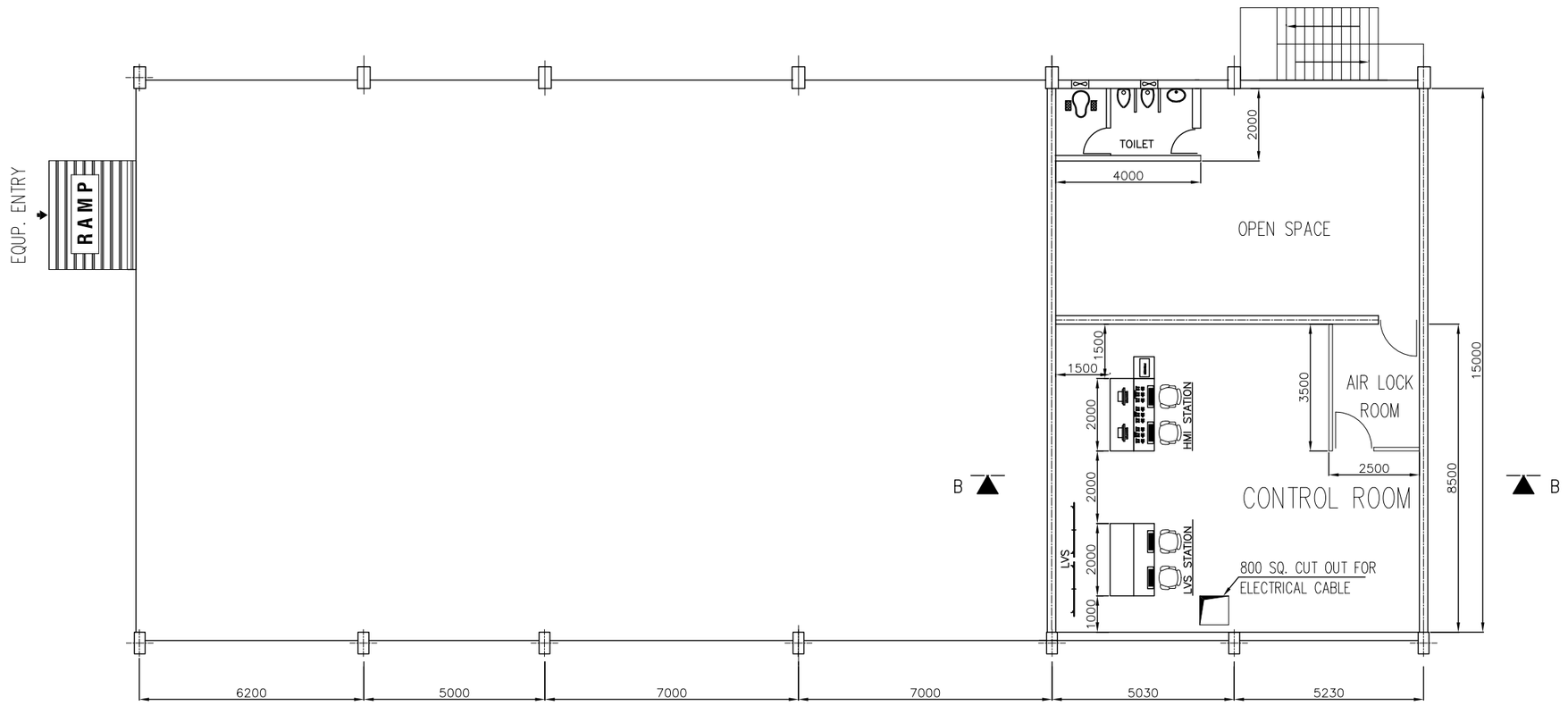
SCALE 1:75 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-119-E138 | REV. 01

FORM 66-301 A

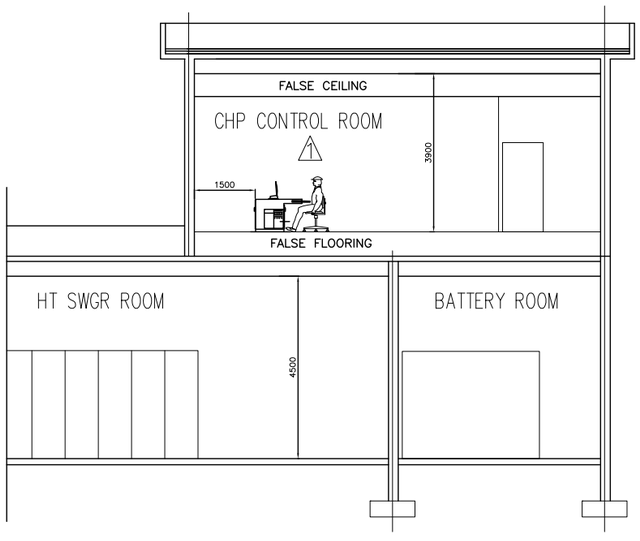
SIZE-A3

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8



PLAN AT 4.5M LEVEL



VIEW B-B

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DRG. NO. IS-3-EE-660-119-E138

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01	06.02.13	REVISED AS PER STEAG/BSEB COMMENTS DTD 04.01.13		

	NAME	SIGN.	DATE
DESIGNED	BSS		26.10.12
DRAWN	NS		26.10.12
CHECKED	SVL		26.10.12
APPROVED	SVL		26.10.12

CAD | DIR : | FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:

steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
HT SWITCHGEAR, MCC-1 & CONTROL ROOM
NEAR CRUSHER HOUSE

NO. OF SHEETS 03 | SHEET. NO. 02

SCALE 1:125 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-119-E138 | REV. 01

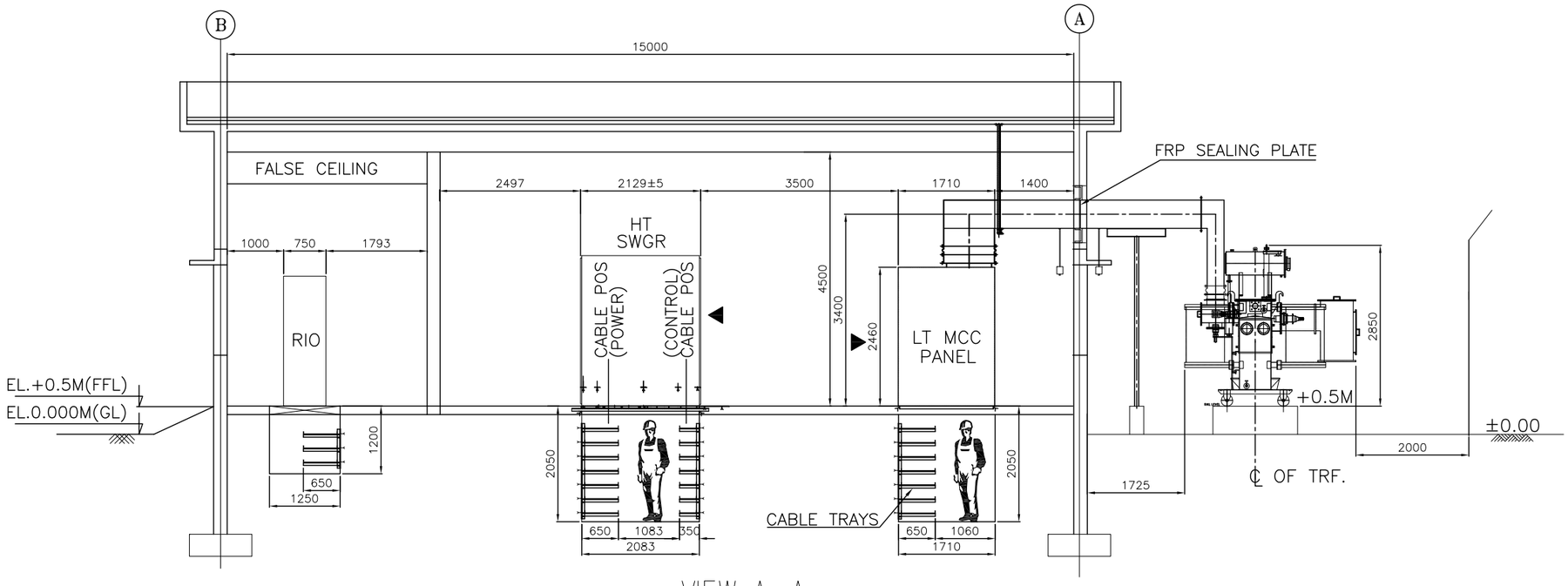
FORM 66-301 A

SIZE-A3

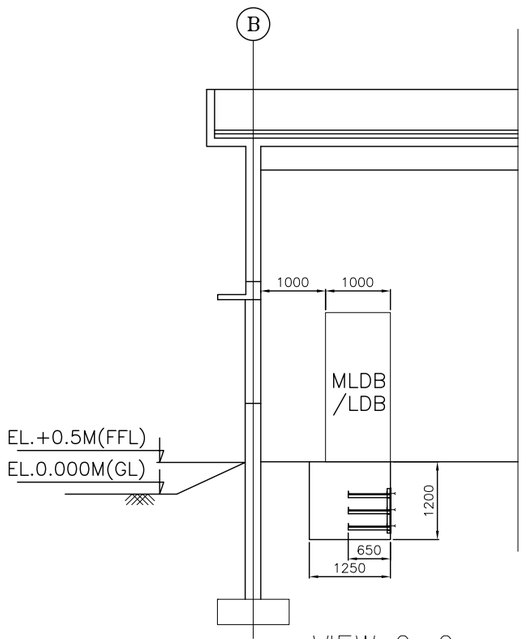
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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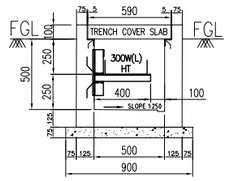
DRG. NO. IS-3-EE-660-119-E138



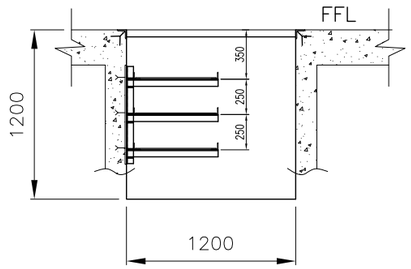
VIEW A–A



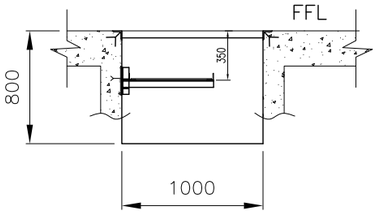
VIEW C–C



VIEW D–D



VIEW E–E



VIEW F–F

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE : ELECTRICAL EQUIPMENT LOCATION PLAN
HT SWITCHGEAR, MCC–1 & CONTROL
ROOM NEAR CRUSHER HOUSE

NO. OF SHEETS 03 | SHEET. NO. 03

SCALE 1:75 | JOB NO. IS–1–10–2013 | DRG. NO. IS-3-EE-660-119-E138 | REV. 01

	NAME	SIGN.	DATE
DESIGNED	BSS		26.10.12
DRAWN	NS		26.10.12
CHECKED	SVL		26.10.12
APPROVED	SVL		26.10.12

CAD | DIR : | FILE NO.:

INVENTORY NO.

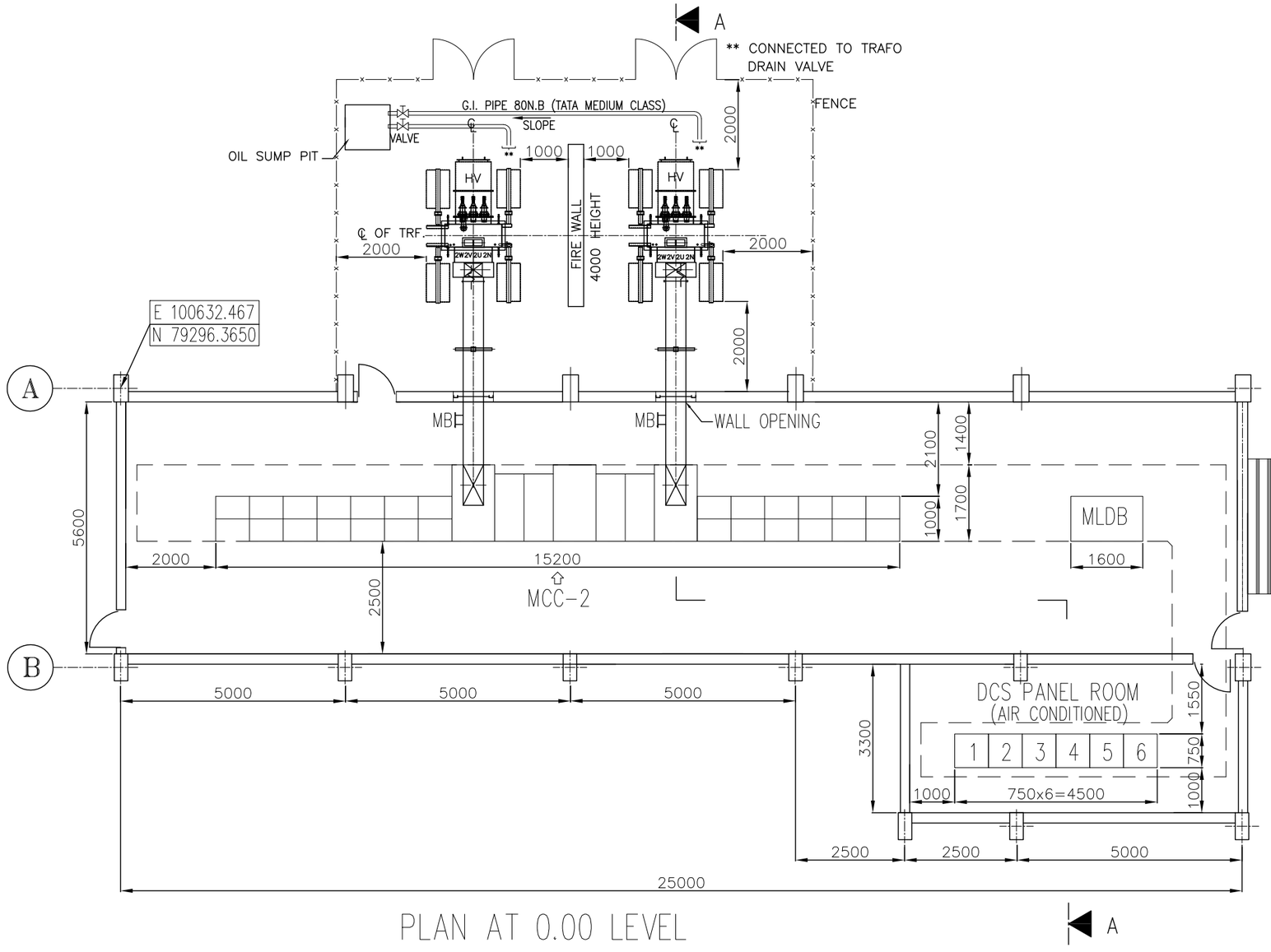
REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	06.02.13	REVISED AS PER STEAG/BSEB COMMENTS DTD 04.01.13		

FORM 66–301 A

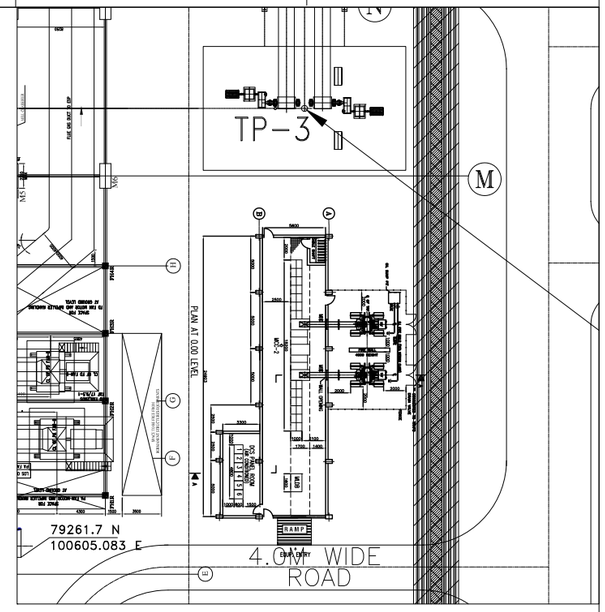
SIZE–A3

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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PLAN AT 0.00 LEVEL



DRG. NO. IS-3-EE-660-121-E139

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01				

	NAME	SIGN.	DATE
DESIGNED	BSS		28.10.12
DRAWN	NS		28.10.12
CHECKED	SVL		28.10.12
APPROVED	SVL		28.10.12

CAD — DIR : — FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE :
ELECTRICAL EQUIPMENT LOCATION PLAN
MCC-2 ROOM NEAR TP3

NO. OF SHEETS: 02
SHEET. NO.: 01
REV.: 00

SCALE 1:75 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-121-E139

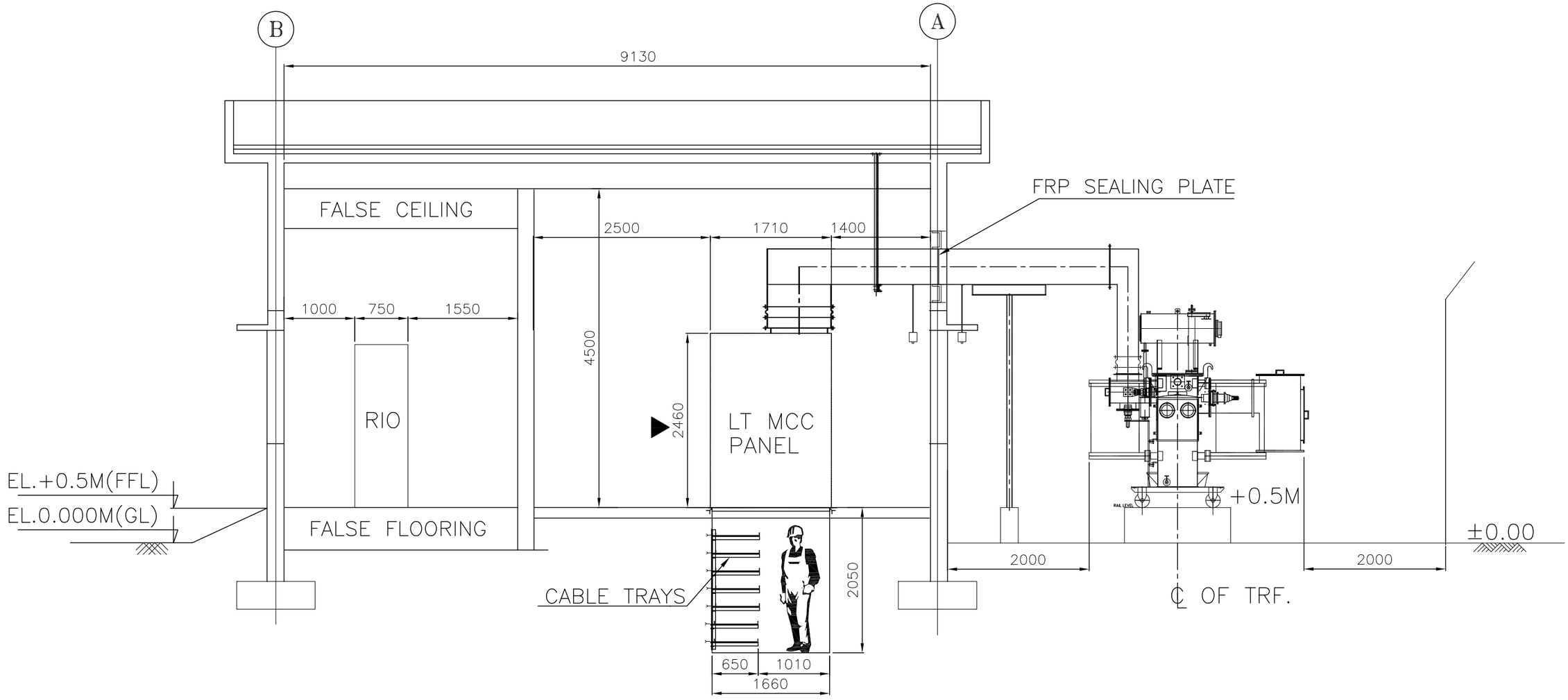
FORM 66-301 A

SIZE-A3

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8

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VIEW A-A

DRG. NO. IS-3-EE-660-121-E139

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	BSS		28.10.12
DRAWN	NS		28.10.12
CHECKED	SVL		28.10.12
APPROVED	SVL		28.10.12

CAD — DIR : — FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE :
ELECTRICAL EQUIPMENT LOCATION PLAN
MCC-2 ROOM NEAR TP3

NO. OF SHEETS: 02
SHEET. NO.: 02

SCALE 1:75 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-121-E139 | REV. 00

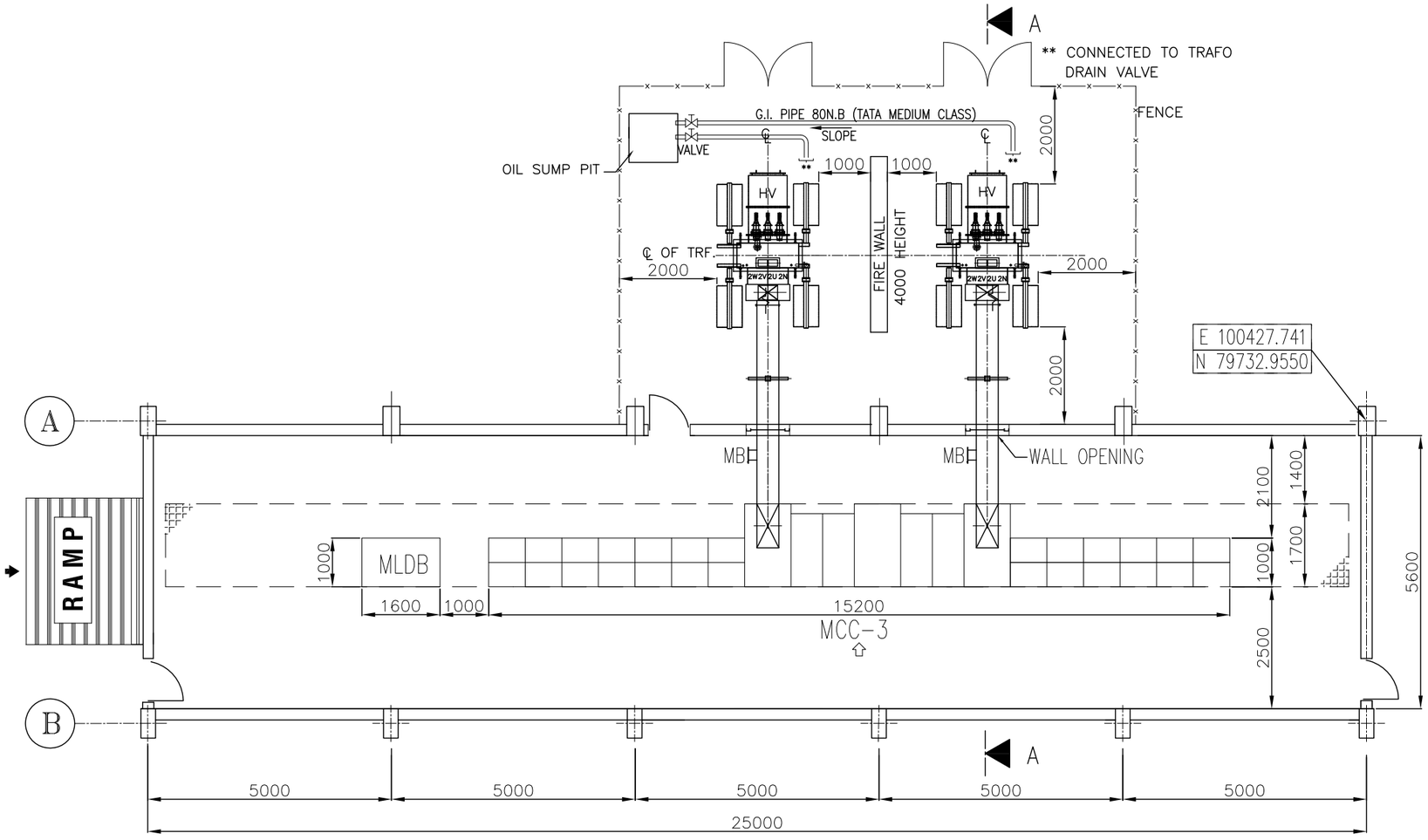
FORM 66-301 A

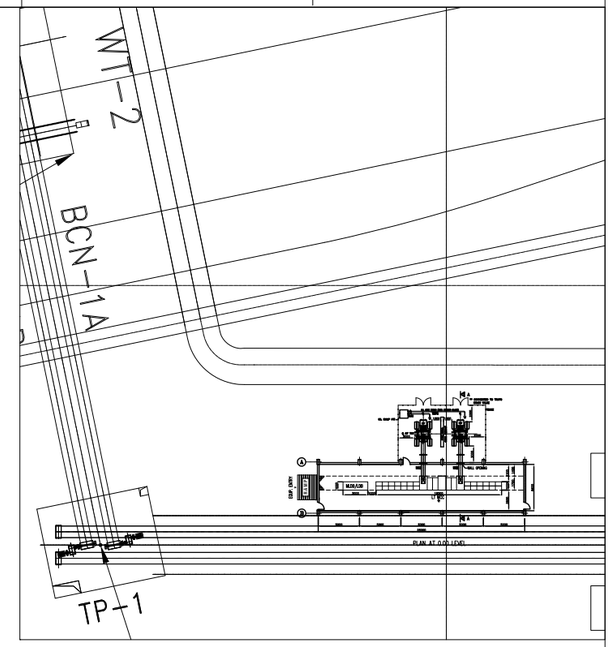
SIZE-A3

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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PLAN AT 0.00 LEVEL

DRG. NO. IS-3-EE-660-121-E140

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01				

	NAME	SIGN.	DATE
DESIGNED	BSS		26.10.12
DRAWN	NS		26.10.12
CHECKED	SVL		26.10.12
APPROVED	SVL		26.10.12

CAD — DIR : — FILE NO.:

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:
steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE :
ELECTRICAL EQUIPMENT LOCATION PLAN
MCC-3 ROOM NEAR WAGON TIPPLER

NO. OF SHEETS: 02
SHEET. NO.: 01

SCALE 1:75 | JOB NO. IS-1-10-2013 | DRG. NO. IS-3-EE-660-121-E140 | REV. 00

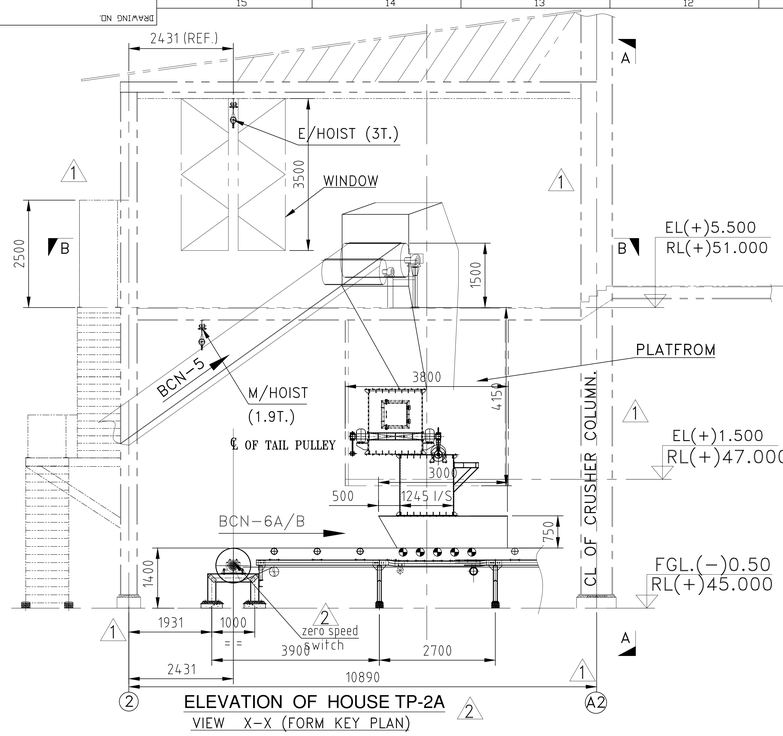
FORM 66-301 A

SIZE-A3

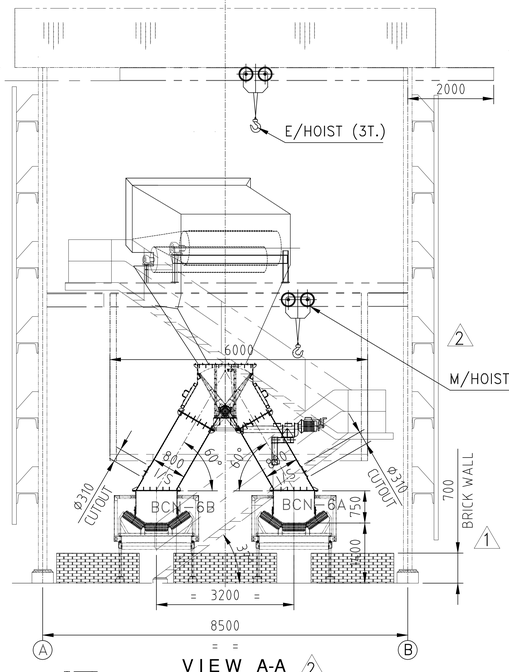
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ALL DIMENSIONS ARE IN MM

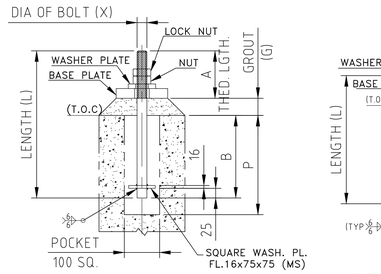
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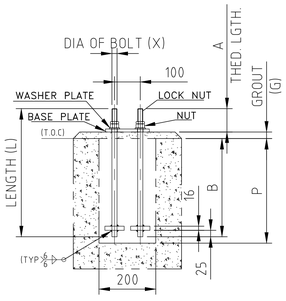
ELEVATION OF HOUSE TP-2A
VIEW X-X (FORM KEY PLAN)



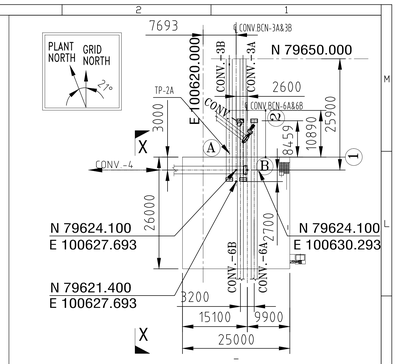
VIEW A-A



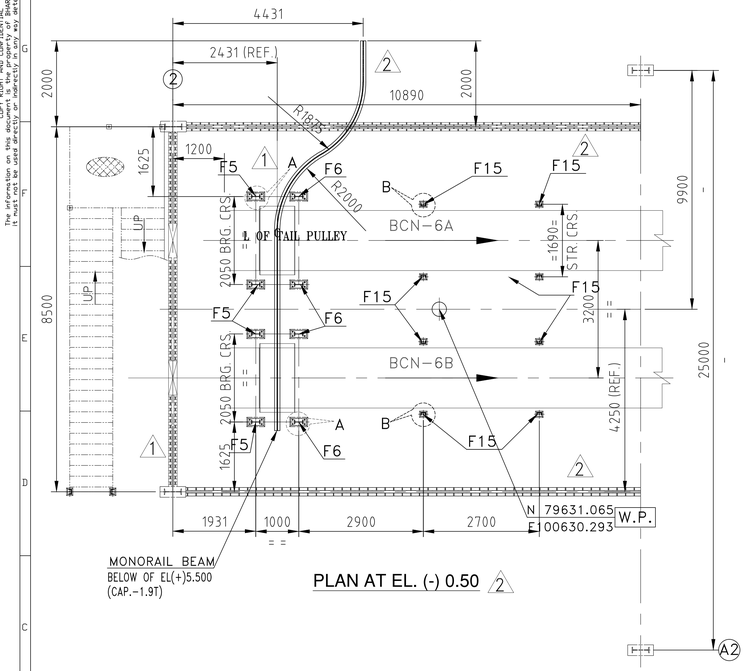
TYP. DETAIL OF ANCHOR BOLT
VIEW F-F



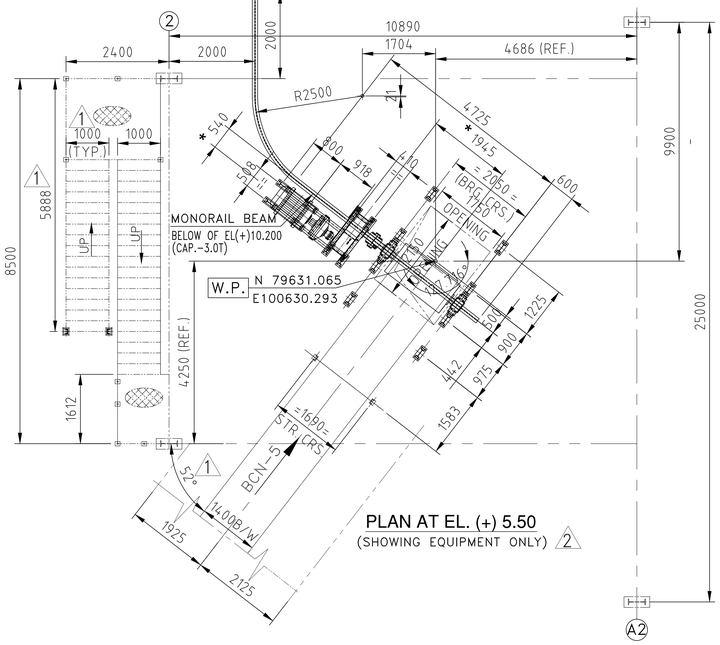
TYP. DETAIL OF ANCHOR BOLT
VIEW E-E



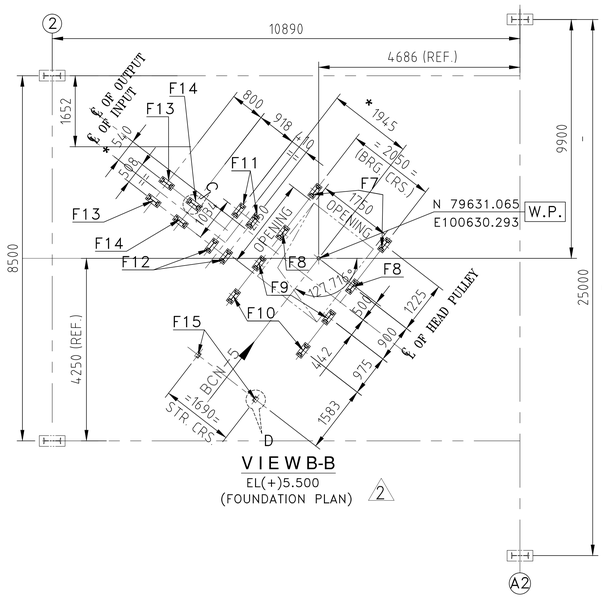
KEY PLAN



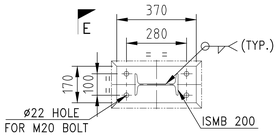
PLAN AT EL. (-) 0.50



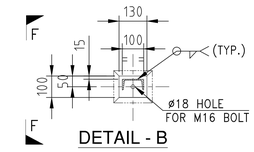
PLAN AT EL. (+) 5.50
(SHOWING EQUIPMENT ONLY)



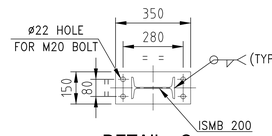
VIEW B-B
EL(+)5.500
(FOUNDATION PLAN)



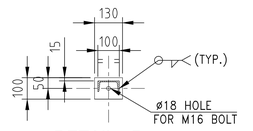
DETAIL - A
(FOR F5 TO F6)



DETAIL - B



DETAIL - C
(FOR F7 TO F14)



DETAIL - D

LOAD DATA

POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T) ⟷	LOCATION
F5	1.0	-	-	TAIL FRAME
F6	-	0.5	-	"
F7	0.85	-	10.5	HEAD FRAME
F8	-	1.7	10.5	"
F9	-	2.9	10.5	"
F10	-	0.75	0.5	"
F11	-	2.5	-	DRIVE FRAME
F12	2.0	-	-	"
F13	-	0.5	-	"
F14	-	0.25	-	"
F15	-	0.5	-	STR. SUPPORT

NOTE :-
1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB-BARAUNI DRG. NO. PE-DG-374-100-M001 (Rev. 01)
3. RL. (+) 45.0M CORRESPONDS TO EL. (-) 0.5(FGL)
4. ALL CIVIL, STRUCTURAL WORKS INCLUDING MONORAIL ARE IN BHEL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002

BARAUNI ANCHOR BOLT LIST (MECHANICAL)

SL.NO.	DESCRIPTION	DWG. NO.	SIZE OF BOLT (X)	NO. OF BOLTS	NO. OF NUTS	NO. OF LOCK NUTS	NO. OF PLAIN WASHER	Sq. pl.	PROJECTED (A+G)	THREADED (A)	GROUT (G)	LENGTH (L)	(B)	POCKET 100 SQ. (P) LG.
EMERGENCY RECLAIM HOUSE														
1.	TAIL FRAME	MHPD/1061/ BSEBB/M/149	M20	16+16	16+16	16+16	16+16	75 SQ.x16 THK.	125	100	25	550	400	450
2.	SHORT POST		M16	4+4	4+4	4+4	4+4	75 SQ.x16 THK.	125	100	25	450	300	350

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
2	20.06.12	DRG. REVISED AS PER BHEL COMMENT DATED	A.BAUL	G.M	G.M
1	27.04.12	DRG. REVISED AS PER BHEL COMMENT DATED 4.17.12	T.K.ROY	G.C	G.M

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.
REV. NAME SIGN DATE
ALTERED
CHECKED
APPROVED
ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/149 REV. 2

	NAME	SIGN	DATE
DRN.	S.KUMAR		16.03.2012
CHD.	J.C.		17.03.2012
APPD.	SSG		17.03.2012

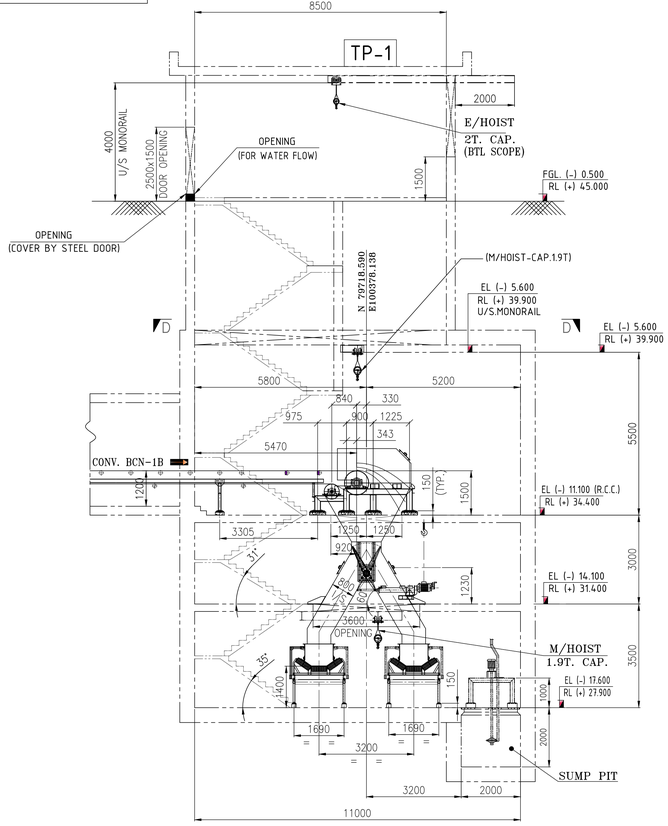
DIRECTORY :
FILE NO. :
SCALE 1:60

TITLE : GA & LOADDATA FOR TP-2A
BHEL DRAWING NO. IS-1-GA-660-103-M015 REV. 2
SHEET NO. 1 OF 1 NO.OF SHTS. 1

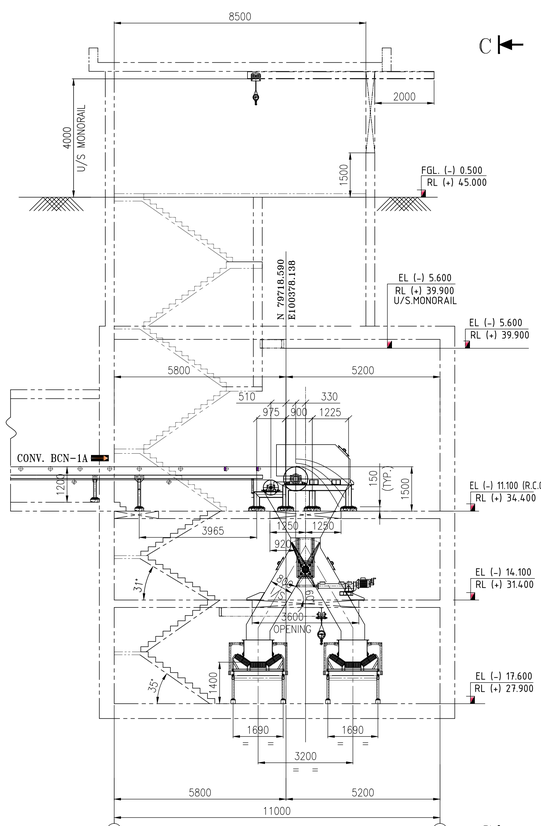
ELECTRONIC FILE NAME

FORMAT SIZE A1

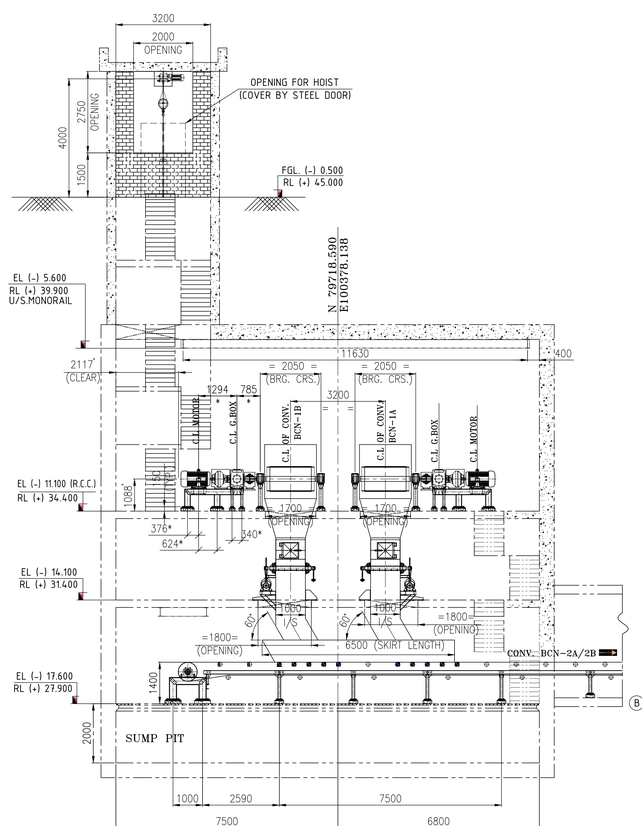
ALL DIMENSIONS ARE IN MM



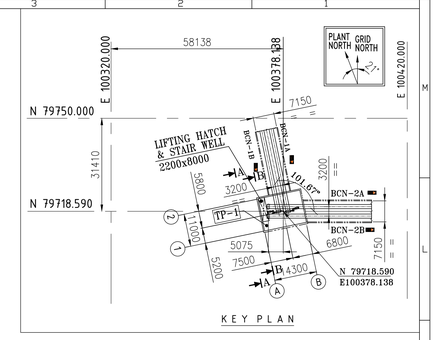
V I E W A – A
(VIEW FROM KEY PLAN)



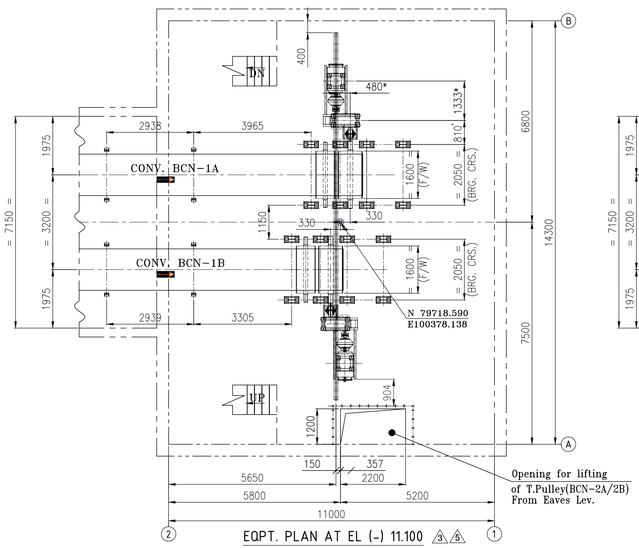
V I E W B – B
(VIEW FROM KEY PLAN)



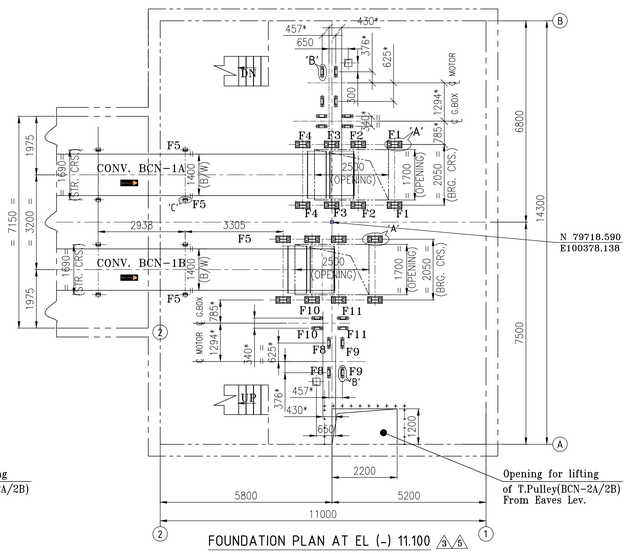
V I E W C – C
(VIEW FROM KEY PLAN)



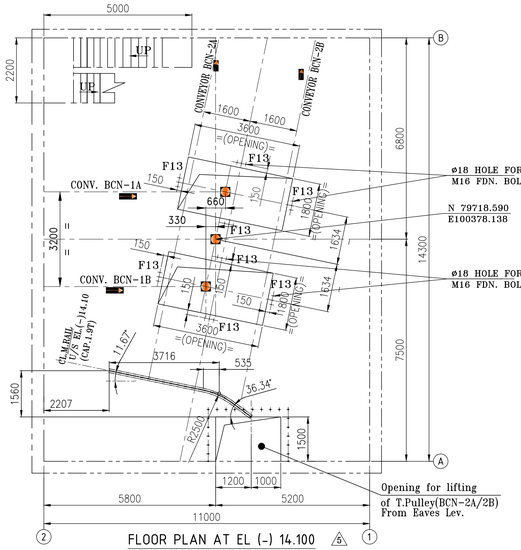
K E Y P L A N



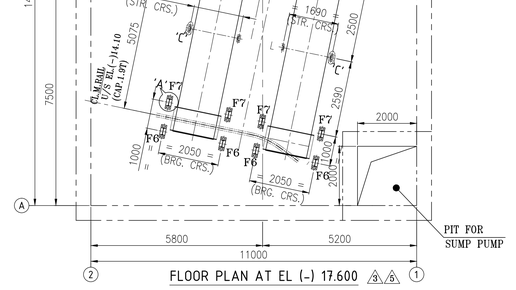
EQPT. PLAN AT EL (-) 11.100



FOUNDATION PLAN AT EL (-) 11.100



FLOOR PLAN AT EL (-) 14.100



FLOOR PLAN AT EL (-) 17.600

NOTE:–

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLANT LAYOUT & SYSTEM ELEVATION OF BSEB-BARAUNI DRG. NO. IS-0-PL-660-100-M001 / IS-0-GA-660-101-M004
3. DIMENSION MKD. THUS (*)ARE TENTATIVE & WILL BE FINALISED IN DUE COURSE.
4. RL.(+) 45.00M CORRESPONDS TO EL.(–) 0.500M(FGL).
5. CIVIL, STRUCTURAL WORKS INCLUDING MONORAIL ARE NOT IN BTL'S SCOPE, BUT FDN. BOLT/INSERT PL. & GROUTING OF PEDESTAL FOR BTL'S SUPPLIED EQUIPMENT SHOWN IN DRG. ARE IN BTL'S SCOPE
6. SEPARATE DRG. WILL BE FURNISHED FOR VENTILATION DUCT, DS, DW& SW.

ALL FOUNDATION BASED ON CIVIL DRG.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	23.08.12	GENERALLY REVISED DURING MEETING AT STEAG DATED 23.08.12 6	R.R	J.C	
5	08.06.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 04.06.12 5	R.R	J.C	
4	11.05.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 05.11.12 4	R.R	J.C	
3	09.05.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 04.16.12 3	R.R	J.C	
2	23.03.12	GENERALLY REVISED AS PER STEAG COMMENTS DTD. 13.03.12	TKR	J.C	
1	21.02.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 07.02.12	R.R	T.K.R	J.C

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV. 2

	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

steag

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700070

BTL DRG. NO. MHPD/1061/BSEBB/M/014 REV. 7

	NAME	SIGN	DATE
DRN.	BUBUN		16.01.12
CHD.	T.K.ROY		17.01.12
APPD.	G.M		17.01.12

DIRECTORY :

SCALE 1 : 100

FILE NO. :

TITLE : GA & LOAD OF TP–1

BHEL DRAWING NO. IS-1-GA-660-104-M016 REV. 4

SHEET NO. 1 OF 2 NO.OF SHTS. 2

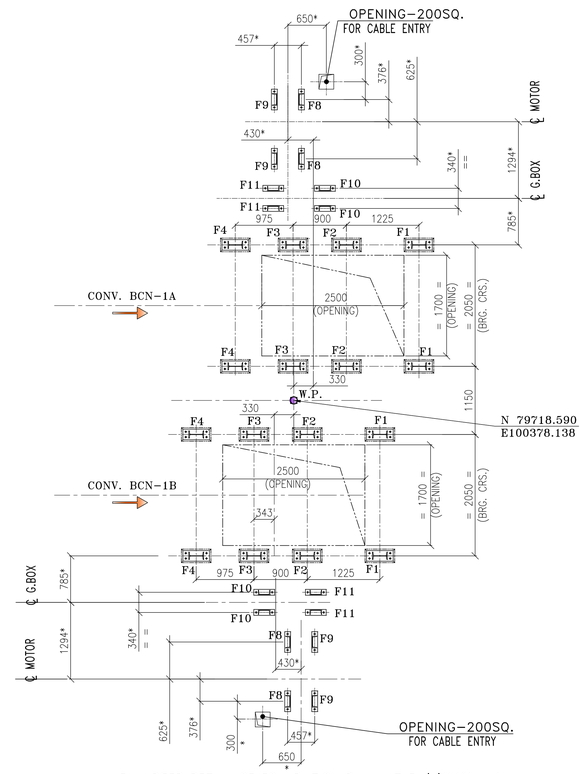
FORMAT SIZE A1

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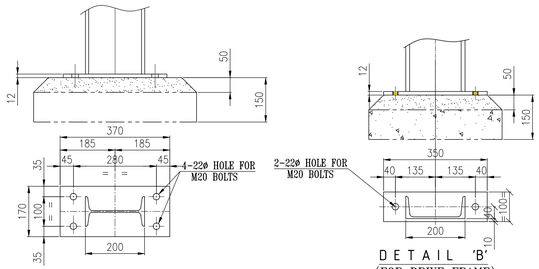
ELECTRONIC FILE NAME

COPY RIGHT AND CONFIDENTIAL
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ALL DIMENSIONS ARE IN MM

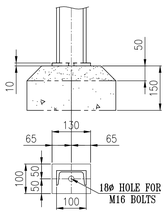


ENLARGED DETAIL OF FOUNDATION PLAN AT EL.(-)11.100 ③

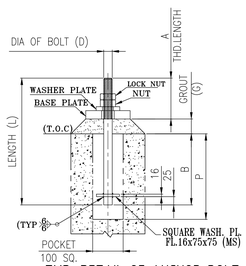


DETAIL 'A'
(FOR HEAD & TAIL FRAME)

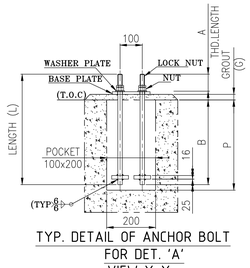
DETAIL 'B'
(FOR DRIVE FRAME)



DETAIL 'C'
(FOR SHORT POST)

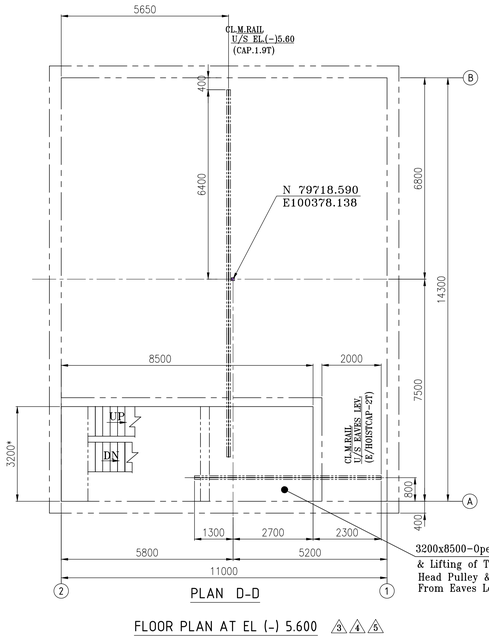


TYP. DETAIL OF ANCHOR BOLT
FOR DET. 'B' & 'C'
VIEW Y-Y



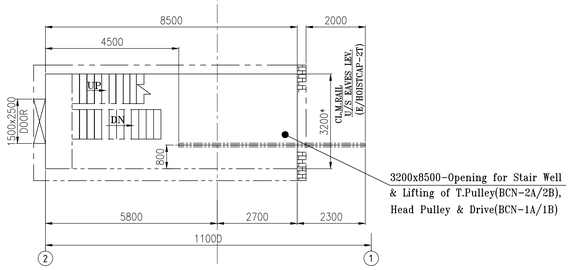
TYP. DETAIL OF ANCHOR BOLT
FOR DET. 'A'
VIEW X-X

LOAD DATA				
POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ←→	LOCATION
F1	1.0	–	6.5	HEAD FRAME
F2	–	2.5	6.5	HEAD FRAME
F3	–	2.0	6.5	HEAD FRAME
F4	–	1.2	1.5	HEAD FRAME
F5	–	.650	–	STRINGER
F6	2.0	–	7.3	TAIL FRAME
F7	–	2.5	7.3	TAIL FRAME
F8	0.4	–	–	DRIVE FRAME
F9	–	0.650	–	DRIVE FRAME
F10	1.7	–	–	DRIVE FRAME
F11	–	2.2	–	DRIVE FRAME
F12	–	.750	–	STRINGER
F13	–	1.2	–	CHUTE SUPPORT



PLAN D–D

FLOOR PLAN AT EL (-) 5.600 ③④⑤



FLOOR PLAN AT FGL. (–) 0.500 ⑤

NOTE :–
FOR GENERAL NOTES REF.DRG.NO.IS–1–GA–660–104–M016 (Sht–1 OF 2)
ALL FOUNDATION WILL BE BASED ON CIVIL DRG.

BARAUNI ANCHOR BOLT LIST (MECHANICAL)

SL.NO.	DESCRIPTION	DWG. NO.	SIZE OF BOLT (X)	NO. OF BOLTS	NO. OF NUTS	NO. OF LOCK NUTS	NO. OF PLAIN WASHER	Sq. pl.	PROJECTED (A+G)	THREADED (A)	GROUT (G)	LENGTH (L)	(B)	POCKET 100 SQ. (P) LG.
HOUSE : TP–1														
1.	HEAD FRAME	TP–1 MHPD/1061/BSEBB/M/014	M20	32+32	32+32	32+32	32+32	75 SQ.x16 THK.	100	75	25	250	150	200
2.	DRIVE FRAME		M20	16+16	16+16	16+16	16+16	75 SQ.x16 THK.	100	75	25	250	150	200
3.	TAIL FRAME		M20	16+16	16+16	16+16	16+16	75 SQ.x16 THK.	100	75	25	250	150	200
4.	SHORT POST		M16	12+12	12+12	12+12	12+12	75 SQ.x16 THK.	85	60	25	235	150	200

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	23.08.12	GENERALLY REVISED DURING MEETING AT STEAG DATED 23.08.12 ⑥	R.R	J.C	
5	08.06.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 04.06.12 ⑤	R.R	J.C	
4	11.05.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 05.11.12 ④	R.R	J.C	
3	09.05.12	GENERALLY REVISED AS PER BHEL COMMENTS DTD. 04.16.12 ③	R.R	J.C	
2	23.03.12	GENERALLY REVISED AS PER STEAG COMMENTS DTD. 13.03.12	TKR	J.C	

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS — QTY.
REV. — NAME — SIGN — DATE
ALTERED
CHECKED
APPROVED
ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

steag

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700070

BTL DRG. NO. MHPD/1061/BSEBB/M/014 — REV. 7

	NAME	SIGN	DATE
DRN.	T.K.ROY		21.03.12
CHD.	J.C		22.03.12
APPD.	J.C		22.03.12

DIRECTORY :
FILE NO. :
SCALE 1 : 100

TITLE : GA & LOAD OF TP–1

BHEL DRAWING NO. IS–1–GA–660–104–M016 — REV. 4

SHEET NO. 2 OF 2 — NO.OF SHTS. 1

ELECTRONIC FILE NAME

FORMAT SIZE A1

DRAWING NO.

ALL DIMENSIONS ARE IN MM

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It must not be used directly or indirectly by any person without the written consent of the company.

ELECTRONIC FILE NAME

DRINCKING WATER ⚠6

EL(+)25.250
RL.(+)70.75
(U/S OF M.RAIL)

EL(+)20.550
RL.(+)66.05
(T.O.C)

DEBRI CHUTE SCOPE BY BHEL ⚠6

M/HOIST (1.9T.)

EL(+)14.050
RL.(+)59.55
(T.O.C)

HOOK CAPACITY=2T FOR BEND PULLEY

CONV. BCN-5A/3B

E/HOIST (21.1T)

EL(+)11.950

EL(+)9.850

EL(+)7.750

EL(+)5.650

EL(+)3.550

EL(+)1.450

FGL.(−)0.500
RL.(+)45.00

BRICK WALL

VIEW B–B
(FROM KEY PLAN & ELEVATION)

HOOK CAPACITY=2T FOR BEND PULLEY

M/HOIST (1.9T.)

CONV. BCN-2A/2B

EL(+)17.850
RL.(+)63.35

EL(+)10.450
RL.(+)55.95

EL(+)11.075
RL.(+)56.557

TRESTLE

CONV. BCN-3A

CONV. BCN-3B

VIEW A–A(FROM KEY PLAN) ⚠4
ELEVATION

EL(+)17.325
RL.(+)62.825
(T.O.STEEL)

1500x2000
OPENING for
Lifting of Tail Pulley
of Conv.3A & 3B ⚠1

LOAD DATA

POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ⟷	LOCATION
F1	3.5	–	2.0	HEAD FRAME
F2	–	4.5	2.0	
F3	–	5.2	2.0	
F4	–	1.2	1.3	DRIVE FRAME
F5	2.5	–	–	x
F6	–	2.3	–	
F7	–	1.5	–	
F8	0.6	–	–	
F9		0.30	–	
F10		0.4	–	
F11	1.3	–	3.9	TAIL FRAME
F12	–	1.30	3.8	TAIL FRAME
F13	–	.850	–	STRINGER
F14	–	1.0	–	CHUTE SUPPORT

B.PL.10Thk. / B.PL.16Thk. / POST MC100 / POST MB200

⚠4 DETAIL–3
FOR SHORT POST
& FOR DRIVE FRAME

DETAIL–2
FOR DRIVE FRAME

PLANT GRID NORTH / GRID NORTH

KEY PLAN ⚠1

W.P N79718.590
E100627.693

N79718.590

TP–2

BCN–2A / BCN–2B / BCN–3A / BCN–3B

STAIRS ⚠4

℄MONORAIL (BELOW EAVES LEV.)

Door For M.Rail EXIT

W.P N79718.590
E100627.693

℄G.BOX ℄CONV. ℄MOTOR

300ø DEBRIS CHUTE

BCN 2A / BCN 2B

PLAN AT EL.(+) 20.550 △
SHOWING DRIVE & M.RAIL POSITION

B.PL.12Thk. / POST MB200

DETAIL–1
FOR HEAD FRAME

1500x2000
OPENING for
Lifting of Tail Pulley
of Conv.3A & 3B ⚠1

OPENING FOR CABLE ENTRY

℄MONORAIL (BELOW EL.+20.550)

℄CONV.BCN–2A ℄CONV.BCN–2B

⚠4 PLAN AT EL.(+) 20.550(T.O.STEEL) ⚠1

℄ OF V.G.T.U. BCN5.

VIEW AT 1–1

PLAN AT FGL.(−) 0.500 ⚠3

10 THK. PLATE

C/WT SNAP GUARD (ISA 50 x 50 x 6)

VIEW P – P

VIEW R – R

4 NOS. ø22 HOLE FOR M20 BOLTS

ø152.4 PIPE

WASHER PL. 50 SQ. x 16THK.

D E T A I L 'E'
(FOR VGTU POST)

ISA 50x50x6

10THK. BASE PL

12THK. INSERT PL

D E T A I L 'F'
(FOR WIRE MESH GUARD)

BHEL SCOPE

W.P N79718.590
E100627.693

300ø DEBRIS CHUTE

SAND PIT(TYP)
1500x2200x1000depth ⚠1

PLAN AT EL.(+) 14.050(T.O.C) ⚠3

WATER TANK
size decided by BHEL

HOIST MAINTENANCE PLATFORM HUNG FROM ROOF

PLAN AT EL.(+) 17.325(T.O.STEEL) ⚠6

32 NB HANDRAIL

NOTE :–

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS–0–PL–660–100–M001 & FLOW DIAGRAM DRG.NO. IS–1–FL–660–100–M002 & GA. OF CONV.PROFILES DRG. NO. IS–0–GA–660–100–M004 (3Snts.)
3. RL (+) 45.0 M CORRESPONDS TO EL (–) 0.500 (FGL)
4. CIVIL, STRUCTURAL WORKS INCLUDING MONORAIL ARE NOT IN BTL'S SCOPE, BUT FOUNDATION BOLT/INSERT PL. & GROUTING OF PEDESTAL FOR BTL'S SUPPLIED EQUIPEMENT SHOWN IN DRG. ARE IN BTL'S SCOPE.
5. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
6. FOR GA OF BELT CONVEYOR 2–A/B, REFER DRG. NO.: IS–1–GA–66–101–M007
7. FOR GA OF BELT CONVEYOR 3–A/B, REFER DRG. NO.: IS–1–GA–66–101–M008
8. THE LOADS FURNISHED IN THE DRG. ARE EQUIPMENT LOADS ONLY, ALL OTHER LOADS LIKE LIVE LOAD VARIOUS FLOORS/PLATFROMS, WALKWAYS. STAIRCASES,ETC, WIND LOAD & SEISMIC LOADS SHALL BE CONSIDERED WHILE DESIGNING THE STRUCTURE AS PER REQUIREMENT.
9. DIMENSIONS MARKED WITH ASTERISKS(*)ARE SUBJECT TO CHANGES AFTER APPROVAL OF RELEVANT CONVEYOR DRIVE GA DRGS.
10. SEPARATE CIVIL/STRUCTURAL DESIGN & DETAILED DRAWING SHALL BE GENERATED FOR CONSTRUCTION PURPOSE.
11. SKIRT BOARD LENGTH SHALL BE SUIT TO DSS REQUIREMENTS.
12. DETAIL OF ELECTRICAL LAYOUT, UTILITY FACILITIES, ILLUMINATION OF JUNTION TOWERS, CONVEYOR GALLERIES SHALL BE SHOWN IN SEPARATE DRAWINGS.
13. THIS DRG. IS TO BE READ IN CONJUNCTION WITH DESIGN BASIS REPORT OF SERVICE WATER SYSTEM, Drg. no.: IS–4–DC–660–110–M144, P&ID FOR HIGH PRESSURE MIST GENERATING SYSTEM, Drg. no.: IS–3–PI–660–110–M153, P&ID FOR POTABLE WATER SYSTEM, Drg. no.: IS–3–PI–660–110–M208, DBR FOR POTABLE WATER SYSTEM, Drg. no.: IS–4–DC–660–110–M209 & DBR FOR HIGH PRESSURE MIST GENERATING SYSTEM, Drg. no.: IS–4–DC–660–110–M210.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	24.08.12	REVISED DURING MEETING AT STEAG Dated 23.08.12 & MKD. ⚠6	AB	JC	GM
5	25.07.12	REVISED AS PER STEAG COMMENTS Dated 17.07.12 & MKD. ⚠5	AB	JC	GM
4	28.06.12	REVISED AS PER STEAG COMMENTS Dated 11.05.12 & MKD. ⚠4	AB	JC	GM
3	11.05.12	REVISED AS PER STEAG COMMENTS Dated 11.05.12 & MKD. ⚠3	RR	JC	GM
2	07.05.12	REVISED AS PER STEAG COMMENTS Dated 03.05.12 & MKD. ⚠2	RR	JC	GM
1	07.04.12	REVISED AS PER STEAG COMMENTS Dated 02.04.12 & MKD. ⚠1	TKR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700070

BTL DRG. NO. MHPD/1061/BSEBB/M/016 REV. 6

	NAME	SIGN	DATE
DRN.	TKROY		04.02.12
CHD.	GM		06.02.12
APPD.	SSG		06.02.12

DIRECTORY :

FILE NO. :

SCALE 1:100

TITLE :
GA & LOAD DATA OF TP–2

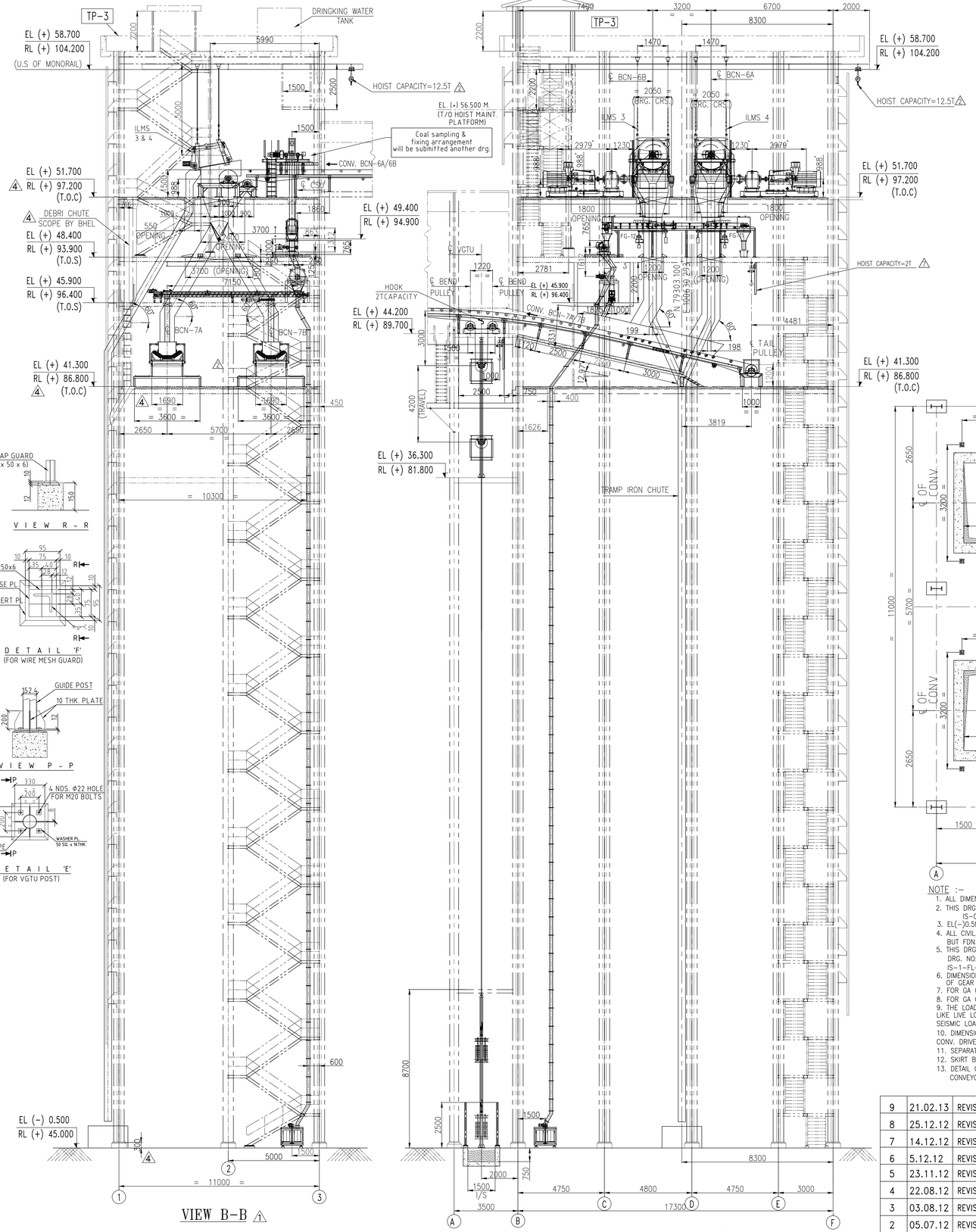
BHEL DRAWING NO. IS-1-GA-660-104-M017 REV. 5

SHEET NO. 1 OF 1 NO.OF SHTS. 1

FORMAT SIZE A1

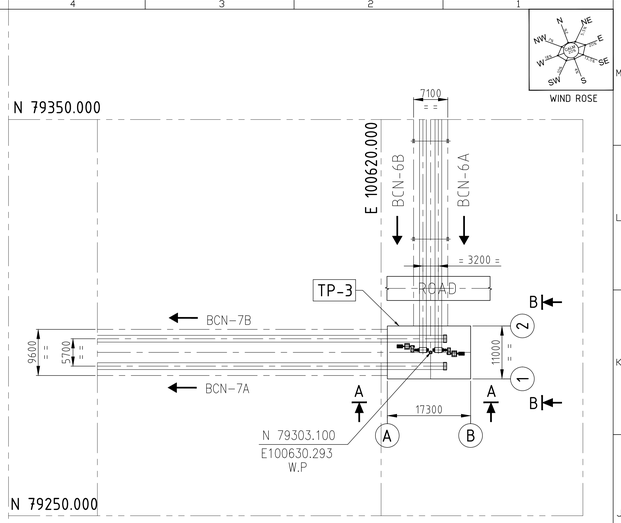
ALL DIMENSIONS ARE IN MM

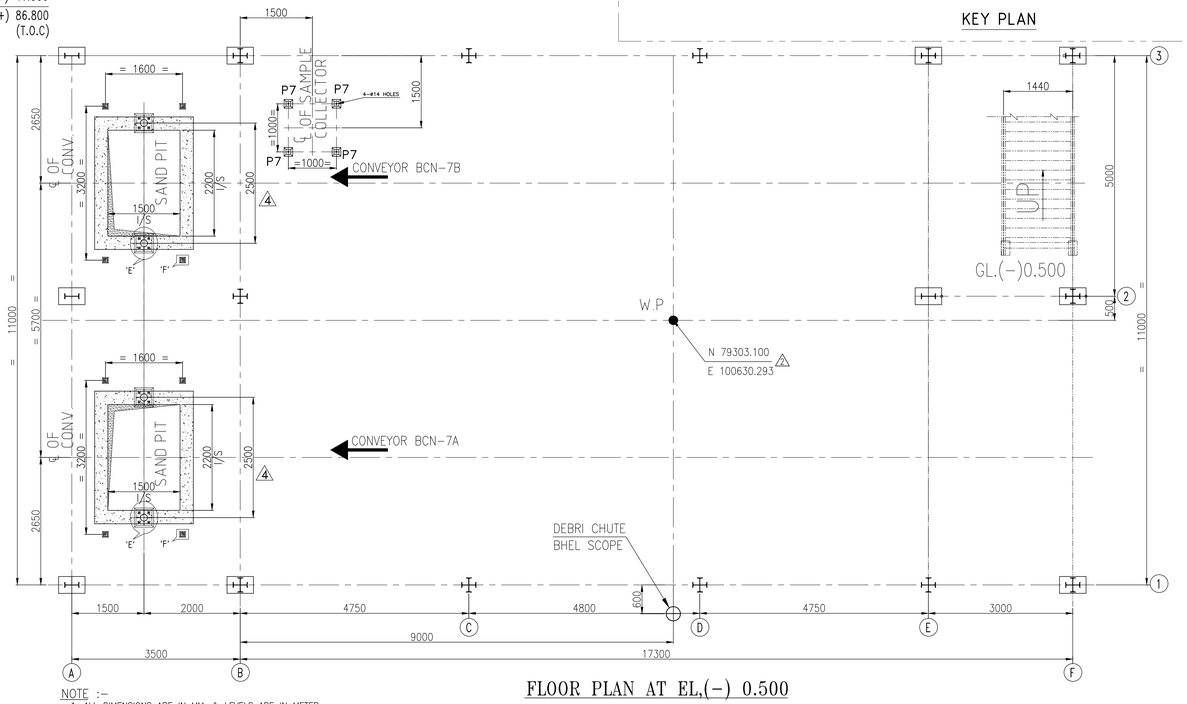
DRAWING NO.



LOAD DATA

POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T)	LOCATION
F1	3.7	–		
F2	–	4.5	4.2	HEAD FRAME (FLOOR LEVEL EL(+)51.700)
F3	–	5.2		
F4	–	1.2		
F5	–	1.5	3.5	TAIL FRAME (FLOOR LEVEL EL(+)41.300)
F6	0.8	–		
F7	–	1.0	–	DRIVE BASE (FLOOR LEVEL GL(+)51.700)
F8	0.5	–		
F9	–	5.6		
F10	–	5.0		
F11	–	5.0		
F12	–	0.5		SHORT POST
F12A		0.85		
F13		1.4		BEND FRAME (FLOOR LEVEL GL(±)44.200)
F14		1.4		
F15		1.6		
F16		1.2		CHUTE SUPPORT





NOTE :-
1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PROFILE DRG.(3-Shts.) BSEB-BARAUNI DRG. NO. IS-0-GA-660-101-M004(Rev. 6)
3. EL(-)0.5M ELEVATION CORRESPONDS TO RL. (+)45.0 M. (FGL LEVEL)
4. ALL CIVIL, STRUCTURAL WORKS INCLUDING MONORAIL ARE NOT IN BTL'S SCOPE, BUT FDN. BOLT /INSERT PL. & GROUTING OF PEDESTAL SHOWN IN DRG. ARE IN BTL'S SCOP.
5. THIS DRG. IS TO BE READ IN CONJUNCTION WITH GENERAL PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 (Rev.4), FLOW DIAGRAM DRG.NO. IS-1-FL-660-100-M002(Rev.2) & PROFILE DRG.NO.IS-0-GA-660-101-M004(3Shts)(Rev.6)
6. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
7. FOR GA OF BELT CONV.6A/B, REFER DRG.NO ; IS-1-GA-66-101-M012
8. FOR GA OF BELT CONV.7A/B, REFER DRG.NO ; IS-1-GA-66-101-M013
9. THE LOADS FURNISHED IN THE DRG. ARE EQUIPMENT LOADS ONLY,ALL OTHER LOADS LIKE LIVE LOAD VARIOUS FLOORS/PLATFORMS, WALKWAYS, STAIRCASES,ETC. WIND LOAD & SEISMIC LOADS SHALL BE CONSIDERED WHILE DESIGNING THE STRUCTURE AS PER REQUIREMENT
10. DIMENSION MARKED WITH ASTERISKS(*) ARE SUBJECT TO CHANGES AFTER APPROVAL OF RELEVANT CONV. DRIVE GA DRGS.
11. SEPARATE CIVIL /STRUCTURAL DESIGN & DETAILED DRAWING SHALL BE GENERATED FOR CONSTRUCTION PURPOSE
12. SKIRT BOARD LENGTH SHALL BE SUIT TO DSS REQUIREMENTS.
13. DETAIL OF ELECTRICAL LAYOUT, UTILITY FACILITIES, ILLUMINATION OF JUNCTION TOWERS. CONVEYOR GALLERIES SHALL BE SHOWN IN SEPARATE DRAWINGS.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
9	21.02.13	REVISED AS PER BHEL/STEAG COMMENTS Dated 15.02.13 . 9	RR	JC	
8	25.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 18.12.12 . 8	RR	JC	GM
7	14.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 06.12.12 . 7	RR	JC	GM
6	5.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 04.12.12 . 6	RR	JC	GM
5	23.11.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 06.11.12 . 5	RR	JC	GM
4	22.08.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 22.08.12 . 4	RR	JC	GM
3	03.08.12	REVISED AS PER BHEL COMMENTS Dated30.07.12 & MKD. 3	RR	JC	GM
2	05.07.12	REVISED AS PER BHEL COMMENTS Dated 20.06.12 & MKD. 2	RR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/017 REV. 9

	NAME	SIGN	DATE
DRN.	G.M		15.03.12
CHD.	J.C		21.03.12
APPD.	SSG		22.03.12

DIRECTORY :
FILE NO. :
SCALE 1:125

TITLE :
GA & LOAD DATA OF TP-3

BHEL DRAWING NO. IS-1-GA-660-104-M020 REV. 6

SHEET NO. 1 NO.OF SHTS. 3

FORMAT SIZE A1

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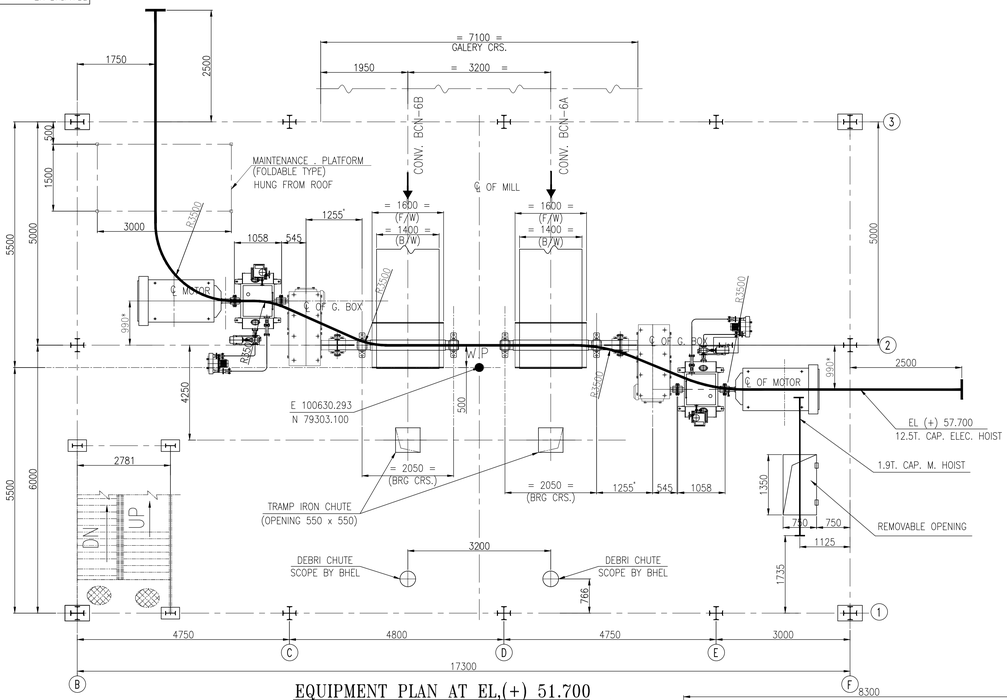
ELECTRONIC FILE NAME

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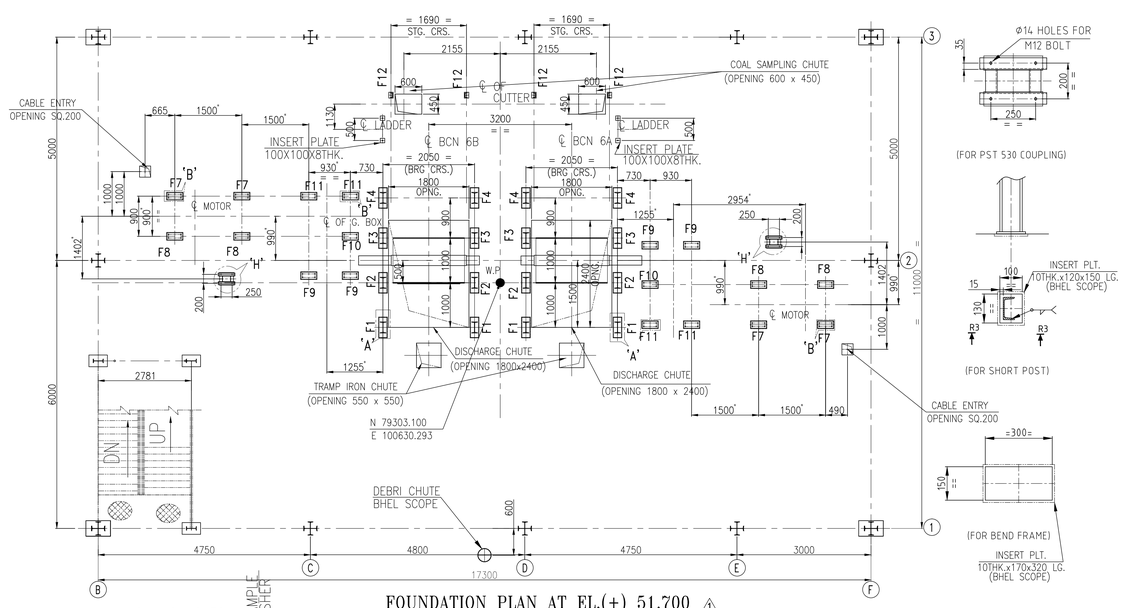
ALL DIMENSIONS ARE IN MM

DRAWING NO.

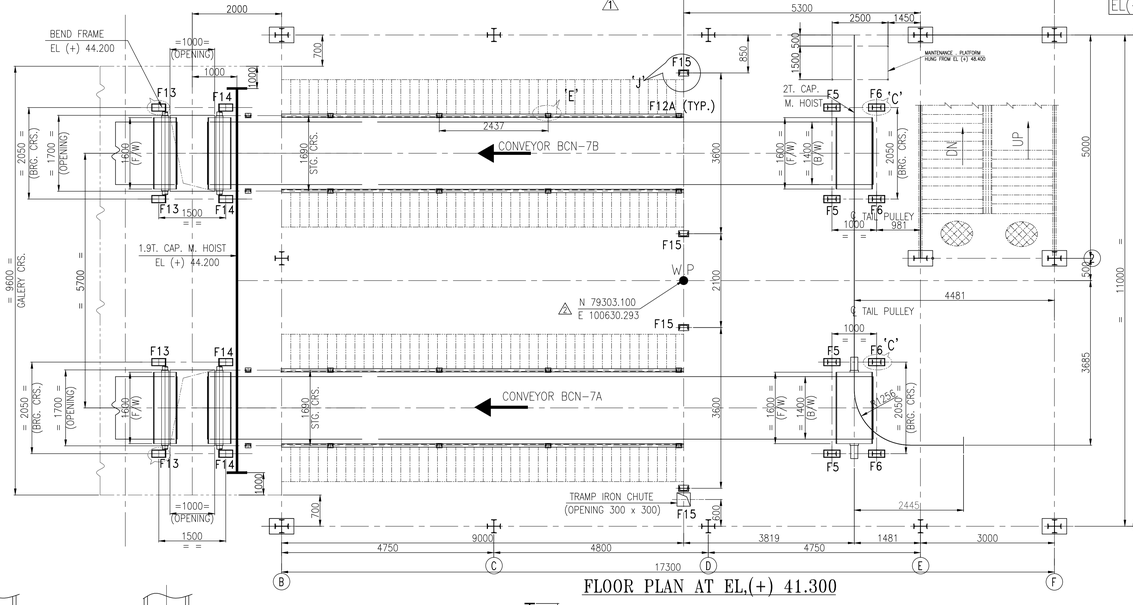
EQUIPMENT PLAN AT EL,(+) 51.700



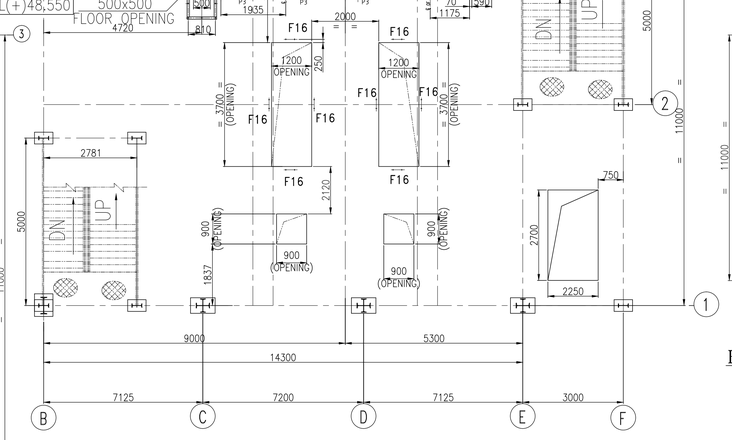
FOUNDATION PLAN AT EL,(+) 51.700 ⚠1



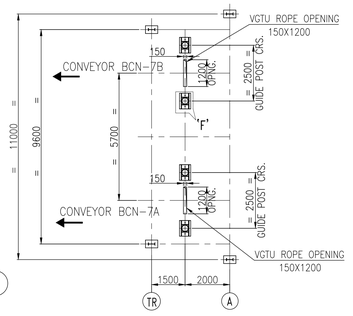
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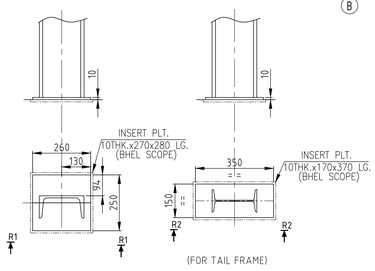


FLOOR PLAN AT EL,(+) 48.400

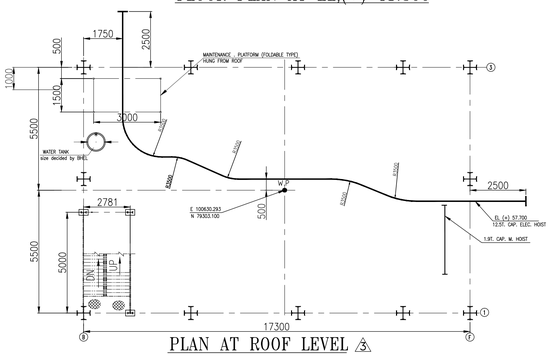


FLOOR PLAN AT EL,(+) 36.300

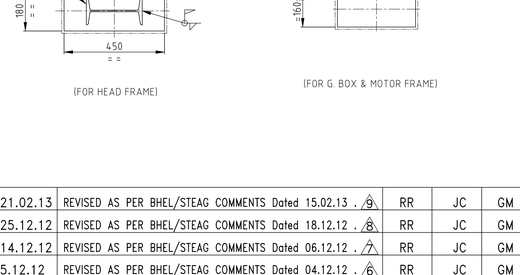




(FOR TAIL FRAME)



PLAN AT ROOF LEVEL ⚠3



(FOR HEAD FRAME)

(FOR G. BOX & MOTOR FRAME)

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
9	21.02.13	REVISED AS PER BHEL/STEAG COMMENTS Dated 15.02.13 . ⚠9	RR	JC	GM
8	25.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 18.12.12 . ⚠8	RR	JC	GM
7	14.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 06.12.12 . ⚠7	RR	JC	GM
6	5.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 04.12.12 . ⚠6	RR	JC	GM
5	23.11.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 06.11.12 . ⚠5	RR	JC	GM
4	22.08.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 22.08.12 . ⚠4	RR	JC	GM
3	03.08.12	REVISED AS PER BHEL COMMENTS Dated30.07.12 & MKD. ⚠3	RR	JC	GM
2	05.07.12	REVISED AS PER BHEL COMMENTS Dated 20.06.12 & MKD. ⚠2	RR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/017 — REV. 9

	NAME	SIGN	DATE
DRN.	G.M		15.03.12
CHD.	J.C		21.03.12
APPD.	SSG		22.03.12

DIRECTORY :
FILE NO. :
SCALE 1:125

TITLE : GA & LOAD DATA OF TP-3

BHEL DRAWING NO. IS-1-GA-660-104-M020 — REV. 6

SHEET NO. 2 — NO.OF SHTS. 3

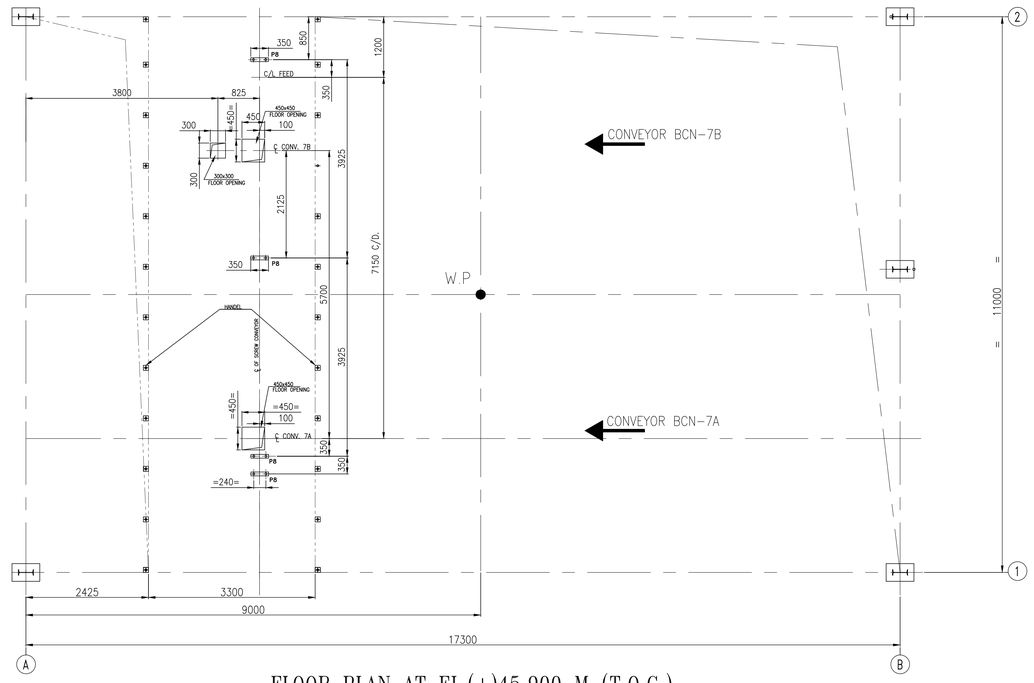
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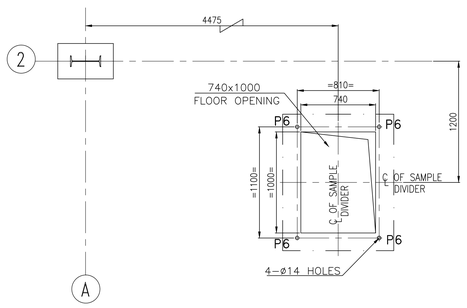
ALL DIMENSIONS ARE IN MM

DRAWING NO.



FLOOR PLAN AT EL.(+)45.900 M (T.O.C.)

FOUNDATION BOLT HOLES OF SCREW CONVEYOR



FLOOR PLAN AT EL.(+)47.200 M (T.O.S.)

FOUNDATION BOLT HOLES OF SAMPLE DIVIDER

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
9	21.02.13	REVISED AS PER BHEL/STEAG COMMENTS Dated 16.02.13 . 9	RR	JC	GM
8	25.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 18.12.12 . 8	RR	JC	GM
7	14.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 06.12.12 . 7	RR	JC	GM
6	5.12.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 04.12.12 . 6	RR	JC	GM
5	23.11.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 06.11.12 . 5	RR	JC	GM
4	22.08.12	REVISED AS PER BHEL/STEAG COMMENTS Dated 22.08.12 . 4	RR	JC	GM
3	03.08.12	REVISED AS PER BHEL COMMENTS Dated30.07.12 & MKD. 3	RR	JC	GM
2	05.07.12	REVISED AS PER BHEL COMMENTS Dated 20.06.12 & MKD. 2	RR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/017 REV. 9

	NAME	SIGN	DATE
DRN.	G.M		15.03.12
CHD.	J.C		21.03.12
APPD.	SSG		22.03.12

DIRECTORY :
FILE NO. :
SCALE 1:125

TITLE : GA & LOAD DATA OF TP-3

BHEL DRAWING NO. IS-1-GA-660-104-M020 REV. 6

SHEET NO. 3 NO.OF SHTS. 3

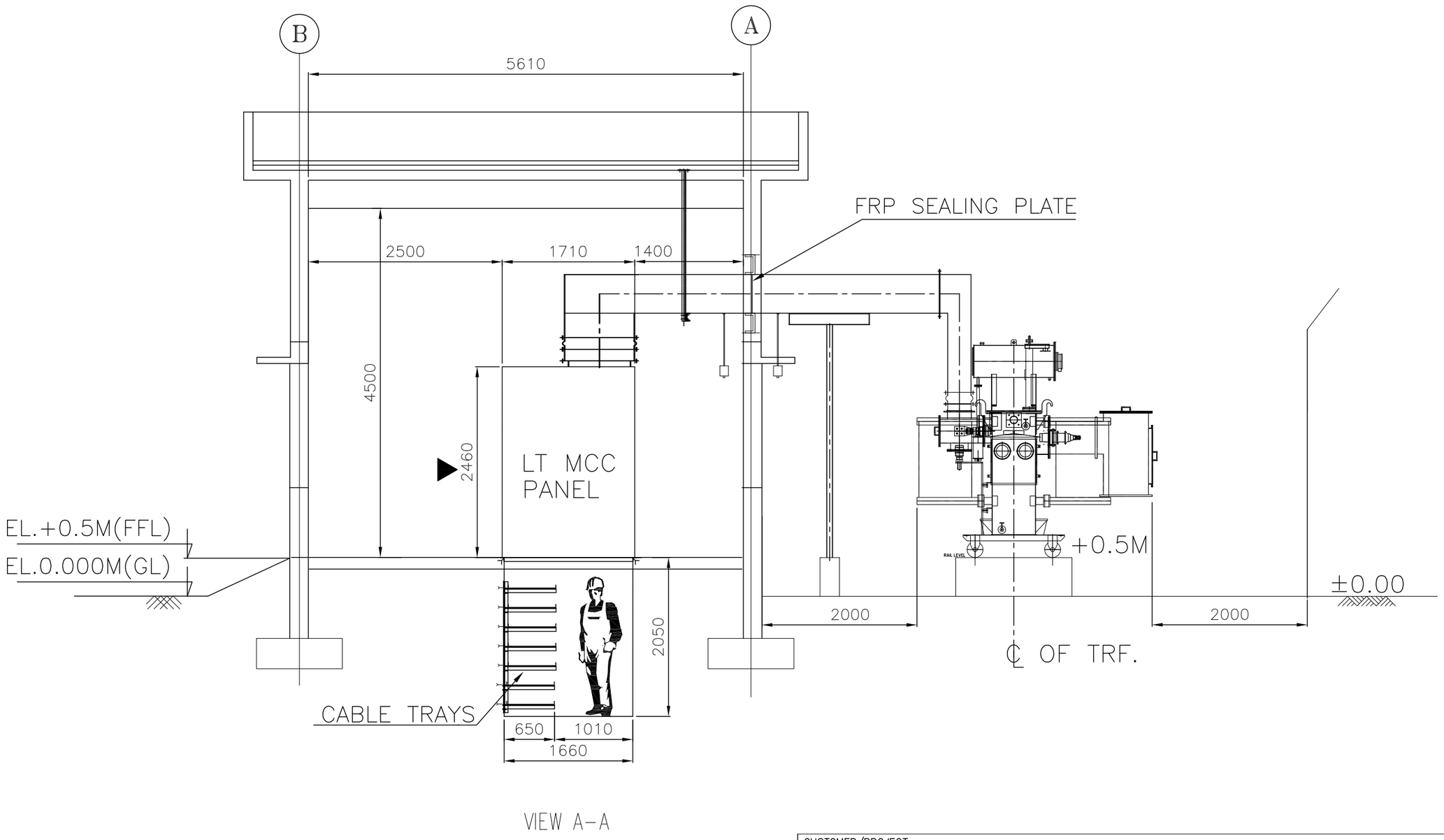
FORMAT SIZE A1

ELECTRONIC FILE NAME

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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VIEW A–A

DRG. NO. IS-3-EE-660-121-E140

CUSTOMER/PROJECT :

BIHAR STATE ELECTRICITY BOARD

2x250MW BARAUNI THERMAL POWER PROJECT
COAL HANDLING PLANT

CUSTOMER CONSULTANT:

steag STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP, BANGALORE

TITLE :

ELECTRICAL EQUIPMENT LOCATION PLAN
MCC–3 ROOM NEAR WAGON TIPPLER

NO. OF SHEETS 02

SHEET. NO. 02

SCALE 1:75 | JOB NO. IS–1–10–2013 | DRG. NO. IS-3-EE-660-121-E140 | REV. 00

	NAME	SIGN.	DATE
DESIGNED	BSS		26.10.12
DRAWN	NS		26.10.12
CHECKED	SVL		26.10.12
APPROVED	SVL		26.10.12

CAD DIR :
FILE NO.:

INVENTORY NO.

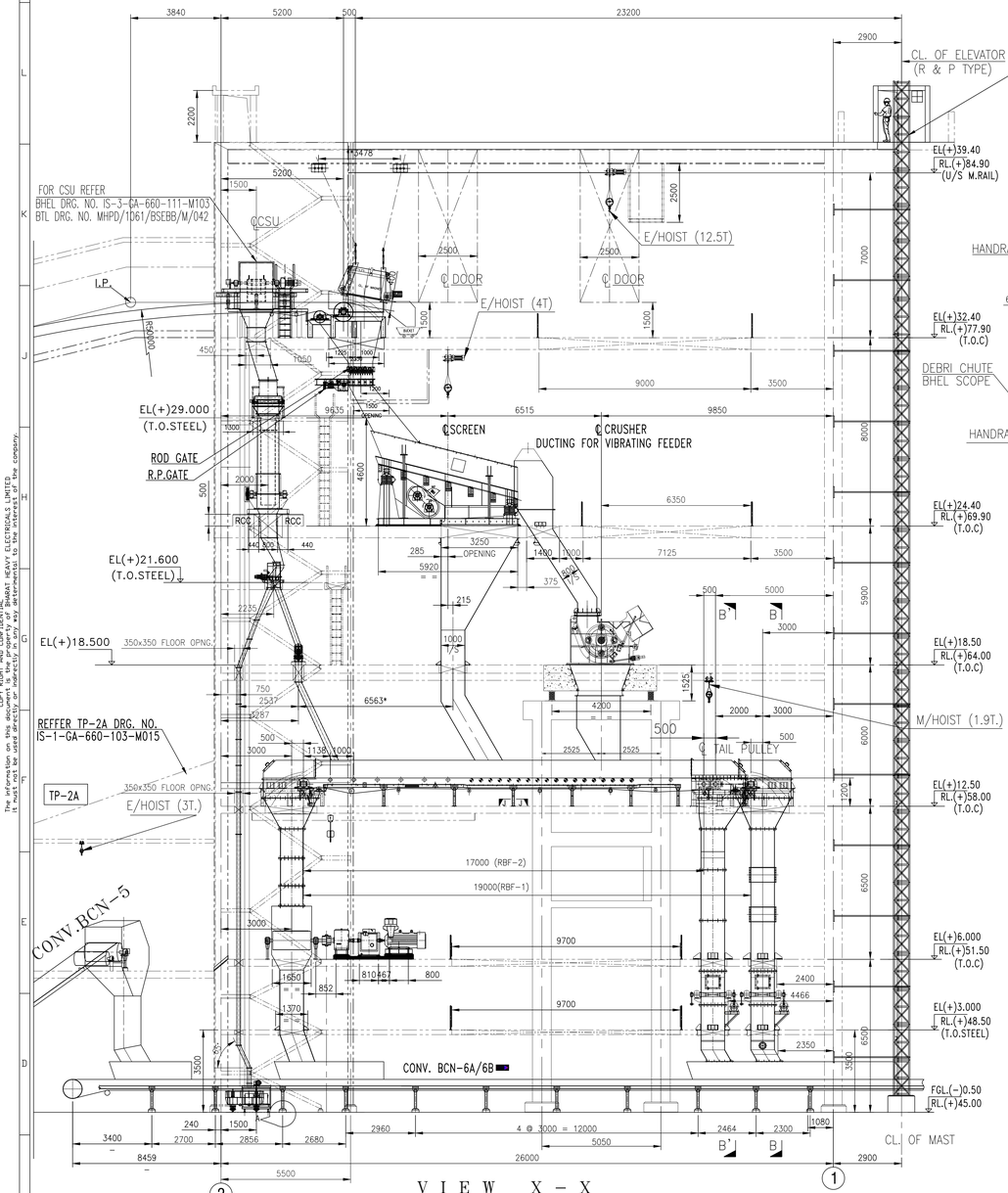
REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

FORM 66–301 A

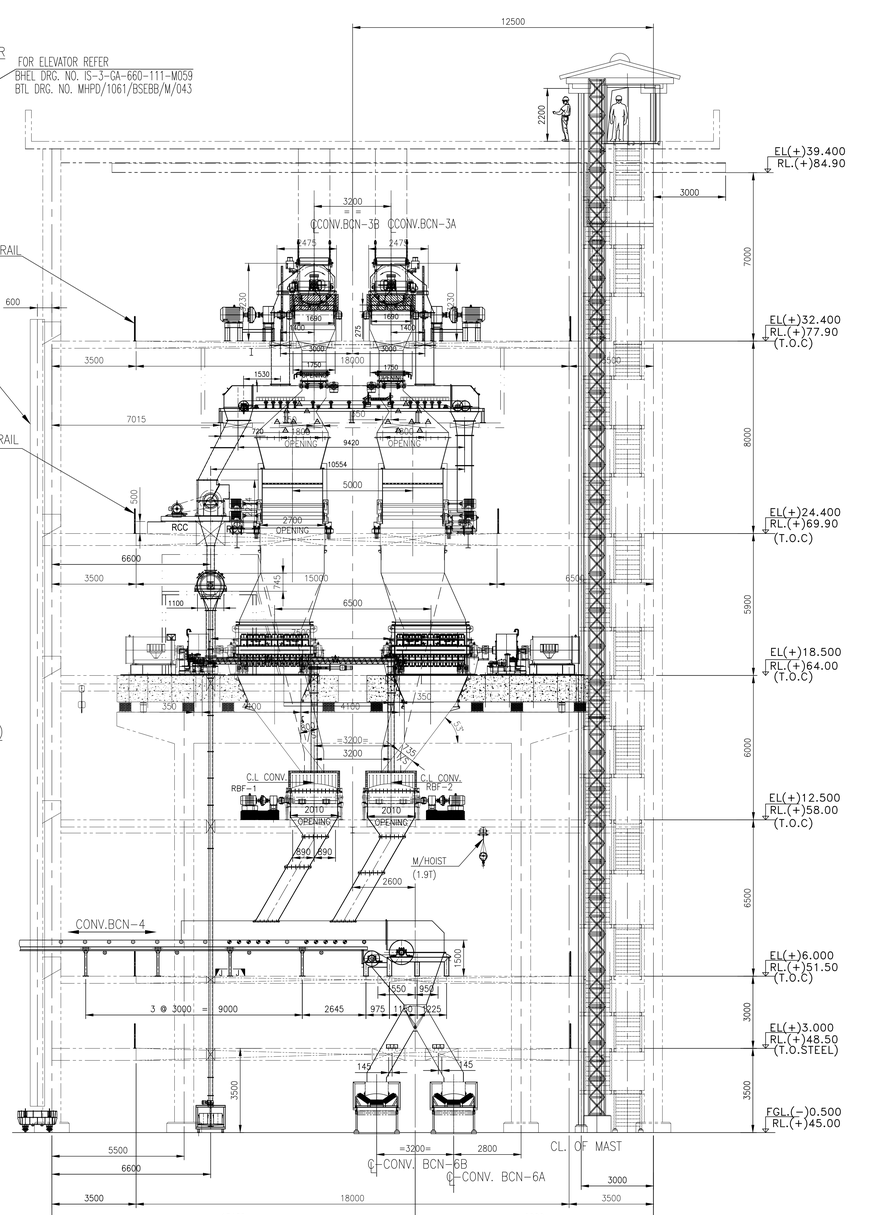
SIZE–A3

ALL DIMENSIONS ARE IN MM

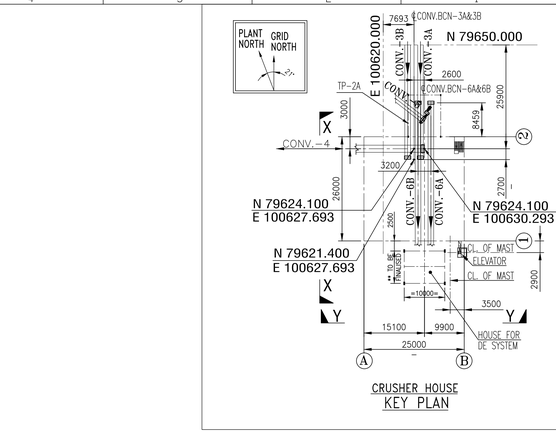
DRAWING NO.

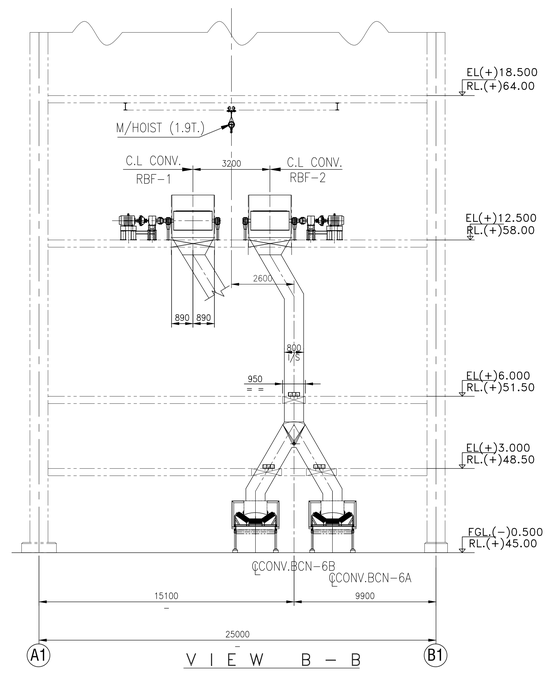


V I E W X – X
(FROM KEY PLAN)

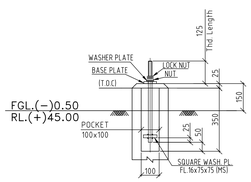


V I E W Y – Y
(FROM KEY PLAN)

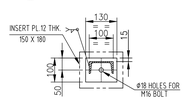




V I E W B – B



DETAIL A
FOR SHORT POST ONLY



VIEW J–J
(SHOWN ON SHORT POST INSERT ON BCN-4, RBF-1 & RBF-2)

NOTES :–

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PROFILE DRG.(3 SHTS.) OF BSEB–BARAUNI DRG. NO. : IS–0–GA–660–101–M004(REV.–6)
3. RL.(+)45.0 M. CORRESPONDS TO EL.(–)0.500M(FGL)
4. CIVIL, STRUCTURAL WORKS INCLUDING MONORAIL ARE NOT IN BTL'S SCOPE,BUT FDN. BOLT/INSERT PLT. & GROUTING OF PEDESTAL FOR BTL'S SUPPLIED EQUIPMENT SHOWN IN DRG. ARE IN BTL'S SCOPE.
5. * DIMENSION TO BE FINAL AFTER C.S.U. FINAL.
6. ** DIMENSION TO BE FINAL AFTER I.L.M.S. FINAL.
7. MOTOR RATING, EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.
8. FOR GA OF DUCTING LAYOUT OF DE SYSTEM FOR CRUSHER HOUSE REFER DRG. NO. : IS–1–GA–660–110–M065.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
5	11.1.13	DRAWING REVISED AS PER MEETING AT BTTL Dated –05.1.13	AB	PB	GM
4	22.11.12	REVISED AS PER BHEL COMMENTS Dated 07.11.12	AB	PB	GM
3	13.08.12	REVISED AS PER BHEL COMMENTS Dated 20.07.12	AB	PB	GM
2	11.05.12	REVISED AS PER BHEL COMMENTS Dated 01.05.12	TKR	JC	GM
1	16.03.12	REVISED AS PER BHEL COMMENTS Dated 13.03.12	TKR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700070

BTL DRG. NO. MHPD/1061/BSEBB/M/015 REV. 7

	NAME	SIGN	DATE
DRN.	TKROY		09.03.12
CHD.	JC		09.03.12
APPD.	SSG		09.03.12

DIRECTORY : FILE NO. : SCALE 1:125

TITLE : GA & LOAD DATA OF CRUSHER HOUSE

BHEL DRAWING NO. IS1-GA-660-104-M018 REV. 5

SHEET NO. 1 OF 3 NO. OF SHTS. 3

FORMAT SIZE A1

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ELECTRONIC FILE NAME

DRAWING NO.

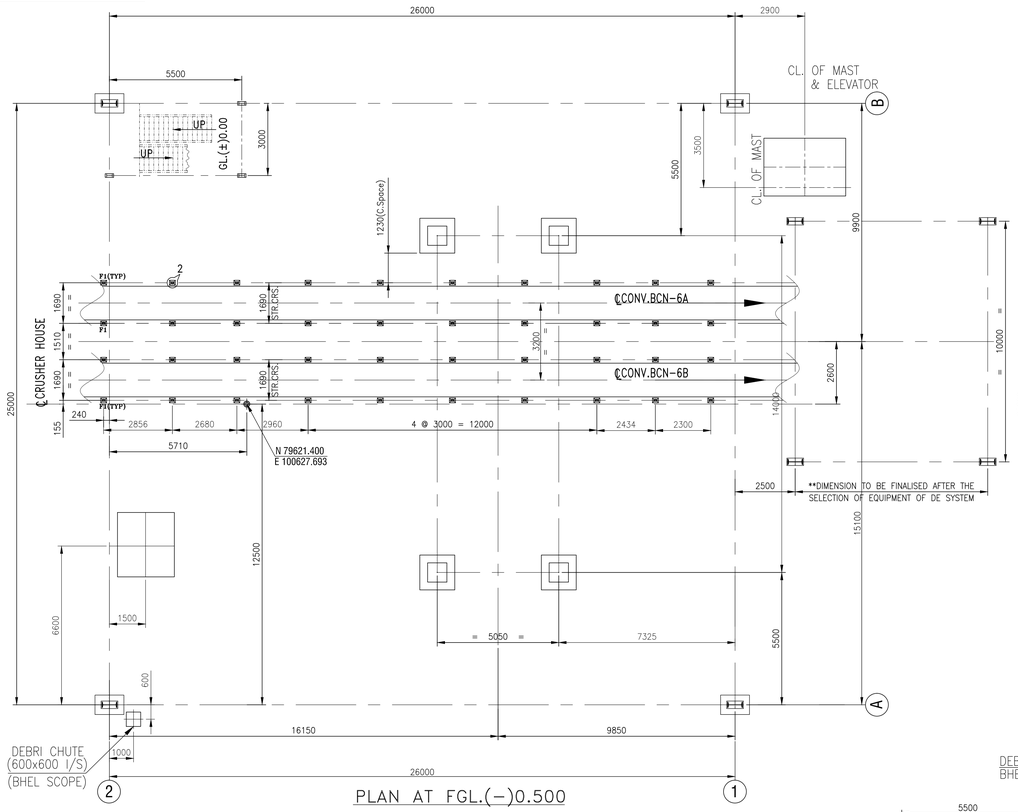
ALL DIMENSIONS ARE IN MM

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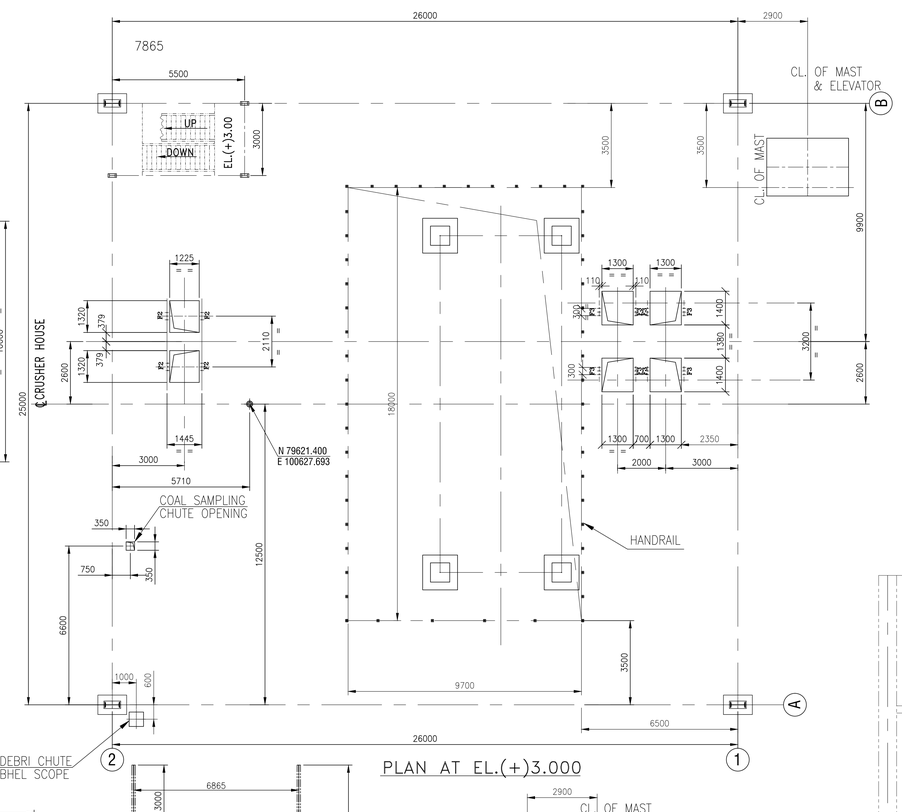
ELECTRONIC FILE NAME

LOAD DATA

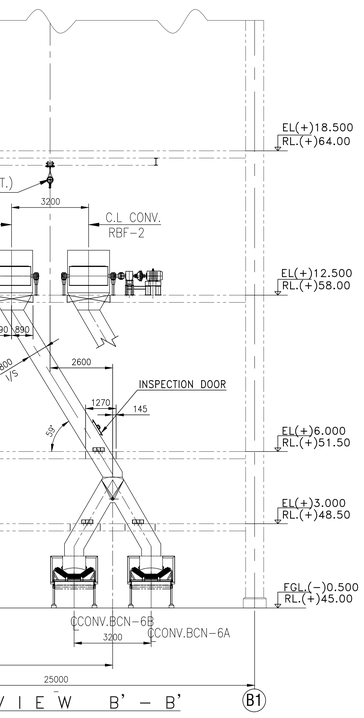
POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ← →	LOCATION
F1	–	0.35	–	CONVEYOR SUPPORT(AT FGL–0.500)
F2	–	–	–	CHUTE SUPPORT(AT EL+3.000)
F3	–	–	–	CHUTE SUPPORT(AT EL+3.000)
F4	1.6	–	13.78	HEAD FRAME(AT EL+6.000)
F4A	–	1.5	13.78	,,
F5	–	1.7	13.78	,,
F6	–	0.8	4.02	HEAD FRAME(AT EL+6.000)
F7	–	0.5	–	STRINGER SUPPORT(AT EL+6.000)
F8	–	2.9	–	DRIVE FRAME(AT EL+6.000)
F9	–	3.18	–	,,
F10	2.6	–	–	,,
F11	–	0.4	–	,,
F12	–	0.35	–	,,
F13	–	0.35	–	,,
F14	–	0.3	–	DRIVE FRAME(AT EL+6.000)
F15	–	1.5	–	CHUTE SUPPORT(AT EL+6.000)



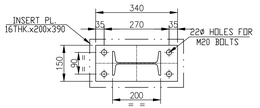
PLAN AT FGL.(–)0.500



PLAN AT EL.(+)3.000



V I E W B' – B'

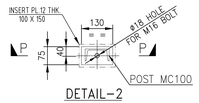


DETAIL–1

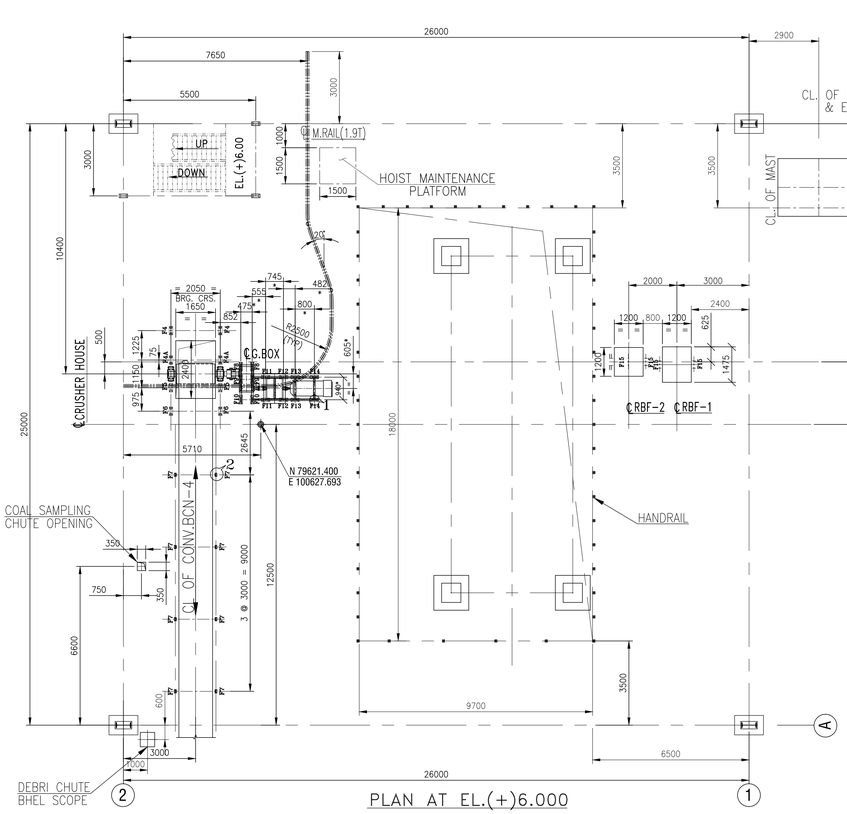
(SHOWN ON DRIVE FRAME POST INSERT ON BCN-4, RBF-1 & RBF-2)



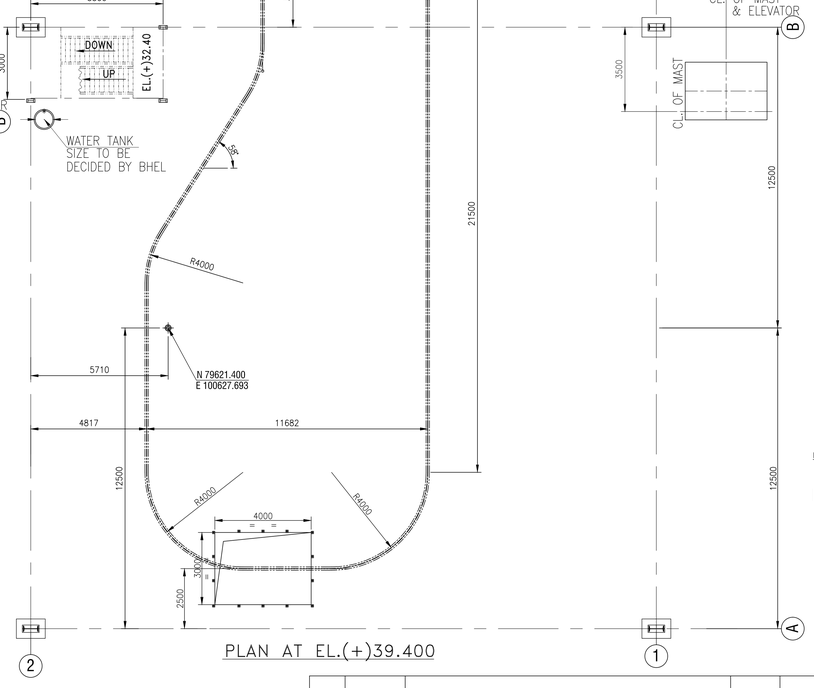
VIEW P–P



DETAIL–2



PLAN AT EL.(+)6.000



PLAN AT EL.(+)39.400

NOTE :–

FOR GENERAL NOTES REF.DRG.NO.IS–1–GA–660–106–M018 (Sht–1 OF 3)

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
5	11.1.13	DRAWING REVISED AS PER MEETING AT BTTL Dated –05.1.13	AB	PB	GM
4	22.11.12	REVISED AS PER BHEL COMMENTS Dated 07.11.12	AB	PB	GM
3	13.08.12	REVISED AS PER BHEL COMMENTS Dated 20.07.12	AB	PB	GM
2	11.05.12	REVISED AS PER BHEL COMMENTS Dated 01.05.12	TKR	JC	GM
1	16.03.12	REVISED AS PER BHEL COMMENTS Dated 13.03.12	TKR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700070

BTL DRG. NO. MHPD/1061/BSEBB/M/015 — REV. 7

	NAME	SIGN	DATE
DRN.	TKROY		04.02.12
CHD.	JC		06.02.12
APPD.	SSG		06.02.12

DIRECTORY :
FILE NO. :
SCALE 1:125

TITLE : GA & LOAD DATA OF CRUSHER HOUSE

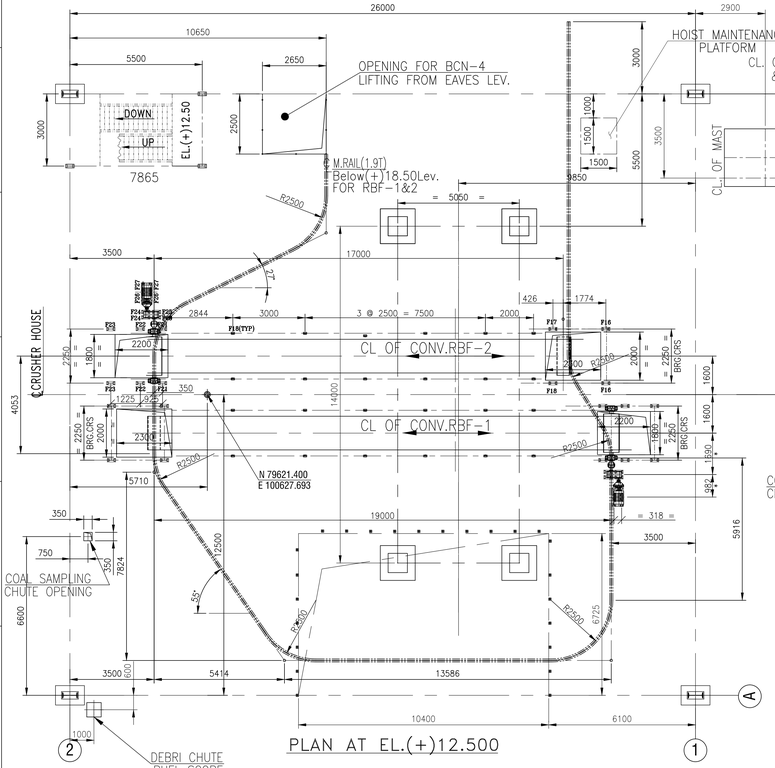
BHEL DRAWING NO. IS1-GA-660-104-M018 — REV. 5

SHEET NO. 2 OF 3 — NO. OF SHTS. 3

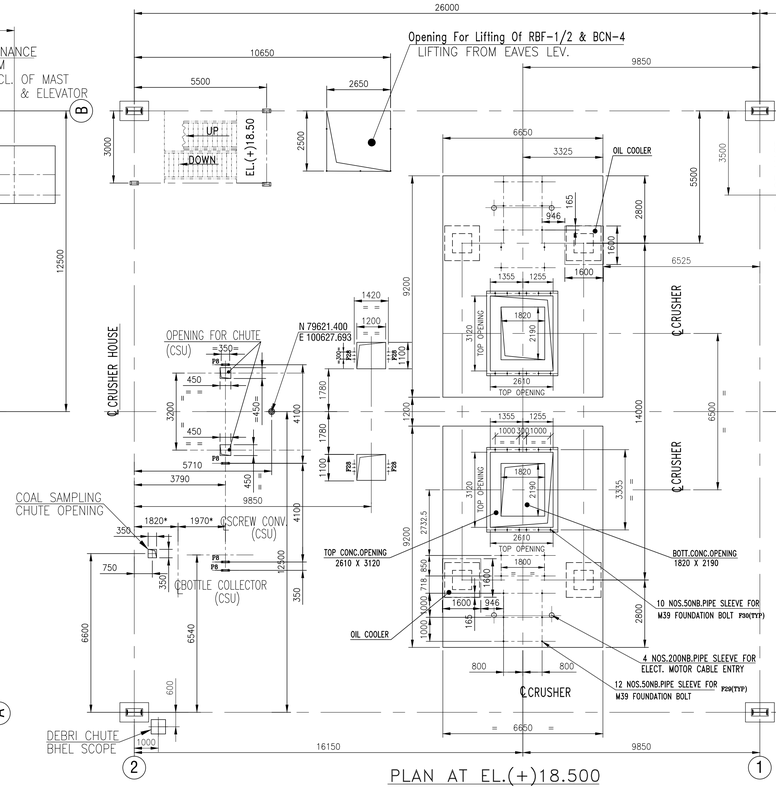
FORMAT SIZE A1

ALL DIMENSIONS ARE IN MM

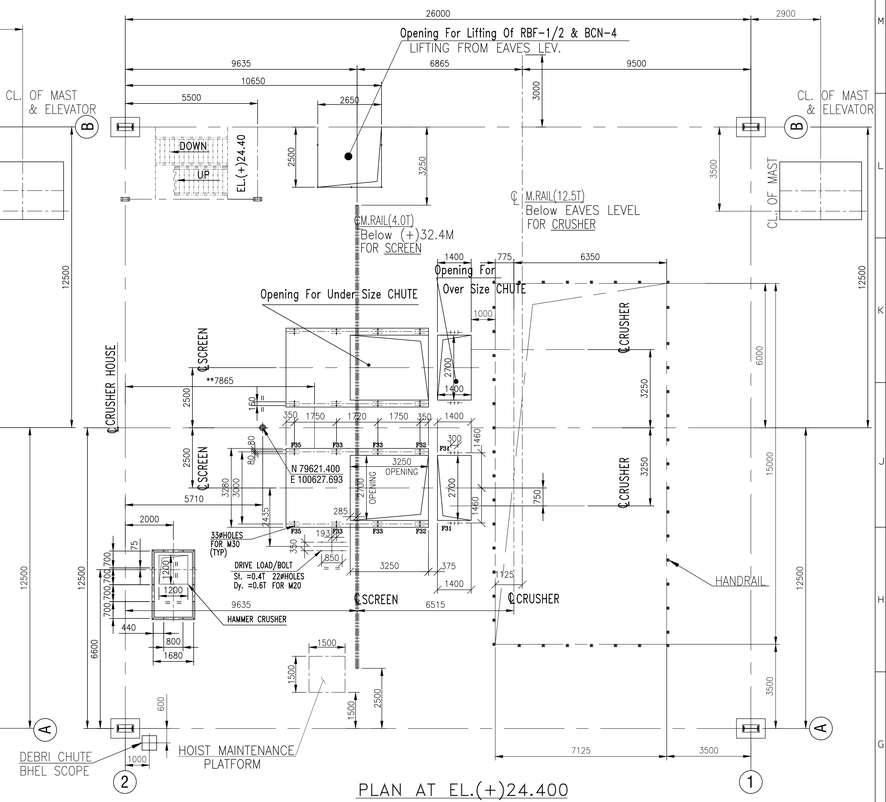
DRAWING NO.



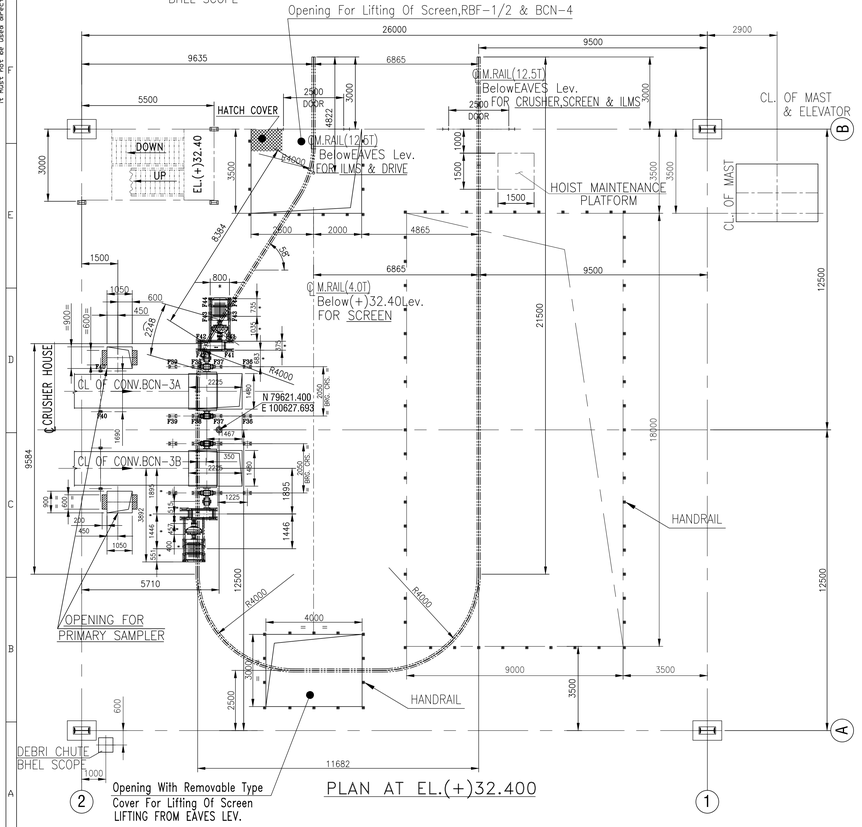
PLAN AT EL.(+)12.500



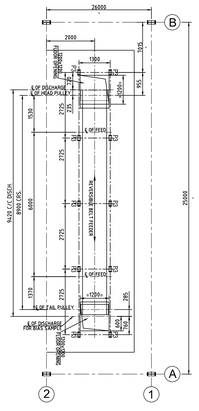
PLAN AT EL.(+)18.500



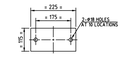
PLAN AT EL.(+)24.400



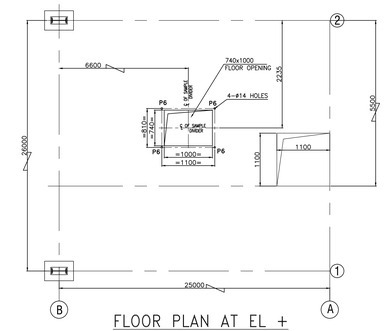
PLAN AT EL.(+)32.400



PLAN AT EL.(+)29.000(T.O.S.)



ENLARGED DET. OF 'P3' AT EL.(+)29.000M(T.O.S.)



FLOOR PLAN AT EL + 21.600M (T.O.S.)
FOUNDATION BOLT HOLES OF SAMPLE DIVIDER

LOAD DATA

POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T) ←→	LOCATION
F16	1.4	–	–	TAIL FRAME(AT EL+12.500)
F17		1.5	1.2	TAIL FRAME(AT EL+12.500)
F18	–	0.35	–	CONV.SUPPORT(AT EL+12.500)
F19	VOID		–	
F20	VOID		–	
F21	1.0	–	2.5	HEAD FRAME(AT EL+12.500)
F22	–	1.4	2.5	,,
F23	–	1.2	2.5	HEAD FRAME(AT EL+12.500)
F24	–	2.0	–	CONV.DRIVE FRAME(AT EL+12.500)
F25	1.5	–	–	,,
F26	–	0.25	–	,,
F27	–	0.45	–	CONV.DRIVE FRAME(AT EL+12.500)
F28	–	1.50	–	CHUTE SUPPORT(AT EL18.500)
F29	–	–	–	CRUSHER DRIVE FRAME(AT EL+18.500)
F30	–	–	–	CRUSHER SUPPORT(AT EL+18.500)
F31	–	1.50	–	CHUTE SUPPORT(AT EL+24.00)
F32	–	–	–	SCREEN SUPPORT(AT EL+24.400)
F33	–	–	–	,,
F34	NOT	USED		–
F35	–	–	–	SCREEN SUPPORT(AT EL+24.400)
F36	1.0	–	–	HEAD FRAME(AT EL+32.400)
F37	–	1.8	10.5	,,
F38	–	3.0	10.5	,,
F39	–	0.9	0.5	HEAD FRAME(AT EL+32.400)
F40	–	0.6	–	CONV. SUPPORT(AT EL+32.400)
F41	–	2.5	–	CONV. DRIVE FRAME(AT EL+32.400)
F42	2.0	–	–	,,
F43	–	0.5	–	,,
F44	–	0.35	–	CONV. DRIVE FRAME(AT EL+32.400)

LOADING DATA

A.	CRUSHER LOAD DATA			
1.	WEIGHT OF CRUSHER (M/c. NOT IN OPERATION)	=	23,000	Kgs.
2.	WEIGHT OF ROTOR ASSEMBLY	=	9,000	Kgs.
3.	FV1 TOTAL STATIC EQUIVALENT VERTICAL LOAD	=	42,000	Kgs.
4.	FH1 TOTAL STATIC EQUIVALENT HORIZONTAL LOAD	=	20,000	Kgs.
B.	DRIVE LOAD DATA			
1.	WEIGHT OF DRIVE WITH ELECTRIC MOTOR	=	10,500	Kgs.
2.	FV2 TOTAL STATIC EQUIVALENT VERTICAL LOAD	=	16,000	Kgs.
3.	FH2 TOTAL STATIC EQUIVALENT HORIZONTAL LOAD	=	8,000	Kgs.
	LOADS FV1 & FH1 ACT AT BEARING OF CRUSHER ROTOR			
	LOADS FV2 & FH2 ACT AT CENTER OF DRIVE MOTOR			
4.	UNBALANCE FORCE DUE TO ONE NO. BROKEN / MISSING =		8,000	Kgs.

REF.ELECON DRG.NO. IS-1-GA-660-106-M036

Location	When M/c not in operation Static vertical load (Load/bolt pair in Ton)	When M/c is in operation in operation (Load/bolt pair in Ton) PDy.hoz.	PDy.Vertical down	While starting/stopping of M/c (Load/bolt pair in Ton) PDy.hoz.	PDy.Vertical down
F32	6.0	+/- 1.0	5.0	+/- 1.25	7.5
F33	3.0	+/- 0.4	2.0	+/- 0.4	3.0
F35	4.5	+/- 0.7	4.0	+/- 1.0	6.0

REF.ELECON DRG.NO. IS-1-GA-660-106-M055

NOTE :-

1. FOR GENERAL NOTES REF.DRG.NO. IS1-GA-660-104-M018 (Sht-1 OF 3)

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
5	11.1.13	DRAWING REVISED AS PER MEETING AT BTTL Dated -05.1.13	AB	PB	GM
4	22.11.12	REVISED AS PER BHEL COMMENTS Dated 07.11.12	AB	PB	GM
3	13.08.12	REVISED AS PER BHEL COMMENTS Dated 20.07.12	AB	PB	GM
2	11.05.12	REVISED AS PER BHEL COMMENTS Dated 01.05.12	TKR	JC	GM
1	16.03.12	REVISED AS PER BHEL COMMENTS Dated 13.03.12	TKR	JC	GM

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700070

	NAME	SIGN	DATE
DRN.	TKROY		04.02.12
CHD.	JC		06.02.12
APPD.	SSG		06.02.12

BTL DRG. NO. MHPD/1061/BSEBB/M/015 REV. 7
DIRECTORY :
FILE NO. :
SCALE 1:125
BHEL DRAWING NO. IS1-GA-660-104-M018 REV. 5
SHEET NO. 3 OF 3 NO. OF SHTS. 3
TITLE : GA & LOAD DATA OF CRUSHER HOUSE

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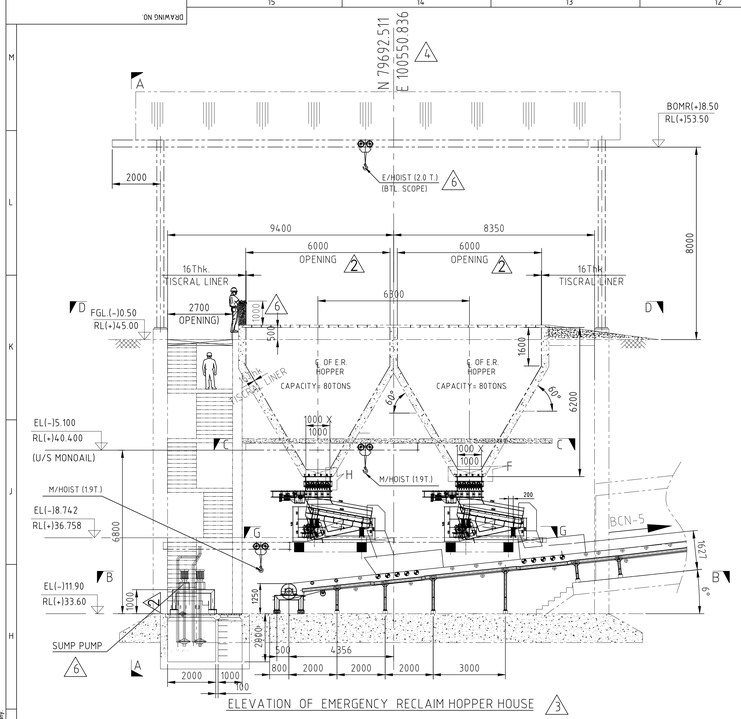
ELECTRONIC FILE NAME

FORMAT SIZE A1

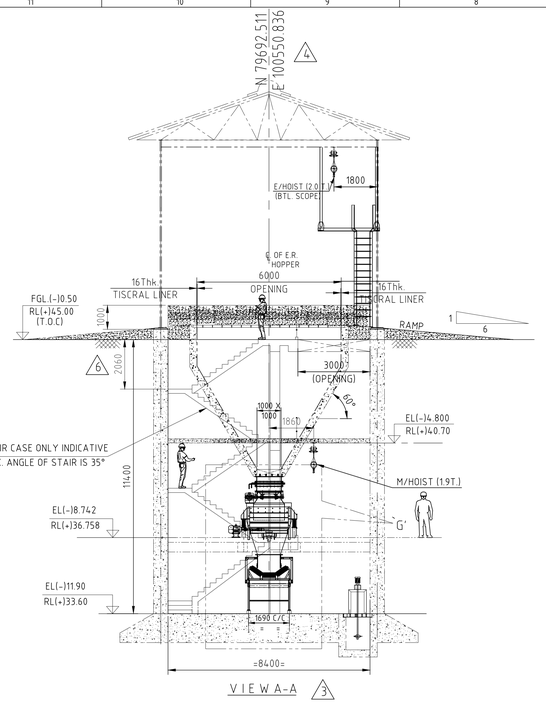
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DRAWING NO

ALL DIMENSIONS ARE IN MM

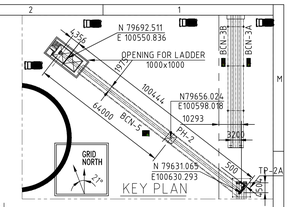


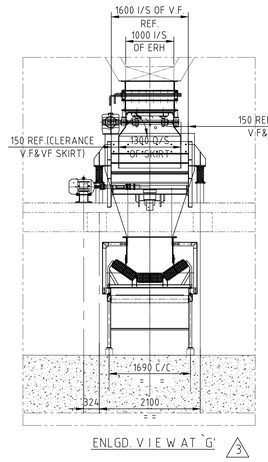
ELEVATION OF EMERGENCY RECLAIM HOPPER HOUSE 3



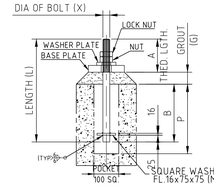
VIEW A-A 3

BARAUNI ANCHOR BOLT LIST (MECHANICAL)																	
SL.NO.	DESCRIPTION	DWG. NO.	SIZE OF BOLT (X)	NO. OF BOLTS	NO. OF NUTS	NO. OF LOCK NUTS	NO. OF PLAIN WASHER	Sq. pl.	PROJECTED (A+G)	THREADED (A)	GROUT (G)	LENGTH (L)	(B)	(C)	(D)	POCKET 100 SQ. PFI LG.
EMERGENCY RECLAIM HOUSE																
1.	TAIL FRAME	MHPD/1061/BSEBB /M/032	M20	16	16	16	16	75 SQ.x16 THK	125	100	25	550	400	100	200	450
2.	VIBRATING FEEDER MOTOR		M16	16	16	16	16	75 SQ.x16 THK	125	100	25	550	400	150	250	425
3.	VIBRATING FEEDER MOTOR		M16	4	4	4	4	75 SQ.x16 THK	125	100	25	550	400	-	-	425
4.	SHORT POST		M16	10	10	10	10	75 SQ.x16 THK	125	100	25	450	300	-	-	350

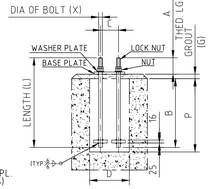




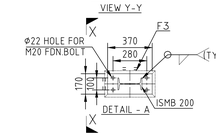
ENLGD. VIEW AT `G' 3

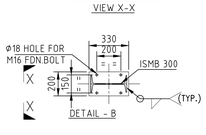


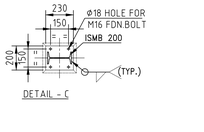
TYP. DETAIL OF FDN. BOLT
FOR DET. 'D'
VIEW Y-Y

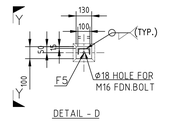


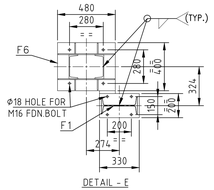
TYP. DETAIL OF FDN. BOLT
FOR DET. 'A', 'B' & 'C'
VIEW X-X

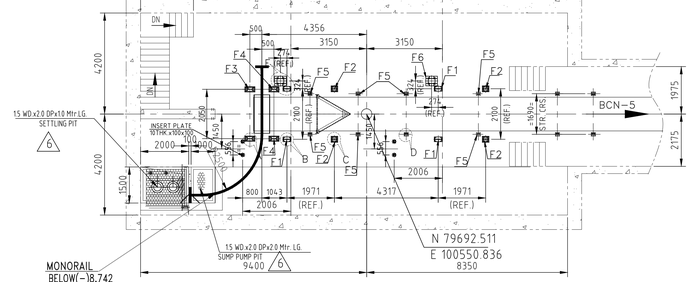






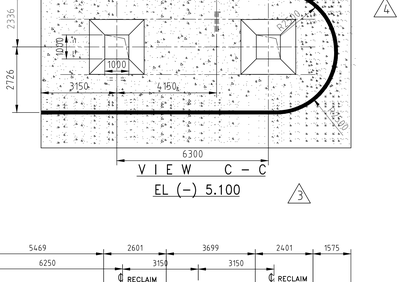




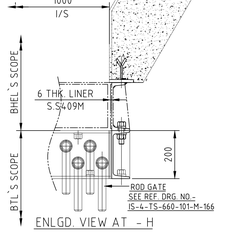


VIEW B-B
(EL(-)11.90) 6

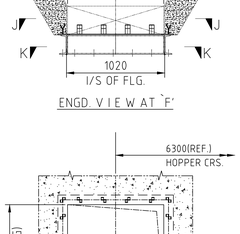
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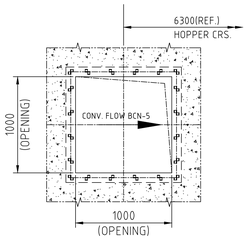
VIEW C - C
EL (-) 5.100 3



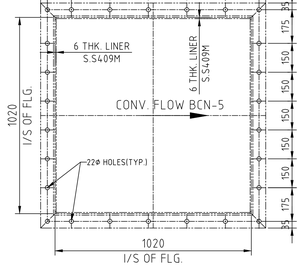
ENLGD. VIEW AT - H



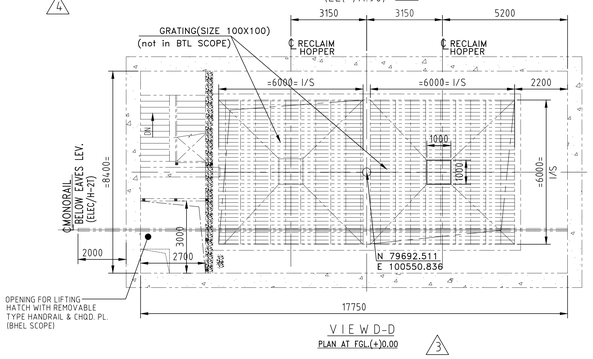
ENGD. VIEW AT `F'



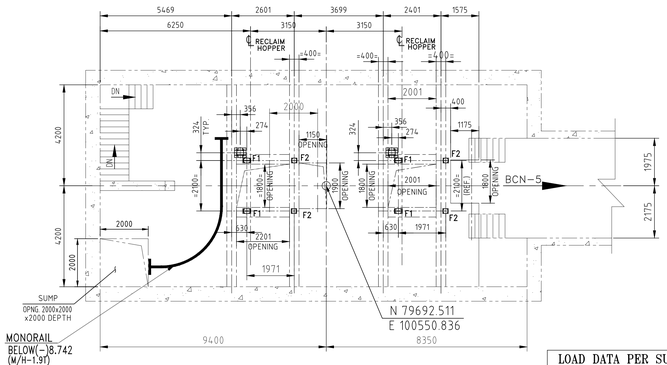
ENGD. SEC. AT `J-J'



ENGD. VIEW AT `K-K'



VIEW D-D
PLAN AT FGL(+)0.00 3



VIEW G-G
PLAN AT EL(-)8.742 3

LOAD DATA PER SUPPORT IN KG				
POINTS	STATIC CONDITION		DYNAMIC CONDITION	
	WITH MATERIAL	WITHOUT MATERIAL	VERTICAL	HORIZANTAL
F1	1010	760	80	75
F2	500	250	45	40

LOAD DATA				
POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T)	LOCATION
F3	1.2	-		TAIL FRAME
F4	-	1.5		"
F5		0.5		STR. SUPPORT
F6		0.250		VIBRATING FEEDER MOTOR SUPPORT

LOAD DATA PER SUPPORT IN "KG"				
	STATIC CONDITION		DYNAMIC CONDITION	
	WITH MATERIAL	WITHOUT MATERIAL	VERTICAL	HORIZONTAL
FEED END (F1)	1010	760	80	75
DISCHARGE END(F2)	500	250	45	40

REF. DRG. NO.		
	Description	BHEL'S DRG. NO.
1	G.A. OF ROD GATE	IS-1-GA-660-111-M050 (SHT. 2 OF 2)
2	G.A. OF RX P GATE OF ERH HOUSE INCLUDING DATA SHEET	IS-1-GA-660-111-M058
3	G.A. OF VIBRO FEEDER FOR ERH	IS-1-GA-660-101-M057
4	G.A. & LOAD DATA FOR TP-2A	IS-1-GA-660-103-M015

NOTE :-

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB-BARAUNI DRG. NO. PE-DG-374-100-M001 (Rev. 01)
3. RL. (+) 45.0M CORRESPONDS TO EL. (-) 0.5(FGL)
4. CIVIL, STRUCTURAL WORKS INCLUDING MONORAIL ARE NOT IN BTL'S SCOPE,BUT FDN. BOLT/INSERT PL. & GROUTING OF PEDESTAL FOR BTL'S SUPPLIED EQUIPMENT SHOWN IN DRG. ARE IN BTL'S SCOPE
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002
7. FOR DUST SUPPRESSION SYSTEM,SERVICE WATER LINE & VENTILATION SYSTEM SEPARETE DRG. WILL BE PROVIDED.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	22.08.12	DRG. REVISED DURING MEETING AT STEAG DT 23.08.12	R.R	P.B.	
5	10.08.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 10.08.12	R.R	P.B.	
4	09.08.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 28.07.12	R.R	P.B.	
3	23.06.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 19.06.12	R.R	P.B.	
2	10.05.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 17.04.12	R.R	P.B.	
1	24.03.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 16.3.12	G.C.	J.C.	

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/032 REV-6

	NAME	SIGN	DATE
DRN.	S.KUMAR		12.03.2012
CHD.	J.C.		13.03.2012
APPD.	SSG		13.03.2012

DIRECTORY :
FILE NO. :
SCALE

TITLE :
MECHANICAL G.A OF ERH

BHEL DRAWING NO. IS-1-GA-660-109-M174 REV. 4

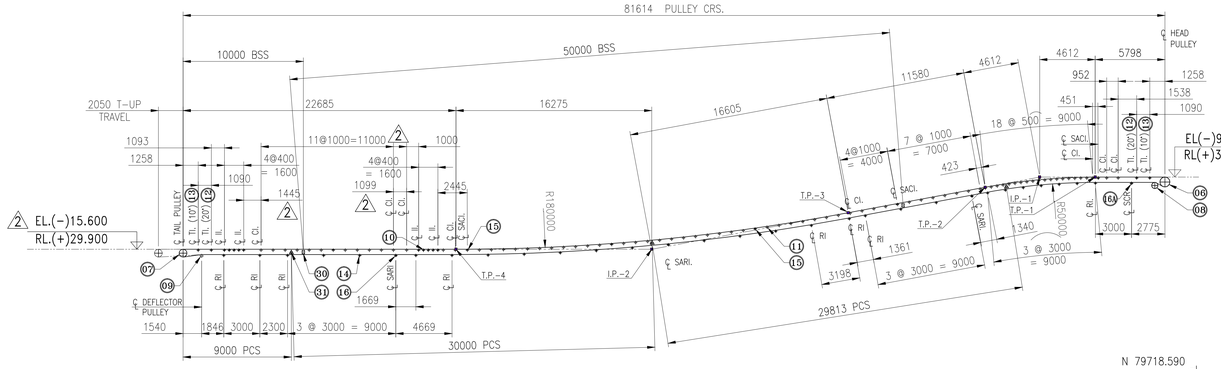
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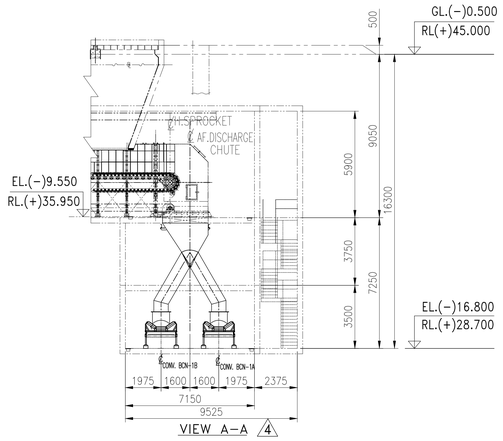
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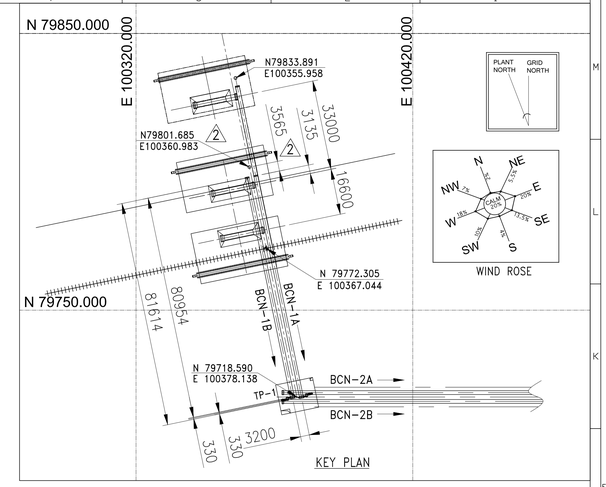
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
ALL DIMENSIONS ARE IN MM

DRAWING NO. XXX



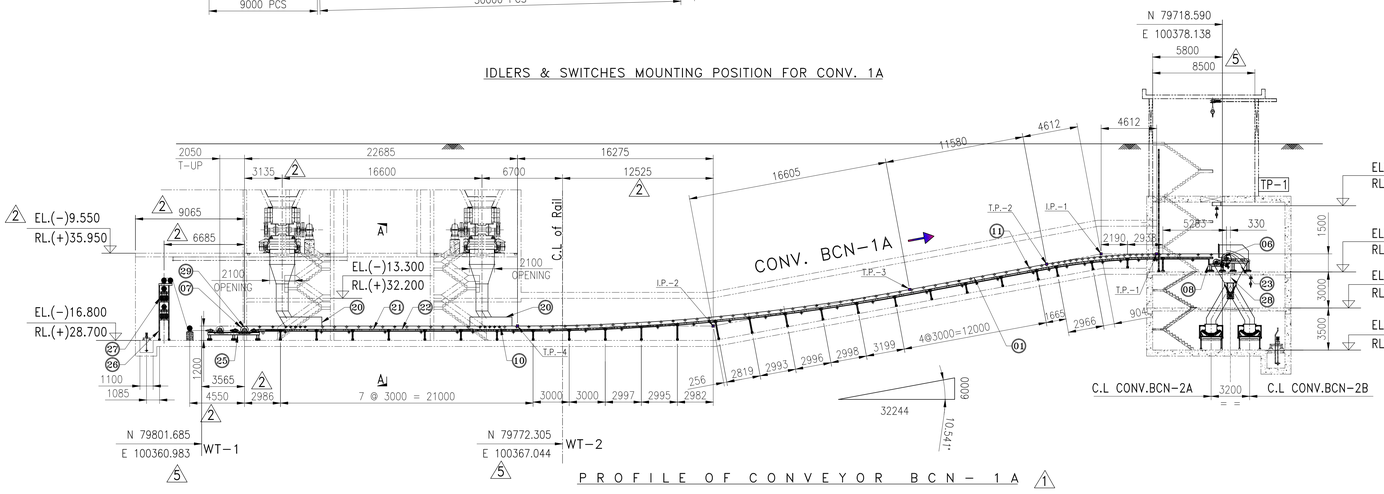


VIEW A−A 4

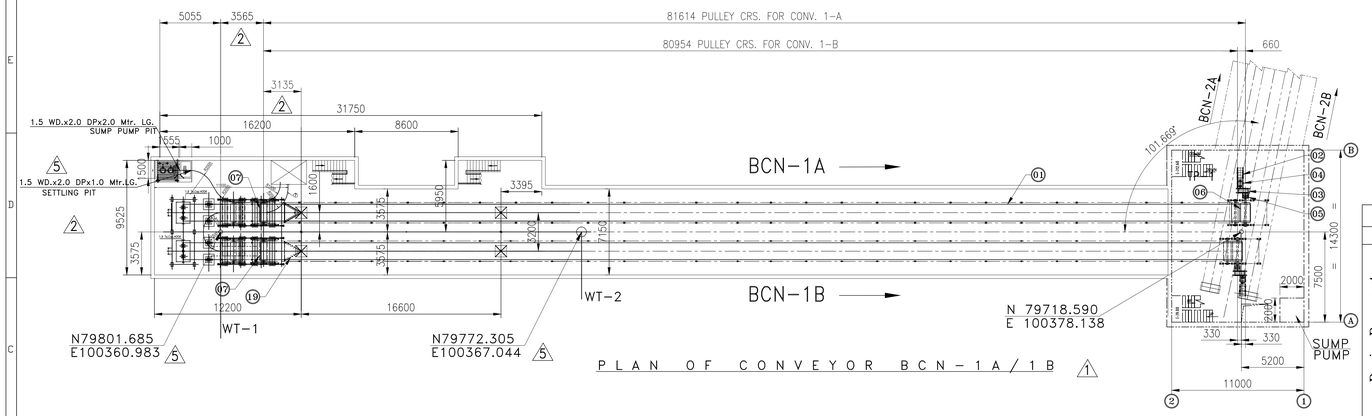


KEY PLAN

IDLERS & SWITCHES MOUNTING POSITION FOR CONV. 1A



PROFILE OF CONVEYOR BCN − 1A 1



PLAN OF CONVEYOR BCN − 1A / 1B 1

Item No.	Description	Quantity	Material	Make
31	PULL CHORD SWITCH	3 Pair		
30	BELT SWAY SWITCH	2 Pair		
29	ZERO SPEED SWITCH	1		
28	DISCHARGE CHUTE AT HEAD END - 10TH M.S.BODY PLATE & 6 TH SS 409M LINER HOOD-4THK.	1	ASSY	
27	COUNTER WEIGHT.	1300KG.		
26	HORIZONTAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 2050 mm	1	ASSY	
25	TAIL UNIT FRAME ISMB-200	1	ASSY	
24	DRIVE UNIT FRAME ISMC-200	1	ASSY	
23	HEAD UNIT FRAME ISMB-200	1	ASSY	
22	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT	ASSY	
21	STRINGER FRAME ISMC-125 & SHORT SUPPORTS - ISMC 100	I LOT	ASSY	
20	SKIRT BOARD AT TAIL END - 10 TH. M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	2	ASSY	
19	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE ELASTOMOUNT C/W POLYEURETHENE BLADES	1	ASSY	
18	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	ASSY	
17	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	ASSY	
16A	SELF CLEANER RUBBER DISK RETURN IDLER -1 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35BRG. AS PER IS: 8598-1987	1	ASSY	
16	SELF ALIGNING RETURN IDLER -1 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35BRG. AS PER IS: 8598-1987	3	ASSY	
15	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	3	ASSY	
14	RETURN IDLER - 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 25 BRG. AS PER IS: 8598-1987	27	ASSY	
13	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
12	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
11	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY-152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	78	ASSY	
10	IMPACT IDLER 35° 3 ROLL ASS'Y Ø190 RUBBER 139.70 ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	10	ASSY	

Bill of Materials

Conveyor Basic Parameters	Description	Unit	Values
	Conveyor No.	-	1A
	Type Of Conveyor	-	Belt Conveyor
	Conv. Profile	-	Inclined
	Material Conveyed	-	Sized Coal
	Lump Size	mm	(−) 300
	Bulk Density vol/load	T/M.^{3}	0.8
	Moisture	%	20
	Belt Width	mm	1400
	Capacity (Rated)	T/Hr.	1200
	Capacity (Designed)	T/Hr.	1320
	Belt Speed (Nominal)	M/Sec.	2.75
	Horizontal Crs.	mm	81614
	Vertical Lift	mm	6000

Technical Characteristics

Conveyor Basic Parameters	Description	Unit	Values
	Troughing Angle	Degree	35
	No Of Feed Point		2
	No Of Disch. Point		1
	Conv. Inclination Max.	Degree	10.54
	Type Of Take Up		HGTU
	Take up Travel	mm	2050 mm
	Motor Rating	KW	90
	BELT TENSIONS:	N	39993.50
	T1	N	33671.5
	T2	N	9271.863
	T Tail	N	9156.532
	ANGLE OF WRAP	Degree	210°
	COUNTER WT.	KG	1300

Item No.	Description	Quantity	Material	Make
9	DEFLECTOR PULLEY - 219.1 mm O.D. X 1600 mm FACE X 7.1 THK. SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CK, ADAPTOR SLEEVES - H311, SHORE HARDNESS 45-55°	1	ASS'Y.	
6 8	SNUB PULLEY - 500 mm O.D. X 1600 mm FACE X 12 THK. SHELLX12 THK.RUBBER LAGGING X 100 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 522 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22222 CK, ADAPTOR SLEEVES - H322, LOCATING RINGS 2FRB 8/200 +1FRB 11/200 LABYRINTH SEALS SHORE HARDNESS 45-55°	1	ASS'Y.	
6 7	TAIL / TAKE-UP PULLEY - 630 mm O.D. X1600 mm FACE X 12 THK. SHELLX12 THK RUBBER LAGGING X 125 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK, ADAPTOR SLEEVES - H3128, LOCATING RINGS 3 FRB 10/250 LABYRINTH SEALS SHORE HARDNESS 45-55°	1	ASS'Y.	
2 6	HEAD / DRIVE PULLEY - 800 mm O.D. X1600 mm FACE X 16 THK. SHELL X 12THK. DIAMOND GROOVE RUBBER LAGGING X 140 DIA SHAFT AT COOPER BEARING 01 BC SNC532 140MM EX ALT BPTL (FREE TYP) COOPER BEARING 01 BC SNC532 140MM GR ALT (FIXED TYP)	1	ASS'Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG-07.	1	STD.	
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 90 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - SDFC450,	1	STD.	
	VOID			
3	GEAR REDUCER - PARALLEL HELICAL TYPE 2 STAGE WITH UOT FAN & INTEGRAL HOLDBACK NORMAL RATIO- 23.2:2, SIZE CSB-250 SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 139 KW.	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 90 KW RATING X 1500 RPM, FRAME SIZE - D280M PROTECTION - IP 55, INSULATION CLASS-B, SUITABLE FOR 50 DEGREE AMBIENT AND 3 PHASE, 415 VOLT + -10% , 50 HZ + - 5% , AC SUPPLY	1	STD.	
1	BELTING-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 500/4 MHD, COVER GRADE - FR TOP - 5 THK. + BOTTOM - 3THK.	165.2M TAPE LENGTH	STD.	BHEL SCOPE

Bill of Materials

Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		24000
Return Idler	RI		3000
Self Aligning Return Idler	SARI		24000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000

NOTE :−

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB−BARAUNI DRG. NO. PE−DG−374−100−M001 (Rev. 01)
3. RL. (+)45.0 M. CORRESPONDS TO EL (−) 0.500 M (FGL).
4. ALL CIVIL, STRUCTURAL WORKS(WITH OUT CIVIL & STR. OF BTL EQUIPMENT) ARE NOT BTL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS−0−PL−660−100−M001 & FLOW DIAGRAM DRG. NO: IS−1−FL−660−100−M002,WAGON TIPPLER DRG NO−IS−1−GA−660−103−M014 & GA & LOAD OF TP−1 DRG NO−IS−1−GA−660−104−M016.
7. SCREEN, CRUSHER,TIPPLER,STRACKER RECLAIMER ARE FREE ISSUE ITEM FROM BHEL'S.
8. CONVEYORS PROFILE DRAWN ON BASIS OF EQUIP. G.A. DRG. RECEIVED. AFTER RECEIVING OF APPROVED STAMPED EQUIP. G.A. DRGS. THEN PROFILES MAY BE CHANGED OR ALTERED.
9. ALL DIMENSSIONS MARKED * WILL BE CHANGED DURING DETAILING.
10. THIS DRG. READ IN CONJUNTION WITH TYP.CROSS SECTION DRG.NO−IS−1−GA−660−100−M003 .
11. REFER SEPARATE DRG FOR VENTILATION DUCT ,DS,SW & DW .

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	24.08.12	DRG. REVISED DURING MEETING AT STEAG DATED 23.08.12	AB	PB	
5	18.08.12	DRG. REVISED AS PER BHEL COMMENT DATED 13.08.12	AB	PB	
4	20.07.12	DRG. REVISED AS PER BHEL COMMENT DATED 14.07.12	AB	PB	
3	28.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 26.06.12	RR	GC	
2	02.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	
1	18.05.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA−700070

BTL DRG. NO. MHPD/1061/BSEBB/M/005 REV. 6

	NAME	SIGN	DATE
DRN.	A.S.BRAHMA		
CHD.	J.CHATTERJEE		
APPD.	S.S.G.		

DIRECTORY :
FILE NO. :
SCALE 1: 300

TITLE :
GA & LOAD DATA OF CONV. BCN−1A

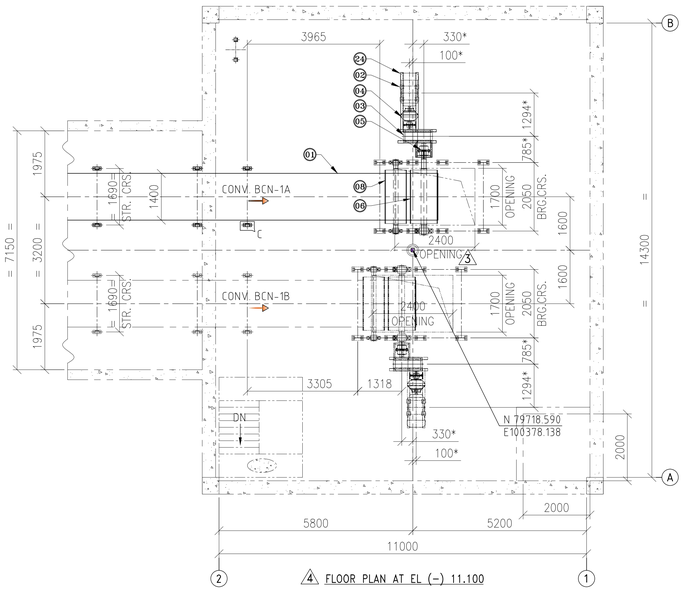
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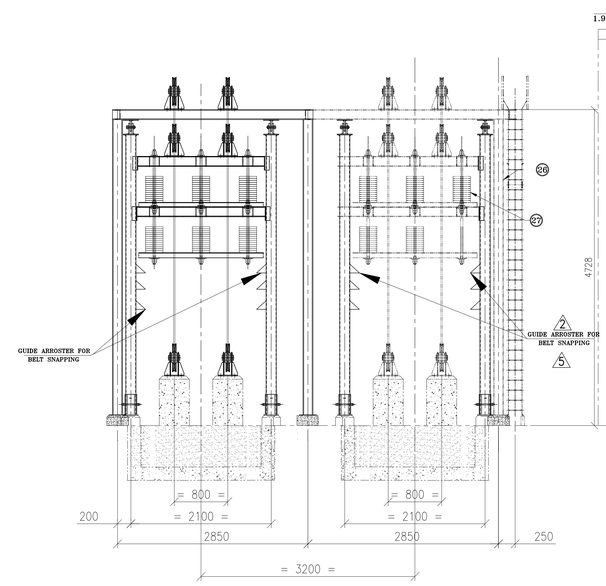
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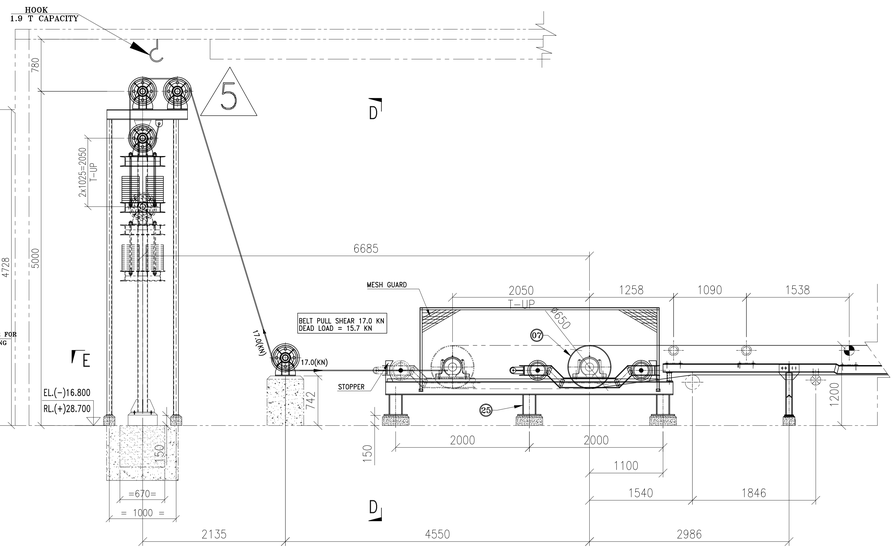
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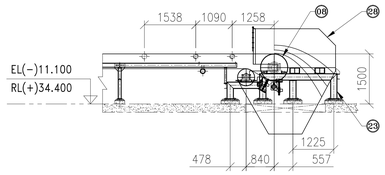
4 FLOOR PLAN AT EL (-) 11.100



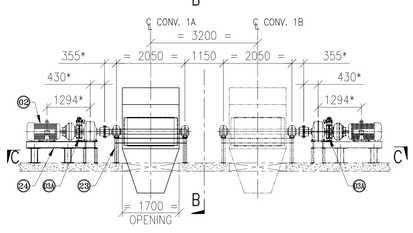
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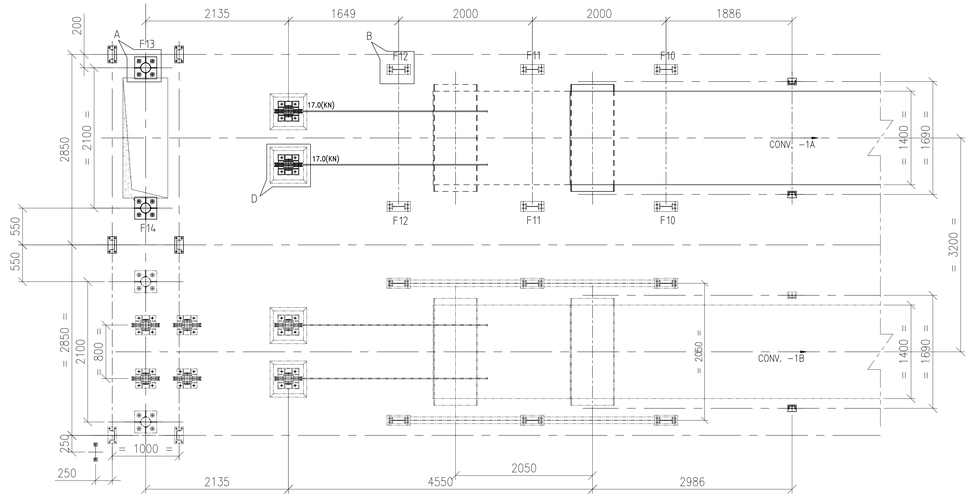
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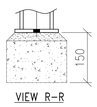
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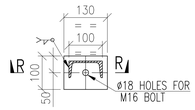
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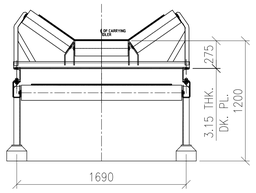
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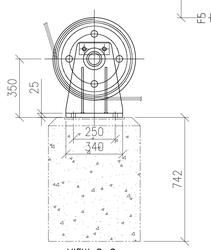
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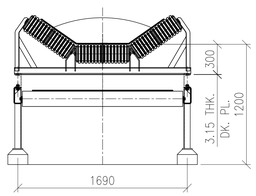
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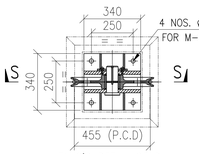
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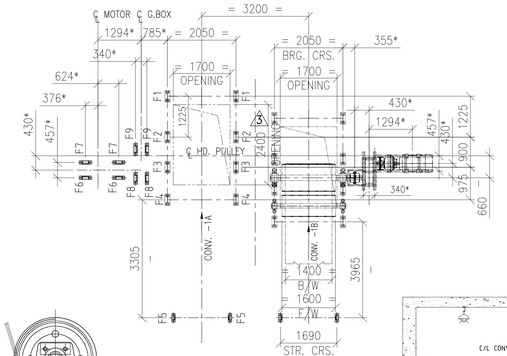
VIEW S-S



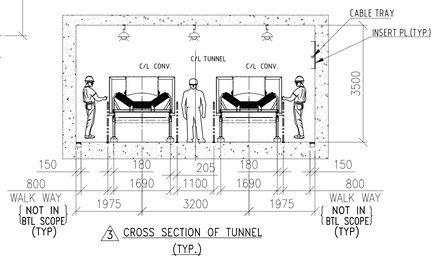
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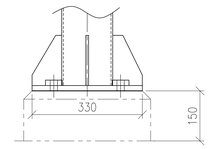


VIEW C-C

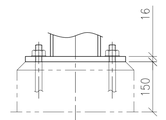


3 CROSS SECTION OF TUNNEL (TYP.)

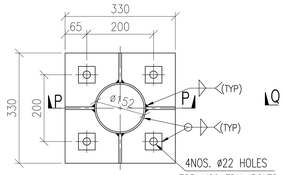
DETAILS REFER TYP.CROSS SECTION DRG.NO-IS-1-GA-660-100-M003 .



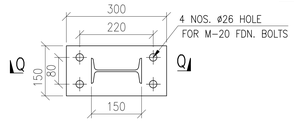
VIEW P-P



VIEW Q-Q



ENLG'D DETAIL OF A (T.U.GUIDE POST)



ENLG'D DETAIL OF B (HGTU FRAME BASE)

LOAD DATA				
POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ←→	LOCATION
F1	1.0	-	6.5	HEAD FRAME
F2	-	2.5	6.5	HEAD FRAME
F3	-	2.0	6.5	HEAD FRAME
F4	-	1.2	1.5	HEAD FRAME
F5	-	.650	-	SHORT POST
F6	0.4	-	-	DRIVE FRAME
F7	-	0.650	-	DRIVE FRAME
F8	1.7	-	-	DRIVE FRAME
F9	-	2.2	-	DRIVE FRAME
F10	0.335	0.4	0.3	TAIL FRAME
F11	-	0.155	0.3	TAIL FRAME
F12	-	0.5	0.3	TAIL FRAME
F13	-	1.5	-	HGTU
F14	-	1.5	-	HGTU

BARAUNI ANCHOR BOLT LIST (MECHANICAL)

SL.NO.	DESCRIPTION	DWG. NO.	SIZE OF BOLT (X)	NO. OF BOLTS	NO. OF NUTS	NO. OF LOCK NUTS	NO. OF PLAIN WASHER	BASE PLT.
CONV. : BCN-1A								
1.	HEAD FRAME	BCN-1A MHPD/1061/BSEBB/M/005	M20	32	32	32	32	150x350x16 THK.
2.	DRIVE FRAME		M20	16	16	16	16	100x350x12 THK.
3.	TAIL FRAME & HGTU		M20	24	24	24	24	150x300x16 THK.
			M20	8	8	8	8	340x340x16 THK.
			M20	8	8	8	8	330x330x16 THK.
4.	SHORT POST		M16	52	52	52	52	100x130x10 THK.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	24.08.12	DRG. REVISED DURING MEETING AT STEAGE DATED 23.08.12	AB	PB	
5	18.08.12	DRG. REVISED AS PER BHEL COMMENT DATED 13.08.12	AB	PB	
4	20.07.12	DRG. REVISED AS PER BHEL COMMENT DATED 14.07.12	AB	PB	
3	28.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 26.06.12	RR	GC	
2	02.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	
1	18.05.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS — QTY.
REV. | NAME | SIGN | DATE
ALTERED
CHECKED
APPROVED
ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700070

BTL DRG. NO. MHPD/1061/BSEBB/M/005 — REV. 6

	NAME	SIGN	DATE
DRN.	A.S.BRAHMA		
CHD.	J.CHATTERJEE		
APPD.	SSG		

DIRECTORY :
FILE NO. :
SCALE 1:75

TITLE : GA & LOAD DATA OF CONV. BCN-1A

BHEL DRAWING NO. IS-1-GA-660-101-M005 — REV. 4

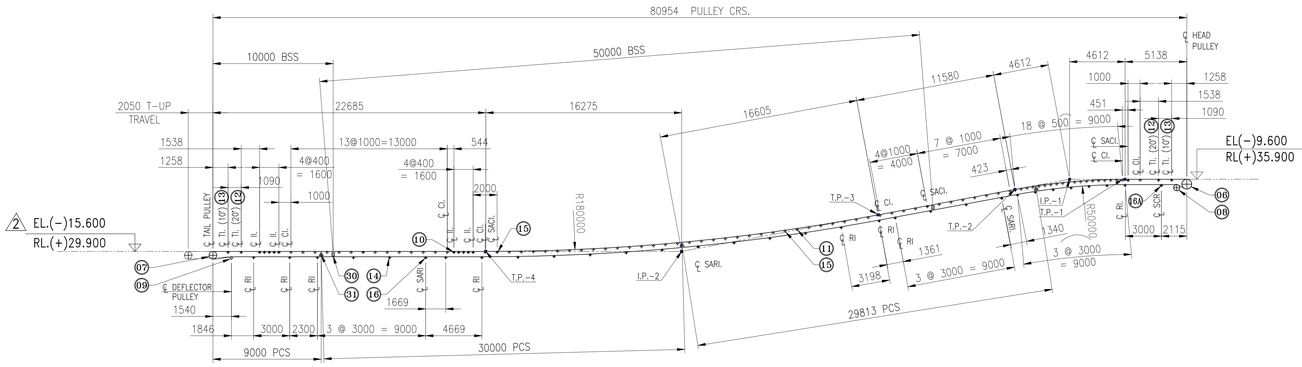
SHEET NO. 2 of 2 — NO.OF SHTS. 2

FORMAT SIZE A1

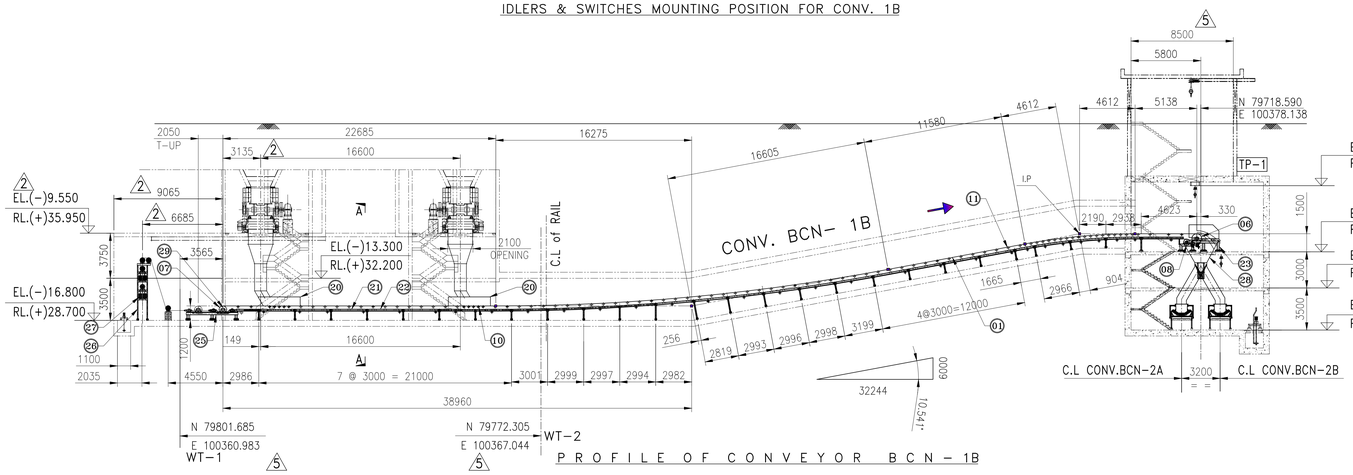
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

DRAWING NO. XXX

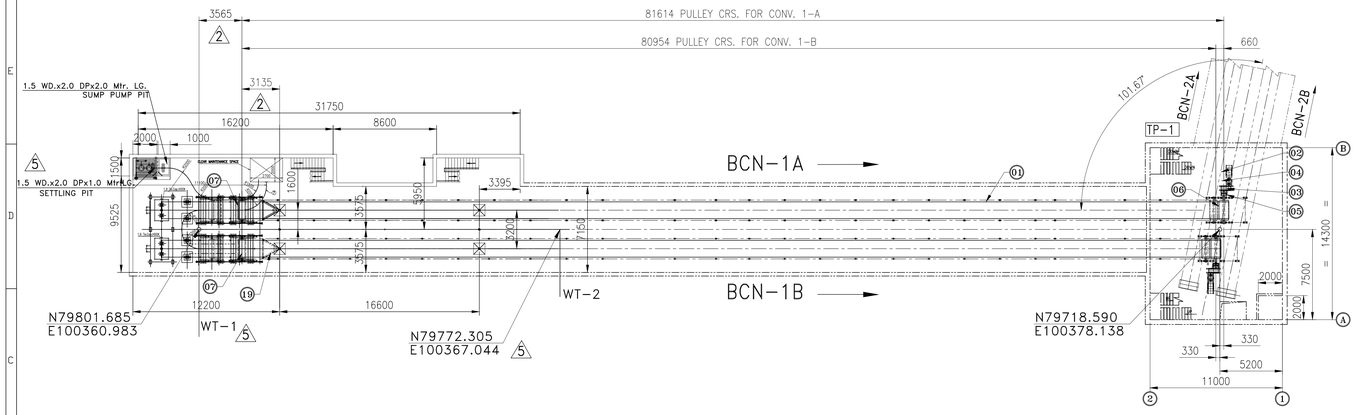
ALL DIMENSIONS ARE IN MM

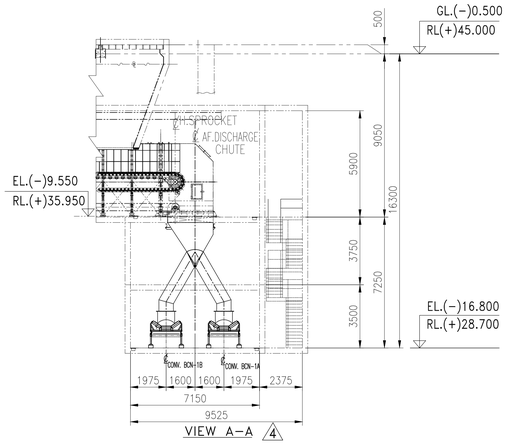


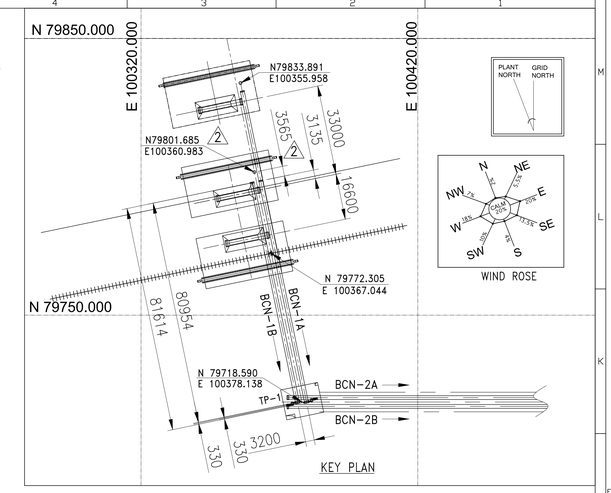
IDLERS & SWITCHES MOUNTING POSITION FOR CONV. 1B



PROFILE OF CONVEYOR BCN − 1B







Item No.	Description	Quantity	Material	Make
31	PULL CHORD SWITCH	3 Pair		
30	BELT SWAY SWITCH	2 Pair		
29	ZERO SPEED SWITCH	1		
28	DISCHARGE CHUTE AT HEAD END - 10TH M.S.BODY PLATE & 6 TH SS 409M LINER HOOD-4THK.	1	ASSY	
27	COUNTER WEIGHT.	1200KG		
26	HORIZONTAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 2050 mm	1	ASSY	
25	TAIL UNIT FRAME ISMB-200	1	ASSY	
24	DRIVE UNIT FRAME ISMC-200	1	ASSY	
23	HEAD UNIT FRAME ISMB-200	1	ASSY	
22	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT	ASSY	
21	STRINGER FRAME ISMC-125 & SHORT SUPPORTS - ISMC 100	I LOT	ASSY	
20	SKIRT BOARD AT TAIL END - 10 TH. M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	2	ASSY	
19	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE ELASTOMOUNT C/W POLYEURETHENE BLADES	1	ASSY	
18	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	ASSY	
17	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	ASSY	
16A	SELF CLEANER RUBBER DISK RETURN IDLER -1 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35BRG. AS PER IS: 8598-1987	1	ASSY	
16	SELF ALIGNING RETURN IDLER -1 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35BRG. AS PER IS: 8598-1987	3	ASSY	
15	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	5	ASSY	
14	RETURN IDLER - 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 25 BRG. AS PER IS: 8598-1987	27	ASSY	
13	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
12	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
11	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY-152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	77	ASSY	
10	IMPACT IDLER 35° 3 ROLL ASS'Y Ø190 RUBBER 139.7Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	10	ASSY	

Bill of Materials

Item No.	Description	Quantity	Material	Make
9	DEFLECTOR PULLEY - 219.1 mm O.D. X 1600 mm FACE X 7.1 THK. SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CK, ADAPTOR SLEEVES - H311, SHORE HARDNESS 45-55°	1	ASS'Y.	
8	SNUB PULLEY - 500 mm O.D. X 1600 mm FACE X 12 THK. SHELLX12 THK.RUBBER LAGGING X 100 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 522 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22222 CK, ADAPTOR SLEEVES - H322, LOCATING RINGS 2FRB 8/200 +1FRB 11/200 LABYRINTH SEALS SHORE HARDNESS 45-55°	1	ASS'Y.	
7	TAIL / TAKE-UP PULLEY - 630 mm O.D. X1600 mm FACE X 12 THK. SHELLX12 THK RUBBER LAGGING X 125 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK, ADAPTOR SLEEVES - H3128, LOCATING RINGS 3 FRB 10/250 LABYRINTH SEALS SHORE HARDNESS 45-55°	1	ASS'Y.	
6	HEAD / DRIVE PULLEY - 800 mm O.D. X1600 mm FACE X 16 THK. SHELL X 12THK. DIAMOND GROOVE RUBBER LAGGING X 140 DIA SHAFT AT COOPER BEARING 01 BC SNC532 140MM EX ALT BPTL (FREE TYP) COOPER BEARING 01 BC SNC532 140MM GR ALT (FIXED TYP)	1	ASS'Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG-07,	1	STD.	
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 90 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - SDFC450,	1	STD.	
	VOID		STD.	
3	GEAR REDUCER - PARALLEL HELICAL TYPE 2 STAGE WITH OUT FAN & INTEGRAL HOLDBACK RATIO- 23.2:2, SIZE CSB-250 SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 139 KW.	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 90 KW RATING X 1500 RPM, FRAME SIZE - D280M PROTECTION - IP 55, INSULATION CLASS-B, SUITABLE FOR 50 DEGREE AMBIENT AND 3 PHASE, 415 VOLT + -10% , 50 HZ + - 5% , AC SUPPLY	1	STD.	
1	BELTING-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 500/4 MHD, COVER GRADE - FR TOP - 5 THK. + BOTTOM - 3THK.	165.2M TAPE LENGTH	STD.	BHEL SCOPE

Bill of Materials

Technical Characteristics

Conveyor Basic Parameters	Description	Unit	Values
	Conveyor No.	-	1B
	Type Of Conveyor	-	Belt Conveyor
	Conv. Profile	-	Inclined
	Material Conveyed	-	Sized Coal
	Lump Size	mm	(−) 300
	Bulk Density vol/load	T/M^3	0.8
	Moisture	%	20
	Belt Width	mm	1400
	Capacity (Rated)	T/Hr.	1200
	Capacity (Designed)	T/Hr.	1320
	Belt Speed (Nominal)	M/Sec.	2.75
	Horizontal Crs.	mm	80954
	Vertical Lift	mm	6000

Technical Characteristics

Conveyor Basic Parameters	Description	Unit	Values
	Troughing Angle	Degree	35
	No Of Feed Point		2
	No Of Disch. Point		1
	Conv. Inclination Max.	Degree	10.54
	Type Of Take Up		HGTU
	Take up Travel	mm	2050 mm
	Motor Rating	KW	90
	BELT TENSIONS:	N	35969.06
	T1	N	29934.96
	T2	N	8242.96
	T Tail	N	7803.0
	ANGLE OF WRAP	Degree	210°
	COUNTER WT.	KG	1300

Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		12000
Return Idler	RI		3000
Self Aligning Return Idler	SARI		24000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000

NOTE :−

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB−BARAUNI DRG. NO. PE−DG−374−100−M001 (Rev. 01)
3. RL. (+)45.0 M. CORRESPONDS TO EL (−) 0.500 M (FGL).
4. ALL CIVIL, STRUCTURAL WORKS(WITH OUT CIVIL & STR. OF BTL EQUIPMENT) ARE NOT BTL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS−0−PL−660−100−M001 & FLOW DIAGRAM DRG. NO: IS−1−FL−660−100−M002,WAGON TIPPLER DRG NO−IS−1−GA−660−103−M014 & GA & LOAD OF TP−1 DRG NO−IS−1−GA−660−104−M016.
7. SCREEN, CRUSHER,TIPPLER,STRACKER RECLAIMER ARE FREE ISSUE ITEM FROM BHEL'S.
8. CONVEYORS PROFILE DRAWN ON BASIS OF EQUIP. G.A. DRG. RECEIVED. AFTER RECEIVING OF APPROVED STAMPED EQUIP. G.A. DRGS. THEN PROFILES MAY BE CHANGED OR ALTERED.
9. ALL DIMENSSIONS MARKED * WILL BE CHANGED DURING DETAILING.
10. THIS DRG. READ IN CONJUNTION WITH TYP.CROSS SECTION DRG.NO−IS−1−GA−660−100−M003 .
11. REFER SEPARATE DRG FOR VENTILATION DUCT ,DS,SW & DW .

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	24.08.12	DRG. REVISED DURING MEETING AT STEAG DATED 23.08.12	AB	PB	
5	18.08.12	DRG. REVISED AS PER BHEL COMMENT DATED 13.08.12	AB	PB	
4	20.07.12	DRG. REVISED AS PER BHEL COMMENT DATED 14.07.12	AB	PB	
3	28.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 26.06.12	RR	GC	
2	02.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	
1	18.05.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA−700070

BTL DRG. NO. MHPD/1061/BSEBB/M/006 REV. 6

	NAME	SIGN	DATE
DRN.	A.S.BRAHMA		
CHD.	J.CHATTERJEE		
APPD.	S.S.G.		

DIRECTORY :
FILE NO. :
SCALE 1:300

TITLE :
GA & LOAD DATA OF CONV. BCN−1B

BHEL DRAWING NO. IS-1-GA-660-101-M006 REV. 4

SHEET NO. 1 of 2 NO.OF SHTS. 2

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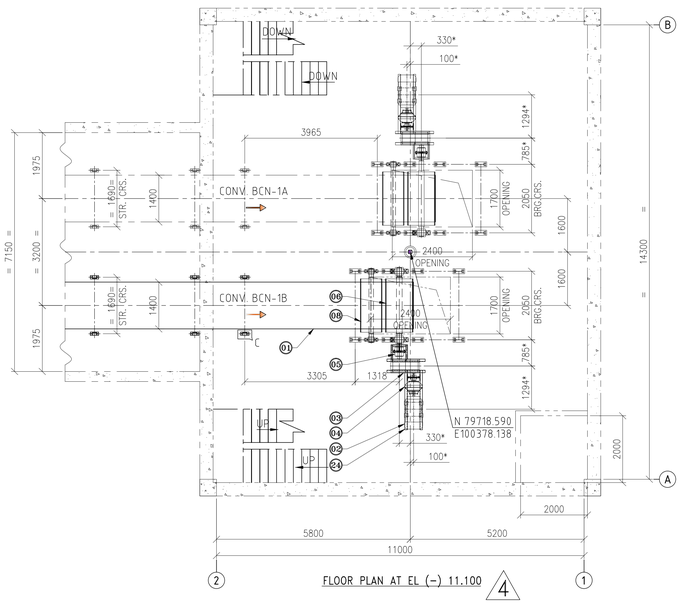
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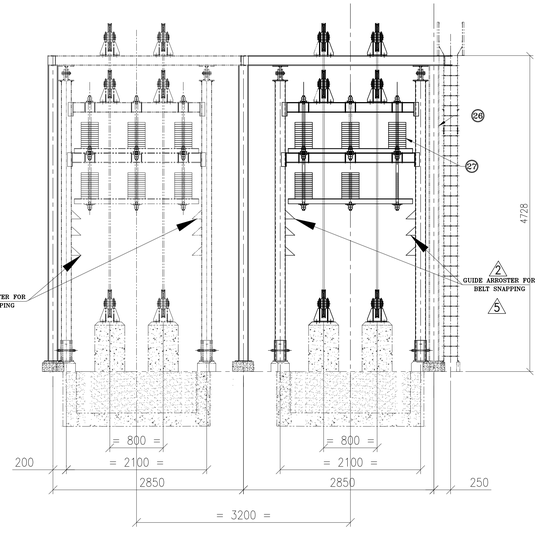
ALL DIMENSIONS ARE IN MM

DRAWING NO.

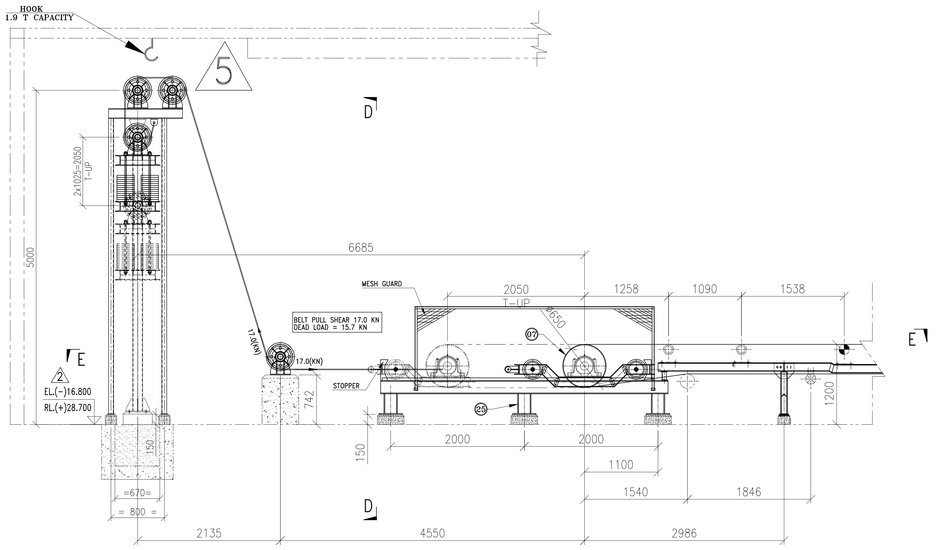
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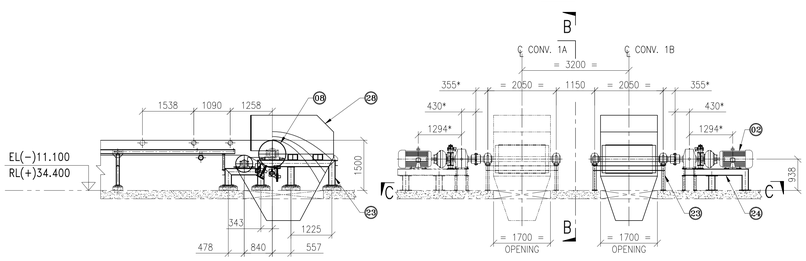


FLOOR PLAN AT EL (–) 11.100 4



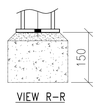
VIEW D–D



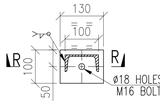


VIEW B–B

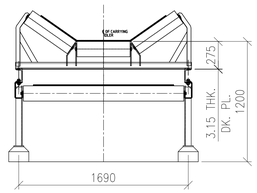
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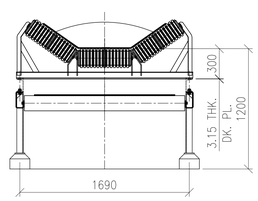
VIEW R–R



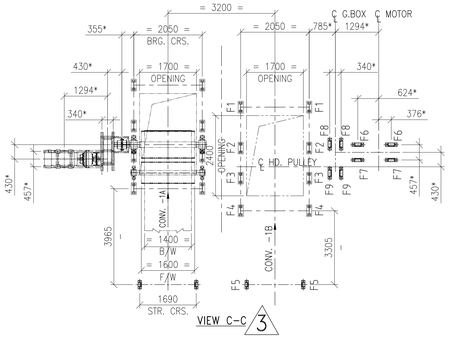
ENLG'D DETAIL OF C
(SHORT POST)



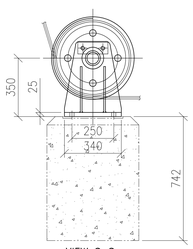
TYP. CROSS SEC. OF CONV.



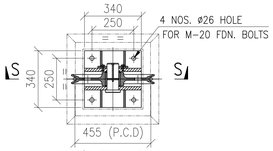
TYP. CROSS SEC. OF CONV. AT IMPECT IDLER POSITION



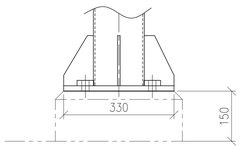
VIEW C–C 3



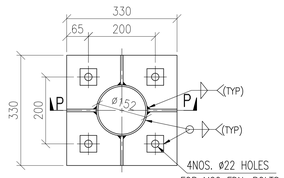
VIEW S–S



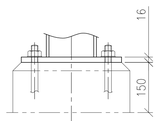
ENLG'D DETAIL OF D
(SHEAVE POST)



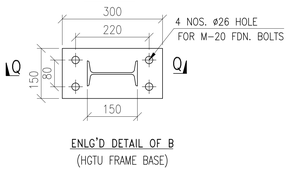
VIEW P–P



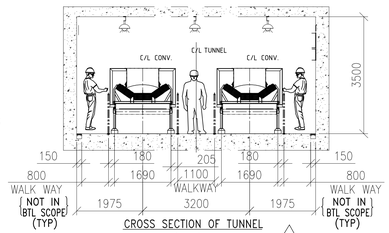
ENLG'D DETAIL OF A
(T.U.GUIDE POST)



VIEW Q–Q

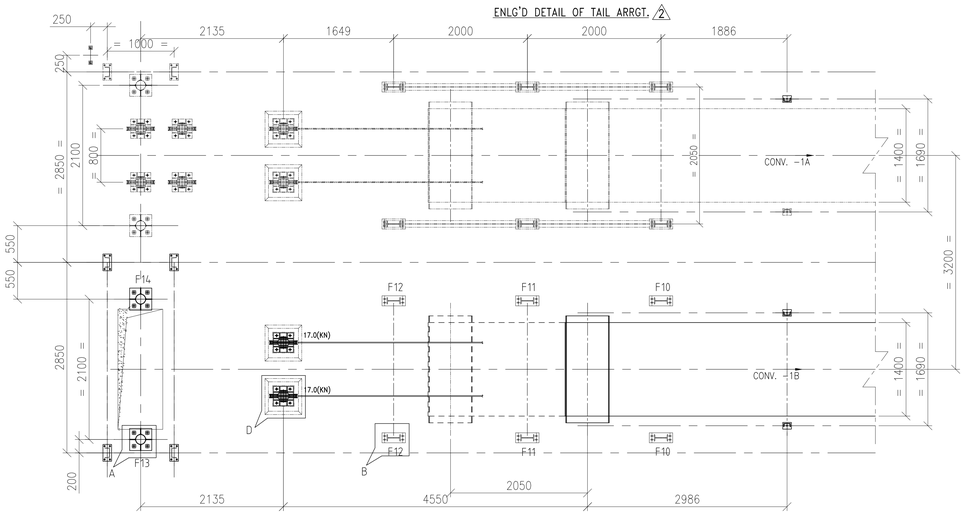


ENLG'D DETAIL OF B
(HGTU FRAME BASE)



CROSS SECTION OF TUNNEL
(TYP.) 3

ENLG'D DETAIL OF TAIL ARRGT. 2



VIEW E–E

LOAD DATA				
POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ←→	LOCATION
F1	1.0	–	6.5	HEAD FRAME
F2	–	2.5	6.5	HEAD FRAME
F3	–	2.0	6.5	HEAD FRAME
F4	–	1.2	1.5	HEAD FRAME
F5	–	.650	–	SHORT POST
F6	0.4	–	–	DRIVE FRAME
F7	–	0.650	–	DRIVE FRAME
F8	1.7	–	–	DRIVE FRAME
F9	–	2.2	–	DRIVE FRAME
F10	0.335	0.4	0.3	TAIL FRAME
F11	–	0.155	0.3	TAIL FRAME
F12	–	0.5	0.3	TAIL FRAME
F13	–	1.5	–	HGTU
F14	–	1.5	–	HGTU

BARAUNI ANCHOR BOLT LIST (MECHANICAL)

SL.NO.	DESCRIPTION	DWG. NO.	SIZE OF BOLT (X)	NO. OF BOLTS	NO. OF NUTS	NO. OF LOCK NUTS	NO. OF PLAIN WASHER	BASE PLT.
CONV. : BCN–1B								
1.	HEAD FRAME	BCN.–1B MHPD/1061/BSEBB/M/005	M20	32	32	32	32	150x350x16 THK.
2.	DRIVE FRAME		M20	16	16	16	16	100x350x12 THK.
3.	TAIL FRAME & HGTU		M20	24	24	24	24	150x300x16 THK.
			M20	8	8	8	8	340x340x16 THK.
			M20	8	8	8	8	330x330x16 THK.
4.	SHORT POST		M16	52	52	52	52	100x130x10 THK.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	24.08.12	DRG. REVISED DURINGM MEETING AT STEAGE DATED 23.08.12	AB	PB	
5	18.08.12	DRG. REVISED AS PER BHEL COMMENT DATED 13.08.12			
4	20.07.12	DRG. REVISED AS PER BHEL COMMENT DATED 14.07.12	AB	PB	
3	28.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 26.06.12	RR	GC	
2	02.06.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	
1	18.05.12	DRG. REVISED AS PER BHEL COMMENT DATED 17.04.12	RR	GC	

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700070

BTL DRG. NO. MHPD/1061/BSEBB/M/005 REV. 6

	NAME	SIGN	DATE
DRN.	A.S.BRAHMA		
CHD.	J.CHATTERJEE		
APPD.	SSG		

DIRECTORY :
FILE NO. :
SCALE 1:75

TITLE :
GA & LOAD DATA OF CONV. BCN–1B

BHEL DRAWING NO. IS-1-GA-660-101-M006 REV. 4

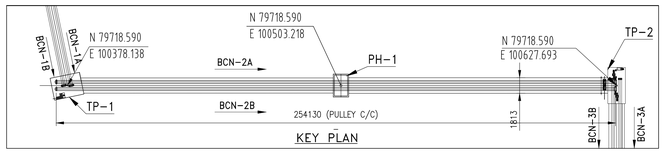
SHEET NO. 2 of 2 NO.OF SHTS. 2

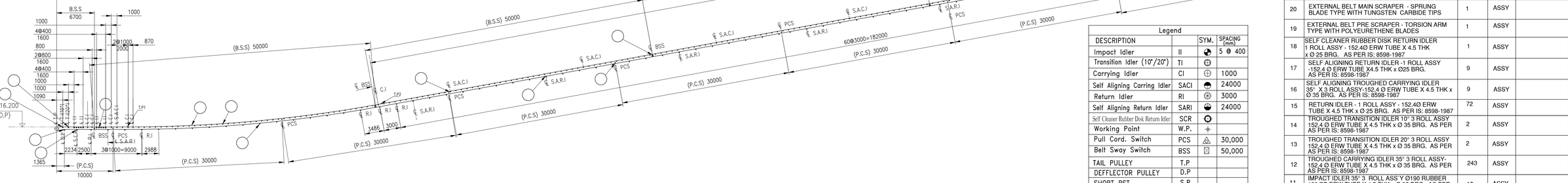
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FORMAT SIZE A1

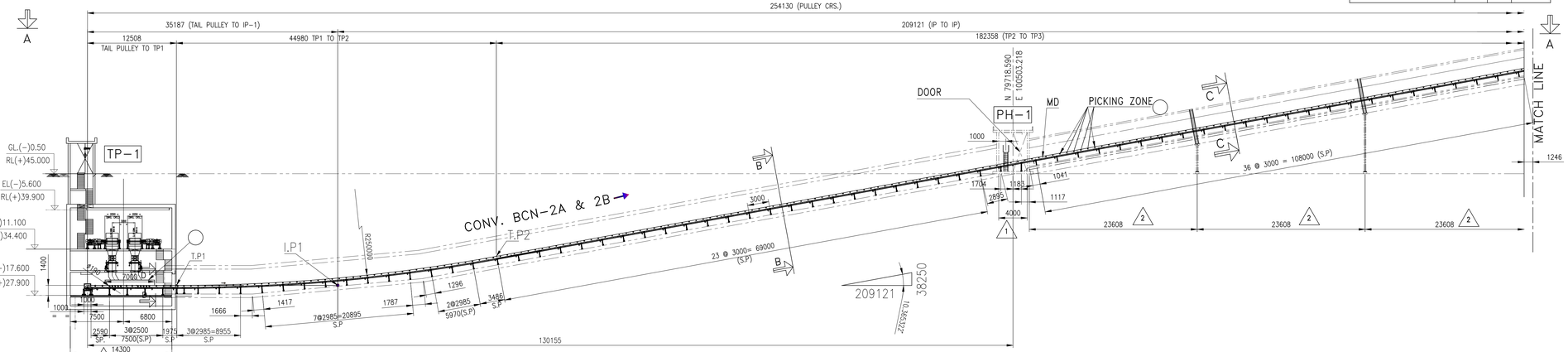
ALL DIMENSIONS ARE IN MM

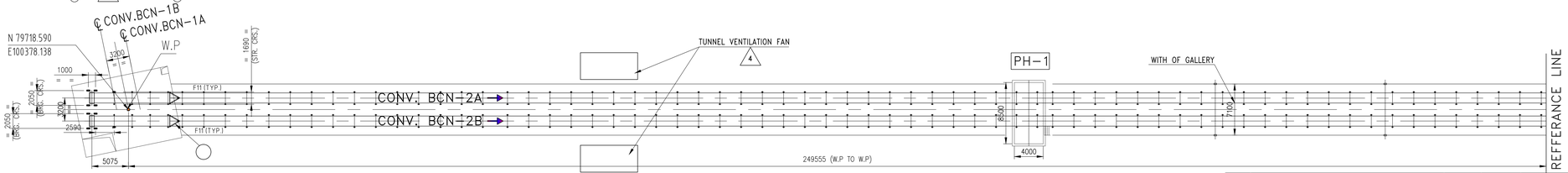
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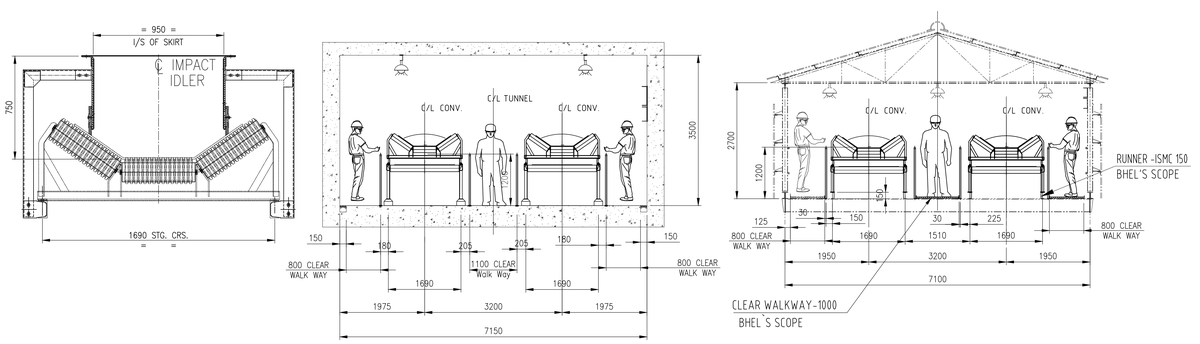




Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		24000
Return Idler	RI		3000
Self Aligning Return Idler	SARI		24000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000
TAIL PULLEY	T.P		
DEFFLECTOR PULLEY	D.P		
SHORT PST	S.P		







NOTE :−

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB−BARAUNI DRG. NO. PE−DG−374−100−M001 (Rev. 01)
3. RL (+) 45.0 M CORRESPONDS TO EL (−) 0.500 (FGL)
4. ALL CIVIL, STRUCTURAL WORKS ARE IN BHEL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS−0−PL−660−100−M001 & FLOW DIAGRAM DRG. NO: IS−1−FL−660−100−M002
7. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
8. MOTOR RATING,EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.
9. REFER TYP. CROSS SECTION OF GALLERY & TUNNEL FOR LIGHTING & FIRE WATER PIPE.
10. REFER SEPARATED DRG.FOR VENTILATION DUCT,DS,SW,DW.

Item No.	Description	Quantity	Material	Make
34	PICK UPROLLER	6		
33	PULL CHORD SWITCH	9 Pair		
32	BELT SWAY SWITCH	6 Pair		
31	ZERO SPEED SWITCH	1		
30	DISCHARGE CHUTE AT HEAD END - 10TH M.S.BODY PLATE & 6 TH SS 409M LINER .HOOD 4 THK.	1	ASSY	
29	COUNTER WEIGHT.	5.0 T	C.I.	
28	VERTICAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 6400	1	ASSY	
27	TAIL UNIT FRAME C/W GUARD	1	ASSY	
26	DRIVE UNIT FRAME - ISMB 200	1	ASSY	
25	HEAD UNIT FRAME - ISMB 200	1	ASSY	
24	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT	ASSY	
23	STRINGER FRAME -ISMC 125 & SHORT SUPPORTS POST - ISMC 100	I LOT	ASSY	
22	SKIRT BOARD AT TAIL END - 10 TH, M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	6.5M	ASSY	
21	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE ELASTOMOUNT C/W POLYEURETHENE BLADES	1		
20	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	ASSY	
19	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	ASSY	
18	SELF CLEANER RUBBER DISK RETURN IDLER 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 25 BRG. AS PER IS: 8598-1987	1	ASSY	
17	SELF ALIGNING RETURN IDLER -1 ROLL ASSY -152.4 Ø ERW TUBE X4.5 THK x Ø25 BRG. AS PER IS: 8598-1987	9	ASSY	
16	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	9	ASSY	
15	RETURN IDLER - 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 25 BRG. AS PER IS: 8598-1987	72	ASSY	
14	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
13	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
12	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	243	ASSY	
11	IMPACT IDLER 35° 3 ROLL ASS'Y Ø190 RUBBER 139.7Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	10	ASSY	
10	DEFLECTOR PULLEY - 219.1 mm OD X 1600 mm FACE X 7.1 TH SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CK/W33, ADAPTOR SLEEVES - H 3111, SHORE HARDNESS 45-55 DEGREE A	1	ASS'Y.	
9	BEND PULLEY - 500 mm OD X 1600 mm FACE X 12 TH SHELLX12 THK RUBBER LAGGING X 135DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 530 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22230 CK, ADAPTOR SLEEVES - H 3130, SHORE HARDNESS 45-55 DEGREE A	2	ASS'Y.	
8	SNUB PULLEY - 500 mm OD X 1600 mm FACE X 12 TH SHELLX12THK RUBBER LAGGING X 125DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK, ADAPTOR SLEEVES - H 3128, SHORE HARDNESS 45-55 DEGREE A	1	ASS'Y.	
7	TAIL/TAKEUP PULLEY - 630 mm OD X1600 mm FACE X 12 TH SHELLX12 THK.RUBBER LAGGING X 140 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE -SNA 532 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22232 CCK/W33, ADAPTOR SLEEVES - H 3132, SHORE HARDNESS 45-55 DEGREE A	1+1	ASS'Y.	
6	HEAD / DRIVE PULLEY - 800 mm OD X1600 mm FACE X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 180 DIA SHAFT AT COPPER BEARING 01 BC SDC 3140 180 MM EX ALT BPTL(FREE TYPE) & 01 BC SDC 3140 180MM GR ALT (FIXED TYPE)	1	ASS'Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG-10.	1	STD.	
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 270 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - PST 500 (SCOOP)	1	STD.	
3	GEAR REDUCER - PARALLEL HELICAL TYPE INTEGRAL HOLDBACK RATIO- 23:2:1, SIZE CSB 400 SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 490 KW	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 270 KW RATING X 1500 RPM,	1	STD.	BHEL SCOPE
1	BELTING-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 1400/4 MHD, COVER GRADE - FR TOP - 5 TH. + BOTTOM - 3TH.	522 M (TAPE LENGTH) (SPLICE LENGTH) NOT CONSIDERD	STD.	BHEL SCOPE

Bill of Materials (FOR ONE CONV. ONLY)

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	14.08.12	REVISED AS PER STEAG/BHEL COMMENTS Dated 14.08.12.	AB	PB	GM
3	09.08.12	REVISED AS PER STEAG/BHEL COMMENTS Dated 6.07.12.	AB	PB	GM
2	05.07.12	REVISED AS PER BHEL COMMENTS Dated 14.06.12. AS MKD. 2	RR	JC	GM
1	05.06.12	REVISED AS PER BHEL COMMENTS Dated 17.04.12 .	RR	JC	GM

REVISIONS

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA−700028

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

BTL DRG. NO. MHPD/1061/BSEBB/M/007 REV-4

	NAME	SIGN	DATE
DRN.	G.M		16.02.12
CHD.	J.C		01.03.12
APPD.	S.S.G		01.03.12

DIRECTORY :
FILE NO. :
SCALE 1:350

TITLE :
GA & LOAD DATA OF CONV. BCN 2A/2B WITH PH-1

BHEL DRAWING NO. IS−1−GA−660−101−M007 REV. 2
SHEET NO. 1 OF 2 NO.OF SHTS. 2

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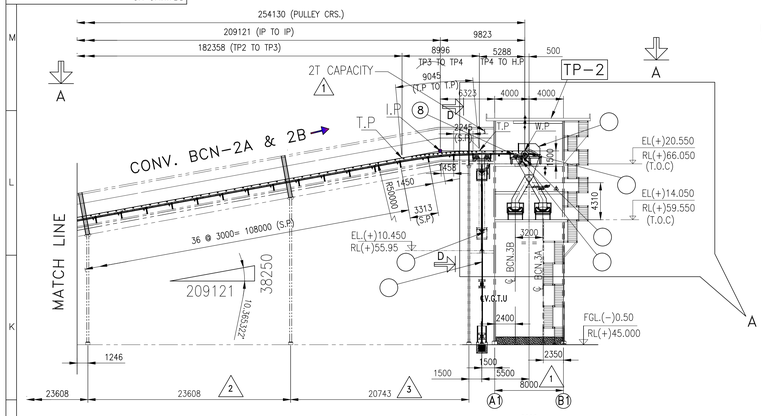
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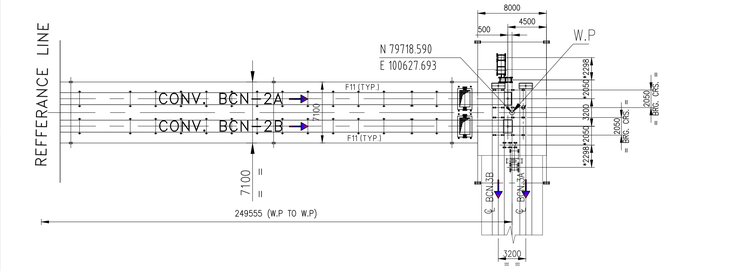
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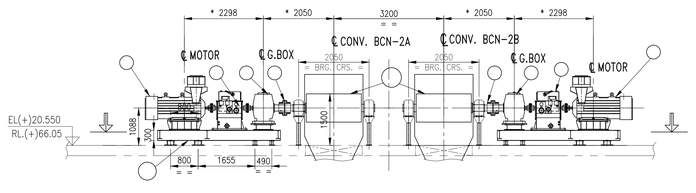
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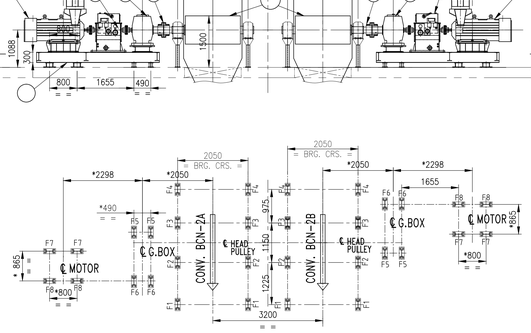
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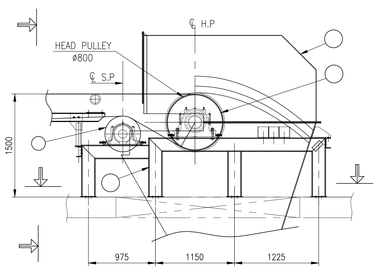
ALL DIMENSIONS ARE IN MM

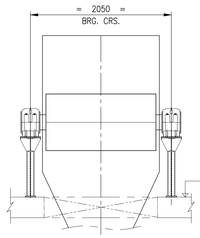


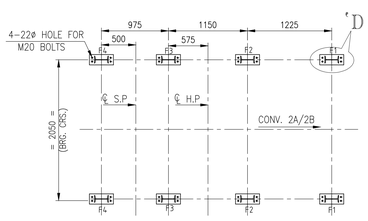


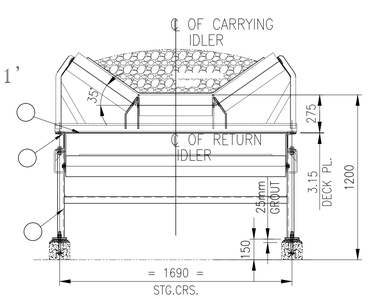


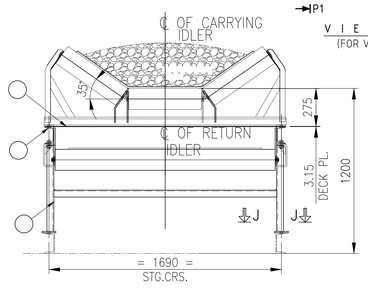


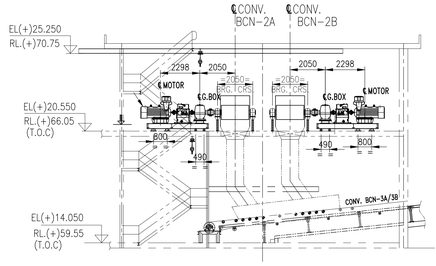


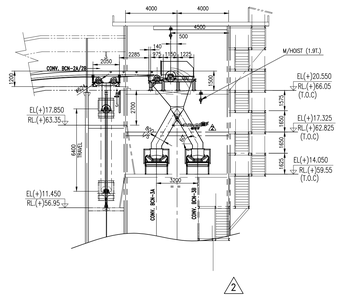


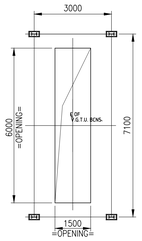


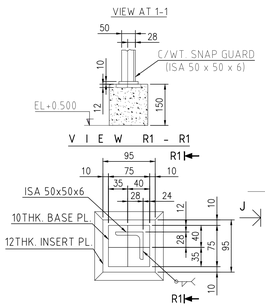


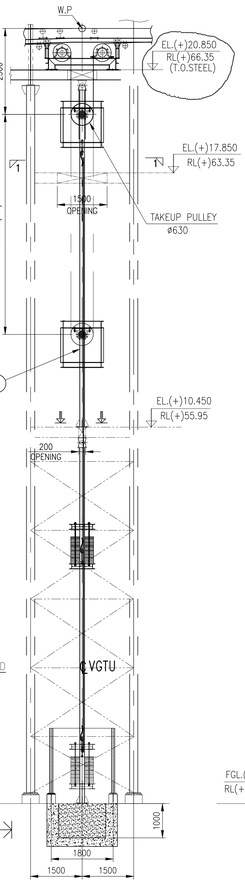


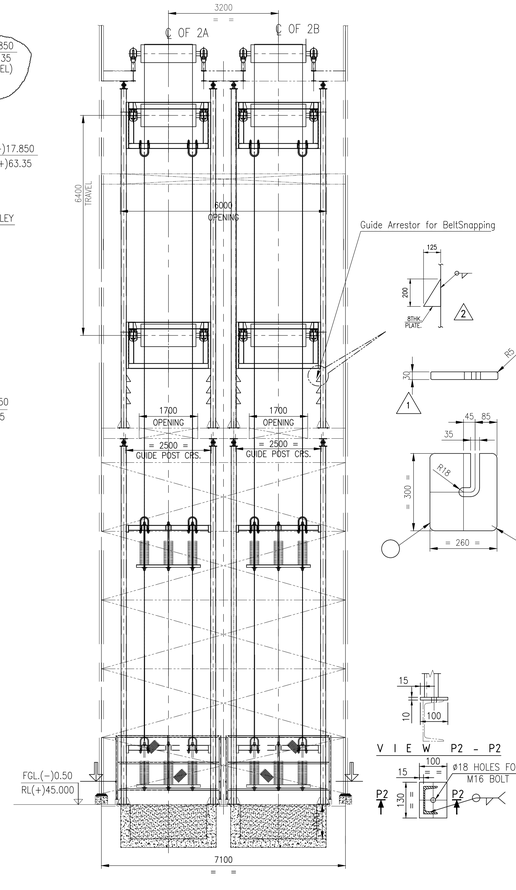


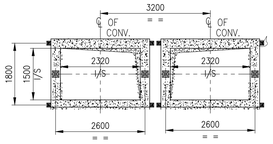


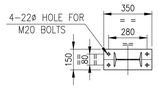


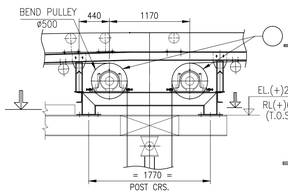


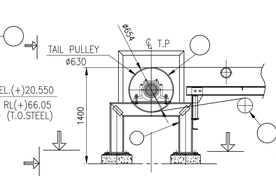


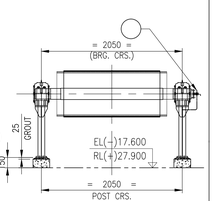


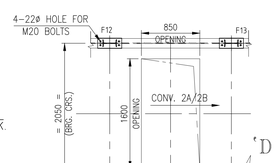


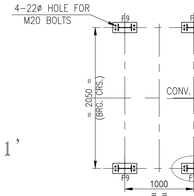


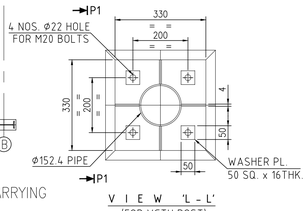


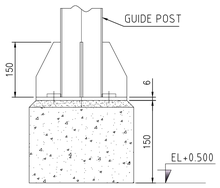












LOAD DATA

POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T)	LOCATION
F1	3.7	–	2.0	HEAD FRAME
F2	–	4.5	2.0	"
F3	–	5.2	2.0	"
F4	–	1.2	1.3	"
F5	3.2	–	–	DRIVE BASE
F6	5.5	–		"
F7	–	1.5		"
F8	6	–	–	"
F9	1.3	–	3.9	TAIL FRAME
F10	–	1.3	3.8	"
F11	–	0.850		SHORT POST
F12	–	1.8		BEND FRAM
F13	–	1.8		BEND FRAM

Technical Characteristics

Conveyor Basic Parameters

Description	Unit	Values
Conveyor No.	-	2A/2B
Type Of Conveyor	-	Belt Conveyor
Conv. Profile	-	Inclined
Material Conveyed		Sized Coal
Lump Size	mm	(−) 300
Bulk Density vol/load	T/M.^{3}	0.8
Moisture	%	15−20
Belt Width	mm	1400
Capacity (Rated)	T/Hr.	1200
Capacity (Designed)	T/Hr.	1320
Belt Speed (Nominal)	M/Sec.	2.75
Horizontal Crs.	mm	254130
Vertical Lift	mm	38163
Troughing Angle	Degree	35
No Of Feed Point		2
No Of Disch. Point		1
Conv. Inclination Max.	Degree	10.365322
Type Of Take Up		VGTU
Take up Travel	mm	6400
Motor Rating	KW/RPM	270
BELT TENSIONS:		
T1	N	108950.07
T2	N	30000
T Tail	N	24318.08
ANGLE OF WRAP	Degree	210°
COUNTER WT.	KG	5000 KG.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	14.08.12	REVISED AS PER STEAG/BHEL COMMENTS Dated 14.08.12.	AB	PB	GM
3	09.08.12	REVISED AS PER STEAG/BHEL COMMENTS Dated 6.07.12.	AB	PB	GM
2	05.07.12	REVISED AS PER BHEL COMMENTS Dated 14.06.12. AS MKD. 2	RR	JC	GM
1	05.06.12	REVISED AS PER BHEL COMMENTS Dated 17.04.12 .	RR	JC	GM

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA−700028

BTL DRG. NO. MHPD/1061/BSEBB/M/007 REV-4

	NAME	SIGN	DATE
DRN.	G.M		16.02.12
CHD.	J.C		01.03.12
APPD.	S.S.G		01.03.12

DIRECTORY : FILE NO. : SCALE 1:350

TITLE : GA & LOAD DATA OF CONV. BCN 2A/2B WITH PH−1

BHEL DRAWING NO. IS−1−GA−660−101−M007 REV. 2

SHEET NO. 2 OF 2 NO.OF SHTS. 2

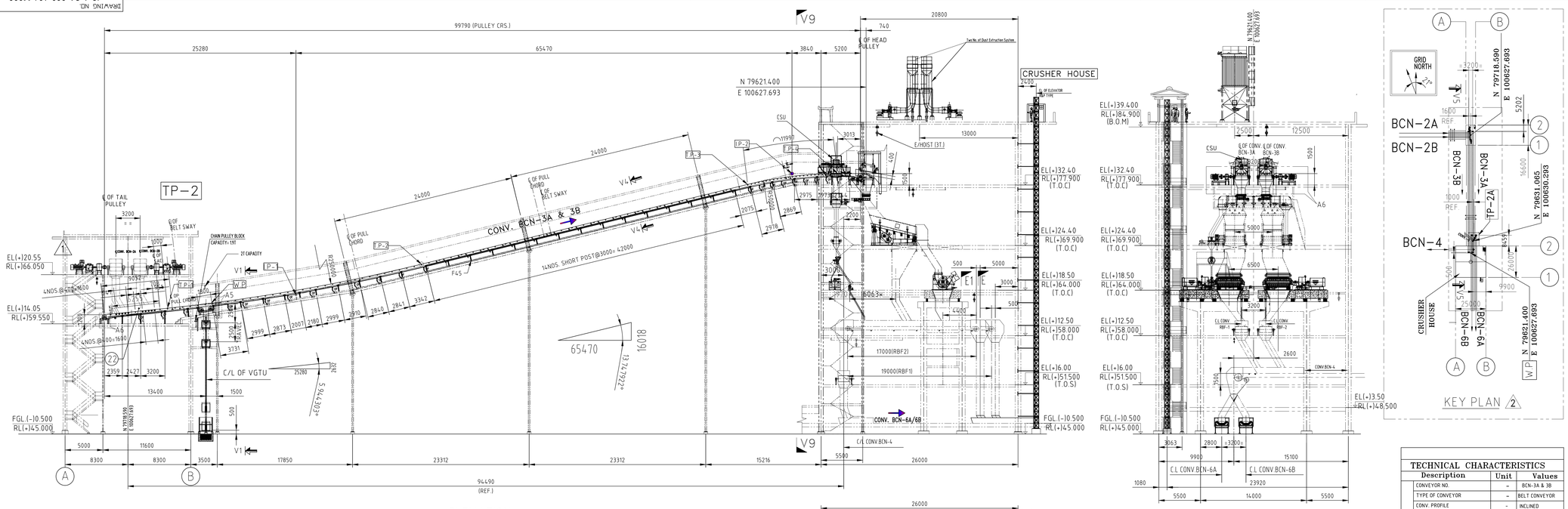
FORMAT SIZE A1

ELECTRONIC FILE NAME

DRAWING NO. IS-1-GA-660-101-M008

ALL DIMENSIONS ARE IN MM

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ELEVATION
VIEW `V5-V5'(from key plan) 2

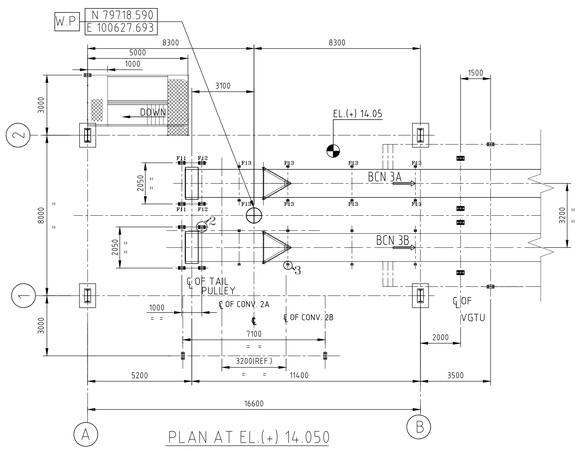


PLAN VIEW OF CONV. 3A & 3B 2

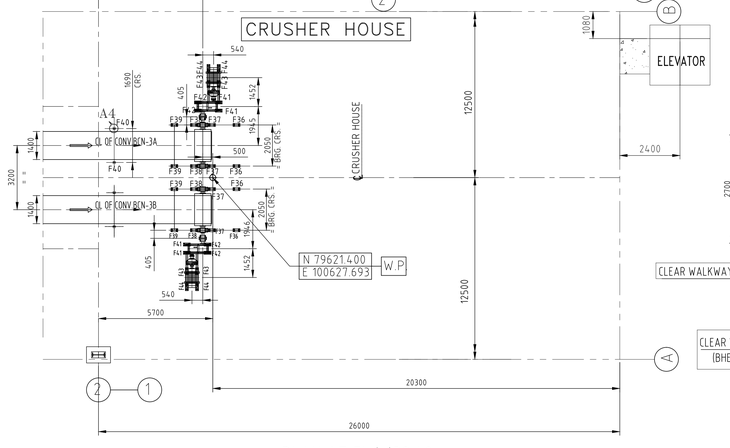
VIEW `V9-V9' 2

LOAD DATA

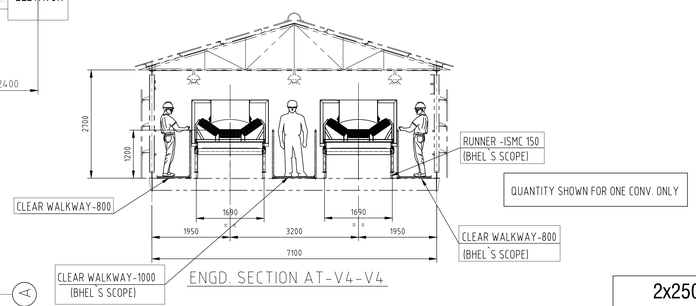
POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T) ⟷	LOCATION
F11	1.3	–	3.9	TAIL FRAME
F12	–	1.3	3.8	”
F13	–	0.85	–	CONV.SUPPORT
F20	–	–	–	BEND FRAME
F21	–	–	–	”
F36	1.0	–	–	HEAD FRAME
F37	–	1.8	10.5	”
F38	–	3.0	10.5	”
F39	–	0.9	0.5	HEAD FRAME
F40	–	0.6	–	CONV.SUPPORT
F41	–	2.5	–	CONV.DRIVE FRAME
F42	2.0	–	–	”
F43	–	0.5	–	”
F44	–	0.35	–	CONV.DRIVE FRAME
F45	–	0.5	–	CONV.SUPPORT (ON GALLERY)



PLAN AT EL.(+) 14.050
ENGD VIEW AT A2 2



PLAN AT EL.(+)32.40
ENGD VIEW AT A1 2



ENGD. SECTION AT-V4-V4
CONV.BCN-3A&3B)

TECHNICAL CHARACTERISTICS

	Description	Unit	Values
CONVEYOR BASIC PARAMETERS	CONVEYOR NO.	–	BCN-3A & 3B
	TYPE OF CONVEYOR	–	BELT CONVEYOR
	CONV. PROFILE	–	INCLINED
	MATERIAL CONVEYED		SIZED COAL
	LUMP SIZE	mm	(-) 300
	BULK DENSITY VOL/LOAD	T/M^3	0.8
	MAX. MOISTURE CONTENT	%	15-20%
	BELT WIDTH	mm	1400
	CAPACITY (RATED)	T/Hr.	1200
	CAPACITY (DESIGNED)	T/Hr.	1320
	BELT SPEED (NOMINAL)	M/Sec.	2.75
	HORIZONTAL CRS.	mm	99190
	VERTICAL LIFT	mm	18650
	TROUGHING ANGLE	Degree	35
	NO. OF FEED POINT		2
	NO. OF DISCH. POINT		1
	CONV. INCLINATION MAX.	Degree	13.747922°
	TYPE OF TAKE UP		VGTU
	TAKE UP TRAVEL	mm	2500
	MOTOR RATING	KW/RPM	132
	BELT TENSIONS:		
	T1	N	552015
	T2	N	15200.4
	T e	N	12650.45
	ANGLE OF WRAP	Degree	210°
	COUNTER WT.	KG	1200

Item No.	Description	Qty.	Matl.	Make
33	PULL CHORD SWITCH	3 Pair		
32	BELT SWAY SWITCH	3 Pair		
33	ZERO SPEED SWITCH	1		
32	SELF CLEANING RETURN T ROLL ASS`Y Φ190 RUBBER 139.7Φ ERW TUBE X 4.5 THK x Φ 25 BRG. AS PER	1	ASSY	
31	BEND FRAME	1	ASSY	
30	DISCHARGE CHUTE AT HEAD END - 10TH M.S.MOTHER PLATE & 6 TH S.S. 409M LINER ,HOOD-4 THK.	1	ASSY	
29	COUNTER WEIGHT -1200KG.	LOT		
28	VERTICAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 2500	1	ASSY	
27	TAIL UNIT FRAME C/W GUARD	1	ASSY	
26	DRIVE UNIT FRAME	1	ASSY	
25	HEAD UNIT FRAME	1	ASSY	
24	DECK PLATE 3.15 THK. (THROUGH OUT)	1 LOT	ASSY	
23	STRINGER FRAME -ISMC125 & SHORT SUPPORTS - ISMC 100	1 LOT	ASSY	
22	SKIRT BOARD AT TAIL END - 10 TH M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	5.965 M	ASSY	
21	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE HARD RUBBER STRIPS	1	ASSY	
20	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	ASSY	
19	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	ASSY	
18	SELF ALIGNING RETURN IDLER -1 ROLL ASSY - 152.4 Φ ERW TUBE X 4.5 THK x Φ 25BRG. AS PER IS: 8598-1987	3	ASSY	
17	SELF ALIGNING CARRYING IDLER 35° X 3 ROLL ASSY-152.4 Φ ERW TUBE X 4.5 THK x Φ 35 BRG. AS PER IS: 8598-1987	3	ASSY	
16	RETURN IDLER - 1 ROLL ASSY - 152.4Φ ERW TUBE X 4.5 THK x Φ 25 BRG. AS PER IS: 8598-1987	33	ASSY	
15	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4 Φ ERW TUBE X 4.5 THK x Φ 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
14	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4 Φ ERW TUBE X 4.5 THK x Φ 35 BRG. AS PER AS PER IS: 8598-1987	1	ASSY	
13	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY - 152.4 Φ ERW TUBE X 4.5 THK x Φ 35 BRG. AS PER AS PER IS: 8598-1987	102	ASSY	
12	IMPACT IDLER 35° 3 ROLL ASS`Y Φ190 RUBBER 139.7Φ ERW TUBE X 4.5 THK x Φ 35 BRG. AS PER IS: 8598-1987	9	ASSY	
11	IMPACT IDLER 20°TRANSI. 3 ROLL ASS`Y Φ190 RUBBER 139.7Φ ERW TUBE X 4.5THK.XΦ 35 BRG. AS PER IS: 8598-1987	1	ASSY	
10	DEFLECTOR PULLEY - 219.1 mm OD X 1600 mm FACE X 7.1 TH SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22217CK, ADAPTOR SLEEVES - H311,	1	ASS`Y.	
9	BEND PULLEY - 500 mm OD X 1600 mm FACEX12THK SHELL X 12THK. PLAIN LAGGING X1150A SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 526 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22224 CK, ADAPTOR SLEEVES - H326, SHORE HARDNESS 45-55° A	2	ASS`Y.	
8	SNUB PULLEY - 500 mm OD X 1600 mm FACEX12THK SHELL X 12THK. PLAIN LAGGING X1150A SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 522 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22222 CK, ADAPTOR SLEEVES - H322, SHORE HARDNESS 45-55° A	1	ASS`Y.	
7	TAIL & TAKE-UP PULLEY - 630 mm OD X1600 mm FACE X 12 TH SHELL X 1250A SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK, ADAPTOR SLEEVES - H328, SHORE HARDNESS 45-55° A	1+1	ASS`Y.	
6	HEAD / DRIVE PULLEY - 800 mm O.D. X1600 mm FACE X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 750 DIA SHAFT AT BEARING 01 BC SDC3134 150 MM EX ALT BPTL & 01 BC SDC3134 150 MM EX GR ALT 5	1	ASS`Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 55° C AMBIENT & CONTINUOUS DUTY OPERATION SIZE - RG-08, MAX. BORE 150 MM	1	STD.	
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 132 KW MOTOR & CONTINOUS DUTY OPERATION - SIZE - SDFC 500, 5	1	STD.	
3	GEAR REDUCER - PARALLEL HELICAL TYPE INTEGRAL HOLDBACK RATIO- 23.2:1, SIZE CSB-315 AMBIENT AND CONTINOUS DUTY OPERATION MECH. RATING 262 KW	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 132 KW RATING X 1500 RPM, FRAME SIZE - 315L, PROTECTION - IP 55, INSULATION CLASS-B, SUITABLE FOR 50 DEGREE AMBIENT AND 3 PHASE, 415 VOLT	1	STD.	
1	BELTING-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 800/4 MHD, COVER GRADE - FR TOP - 5 TH.	210 SM (TAPE LENGTH SPLICE LENGTH NOT CONSIDERD)	STD.	BHEL`S SCOPE

Bill of Materials

Legend		SPACINGING MM.
Impact Idler	II	5@400
Transition Impact Idler	TII	400
Troughed Carring Idler	TCI	1000
Self Aligning Troughed Carring Idler	SATCI	24000
Return Idler	RI	3000
Self Aligning Return Idler	SARI	24000
Working Point	W.P	
Pull cord. Switch		30000
Belt sway Switch		50000
Transition Idler	TI	

NOTE :-
1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB-BARAUNI DRG. NO. PE-DG-374-100-M001 (Rev. 01)
3. RL. (+) 45.0M CORRESPONDS TO EL. (-) 0.5(FGL)
4. ALL CIVIL, STRUCTURAL WORKS ARE IN BHEL'S SCOPE.
2 5. DE SYSTEM FOR CRUSER HOUSE IN BTL SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002
7. DIMENSION MKD ** SHALL BE FINALISED AFTER APPROVAL OF G.BOX MOTOR & COUPLING
8. THIS DRG. READ IN CONJUNTION WITH TYP.CROSS SECTION DRG.NO-IS-1-GA-660-100-M003.
9. REFER SEPARATE DRG FOR VENTILATION DUCT ,DS,SW & DW .
10. ALL FONDATION SHALL BE AS PER CIVIL DRG .

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
5	28.11.12	REVISED AS PER STEAG COMMENTS Dated 24.11.12	A.B	JC	SSG
4	16.08.12	REVISED AS PER STEAG COMMENTS Dated 18.07.12	A.B	JC	SSG
3	02.07.12	REVISED AS PER STEAG COMMENTS Dated 28.06.12	A.B	JC	SSG
2	01.06.12	REVISED AS PER STEAG COMMENTS Dated 17.04.12	RR	JC	SSG
1	03.03.12	REVISED AS PER BHEL COMMENTS Dated 29.02.12	GC	JC	SSG

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/008 REV. 5

	NAME	SIGN	DATE
DRN.	G.C.		20.02.12
CHD.	J.C.		25.02.12
APPD.	SSG		25.02.12

DIRECTORY :
FILE NO. :
SCALE 1:300

TITLE : GA & LOAD DATA OF CONV. BCN-3A/3B.

BHEL DRAWING NO. IS-1-GA-660-101-M008 REV. 5

SHEET NO. 1 OF 2 NO.OF SHTS. 2

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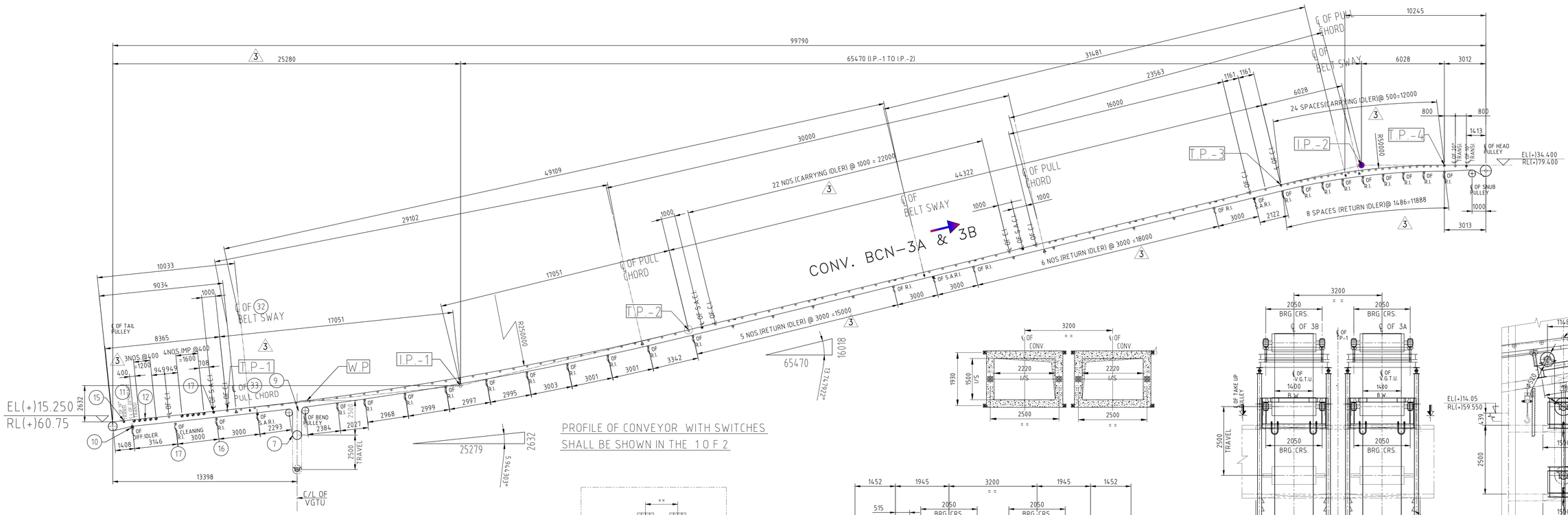
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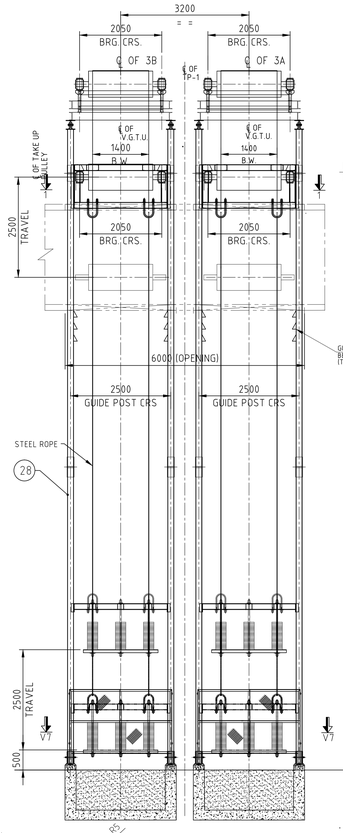
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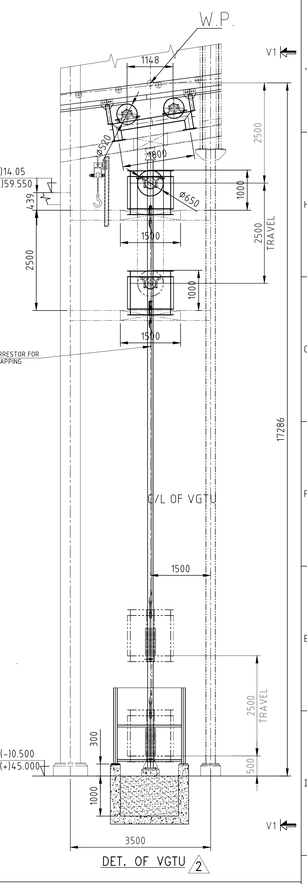
ALL DIMENSIONS ARE IN MM

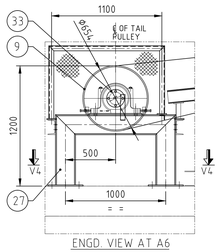
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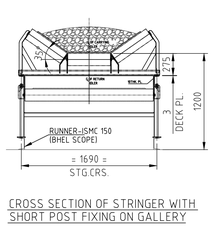
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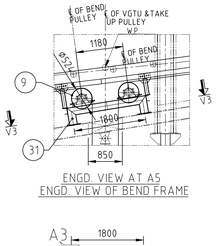


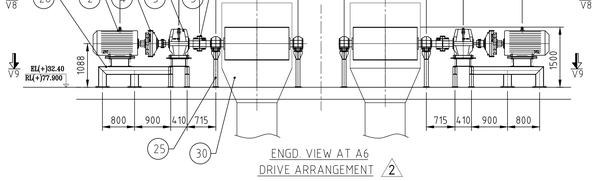


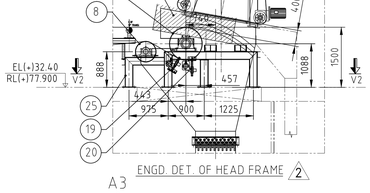


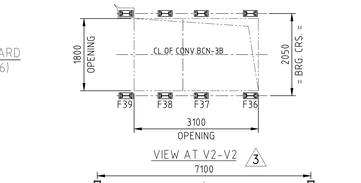


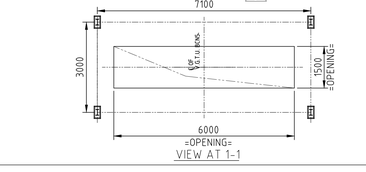




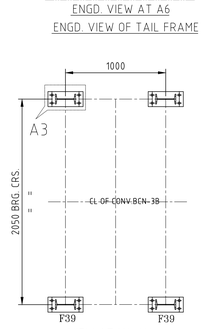


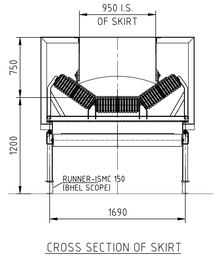


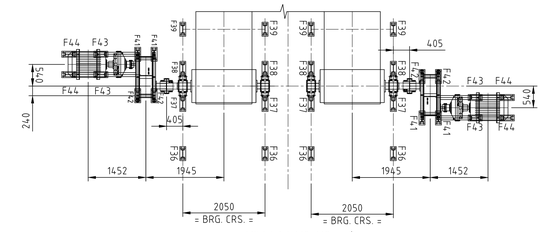


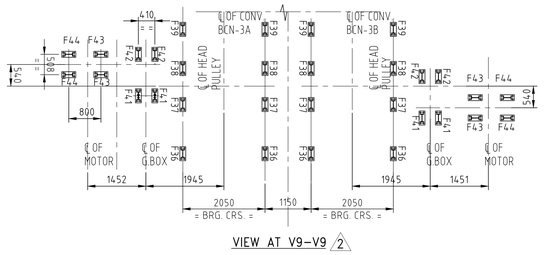


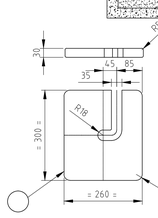




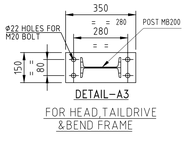








VIEW AT V1-V1 2



Legend			SPACINGING MM.
Impact Idler	II	●	5@400
Transition Impact Idler	TII	◍	400
Troughed Carring Idler	TCI	⊖	1000
Self Aligning Troughed Carring Idler	SATCI	◓	24000
Return Idler	RI	⊖	3000
Self Aligning Return Idler	SARI	◒	24000
Working Point	W.P.		
Pull cord. Switch		△	30000
Belt sway Switch		□	50000
Transition Idler	TI	⊙	

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
5	28.11.12	REVISED AS PER STEAG COMMENTS Dated 24.11.12	A.B	JC	SSG
4	16.08.12	REVISED AS PER STEAG COMMENTS Dated 18.07.12	A.B	JC	SSG
3	02.07.12	REVISED AS PER STEAG COMMENTS Dated 28.06.12	A.B	JC	SSG
2	01.06.12	REVISED AS PER STEAG COMMENTS Dated 17.04.12	R.R	JC	SSG
1	03.03.12	REVISED AS PER BHEL COMMENTS Dated 29.02.12	GC	JC	SSG

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/008 REV. 5

	NAME	SIGN	DATE
DRN.	G.C.		20.02.12
CHD.	J.C.		25.02.12
APPD.	SSG		25.02.12

DIRECTORY :
FILE NO. :
SCALE 1:300

TITLE : GA & LOAD DATA OF CONV. BCN-3A/3B.

BHEL DRAWING NO. IS-1-GA-660-101-M008 REV. 5

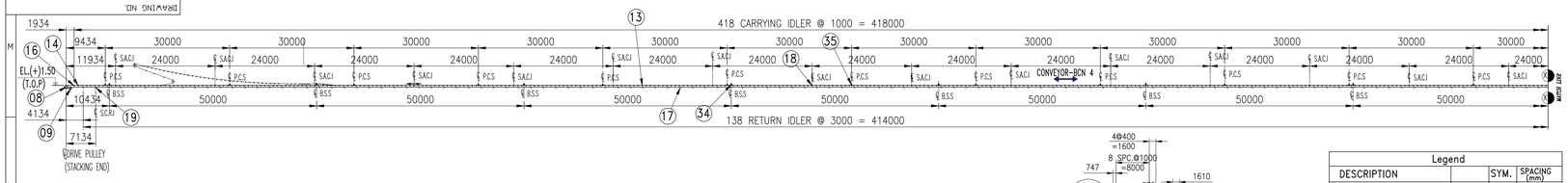
SHEET NO. 2 OF 2 NO.OF SHTS. 2

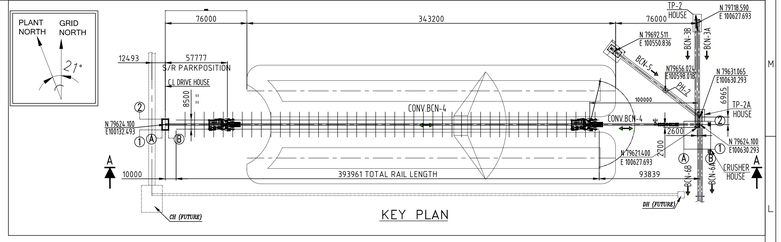
FORMAT SIZE A1

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ALL DIMENSIONS ARE IN MM

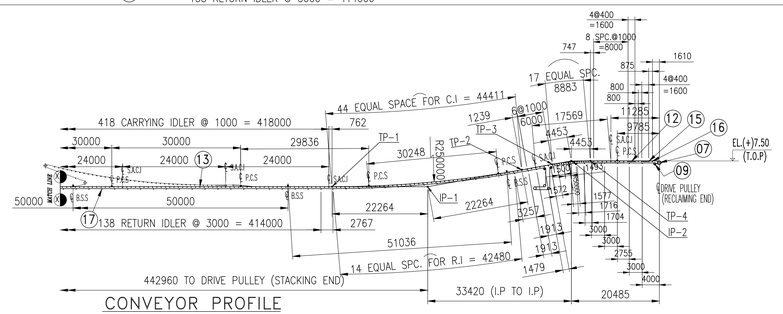
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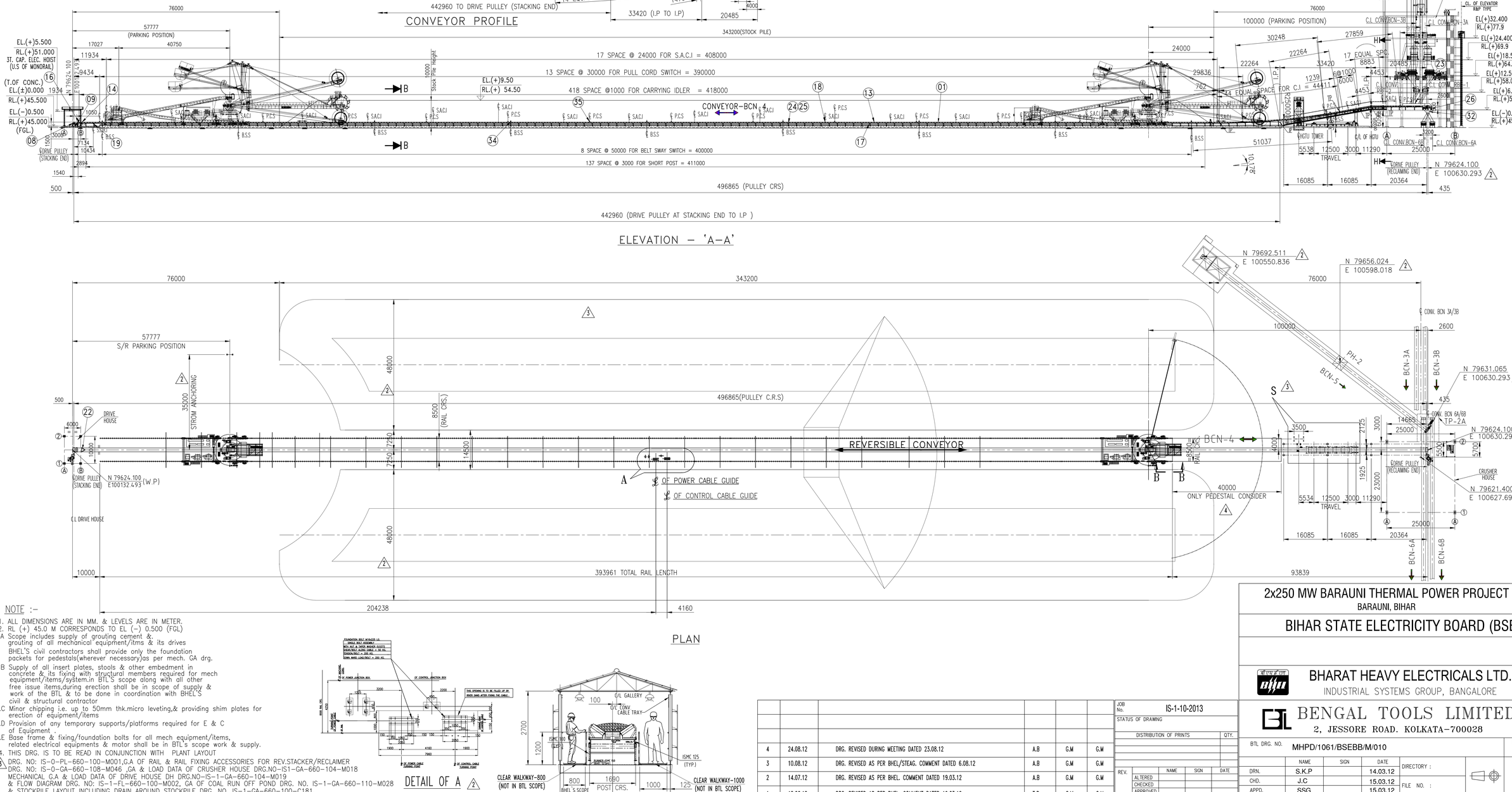


KEY PLAN

Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Impact Transition Idler 20°	ITI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		24000
'V' Type Return Idler	RI		3000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000



CONVEYOR PROFILE



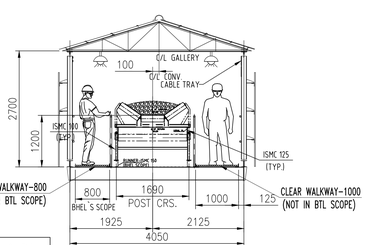
ELEVATION – 'A–A'

PLAN

NOTE :–

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. RL (+) 45.0 M CORRESPONDS TO EL (–) 0.500 (FGL)
- 3.A Scope includes supply of grouting cement &. grouting of all mechanical equipment/items & its drives BHEL'S civil contractors shall provide only the foundation packets for pedestals(wherever necessary)as per mech. GA drg.
- 3.B Supply of all insert plates, stools & other embedment in concrete & its fixing with structural members required for mech equipment/items/system.in BTL'S scope along with all other free issue items,during erection shall be in scope of supply & work of the BTL & to be done in coordination with BHEL'S civil & structural contractor
- 3.C Minor chipping i.e. up to 50mm thk.micro leveling,& providing shim plates for erection of equipment/items
- 3.D Provision of any temporary supports/platforms required for E & C of Equipment
- 3.E Base frame & fixing/foundation bolts for all mech equipment/items, related electrical equipments & motor shall be in BTL's scope work & supply.
4. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT
3. DRG. NO: IS-0-PL-660-100-M001,G.A OF RAIL & RAIL FIXING ACCESSORIES FOR REV.STACKER/RECLAIMER DRG. NO: IS-0-GA-660-108-M046 ,GA & LOAD DATA OF CRUSHER HOUSE DRG.NO–IS1-GA-660-104-M018 MECHANICAL G.A & LOAD DATA OF DRIVE HOUSE DH DRG.NO–IS-1-GA-660-104-M019 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002, GA OF COAL RUN OFF POND DRG. NO. IS-1-GA-660-110-M028 & STOCKPILE LAYOUT INCLUDING DRAIN AROUND STOCKPILE DRG. NO. IS-1-GA-660-100-C181.
5. STRACKER RECLAIMER ARE FREE ISSUE ITEM FROM BHEL
6. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
7. MOTOR RATING, EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.

DETAIL OF A (2)



VIEW–'H–H' (3)

REFER SEPARATE DRG FOR VENTILATION DUCT ,DS,SW & DW .

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	24.08.12	DRG. REVISED DURING MEETING DATED 23.08.12	A.B	G.M	G.M
3	10.08.12	DRG. REVISED AS PER BHEL/STEAG. COMMENT DATED 6.08.12	A.B	G.M	G.M
2	14.07.12	DRG. REVISED AS PER BHEL. COMMENT DATED 19.03.12	A.B	G.M	G.M
1	12.06.12	DRG. REVISED AS PER BHEL. COMMENT DATED 19.03.12	T.R	G.M	G.M

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700028

BTL DRG. NO. MHPD/1061/BSEBB/M/010 REV. 4

	NAME	SIGN	DATE
DRN.	S.K.P		14.03.12
CHD.	J.C		15.03.12
APPD.	SSG		15.03.12

DIRECTORY :
FILE NO. :
SCALE 1:700

TITLE : GA & LOAD DATA OF YARD CONV.BCN - 4 (REVERSIBLE)

BHEL DRAWING NO. IS-1-GA-660-101-M010 REV. 4

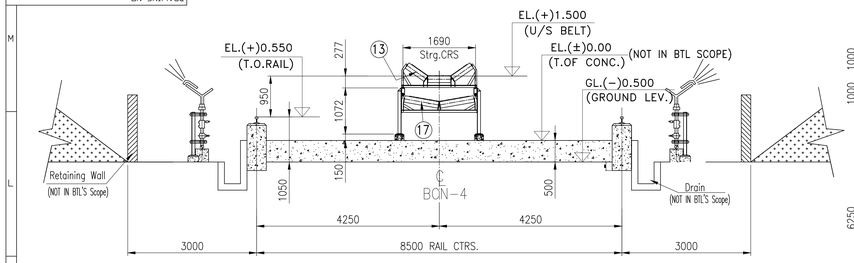
SHEET NO. 1 NO.OF SHTS. 2

FORMAT SIZE A1

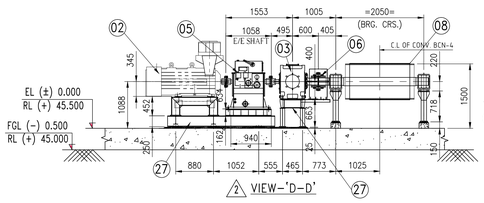
ELECTRONIC FILE NAME

ALL DIMENSIONS ARE IN MM

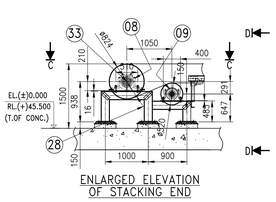
DRAWING NO.



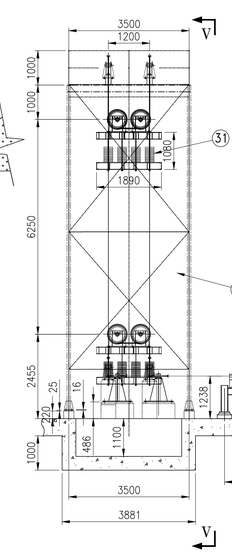
VIEW−'B−B'



2 VIEW−'D−D'

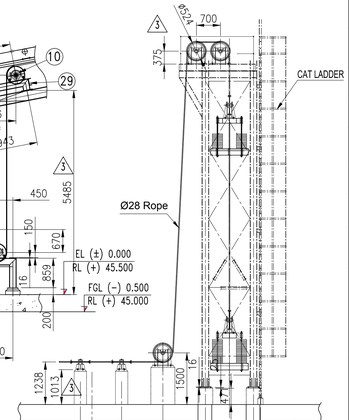


ENLARGED ELEVATION OF STACKING END

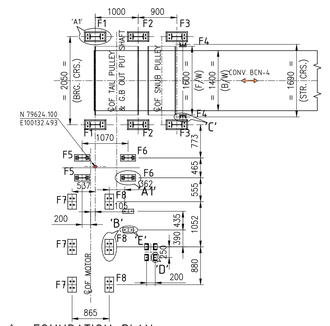


2 ELEVATION OF TAKEUP ARRANGEMENT

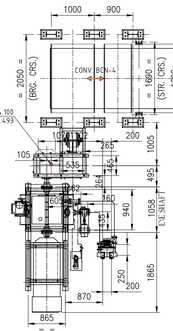
LOAD DATA (FOR RECLAIMING END)				
POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ←→	LOCATION
F9	1.6	−	13.78	HEAD FRAME (FLOOR LEVEL EL(+)6.000
F10	−	1.5	13.78	
F11	−	1.7	13.78	
F12	−	0.8	4.02	
F13	−	0.5	−	STRINGER SUPPORT
F14	−	2.9	−	
F15	2.6	−	−	DRIVE FRAME (FLOOR LEVEL EL(+)6.000
F16	−	0.4	−	
F17	−	0.35	−	
F18	−	0.35	−	



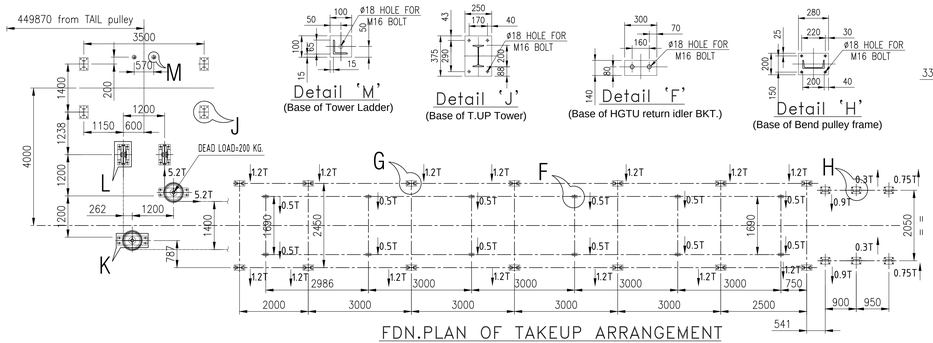
VIEW−'V−V'



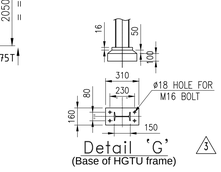
2 FOUNDATION PLAN AT EL (±) 0.000

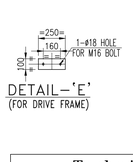


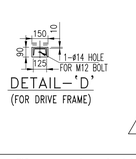
2 PLAN−'C−C'

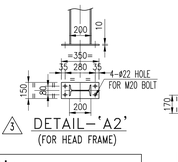


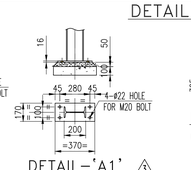
FDN.PLAN OF TAKEUP ARRANGEMENT
DETAIL VIEW−S

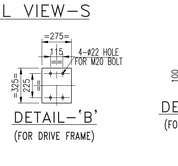


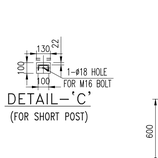


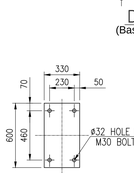


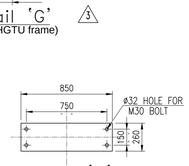


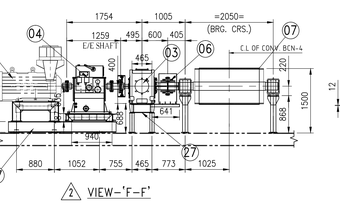




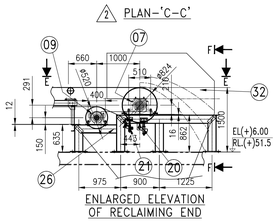




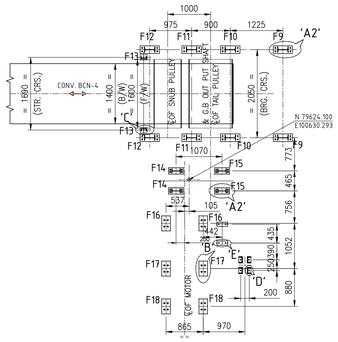




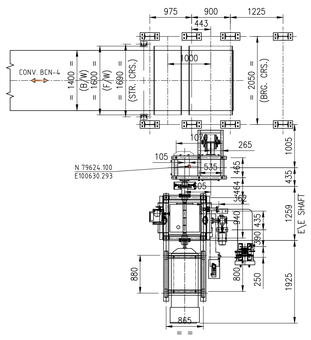
2 VIEW−'F−F'



ENLARGED ELEVATION OF RECLAIMING END



2 FOUNDATION PLAN AT EL (±) 6.500



2 PLAN−'E−E'

NOTE :−
FOR GENERAL NOTES REF.DRG.NO.IS−1−GA−660−101−M010 (Sht−1 OF 2)

Technical Characteristics			
Description		Unit	Values
Conveyor Basic Parameters	Conveyor No.	-	BCN−4
	Type Of Conveyor	-	Belt Conveyor
	Conv. Profile	-	Inclined
	Material Conveyed		Sized Coal
	Lump Size	mm	(−) 20
	Bulk Density vol/load	T/M. ^{3}	0.8
	Moisture	%	15−20
	Belt Width	mm	1400
	Capacity (Rated)	T/Hr.	1200
	Capacity (Designed)	T/Hr.	1320
	Belt Speed− Nominal	M/Sec.	2.75
	Horizontal Crs.	mm	496865
	Vertical Lift	mm	6000
	Troughing Angle	Degree	35
	No Of Feed Point		1
	No Of Disch. Point		1
	Conv. Inclination Max.	Degree	10.178°
	Type Of Take Up		HGTU
	Take up Travel	mm	12500
	Motor Rating	KW/RPM	225KW
	BELT TENSIONS:		Drive in operation at DRIVE HOUSE Reclaiming / Drive in operation at CRUSHER HOUSE Stacking
	T1	N	79535.15 / 81049.23
	T2	N	21900.38 / 22317.90
	T Tail	N	24414.05 / 24558.25
	ANGLE OF WRAP	Degree	210° / 210°
	COUNTER WT.	KG	3000

LOAD TABLE (FOR STACKING END)			
POINT	VERTICAL LOAD (IN T.)	HORIZONTAL LOAD IN T. ALONG THE CONVEYOR	HORIZONTAL LOAD IN T. ACROSS THE CONVEYOR
	CASE−I	CASE−I	CASE−I
F1	(−) 2.5	(+) 3.5	(±) 0.3
F2	(+) 5.5	(+) 3.5	(±) 0.3
F3	(+) 1.5	(+) 3.5	(±) 0.3
F4	(+) 0.85	(+) .20	−
F5	(+) 2.5	−	−
F6	(+) 1.8		−
F7	(−) 0.30		−
F8	(+) 0.50		−

SIGN CONVENTION
(V) VERTICAL LOAD UPWARD (−) DOWNWARD (+)
(H) HORIZONTAL LOAD TOWARDS HEAD PULLEY−(+) TOWARDS TAIL PULLEY−(−)
REVERSIBLE LOAD (+/−)
CASE−I: CONVEYOR NORMAL RUNNING + CHUTE BLOCKED

ITEM NO.	DESCRIPTION	QTY.	MATERIAL	MAKE
35	PULL CHORD SWITCH	17 Pair		
34	BELT SWAY SWITCH	10 Pair		
33	ZERO SPEED SWITCH	1		
32	DISCHARGE CHUTE AT HEAD END − 10TH M.S.BODY PLATE & 6 TH SS 409M LINER	1		ASSY
31	COUNTER WEIGHT.	3000 KG	CI	
30	HORIZONTAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 12500 mm	1		ASSY
29	BEND FRAME (1 IN GALLERY & 1 IN CONC. BASE)	2		ASSY
28	TAIL FRAME C/W GUARD AT STACKING END	1		ASSY
27	DRIVE FRAME (1 IN STACKING END & 1 IN RECLAIMING END)	2		ASSY
26	HEAD FRAME AT RECLAIMING END	1		ASSY
25	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT		ASSY
24	STRINGER FRAME & SHORT SUPPORTS - ISMC 125	I LOT		ASSY
23	SKIRT BOARD - 10 TH. M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	1		ASSY

Bill of Materials (FOR INFORMATION)

ITEM NO.	DESCRIPTION	QTY.	MATERIAL	MAKE
22	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE ELASTOMOUNT C/W POLYEURETHENE BLADES	1		ASSY
21	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1		ASSY
20	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1		ASSY
19	SELF CLEANING RETURN IDLER -1 ROLL ASSY 190Ø RUBBER, 139.7 Ø ERW TUBE X 4.5 THK X40 BRG. AS PER IS: 8598-1987	1		ASSY
18	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	20		ASSY
17	'V' TYPE RETURN IDLER - 2 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	165		ASSY
16	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2		ASSY
15	IMPACT TRANSITION IDLER 20° 3 ROLL ASSY 190 Ø RUBBER X139.7Ø ERW TUBEx 4.5 THK x Ø35 BRG. AS PER IS: 8598-1987	1		ASSY
14	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	1		ASSY
13	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY- 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	475		ASSY
12	IMPACT IDLER 35° 3 ROLL ASS'Y Ø190 RUBBER 139.7Ø ERW TUBE X 4.5 THK x Ø 40 BRG. AS PER IS: 8598-1987	10		ASSY
11	TAKE UP PULLEY - 630 mm OD X1600 mm FACE X 12 TH SHELL X 12 TH LAGGING X 150 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SD3134 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 23134CCK/W33, ADAPTOR SLEEVES - H3134, SHORE HARDNESS 45 - 55°A	1	ASS'Y.	
10	BEND PULLEY - 500 mm OD X 1600 mm FACE X 12 TH SHELL X 12 TH LAGGING X 125 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK/W33, ADAPTOR SLEEVES - H3128, SHORE HARDNESS 45 - 55° A	4	ASS'Y.	
09	SNUB PULLEY - 500 mm OD X 1600 mm FACE X 12 TH SHELL X 12 TH LAGGING X 125 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228CK/W33, ADAPTOR SLEEVES - H3128, SHORE HARDNESS 45 -55° A	2	ASS'Y.	
08	HEAD / DRIVE PULLEY - 800 mm OD X1600 mm FACE X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 180 DIA SHAFT AT BEARING 01BCSDC3140 180MM EX ATL BPTL (FREE TYPE) 01BCSDC3140 180MM GR ATL (FIXED TYPE)	1	ASS'Y.	
07	HEAD / DRIVE PULLEY - 800 mm OD X1600 mm FACE X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 180 DIA SHAFT AT BEARING 01BCSDC3140 180MM EX ATL BPTL (FREE TYPE) 01BCSDC3140 180MM GR ATL (FIXED TYPE)	1	ASS'Y.	
06	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG - 09	2	STD.	FENNER
05	INPUT COUPLING - SCOOP CONTROL FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 225 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - PST-500 WITHOUT BREAK DRUM AT STACKING END (D.H)	1	STD.	
04	INPUT COUPLING - SCOOP CONTROL FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 225 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - PST-500 WITH BREAK DRUM DIA. ----- AT RECLAIMING END	1	STD.	
03	GEAR REDUCER - PARALLEL HELICAL TYPE 2 STAGE WITH 1 FAN & INTEGRAL HOLDBACK RATIO- 23.2:1, SIZE CSB-355 FC SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 390 KW	2	STD.	
02	MOTOR - TEFC SQ. CAGE TYPE - 225 KW RATING X 1500 RPM	2	STD.	"BHEL SCOPE"
01	BELT-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 1000/4 , COVER GRADE - FR TOP - 5 TH. + BOTTOM - 3TH.	1040 M (TAPE LENGTH) SPLICE LENGTH NOT CONSIDERED	STD.	"BHEL SCOPE"

Bill of Materials (FOR INFORMATION)

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA−700028

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	24.08.12	DRG. REVISED DURING MEETING DATED 23.08.12	A.B	G.M	G.M
3	10.08.12	DRG. REVISED AS PER BHEL/STEAG. COMMENT DATED 6.08.12	A.B	G.M	G.M
2	14.07.12	DRG. REVISED AS PER BHEL. COMMENT DATED 19.03.12	A.B	G.M	G.M
1	12.06.12	DRG. REVISED AS PER BHEL. COMMENT DATED 19.03.12	T.R	G.M	G.M

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

BTL DRG. NO. MHPD/1061/BSEBB/M/010 REV. 4

	NAME	SIGN	DATE
DRN.	S.K.P		14.03.12
CHD.	J.C		15.03.12
APPD.	SSG		15.03.12

DIRECTORY :
FILE NO. :
SCALE 1: 700

TITLE : GA & LOAD DATA OF YARD CONV.BCN - 4 (REVERSIBLE)

BHEL DRAWING NO. IS-1-GA-660-101-M010 REV. 4
SHEET NO. 2 NO.OF SHTS. 2

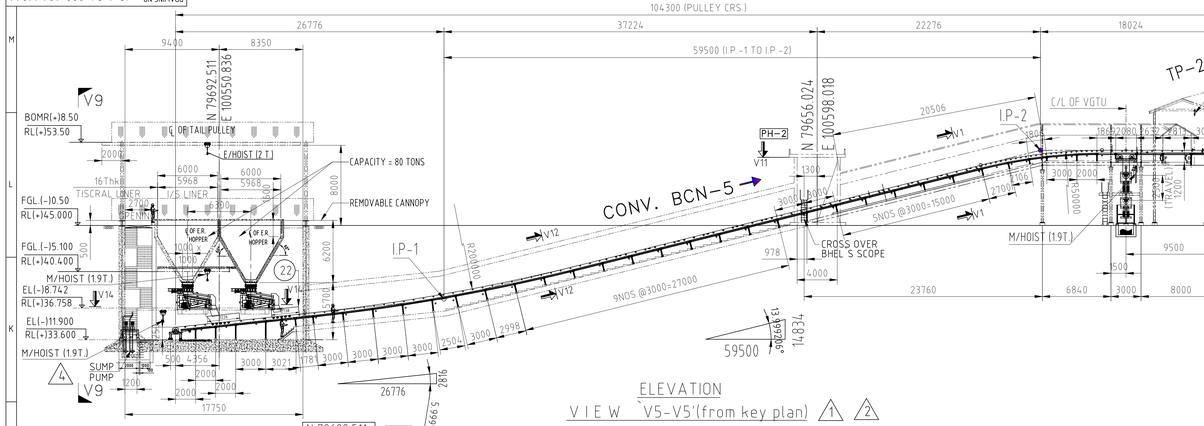
FORMAT SIZE A1

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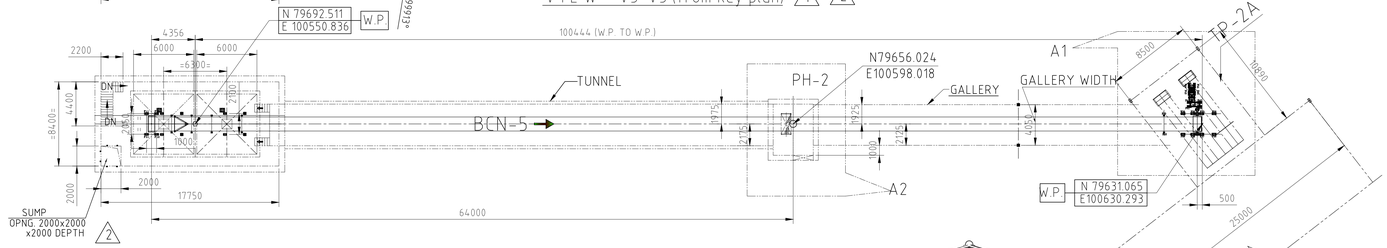
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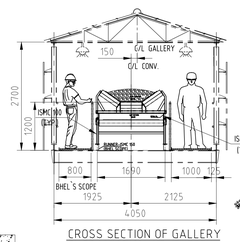
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ALL DIMENSIONS ARE IN MM

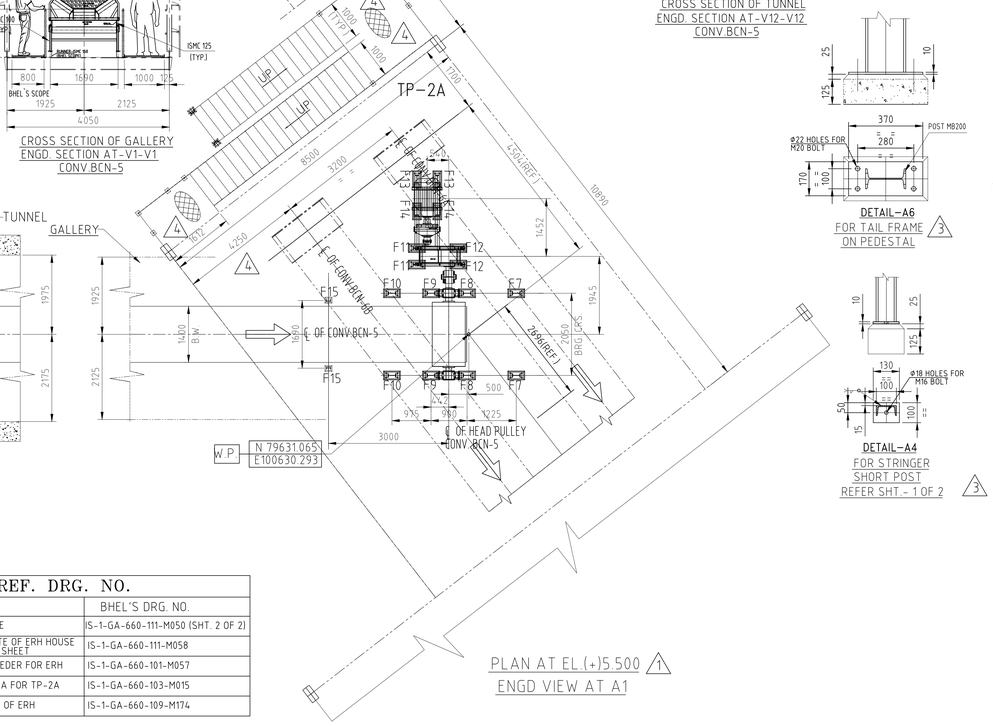


ELEVATION
VIEW `V5-V5'(from key plan) 1 2

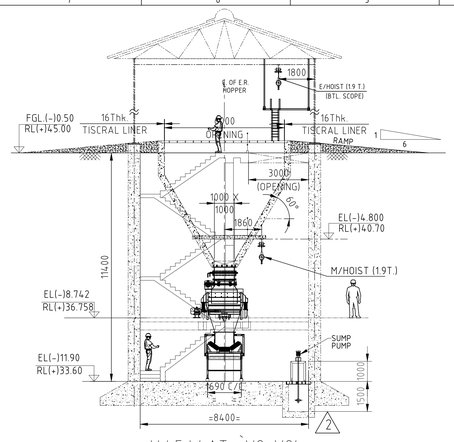




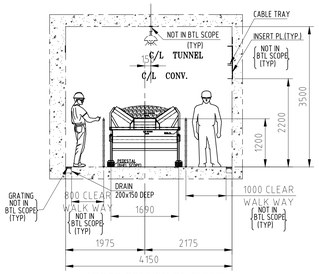
CROSS SECTION OF GALLERY
ENGD. SECTION AT-V1-V1
CONV.BCN-5



PLAN AT EL.(+)5.500 1
ENGD VIEW AT A1

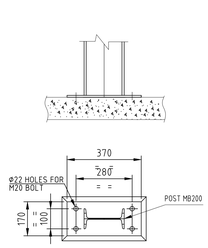


VIEW AT `V9-V9'



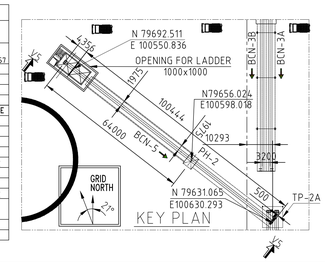
CROSS SECTION OF TUNNEL
ENGD. SECTION AT-V12-V12
CONV.BCN-5

DETAIL-A6
FOR TAIL FRAME
ON PEDESTAL 3



DETAIL-A3
FOR HEAD DRIVE
&BEND FRAME 3

DETAIL-A4
FOR STRINGER
SHORT POST
REFER SHT - 1 OF 2 3



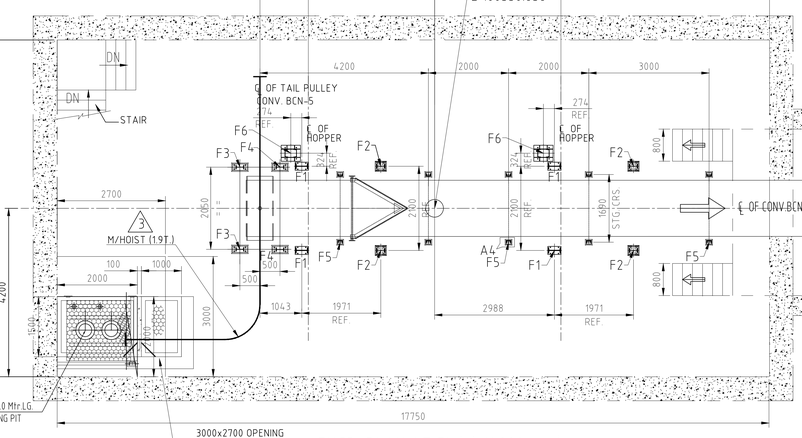
LOAD DATA

POINTS	VERTICAL (T) UPWARD	VERTICAL (T) DOWNWARD	HORIZONTAL (T) —	LOCATION
F1	-	-	-	SEE G.A. OF VIBRO FEEDER FOR ERH IS-1-GA-660-101-M057
F2	-	-	-	〃
F3	1.2	-	-	TAIL FRAME
F4	-	1.5	-	〃
F5	-	0.5	-	CONV.SUPPORT
F6	1.8	-	-	VF MOTOR FRAME
F7	0.85	-	10.5	〃
F8	-	1.7	10.5	〃
F9	-	2.9	10.5	HEAD FRAME
F10	-	0.75	0.5	CONV.SUPPORT
F11	-	2.5	-	CONV.DRIVE FRAME
F12	2.8	-	-	〃
F13	-	0.5	-	〃
F14	-	0.25	-	CONV.DRIVE FRAME
F15	-	0.5	-	CONV.SUPPORT (ON GALLERY)
F16	-	1.3	-	BEND FRAM
F17	-	1.3	-	BEND FRAM

TECHNICAL CHARACTERISTICS

CONVEYOR BASIC PARAMETERS

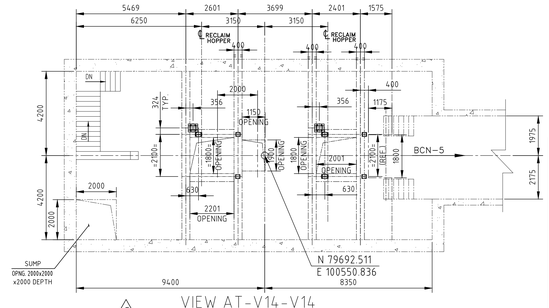
Description	Unit	Values
CONVEYOR NO.	-	BCN-5
TYPE OF CONVEYOR	-	BELT CONVEYOR
CONV. PROFILE	-	INCLINED
MATERIAL CONVEYED		SIZED COAL
LUMP SIZE	mm	(-) 20
BULK DENSITY VOL/LOAD	T/m³	0.8
MAX. MOISTURE CONTENT	%	15-20
BELT WIDTH	mm	1400
CAPACITY (RATED)	T/Hr.	1200
CAPACITY (DESIGNED)	T/Hr.	1320
BELT SPEED (NOMINAL)	M/Sec.	2.75
HORIZONTAL CRS.	mm	104.300
VERTICAL LIFT	mm	17650
TROUGHING ANGLE	Degree	35
NO. OF FEED POINT		2
NO. OF DISCH. POINT		1
CONV. INCLINATION MAX.	Degree	13.999206°
TYPE OF TAKE UP		VGTU
TAKE UP TRAVEL	mm	2500
MOTOR RATING	KW/RPM	132
BELT TENSIONS:		
T1	N	54774.1
T2	N	15082.72
T ↑	N	12693.92
ANGLE OF WRAP	Degree	210°
COUNTER WT.	KG	1600



ENGD. PLAN AT EL.(-) 11.900 2

REF. DRG. NO.

	Description	BHEL'S DRG. NO.
1	G.A. OF ROD GATE	IS-1-GA-660-111-M050 (SHT. 2 OF 2)
2	G.A. OF R& P GATE OF ERH HOUSE INCLUDING DATA SHEET	IS-1-GA-660-111-M058
3	G.A. OF VIBRO FEEDER FOR ERH	IS-1-GA-660-101-M057
4	G.A. & LOAD DATA FOR TP-2A	IS-1-GA-660-103-M015
5	MECHANICAL G.A. OF ERH	IS-1-GA-660-109-M174



VIEW AT-V14-V14
ENGD. PLAN AT EL.(-) 9.150 2

NOTE :-

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB-BARAUNI DRG. NO. PE-DG-374-100-M001 (Rev. 01)
3. RL. (+) 45.0M CORRESPONDS TO EL. (-) 0.5(FGL)
4. ALL CIVIL, STRUCTURAL WORKS ARE IN BHEL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002.
7. DIMENSION MKD. ★ SHALL BE FINALISED AFTER APPROVAL OF G.BOX,MOTOR & COUPLING
8. REFER SEPARATE DRG FOR VENTILATION DUCT ,DS,SW & DW .

REVISIONS

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	23.08.12	DRG. REVISED DURING MEETING AT STEAG DT 23.08.12	A.B	P.B	
3	07.08.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 28.07.12	A.B	P.B	
2	17.07.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 15.06.12	A.B	P.B	
1	02.06.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 16.3.12	R.R	J.C.	

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

Bill of Materials

Item No.	Description	Qty.	Matl.	Make
34	PULL CHORD SWITCH	4 Pair		
33	BELT SWAY SWITCH	3 Pair		
32	ZERO SPEED SWITCH	1		
31	BEND FRAME	1	ASSY	
30	DISCHARGE CHUTE AT HEAD END - 10TH M.S.MOTHER PLATE & 6 TH S.S. 409M LINER ,HOOD -LTHK.	1	ASSY	
29	COUNTER WEIGHT - 1600KG	1.OT	C.I.	
28	VERTICAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 2500	1	ASSY	
27	TAIL UNIT FRAME C/W GUARD	1	ASSY	
26	DRIVE UNIT FRAME	1	ASSY	
25	HEAD UNIT FRAME	1	ASSY	
24	DECK PLATE 3.15 THK. (THROUGH OUT)	1.LOT	ASSY	
23	STRINGER FRAME -ISMC125 & SHORT SUPPORTS - ISMC 100	1.LOT	ASSY	
22	SKIRT BOARD AT TAIL END - 10 TH M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM.	3M+3M	ASSY	IND. WITH BACK PL. IND. WITHOUT B. PL.
21	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE HARD RUBBER STRIPS	1	ASSY	
20	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	ASSY	
19	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	ASSY	
18	SELF ALIGNING RETURN IDLER -1 ROLL ASSY -152 ϕ ERW TUBE X 4.5 THK x ϕ 258RG. AS PER IS: 8598-1987	4	ASSY	
17	SELF ALIGNING CARRYING IDLER 35° X 3 ROLL ASSY.-152 ϕ ERW TUBE X 4.5 THK x ϕ 35 BRG. AS PER IS: 8598-1987	4	ASSY	
16	RETURN IDLER - 1 ROLL ASSY - 152 ϕ ERW TUBE X 4.5 THK x ϕ 25 BRG. AS PER IS: 8598-1987	34	ASSY	
15	TROUGHED TRANSITION IDLER 35° 3 ROLL ASSY 152 ϕ ERW TUBE X 4.5 THK x ϕ 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
14	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152 ϕ ERW TUBE X 4.5 THK x ϕ 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
13	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY.- 152 ϕ ERW TUBE X 4.5 THK x ϕ 35 BRG. AS PER AS PER IS: 8598-1987	104	ASSY	
12	IMPACT IDLER 35° 3 ROLL ASS Y Φ190 RUBBER 139.70 ERW TUBE X 4.5 THK x ϕ 35 BRG. AS PER IS: 8598-1987	10	ASSY	
11	SELF CLEANING RETURN T ROLL ASS Y Φ190 RUBBER 139.70 ERW TUBE X 4.5 THK x ϕ 25 BRG. AS PER	1	ASSY	
10	DEFLECTOR PULLEY - 219.1 mm OD X 1600 mm FACE X 7.1 TH SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CK, ADAPTOR SLEEVES - H311,	1	ASS'Y.	
9	BEND PULLEY - 500 mm OD X 1600 mm FACEX12THK SHELL X 12THK PLAN LAGGING X115DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 526 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22226 CK, ADAPTOR SLEEVES - H326, SHORE HARDNESS 45-55° A	2	ASS'Y.	
8	SNUB PULLEY - 500 mm OD X 1600 mm. FACEX12THK SHELL X 12THK PLAIN LAGGING X100DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 522 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22222 CK, ADAPTOR SLEEVES - H322, SHORE HARDNESS 45-55° A	1	ASS'Y.	
7	TAIL & TAKE-UP PULLEY - 630 mm OD X1600 mm FACE X 12 TH SHELL X 125DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S. A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK, ADAPTOR SLEEVES - H3128, SHORE HARDNESS 45-55° A	1+1	ASS'Y.	
6	HEAD / DRIVE PULLEY - 800 mm O.D. X1600 mm FACE X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 150 DIA SHAFT AT 01BCSDC3134 150MM GR ATL (FIXED TYPE) 01BCSDC3134 150MM EX ATL BPTL (FREE TYPE)	1	ASS'Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 55 ° C AMBIENT & CONTINOUS DUTY OPERATION SIZE - RG-08, MAX. BORE 160 MM	1	STD.	&BEND FRAME
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 132 KW MOTOR & CONTINOUS DUTY OPERATION - SIZE - SDFC-500,	1	STD.	
3	GEAR REDUCER - PARALLEL HELICAL TYPE INTEGRAL HOLDBACK RATIO- 23.2:1, SIZE CSB-315 AMBIENT AND CONTINOUS DUTY OPERATION MECH. RATING 262 KW	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 132 KW RATING X 1500 RPM, FRAME SIZE - 315L PROTECTION - IP 55, INSULATION CLASS-B, SUITABLE FOR 50 DEGREE AMBIENT AND 3 PHASE, 415 VOLT	1	STD.	
1	BELTING-1200mm WIDE, NYLON / NYLON FABRIC, SIZE - 800/4 MHD, COVER GRADE - FR TOP - 5 TH. BOTTOM 3TH.	219.100M (TAPE LENGTH SPLICE LENGTH NOT CONSIDERD)	STD.	BHEL`S SCOPE

2x250 MW BARAUNI THERMAL POWER PROJECT

BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/011 REV-4

	NAME	SIGN	DATE
DRN.	G.C.		10.03.12
CHD.	J.C.		14.03.12
APPD.	SSG		14.03.12

DIRECTORY :
FILE NO. :
SCALE 1:300

TITLE :
GA & LOAD DATA OF OF CONV. BCN-5. & PH-2

BHEL DRAWING NO. IS-1-GA-660-101-M011 REV. 2

SHEET NO. 1 OF 2 NO.OF SHTS. 2

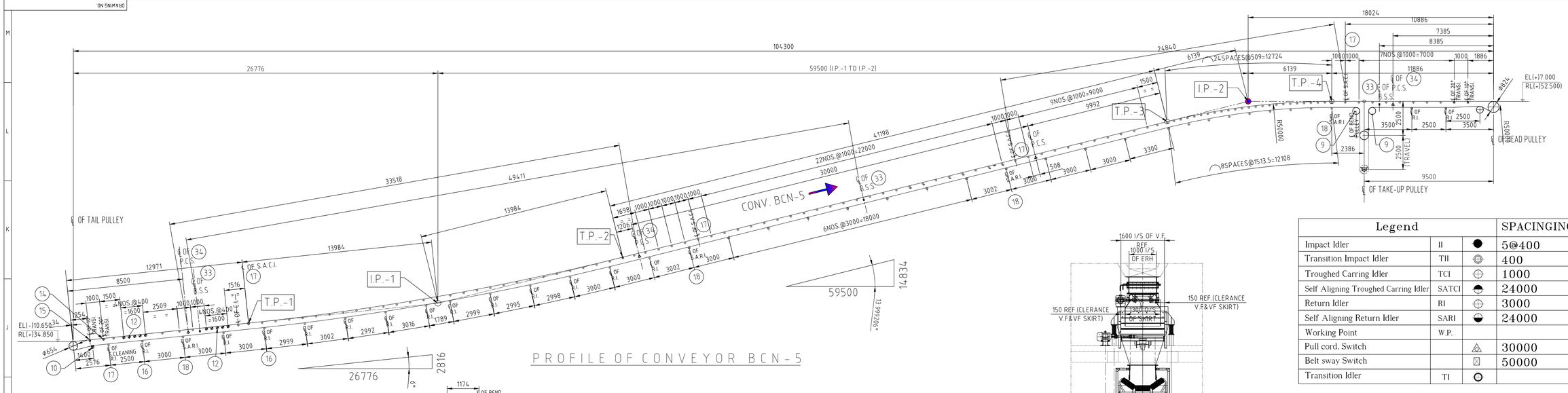
FORMAT SIZE A1

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ELECTRONIC FILE NAME

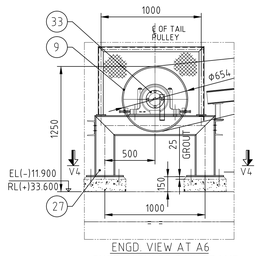
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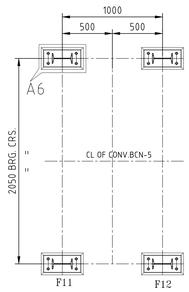
ALL DIMENSIONS ARE IN MM

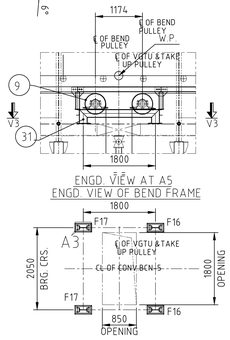


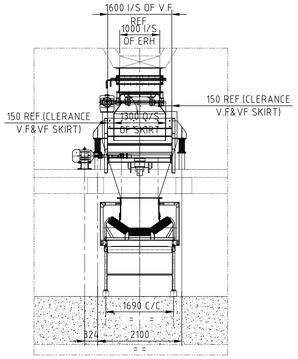
PROFILE OF CONVEYOR BCN-5

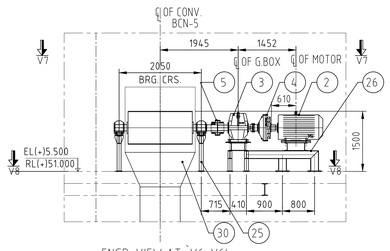
Legend			SPACINGING MM.
Impact Idler	II	●	5@400
Transition Impact Idler	TII	⊜	400
Troughed Carring Idler	TCI	⊕	1000
Self Aligning Troughed Carring Idler	SATCI	◒	24000
Return Idler	RI	⊕	3000
Self Aligning Return Idler	SARI	◒	24000
Working Point	W.P.		
Pull cord. Switch		△	30000
Belt sway Switch		☒	50000
Transition Idler	TI	⊖	

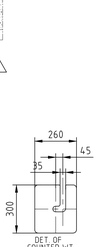


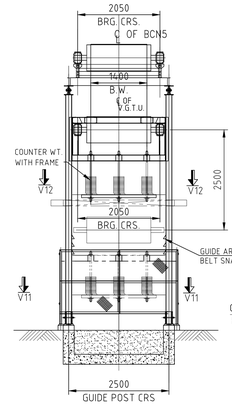


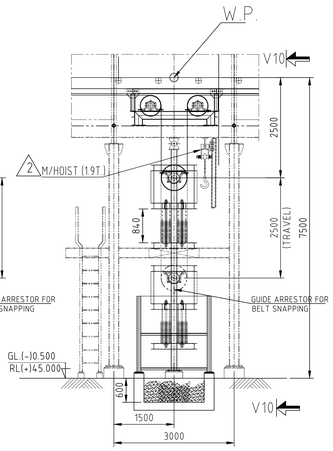


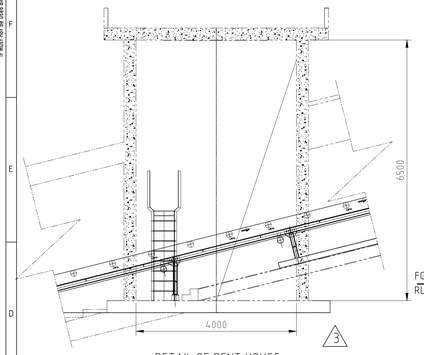


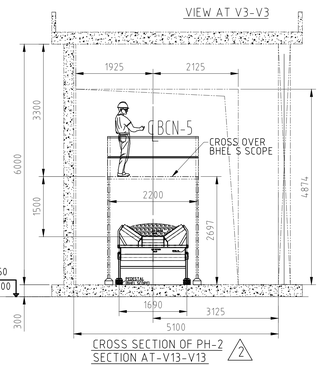


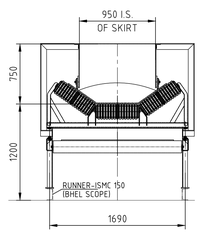


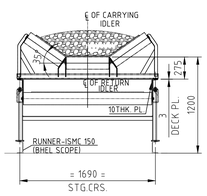


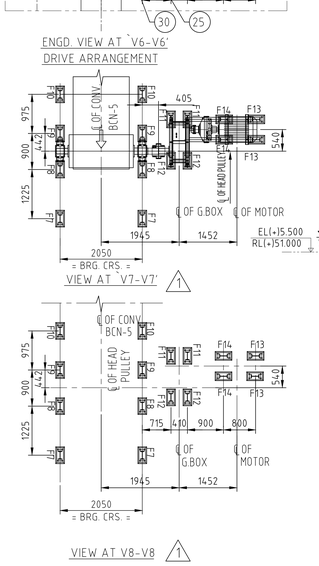


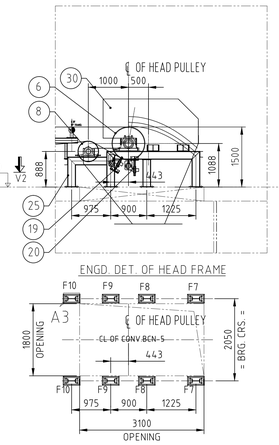


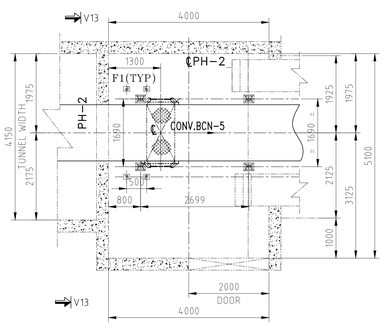












R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	23.08.12	DRG. REVISED DURING MEETING AT STEAG DT 23.08.12	A.B	P.B	
3	07.08.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 28.07.12	A.B	P.B	
2	17.07.12	DRG. REVISED AS PER BHEL'S COMMENTS DT15.06.12	A.B	P.B	
1	02.06.12	DRG. REVISED AS PER BHEL'S COMMENTS DT 16.3.12	R.R	J.C.	

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700028

BTL DRG. NO. MHPD/1061/BSEBB/M/011 — REV-4

	NAME	SIGN	DATE
DRN.	G.C.		10.03.12
CHD.	J.C.		14.03.12
APPD.	SSG		14.03.12

DIRECTORY : — SCALE 1:300 — FILE NO. :

TITLE : GA & LOAD DATA OF OF CONV. BCN-5. & PH-2

BHEL DRAWING NO. IS-1-GA-660-101-M011 — REV. 2

SHEET NO. 2 OF 2 — NO.OF SHTS. 2

FORMAT SIZE A1

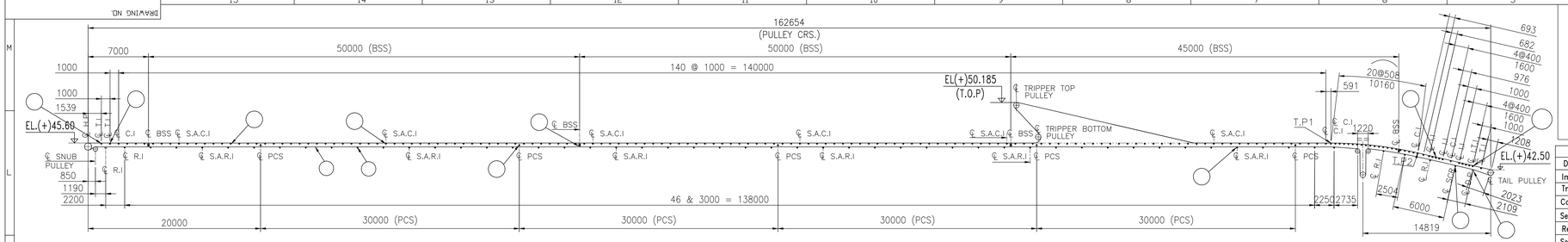
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or disclosed to others without its written permission.

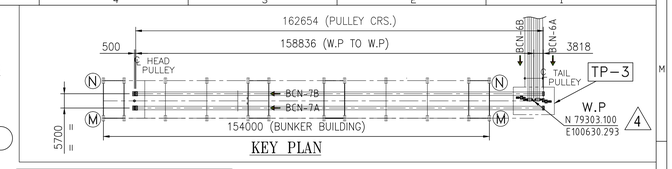
ELECTRONIC FILE NAME

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ALL DIMENSIONS ARE IN MM

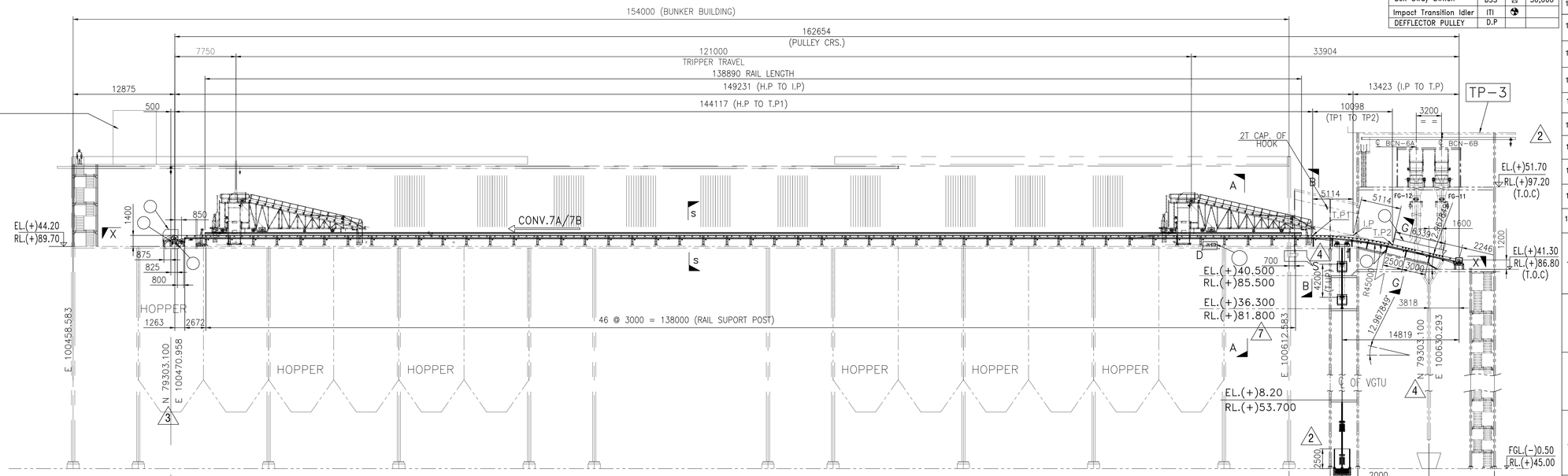
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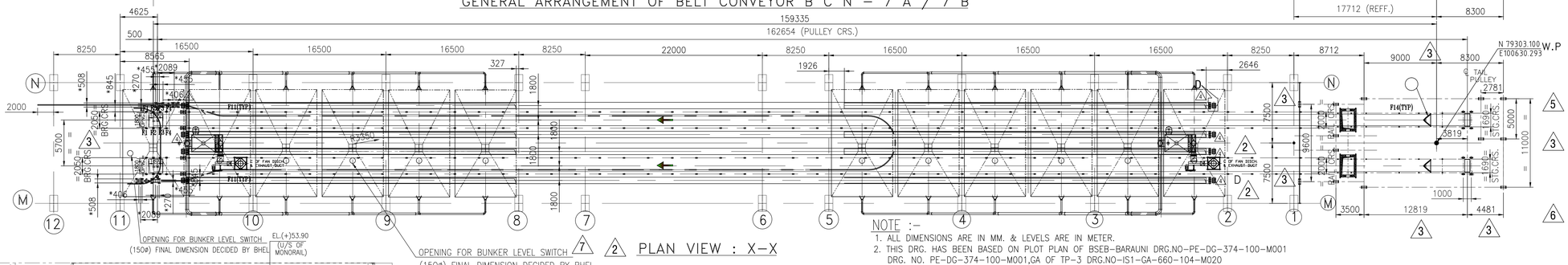


Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		24000
Return Idler	RI		3000
Self Aligning Return Idler	SARI		24000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000
Impact Transition Idler	ITI		
DEFFLECTOR PULLEY	D.P		

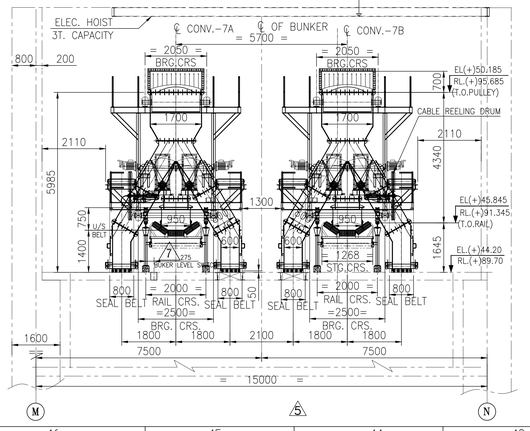
IDLERS & SWITCHES MOUNTING POSITION

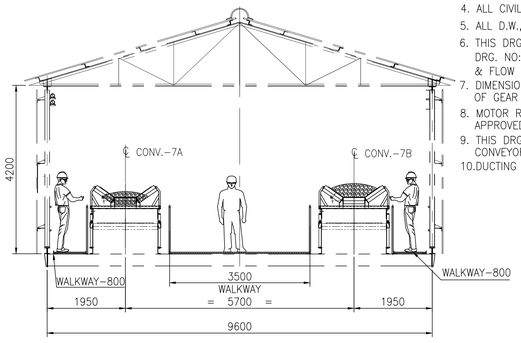


GENERAL ARRANGEMENT OF BELT CONVEYOR B C N – 7 A / 7 B



2 PLAN VIEW : X–X





NOTE :–

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB–BARAUNI DRG.NO–PE–DG–374–100–M001 DRG. NO. PE–DG–374–100–M001,GA OF TP–3 DRG.NO–IS1–GA–660–104–M020 GA OF BCN–6A/B DRG. NO–IS1–GA–660–101–M012
3. RL (+) 45.0 M CORRESPONDS TO EL (–) 0.500 (FGL)
4. ALL CIVIL, STRUCTURAL WORKS ARE IN BHEL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS–0–PL–660–100–M001 & FLOW DIAGRAM DRG. NO: IS–1–FL–660–100–M002
7. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
8. MOTOR RATING,EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.
9. THIS DRG IS TO BE READ IN CONJUNCTION WITH CROSS SECTION OF CONVEYOR GALLERY DRG,NO–IS–1–GA–660–100–103
10. DUCTING DETAILS INDICATED TENTAVIE ONLY.REFER SEPARATE DRG FOR DUCTING AT BUNKERS, IS–1–GA–660–110–M207

Item No.	Description	Quantity	Material	Make
26	TENTIONING ARRGT. FOR SEALING BELT	1	STD.	
25	HEAD UNIT FRAME	1	ASSY	
24	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT	ASSY	
23	STRINGER FRAME -ISMC 125 & SHORT SUPPORTS POST - ISMC 100	I LOT	ASSY	
22	SKIRT BOARD AT TAIL END - 10 TH. M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	6.5M	ASSY	
21	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE	1		
20	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	ASSY	
19	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	ASSY	
18	SELF CLEANER RUBBER DISK RETURN IDLER 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 25 BRG. AS PER IS: 8598-1987	1	ASSY	
17	SELF ALIGNING RETURN IDLER -1 ROLL ASSY -152.4 Ø ERW TUBE X4.5 THK x Ø25 BRG. AS PER IS: 8598-1987	6	ASSY	
16	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	6	ASSY	
15	RETURN IDLER - 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK x Ø 25 BRG. AS PER IS: 8598-1987	45	ASSY	
14	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2	ASSY	
13A	TROUGHED IMPACT TRANSITION IDLER 20° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	1	ASSY	
13	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	1	ASSY	
12	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	158	ASSY	
11	IMPACT IDLER 35° 3 ROLL ASS'Y Ø190 RUBBER 139.7Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	9	ASSY	
10	DEFLECTOR PULLEY - 219.1 mm OD X 1600 mm FACE X 7.1 TH SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S . A. DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CK/W33, ADAPTOR SLEEVES - H 3111, SHORE HARDNESS 45-55 DEGREE A	2	ASS'Y.	
9	BEND PULLEY - 500 mm OD X 1600 mm FACE X 12 TH SHELL X 115 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 526 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22226 CK/W33, ADAPTOR SLEEVES - H 3126, SHORE HARDNESS 45-55 DEGREE A	2	ASS'Y.	
8	SNUB PULLEY - 500 mm OD X 1600 mm FACE X 12 TH SHELL X 100 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 522 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22222 CK/W33, ADAPTOR SLEEVES - H 3122, SHORE HARDNESS 45-55 DEGREE A	1	ASS'Y.	
7	TAIL/TAKEUP PULLEY - 630 mm OD X1600 mm FACE X 12 TH SHELL X 125 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE -SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228 CK/W33, ADAPTOR SLEEVES - H 3128, SHORE HARDNESS 45-55 DEGREE A	1+1	ASS'Y.	
6	HEAD / DRIVE PULLEY - 800 mm OD X1600 mm FACE X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 140 DIA SHAFT AT COOPER BEARING 01 BC SNC532 140MM EX ALT BPTL (FREE TYPE) & 01 BC SNC532 140MM GR ALT (FIXED TYPE)	1	ASS'Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG-07.	1	STD.	
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 115 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - SDFC-450	1	STD.	
3	GEAR REDUCER - PARALLEL HELICAL TYPE INTEGRAL HOLDBACK NORMAL RATIO - 23:2, SIZE CKC 280 (F.C) SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 189 KW	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 115 KW RATING X 1500 RPM.,FRAME SIZE 12D-315M1	1	STD.	
1	BELTING-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 630/4 MHD, COVER GRADE - FR TOP - 5 TH. + BOTTOM - 3TH.	344 M (TAPE LENGTH) SPLICE LENGTH NOT CONSIDERED	STD.	BHEL SCOPE

Bill of Materials (FOR ONE CONV. ONLY)

33	PULL CHORD SWITCH	5 Pair		
32	BELT SWAY SWITCH	4 Pair		
31	ZERO SPEED SWITCH	1		
30	DISCHARGE CHUTE AT HEAD END - 10TH M.S.BODY PLATE & 6 TH SS 409M LINER .HOOD 4 THK.	1	ASSY	
29	COUNTER WEIGHT.	1000 Kg.	ASSY	
28	VERTICAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 4200	1	ASSY	
27	TAIL UNIT FRAME C/W GUARD	1	ASSY	
26A	DRIVE UNIT FRAME	1	ASSY	

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
7	12.01.13	MONORAIL EXTENTION AS PER STEAG COMMENTS.	AB	PB	SSG
7	23.08.12	REVISED DURING MEETING AT STEAG DTD.–22.08–12	AB	PB	SSG
5	30.07.12	REVISED AS PER BHEL COMMENTS DTD.–07.06.12	AB	PB	SSG
4	09.07.12	REVISED AS PER BHEL COMMENTS DTD.–07.06.12	AB	PB	SSG
3	05.07.12	REVISED AS PER BHEL COMMENTS DTD.–16.06.12	AB	PB	SSG
2	21.05.12	REVISED AS PER BHEL COMMENTS DTD.–18.05.12	AB	PB	SSG

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

MHPD/1061/BSEBB/M/013 — REV. 7

	NAME	SIGN	DATE
DRN.	G.M		03.03.12
CHD.	J.C		13.03.12
APPD.	SSG		15.03.12

DIRECTORY :
FILE NO. :
SCALE 1: 300

TITLE : GA & LOAD DATA OF CONV. BCN–7A/7B

BHEL DRAWING NO. IS-1-GA-660-101-M013 — REV. 3

SHEET NO. 1 — NO.OF SHTS. 2

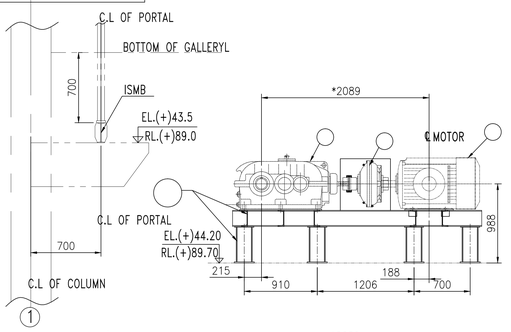
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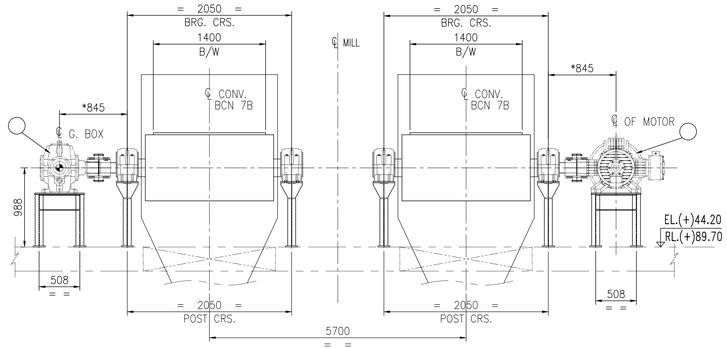
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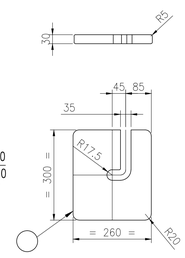
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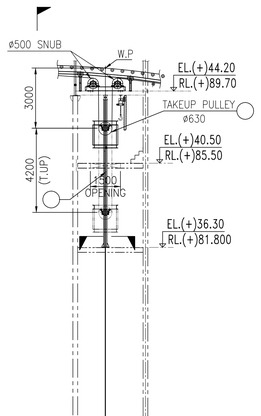
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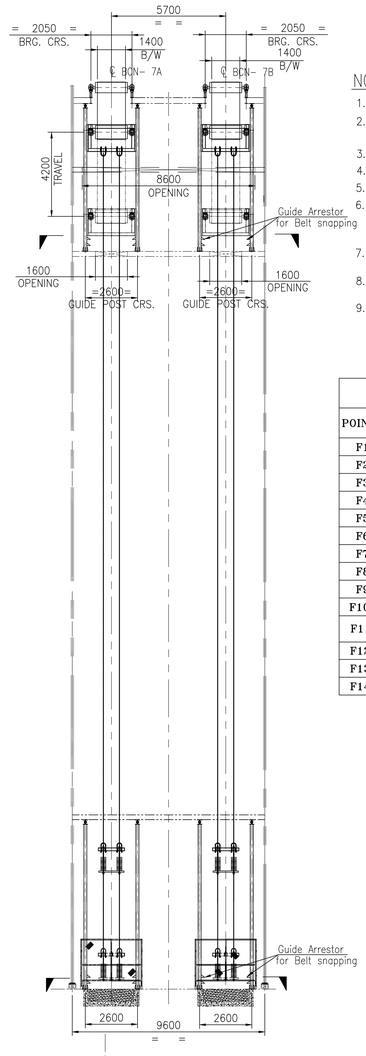
ALL DIMENSIONS ARE IN MM











NOTE :-

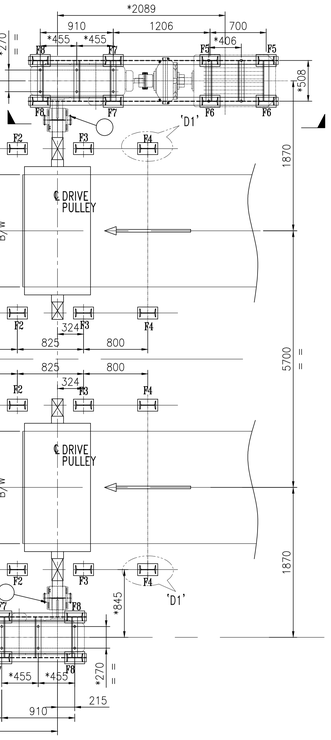
1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB-BARAUNI DRG. NO. PE-DG-374-100-M001 (Rev. 01)
3. RL (+) 45.0 M CORRESPONDS TO EL (-) 0.500 (FGL)
4. ALL CIVIL, STRUCTURAL WORKS ARE IN BHEL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002
7. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
8. MOTOR RATING,EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.
9. THIS DRG IS TO BE READ IN CONJUNCTION WITH CROSS SECTION OF CONVEYOR GALLERY DRG,NO-IS-1-GA-660-100-103

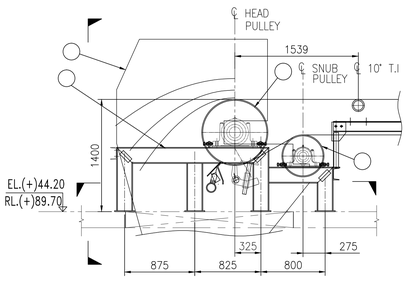
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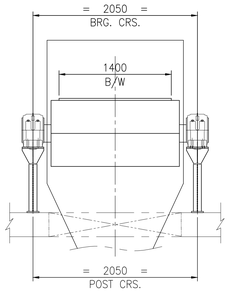
POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD↓	HORIZONTAL(T) →	LOCATION
F1	3.0	–	8.0	HEAD FRAME
F2	–	2.8	8.0	"
F3	–	2.4	8.0	"
F4	–	0.6	0.5	"
F5	–	0.5		DRIVE BASE
F6	–	0.15		"
F7	–	2.8		"
F8	2.5	–		"
F9	–	1.5	3.5	TAIL FRAME
F10	0.8	–	3.5	"
F11	–	9.5		RAIL SHORT POST
F12	–	1.4	–	BEND FRAME
F13	–	1.4	–	"
F14	–	0.85	–	SHORT POST

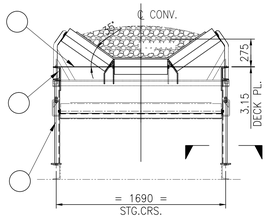
Technical Characteristics

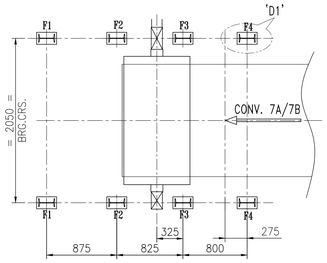
Conveyor Basic Parameters	Description	Unit	Values
	Conveyor No.	-	7A/7B
	Type Of Conveyor	-	Belt Conveyor
	Conv. Profile	-	Inclined
	Material Conveyed		Sized Coal
	Lump Size	mm	(-) 20
	Bulk Density vol/load	$T/M.^3$	0.8
	Moisture	%	15-20
	Belt Width	mm	1400
	Capacity (Rated)	T/Hr.	1200
	Capacity (Designed)	T/Hr.	1320
	Belt Speed (Nominal)	M/Sec.	2.75
	Horizontal Crs.	mm	162654
	Vertical Lift	mm	3100+4700 = 7800
	Troughing Angle	Degree	35
	No Of Feed Point		2
	No Of Disch. Point		1
	Conv. Inclination Max.	Degree	12.967
	Type Of Take Up		VGTU
	Take up Travel	mm	4200
	Motor Rating	KW/RPM	115 (2)
	BELT TENSIONS:		
	T1	N	44525.35
	T2	N	12260.60
	T Tail	N	12238.91
	ANGLE OF WRAP	Degree	210°
	COUNTER WT.	KG	1000 KG.

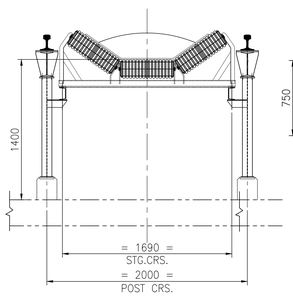


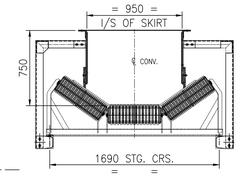


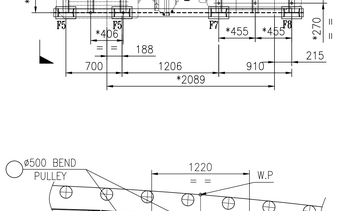


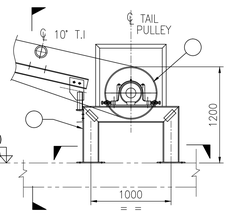


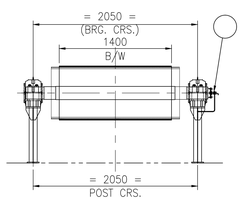


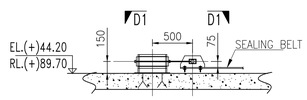




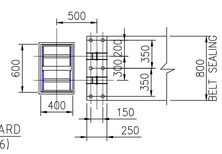


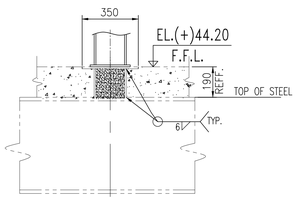




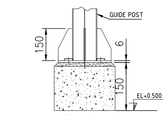


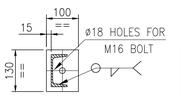
DETAIL -1
(For Head,Drive & Rail POST)

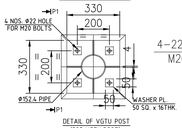


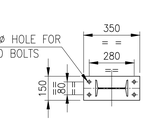


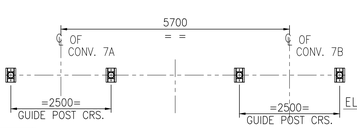
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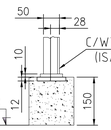


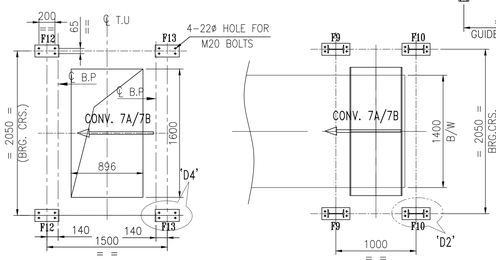


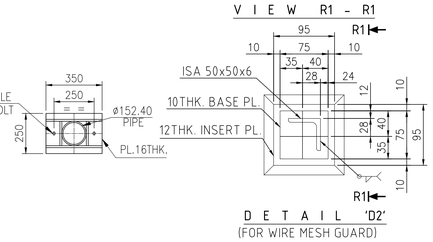




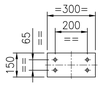








D E T A I L 'D2'
(FOR WIRE MESH GUARD)



ALL FOUNDATION WILL BE BASED ON CIVIL DRG.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
7	12.01.13	MONORAIL EXTENTION AS PER STEAG COMMENTS.	AB	PB	SSG
6	23.08.12	REVISED DURING MEETING AT STEAG DTD.-22.08-12	AB	PB	SSG
5	30.07.12	REVISED AS PER BHEL COMMENTS DTD.-07.06.12	AB	PB	SSG
4	09.07.12	REVISED AS PER BHEL COMMENTS DTD.-07.06.12	AB	PB	SSG
3	05.07.12	REVISED AS PER BHEL COMMENTS DTD.-16.06.12	AB	PB	SSG
2	21.05.12	REVISED AS PER BHEL COMMENTS DTD.-18.05.12	AB	PB	SSG

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS	QTY.

REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

MHPD/1061/BSEBB/M/013 REV. 7

	NAME	SIGN	DATE
DRN.	G.M		03.03.12
CHD.	J.C		14.03.12
APPD.	SSG		15.03.12

DIRECTORY :
FILE NO. :
SCALE 1:300

TITLE : GA & LOAD DATA OF CONV. BCN-7A/7B

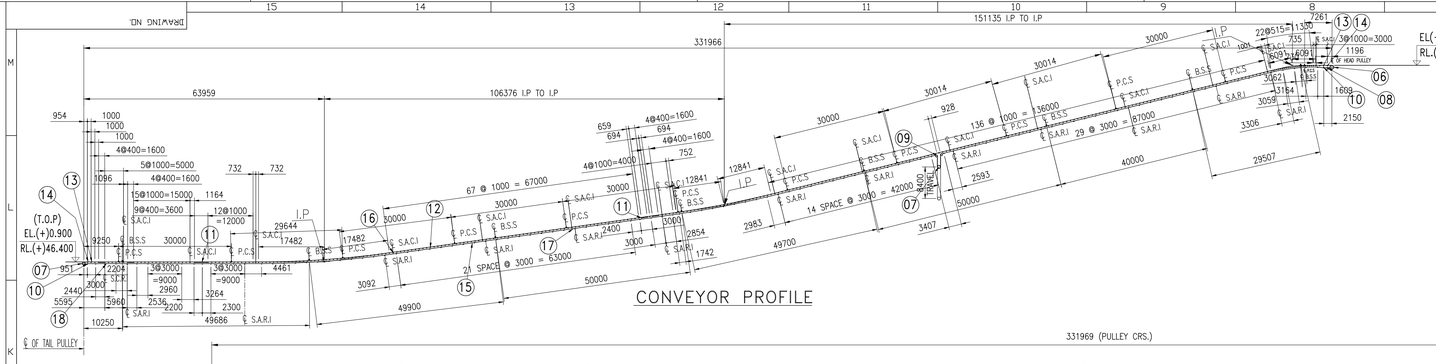
BHEL DRAWING NO. IS-1-GA-660-101-M013 REV. 3

SHEET NO. 2 NO.OF SHTS. 2

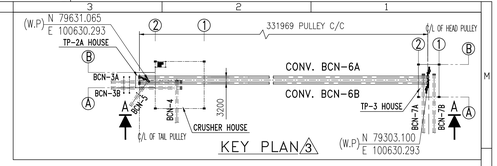
FORMAT SIZE A1

ALL DIMENSIONS ARE IN MM

DRAWING NO.

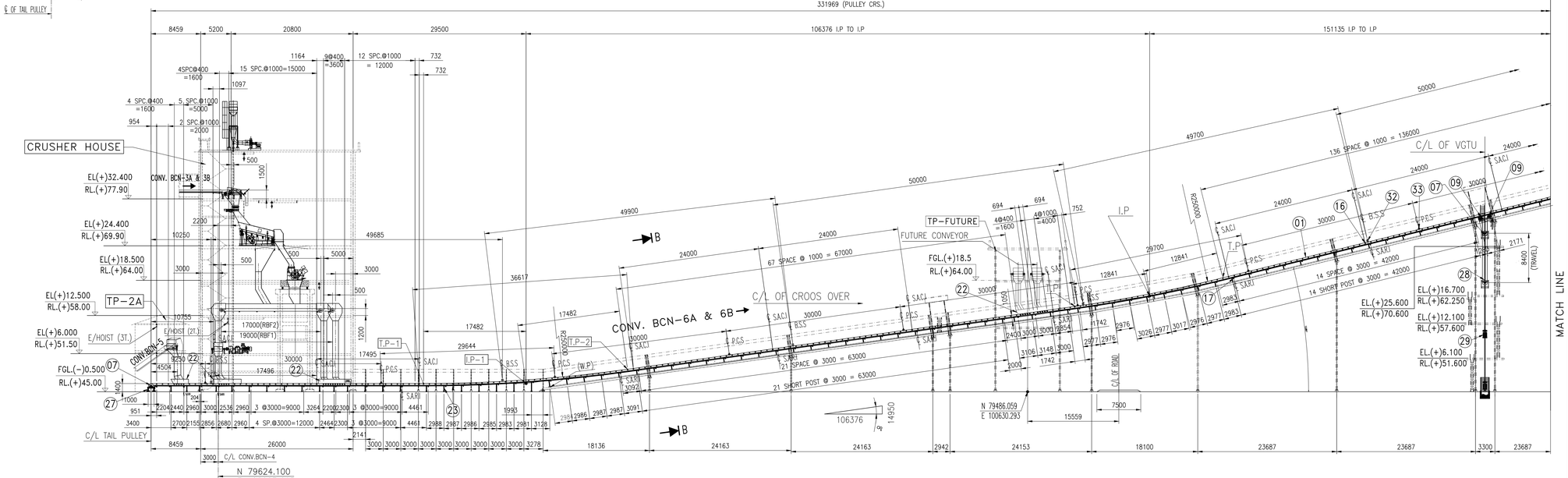


CONVEYOR PROFILE

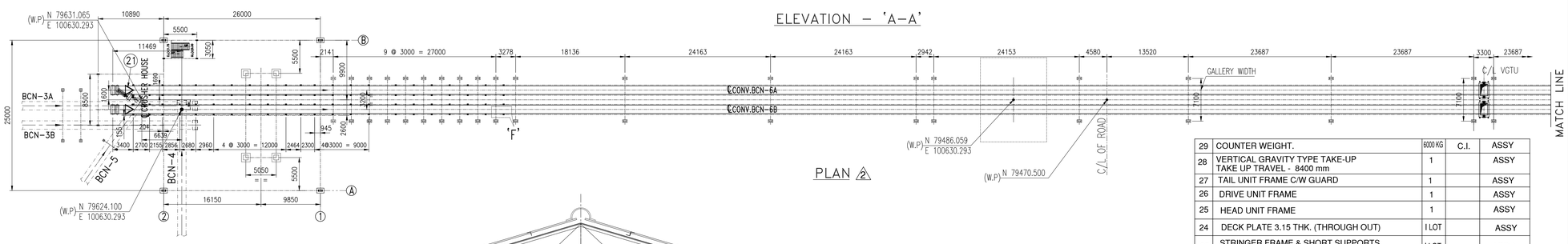


KEY PLAN 3

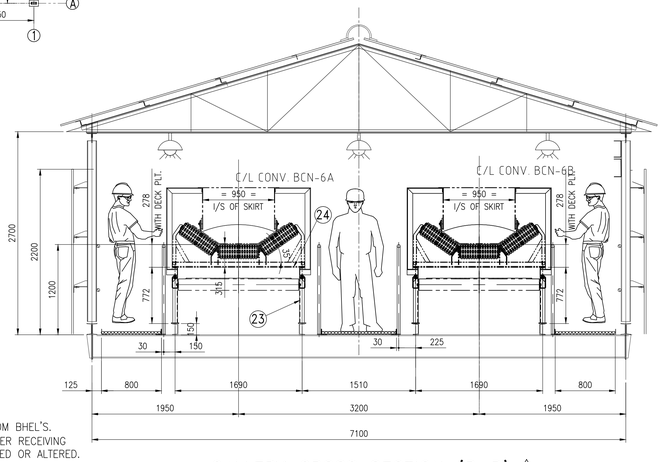
Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		24000
Return Idler	RI		3000
Self Aligning Return Idler	SARI		24000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000



ELEVATION – 'A–A'



PLAN 2



GALLERY CROSS SECTION–'B–B' 2

NOTE :–

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB–BARAUNI DRG. NO. PE–DG–374–100–M001 (Rev. 01)
3. RL (+) 45.0 M CORRESPONDS TO EL (–) 0.500 (FGL)
4. ALL CIVIL, STRUCTURAL WORKS ARE IN BHEL'S SCOPE.
5. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE WILL BE SENT SEPARATELY.
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS–0–PL–660–100–M001 & FLOW DIAGRAM DRG. NO: IS–1–FL–660–100–M002 & CRUSHER HOUSE DRG. NO: IS–1–GA–660–104–M018 & TP–3 HOUSE DRG. NO: IS–1–GA–660–104–M020
7. SCREEN, CRUSHER,TIPPLER,STRACKER RECLAIMER ARE FREE ISSUE ITEM FROM BHEL'S.
8. CONVEYORS PROFILE DRAWN ON BASIS OF EQUIP. G.A. DRG. RECEIVED. AFTER RECEIVING OF APPROVED STAMPED EQUIP. G.A. DRGS. THEN PROFILES MAY BE CHANGED OR ALTERED.
9. DIMENSIONS MKD. '*' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
10. DIMENSIONS MKD. '**' FOR FUTURE PROVISION.
11. MOTOR RATING, EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.
12. THIS DRG. READ IN CONJUNCTION WITH TYP.CROSS SECTION DRG.NO–IS–1–GA–660–100–M003 .
13. REFER SEPARATED DRG.FOR VENTILATION DUCT,DS,SW,DW.

QTY. SHOWN IN BOM FOR ONE CONV. ONLY

ITEM NO.	DESCRIPTION	QTY.	MATERIAL	MAKE
33	PULL CHORD SWITCH	12 Pair		
32	BELT SWAY SWITCH	7 Pair		
31	ZERO SPEED SWITCH	1		
30	DISCHARGE CHUTE AT HEAD END - 10TH M.S.BODY PLATE & 6 TH SS 409M LINER	1		ASSY

Bill of Materials (FOR INFORMATION)

ITEM NO.	DESCRIPTION	QTY.	MATERIAL	MAKE
29	COUNTER WEIGHT.	8000 KG	C.I.	ASSY
28	VERTICAL GRAVITY TYPE TAKE-UP TAKE UP TRAVEL - 8400 mm	1		ASSY
27	TAIL UNIT FRAME C/W GUARD	1		ASSY
26	DRIVE UNIT FRAME	1		ASSY
25	HEAD UNIT FRAME	1		ASSY
24	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT		ASSY
23	STRINGER FRAME & SHORT SUPPORTS - ISMC 125	I LOT		ASSY
22	SKIRT BOARD - 10 TH. M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	6		ASSY
21	INTERNAL BELT SCRAPER - VEE PLOUGH TYPE ELASTOMOUNT C/W POLYEURETHENE BLADES	1		ASSY
20	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1		ASSY
19	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1		ASSY
18	SELF CLEANING RETURN IDLER -1 ROLL ASSY 190O RUBBER, 139.7 Ø ERW TUBE X 4.5 THK X40 BRG. AS PER IS: 8598-1987	1		ASSY

Bill of Materials (FOR INFORMATION)

ITEM NO.	DESCRIPTION	QTY.	MATERIAL	MAKE
17	SELF ALIGNING RETURN IDLER -1 ROLL ASSY -152.4 Ø ERW TUBE X 4.5 THK x Ø 35BRG. AS PER IS: 8598-1987	13		ASSY
16	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	15		ASSY
15	RETURN IDLER - 1 ROLL ASSY - 152.4O ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER IS: 8598-1987	98		ASSY
14	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2		ASSY
13	TROUGHED TRANSITION IDLER 20° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	2		ASSY
12	TROUGHED CARRYING IDLER 35° 3 ROLL ASSY- 152.4 Ø ERW TUBE X 4.5 THK x Ø 35 BRG. AS PER AS PER IS: 8598-1987	319		ASSY
11	IMPACT IDLER 35° 3 ROLL ASS'Y Ø190 RUBBER 139.7Ø ERW TUBE X 4.5 THK x Ø 40 BRG. AS PER IS: 8598-1987	30		ASSY
10	DEFLECTOR PULLEY - 219.1 mm OD X 1600 mm FACE WIDTHX 7.1 TH SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CCK, ADAPTOR SLEEVES - H311	2	ASS'Y.	
09	BEND PULLEY - 500 mm OD X 1600 mm FACE WIDTH X 12 TH SHELL X 12 TH LAGGING X 140 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 530 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22230 CK/W33, ADAPTOR SLEEVES - H3130, SHORE HARDNESS 45 - 55° A	2	ASS'Y.	
08	SNUB PULLEY - 500 mm OD X 1600 mm FACE WIDTH X 12 TH SHELL X 12 TH LAGGING X 125 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 528 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22228CK/W33, ADAPTOR SLEEVES - H3128, SHORE HARDNESS 45 -55° A	1	ASS'Y.	
07	TAIL / TAKE-UP PULLEY - 800 mm OD X1600 mm FACE WIDTH X 12 TH SHELL X 12 TH LAGGING X 150 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SD3134 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 23134CCK/W33, ADAPTOR SLEEVES - H3134, SHORE HARDNESS 45 - 55°A	1+1	ASS'Y.	
06	HEAD / DRIVE PULLEY - 1000 mm OD X1600 mm FACE WIDTH X 16 TH SHELL X 12TH DIAMOND GROOVE RUBBER LAGGING X 220 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - 01 BC SDC 3148 220MM EX ALT BPTL(FREE TYPE) 01 BC SDC 3148 220MM GR ALT.(FIXED TYPE)	1	ASS'Y.	
05	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG - 10	1	STD.	FENNER
04	INPUT COUPLING - SCOOP CONTROL FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 370 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - PST-530	1	STD.	
03	GEAR REDUCER - PARALLEL HELICAL TYPE 2 STAGE WITH 1 FAN & INTEGRAL HOLDBACK RATIO- 28.4:1, SIZE CSC-450 FC SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 660 KW	1	STD.	
02	MOTOR - TEFC SQ. CAGE TYPE - 370 KW RATING X 1500 RPM	1	STD.	"BHEL SCOPE"
01	BELT-1400mm WIDE, NYLON / NYLON FABRIC, SIZE - 1600/4 , COVER GRADE - FR TOP - 5 TH. + BOTTOM - 3TH.	687 M (TAPE LENGTH) SPLICE LENGTH NOT CONSIDERED	STD.	"BHEL SCOPE"

Bill of Materials (FOR INFORMATION)

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA–700028

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	18.08.12	DRG. REVISED AS PER BHEL COMMENT DATED 8.08.12	AB	PB	GM
3	10.07.12	DRG. REVISED AS PER BHEL COMMENT DATED 11.07.12	RR	PB	GM
2	28.05.12	DRAWING GENERALLY REVISED.	RR	JC	SSG
1	03.03.12	REVISED AS PER BHEL COMMENTS Dated 29.02.12	SKP	JC	SSG

REVISIONS

JOB No. IS-1-10-2013
STATUS OF DRAWING
DISTRIBUTION OF PRINTS QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

BTL DRG. NO. MHPD/1061/BSEBB/M/012 REV. 4

	NAME	SIGN	DATE
DRN.	S.K.P		24.02.12
CHD.	J.C		25.02.12
APPD.	SSG		25.02.12

DIRECTORY :
FILE NO. :
SCALE 1: 400

TITLE : GA & LOAD DATA OF BCN - 6A / 6B

BHEL DRAWING NO. IS-1-GA-660-101-M012 REV. 3
SHEET NO. 1 NO.OF SHTS. 2

FORMAT SIZE A1

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ELECTRONIC FILE NAME

ALL DIMENSIONS ARE IN MM

DRAWING NO.

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ELECTRONIC FILE NAME

Technical Characteristics

Conveyor Basic Parameters

Description	Unit	Values
Conveyor No.	-	BCN 6A/6B
Type Of Conveyor	-	Belt Conveyor
Conv. Profile	-	Inclined
Material Conveyed		Sized Coal
Lump Size	mm	(-) 20
Bulk Density vol/load	T/M.^{3}	0.8
Moisture	%	15 - 20
Belt Width	mm	1400
Capacity (Rated)	T/Hr.	1200
Capacity (Designed)	T/Hr.	1320
Belt Speed (Nominal)	M/Sec.	2.75
Horizontal Crs.	mm	331.969
Vertical Lift	mm	51800
Troughing Angle	Degree	35
No Of Feed Point		6
No Of Disch. Point		1
Conv. Inclination Max.	Degree	13.881
Type Of Take Up		VGTU
Take up Travel	mm	8400
Motor Rating	KW/RPM	370KW
BELT TENSIONS:		
T1	N	145307.68
T2	N	40012.26
T Tail	N	31949.63
ANGLE OF WRAP	Degree	210°
COUNTER WT.	KG	6000

LOAD DATA

POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ↔	LOCATION
F1	3.7	-	4.2	HEAD FRAME (FLOOR LEVEL EL(+)52.200)
F2	-	4.5		
F3	-	5.2		
F4	-	1.2		
F5	-	1.0	-	TAIL FRAME (FLOOR LEVEL EL(+)52.200)
F6	-	0.5		
F7	-	1.0	-	DRIVE BASE (FLOOR LEVEL GL(±)0.000)
F8	0.5	-		
F9	-	5.6		
F10	-	5.0		
F11	-	5.0		
F12	-	0.5		SHORT POST
F13	-	2.1		BEND FRAME
F14	-	2.1		BEND FRAME

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
4	18.08.12	DRG. REVISED AS PER BHEL COMMENT DATED 8.08.12	AB	PB	GM
3	18.07.12	DRG. REVISED AS PER BHEL COMMENT DATED 11.07.12	RR	PB	GM
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REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

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REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
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DRN.	S.K.P		24.02.12
CHD.	J.C		25.02.12
APPD.	SSG		25.02.12

DIRECTORY : — FILE NO. : — SCALE 1:400

TITLE : GA & LOAD DATA OF BCN - 6A / 6B

BHEL DRAWING NO. IS-1-GA-660-101-M012 — REV. 3

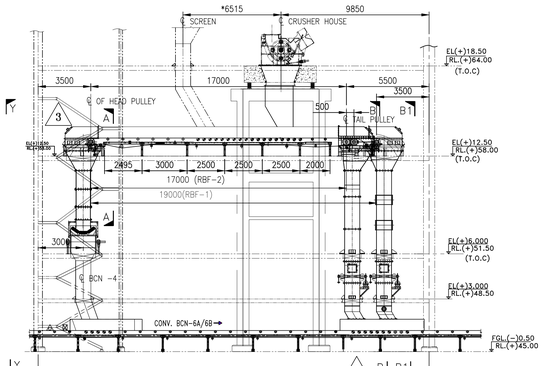
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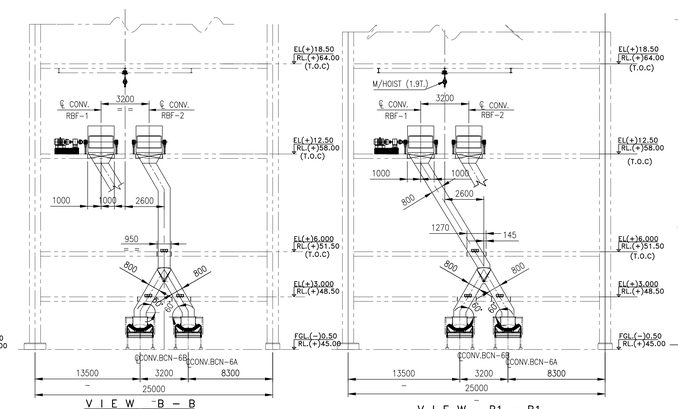
ALL DIMENSIONS ARE IN MM

DRAWING NO.



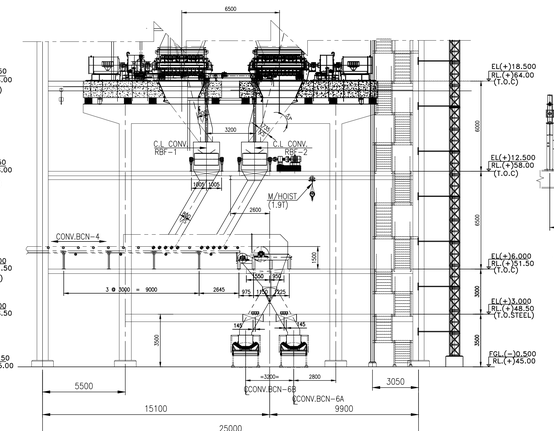
ELEVATION

GENERAL ARRANGEMENT OF BELT CONVEYOR RBF –1 & 2

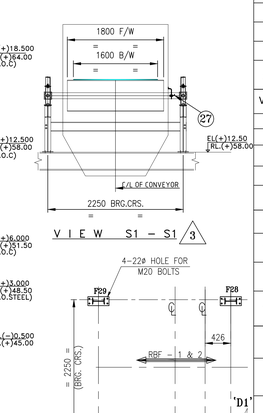


VIEW –B – B

VIEW B1 – B1

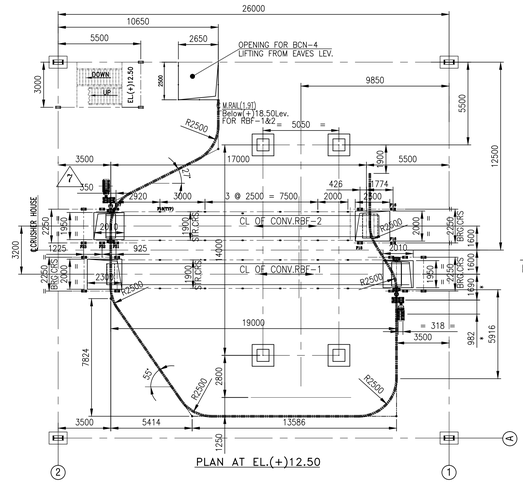


VIEW Y – Y

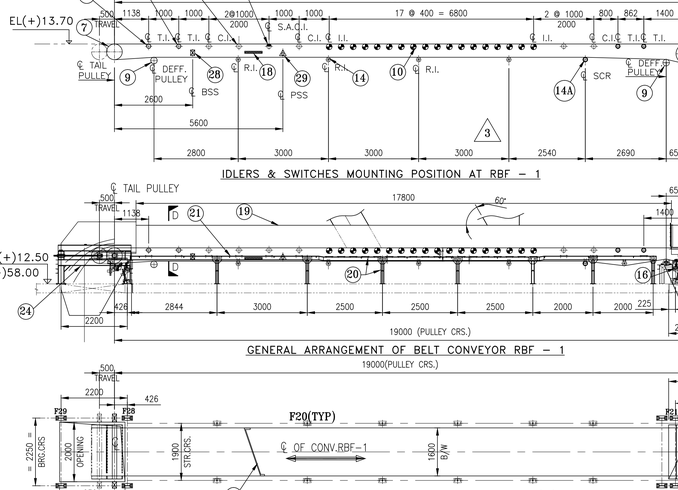


VIEW S1 – S1

VIEW S – S

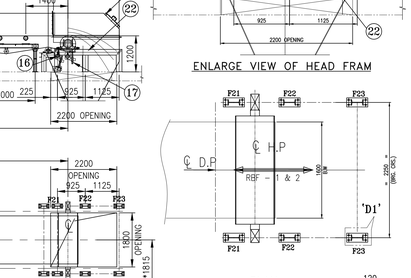


PLAN AT EL.(+)12.50



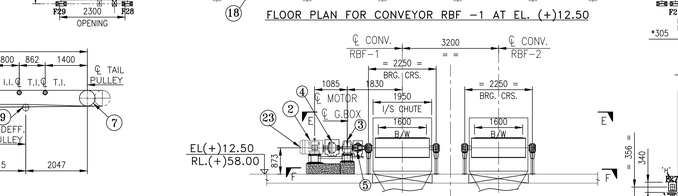
GENERAL ARRANGEMENT OF BELT CONVEYOR RBF – 1

FLOOR PLAN FOR CONVEYOR RBF –1 AT EL. (+)12.50

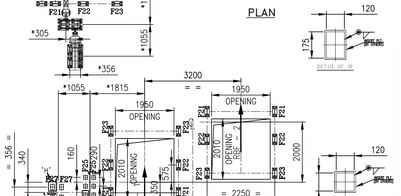


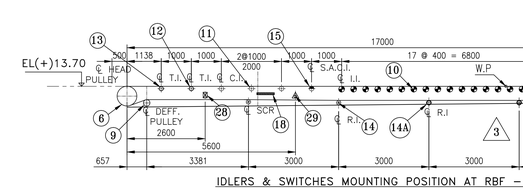
IDLERS & SWITCHES MOUNTING POSITION AT RBF – 2

GENERAL ARRANGEMENT OF BELT CONVEYOR RBF – 1

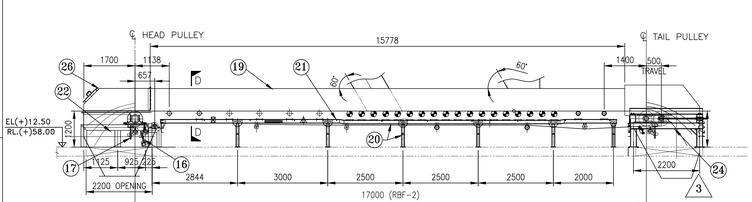


FLOOR PLAN FOR CONVEYOR RBF –1 AT EL. (+)12.50

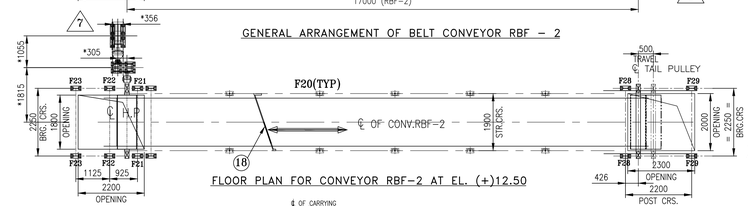




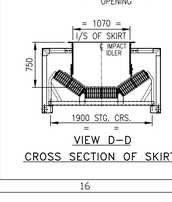
IDLERS & SWITCHES MOUNTING POSITION AT RBF – 2



GENERAL ARRANGEMENT OF BELT CONVEYOR RBF – 2

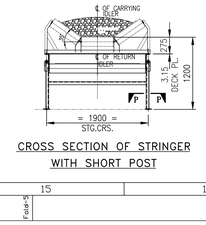


FLOOR PLAN FOR CONVEYOR RBF–2 AT EL. (+)12.50

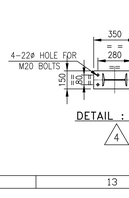


VIEW D–D

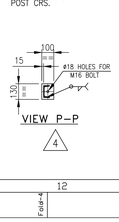
CROSS SECTION OF SKIRT



CROSS SECTION OF STRINGER WITH SHORT POST



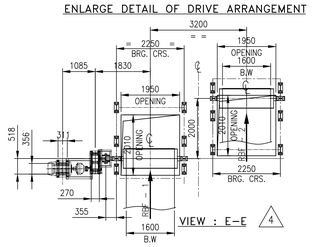
DETAIL : 'D1'



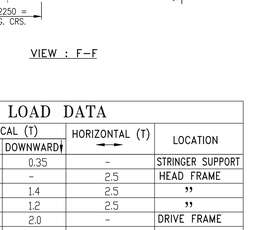
VIEW P–P

ENLARGE DETAIL OF DRIVE ARRANGEMENT

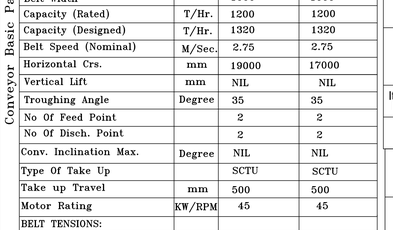
VIEW : F–F



VIEW : E–E



ENLARGE VIEW OF HEAD FRAM



ENLARGE VIEW OF TAIL FRAM

VIEW : A–A

Legend			
DESCRIPTION		SYM.	SPACING (mm)
Impact Idler	II		5 @ 400
Transition Idler (10°/20°)	TI		
Carrying Idler	CI		1000
Self Aligning Carring Idler	SACI		24000
Return Idler	RI		3000
Self Cleaner Rubber Disk Return Idler	SCR		
Working Point	W.P.		
Pull Cord. Switch	PCS		30,000
Belt Sway Switch	BSS		50,000

Technical Characteristics

Conveyor Basic Parameters — Description	Unit		
Conveyor No.	-	RBF 1	RBF 2
Type Of Conveyor	-	Belt Conveyor	Belt Conveyor
Conv. Profile	-	HORIZONTAL	HORIZONTAL
Material Conveyed		Sized Coal	Sized Coal
Lump Size	mm	(–) 20	(–) 20
Bulk Density vol/load	$T/M.^3$	0.8	0.8
Moisture	%	15–20	15–20
Belt Width	mm	1600	1600
Capacity (Rated)	T/Hr.	1200	1200
Capacity (Designed)	T/Hr.	1320	1320
Belt Speed (Nominal)	M/Sec.	2.75	2.75
Horizontal Crs.	mm	19000	17000
Vertical Lift	mm	NIL	NIL
Troughing Angle	Degree	35	35
No Of Feed Point		2	2
No Of Disch. Point		2	2
Conv. Inclination Max.	Degree	NIL	NIL
Type Of Take Up		SCTU	SCTU
Take up Travel	mm	500	500
Motor Rating	KW/RPM	45	45
BELT TENSIONS:			
T1	N	3103.26	3178.87
T2	N	1714.50	1756.30
T Tail	N	3429.01	3512.57
ANGLE OF WRAP	Degree	–	–

LOAD DATA

POINTS	VERTICAL (T) UPWARD ↑	VERTICAL (T) DOWNWARD ↓	HORIZONTAL (T) ← →	LOCATION
F20	–	0.35	–	STRINGER SUPPORT
F21	1.0	–	2.5	HEAD FRAME
F22	–	1.4	2.5	”
F23	–	1.2	2.5	”
F24	–	2.0	–	DRIVE FRAME
F25	1.5	–	–	”
F26	–	0.25	–	”
F27	–	0.45	–	”
F28	–	1.5	1.2	TAIL FRAME
F29	1.4	–	1.2	”

NOTE :-

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB–BARAUNI DRG. NO. PE–DG–374–100–M001 (Rev. 01)
3. RL (+) 45.0 CORRESPONDS TO EL (–) 0.500 FGL
4. A)SCOPE INCLUDES SUPPLY OF GROUTING CEMENT & GROUTING OF ALL. MECHANICAL EQUIPMENT/ITMS & ITS DRIVES BHEL;S CIVIL CONTRACTORS SHALL PROVIDE ONLY THE FOUNDATION PACKETS FOR PEDESTALS AS PER MECH. GA DRG.
   B).SUPPLY OF ALL INSERT PLATES, STOOLS & OTHER EMBEDMENT IN CONCRETE & ITS FIXING WITH STRUCTURAL MEMBERS REQUIRED FOR MECH FREE ISSUE ITEMS, DURING ERECTION SHALL BE IN SCOPE OF SUPPLY & WORK OF THE BTL & TO BE DONE IN COORDINATION WITH BHELS CIVIL & STRUCTURAL CONTRACTOR.
   C).MINOR CHIPPING i,e up to 50MM THK.MICRO LEVETING & PROVIDING SHIM PLATES FOR ERECTION OF EQUIPMENT /ITEMS
   D).PROVISION OF ANY TEMPOTARY SUPPORTS/PLATFORMS REQUIRED FOR E & C OF EQUIPMENT.
   E).BASE FRAME & FIXING/ FOUNDATION BOLTS FOR ALL MECH EQUIPMENT/ITEMS, RELATED ELECTRICAL EQUIPMENT & MOTOR SHALL BE IN BTL'S SCOPE WORK
6. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS–0–PL–660–100–M001 & FLOW DIAGRAM DRG. NO: IS–1–FL–660–100–M002
7. DIMENSIONS MKD. '•' TO BE FINALISED AFTER APPROVAL OF GEAR BOX, MOTOR & COUPLING.
8. MOTOR RATING,EQUIPMENT SELECTION SHALL BE AS PER APPROVED POWER CALCULATION.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
7	11.01.13	DRAWING REVISED DURING MEETING AT BTL DATED 05.01.13	A.B	G.M	SSG
6	23.08.12	DRAWING REVISED DURING MEETING AT STEAG DATED 23.08.12	A.B	G.M	SSG
5	16.08.12	REVISED AS PER STEG COMMENTS DATED 13.08.12	A.B	G.M	SSG
4	26.07.12	REVISED AS PER STEG COMMENTS DATED 18.06.12	A.B	G.M	SSG
3	04.06.12	REVISED AS PER STEG COMMENTS DATED 06.06.12	A.B	G.M	SSG
2	06.03.12	REVISED AS PER BHEL COMMENTS DATED 05.03.12	G.M	J.C	SSG
1	02.03.12	REVISED AS PER BHEL COMMENTS DATED 29.02.12	G.M	J.C	SSG

REVISIONS

Item No.	Description	RBF-1 Quantity	RBF-2 Quantity	Material	Make
29	PULL CHORD SWITCH	1 Pair	1 Pair		
28	BELT SWAY SWITCH	1 Pair	1 Pair		
27	ZERO SPEED SWITCH	1	1		
26	DISCHARGE CHUTE AT HEAD END - 10THK. M.S.BODY PLATE & 6 THK. SS 409M LINER .HOOD 4 THK.	1	1	ASSY	
VOID	VOID	VOID	VOID		
24	TAIL UNIT FRAME C/W GUARD	1	1	ASSY	
23	DRIVE UNIT FRAME - ISMB 200	1	1	ASSY	
22	HEAD UNIT FRAME - ISMB 200	1	1	ASSY	
21	DECK PLATE 3.15 THK. (THROUGH OUT)	I LOT	I LOT	ASSY	
20	STRINGER FRAME -ISMC 125 & SHORT SUPPORTS POST - ISMC 100	I LOT	I LOT	ASSY	
19	SKIRT BOARD - 10 THK. M.S.BODY + 6 TH SS 409M LINER & SKIRT SEALING SYSTEM	17.8M	15.8M	ASSY	
18	INTERNAL BELT SCRAPER - DIAGONAL TYPE	1	1	ASSY	
17	EXTERNAL BELT MAIN SCRAPER - SPRUNG BLADE TYPE WITH TUNGSTEN CARBIDE TIPS	1	1	ASSY	
16	EXTERNAL BELT PRE SCRAPER - TORSION ARM TYPE WITH POLYEURETHENE BLADES	1	1	ASSY	
15	SELF ALIGNING TROUGHED CARRYING IDLER 35° X 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK. x Ø 35 BRG. AS PER IS: 8598-1987	1	1	ASSY	
14A	SELF CLEANER RUBBER DISK RETURN IDLER 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK. x Ø 25 BRG. AS PER IS: 8598-1987	1	1	ASSY	
14	RETURN IDLER - 1 ROLL ASSY - 152.4Ø ERW TUBE X 4.5 THK. x Ø 25 BRG. AS PER IS: 8598-1987	4	3	ASSY	
13	TROUGHED TRANSITION IDLER 10° 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK. x Ø 35 BRG. AS PER AS PER IS: 8598-1987	1	1	ASSY	
12	TROUGHED TRANSITION IDLER 20°, 3 ROLL ASSY 152.4 Ø ERW TUBE X 4.5 THK. x Ø 35 BRG. AS PER AS PER IS: 8598-1987	1	1	ASSY	
11	TROUGHED CARRYING IDLER 35°, 3 ROLL ASSY-152.4 Ø ERW TUBE X 4.5 THK. x Ø 35 BRG. AS PER AS PER IS: 8598-1987	6	3	ASSY	
10	IMPACT IDLER 35°, 3 ROLL ASS'Y Ø190 RUBBER 139.7Ø ERW TUBE X 4.5 THK. x Ø 35 BRG. AS PER	18	18	ASSY	
9	DEFLECTOR PULLEY - 219.1 mm OD X 1800 mm FACE X 7.1 THK. SHELL X 50 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 511 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22211CK/W33, ADAPTOR SLEEVES - H 211, SHORE HARDNESS 45-55 DEG A	2	2	ASS'Y.	
8	VOID	VOID	VOID	ASS'Y.	
7	TAIL PULLEY - 500 mm OD X1800 mm FACE X 12 THK. SHELL X 12 THK. RUBBER LAGGING X 140 DIA SHAFT AT BEARING WITH PLUMMER BLOCK SIZE - SNA 532 C / W S . A . DOUBLE ROW SPHERICAL ROLLER BEARING NO: 22232 CK / W33, ADAPTOR SLEEVES - H 322, SHORE HARDNESS 45-55 DEG A	1	1	ASS'Y.	
6	HEAD / DRIVE PULLEY - 500 mm OD X1800 mm FACE X 16 THK. SHELL X 12THK. DIAMOND GROOVE RUBBER LAGGING X 140 DIA SHAFT BEARING SIZE 01 BC SNC 532 140MM EX ALT BPTL(FREE TYPE) & 01 BC SNC 532 140 MM GR ALT (FIXED TYPE) 4	1	1	ASS'Y.	
5	OUTPUT COUPLING - GEARED TOOTH TYPE FLEXIBLE COUPLING SUITABLE FOR 50 ° C AMBIENT & CONTINIOUS DUTY OPERATION SIZE - RG-06, 4	1	1	STD.	
4	INPUT COUPLING - TRACTION TYPE CONSTANT SPEED FLUID COUPLING SUITABLE FOR 50 ° C AMBIENT, 45 KW MOTOR & CONTINIOUS DUTY OPERATION - SIZE - SDFC 370,	1	1	STD.	
3	GEAR REDUCER - PARALLEL HELICAL TYPE INTEGRAL HOLDBACK RATIO- 17:1, SIZE CSB 200 SUITABLE FOR 50 ° C AMBIENT AND CONTINIOUS DUTY OPERATION MECH. RATING 87 KW	1	1	STD.	
2	MOTOR - TEFC SQ. CAGE TYPE - 45 KW RATING X 1500 RPM, FRAME SIZE - 225M PROTECTION - IP 55, INSULATION CLASS-B, SUITABLE FOR 50 DEGREE AMBIENT AND 3 PHASE, 415 VOLT 4	1	1	STD.	
1	BELTING-1600mm WIDE, NYLON / NYLON FABRIC, SIZE - 400/4(IF AVAILABLE) OR 500/4 MHD, COVER GRADE - FR TOP - 5 THK + BOTTOM - 3THK.	42.0 M (TAPE LENGTH) SPLICE LENGTH NOT CONSIDERED	38.0 M (TAPE LENGTH) SPLICE LENGTH NOT CONSIDERED	STD.	NOT IN BTL SCOPE

Bill of Materials

2x250 MW BARAUNI THERMAL POWER PROJECT

BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

BHARAT HEAVY ELECTRICALS LTD.

INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED

2, JESSORE ROAD. KOLKATA–700028

JOB No.	IS-1-10-2013		
STATUS OF DRAWING			
DISTRIBUTION OF PRINTS		QTY.	
REV.	NAME	SIGN	DATE
ALTERED			
CHECKED			
APPROVED			
ZONE			

BTL DRG. NO.	MHPD/1061/BSEBB/M/009	REV. 7

	NAME	SIGN	DATE
DRN.	G.M		21.02.12
CHD.	J.C		27.02.12
APPD.	SSG		27.02.12

DIRECTORY :

FILE NO. :

SCALE 1:200

TITLE : GA & LOAD DATA OF RBF–1 & 2 (IN CRUSHER HOUSE)

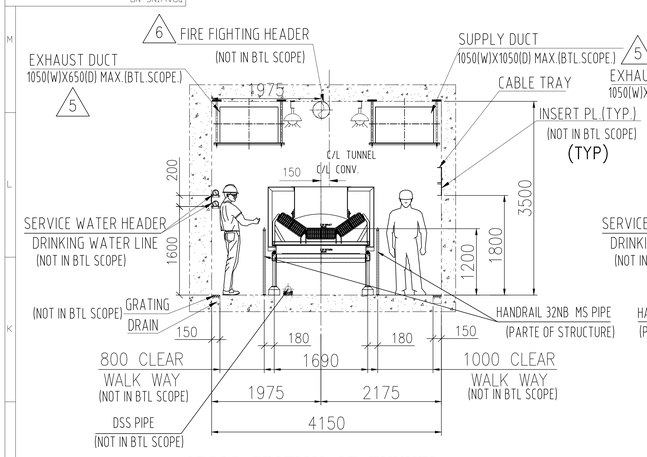
BHEL DRAWING NO. IS1-GA-660-101-M009 REV. 5

SHEET NO. 1 NO.OF SHTS. 1

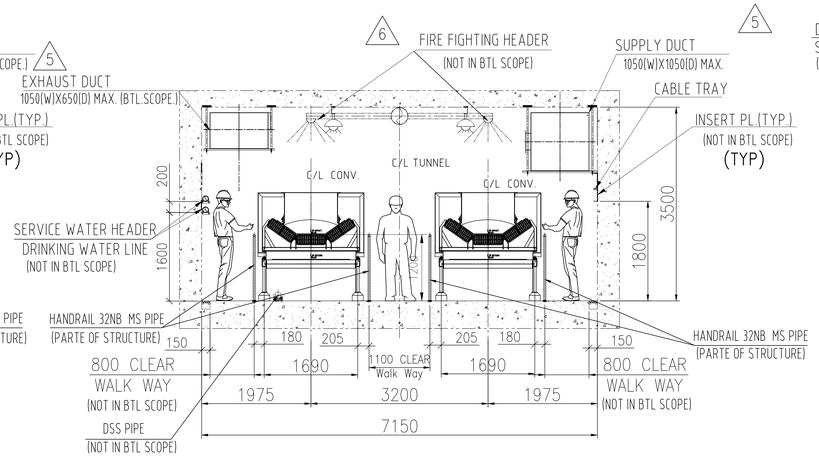
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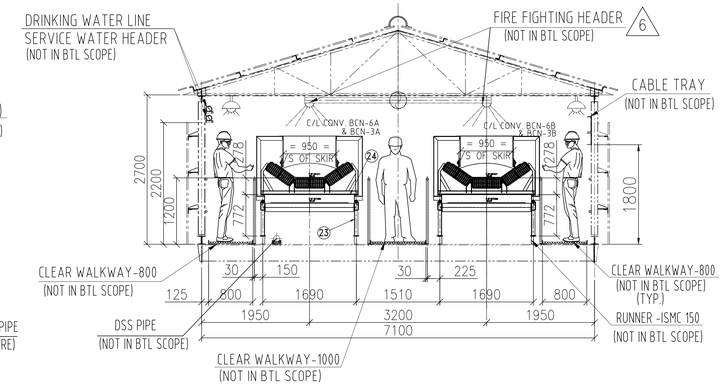
ALL DIMENSIONS ARE IN MM



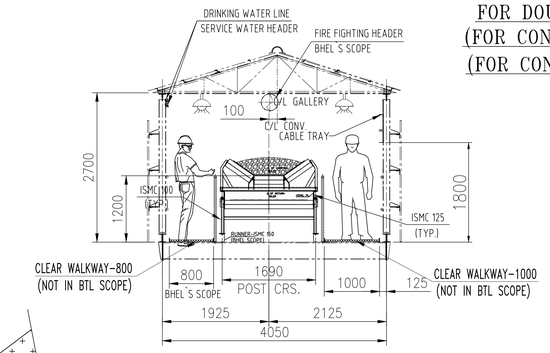
CROSS SECTION OF TUNNEL
FOR SINGLE CONVEYOR
(FOR CONV.BCN-5)



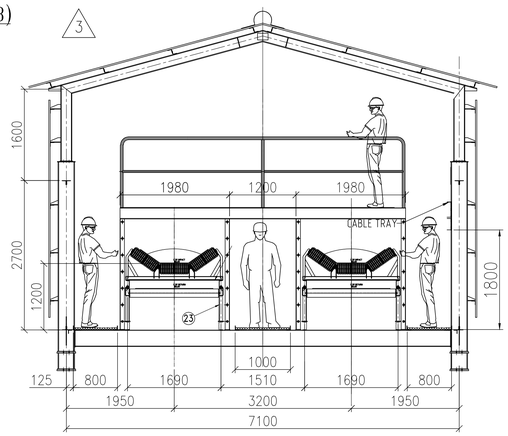
CROSS SECTION OF TUNNEL
FOR DOUBLE CONVEYOR
(FOR CONV.BCN-1A&1B, 2A&2B.)



CROSS SECTION OF GALLERY
FOR DOUBLE CONVEYOR
(FOR CONV.BCN-3A & 3B)
(FOR CONV.BCN-6A & 6B)



CROSS SECTION OF GALLERY
FOR SINGLE CONVEYOR
(FOR CONV.BCN-4)



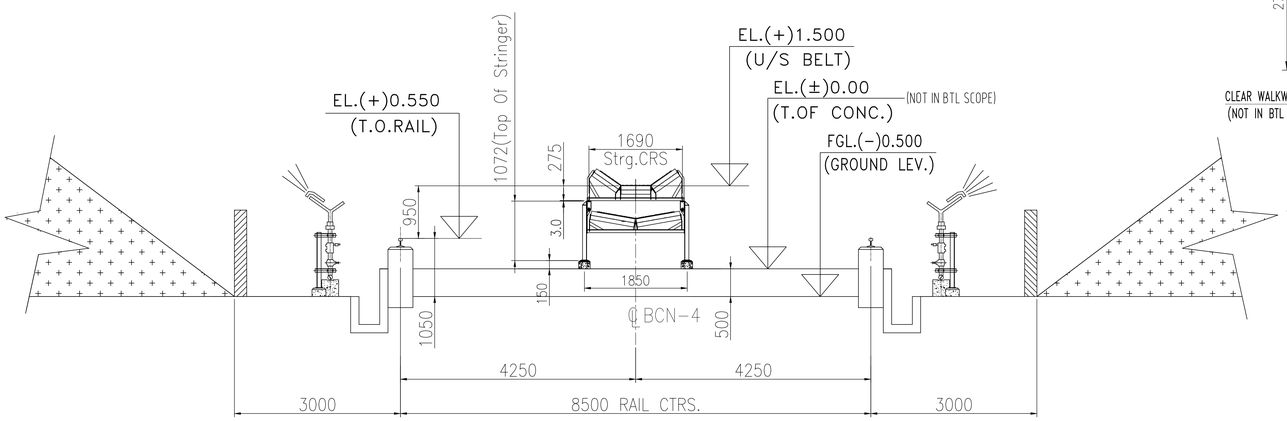
CROSS SECTION CROSS OVER OF GALLERY
FOR DOUBLE CONVEYOR



4

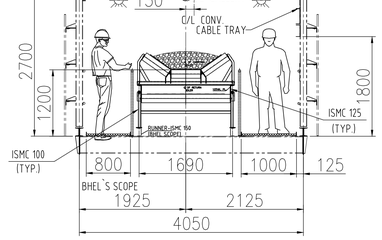
PLAN OF CROSS SECTION CROSS OVER

5



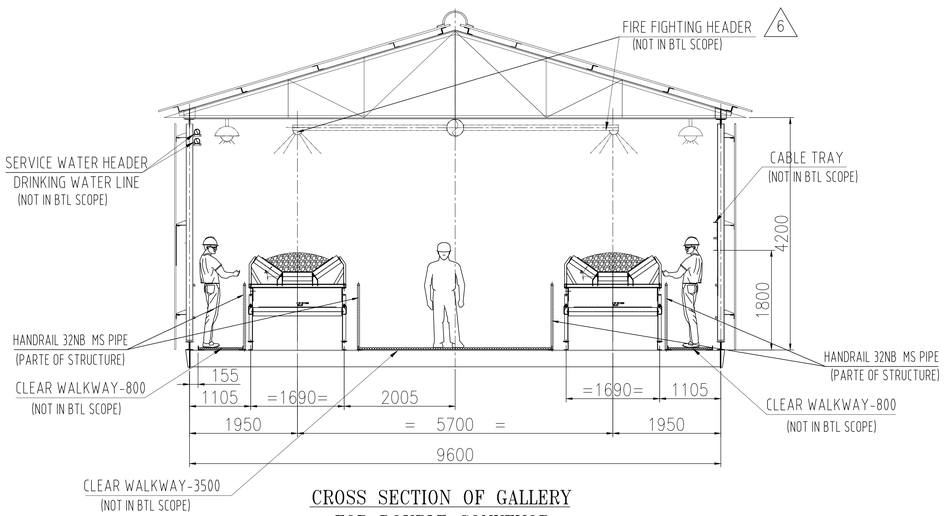
TYP.CROSS SECTION OF CONV. BCN-4

5



CROSS SECTION OF GALLERY
FOR SINGLE CONVEYOR
(FOR CONV.BCN-5)

5



CROSS SECTION OF GALLERY
FOR DOUBLE CONVEYOR
(FOR CONV.BCN-7A&7B)

3

NOTE :-

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METER.
2. THIS DRG. HAS BEEN BASED ON PLOT PLAN OF BSEB-BARAUNI DRG. NO. PE-DG-374-100-M001
3. RL (+) 45.0 M CORRESPONDS TO EL (-) 0.500 (FGL)
4. ALL D.W.,D.S.,S.W. ARE IN BHEL'S SCOPE.
5. THIS DRG. IS TO BE READ IN CONJUNCTION WITH PLANT LAYOUT DRG. NO: IS-0-PL-660-100-M001 & FLOW DIAGRAM DRG. NO: IS-1-FL-660-100-M002
6. FOR IDLER GA DRAWINGS, REF. DRG. NO.: IS-3-GA-660-101-M093
7. WALKWAY SHALL BE PROVIDED WITH CHEQUERED PLATE CONSTRUCTION.
8. FINAL LOCATION 7 ROUTING OF FIRE FIGHTING SYSTEM SHALL BE DECIDED (BY BHEL-PEM) FIRE FIGHTING VENDOR.
9. ALL CIVIL/STRUCTURAL/ELECTRICAL/UTILITY ARRANGEMENTS SHOWN ARE INDICATIVE ONLY. FOR ANY OTHER INFORMATION REFER RESPECTIVE DRAWINGS OF CIVIL/MECHANICAL /STRUCTURAL/ELECTRICAL/UTILITY.
10. SUPPORTING DETAILS OF UTILITY PIPES SHALL BE SHOWN IN RESPECTIVE PIPING LAYOUT DRAWINGS.
11. VENTILATION DUCT SIZES INDICATED ARE SUBJECT TO CHANGE AS PER FINAL SYSTEM CAPACITY, BASED ON DETAILED ENGINEERING.

R.No.	DATE	DESCRIPTION	BY	CHKD.	APPD.
6	22.08.12	GENERALLY REVISED AS PER BHEL/STEAG COMMENTS VIDE E.MAIL Dated .12.08.12	AB	G.M.	SSG
5	16.08.12	GENERALLY REVISED AS PER BHEL COMMENTS VIDE E.MAIL Dated 18.06.12	AB	G.M.	SSG
4	22.06.12	GENERALLY REVISED AS PER BHEL COMMENTS VIDE E.MAIL Dated 18.06.12	RR	G.M.	SSG
3	13.06.12	GENERALLY REVISED AS PER COMMENTS VIDE E.MAIL Dated 24.01.12	RR	G.M.	SSG
2	29.12.2011	GENERALLY REVISED AS PER COMMENTS VIDE E.MAIL Dated 22.12.11	TKR	G.M.	SSG
1	13.12.11	RVISED AS PER M.O.M Dated 07.12.11	TKR	G.M.	SSG

REVISIONS

JOB No. IS-1-10-2013

STATUS OF DRAWING

DISTRIBUTION OF PRINTS — QTY.

REV.		NAME	SIGN	DATE
	ALTERED			
	CHECKED			
	APPROVED			

ZONE

2x250 MW BARAUNI THERMAL POWER PROJECT
BARAUNI, BIHAR

BIHAR STATE ELECTRICITY BOARD (BSEB)

steag

BHARAT HEAVY ELECTRICALS LTD.
INDUSTRIAL SYSTEMS GROUP, BANGALORE

BENGAL TOOLS LIMITED
2, JESSORE ROAD. KOLKATA-700070

BTL DRG. NO. MHPD/1061/BSEBB/M/004 — REV. 7

	NAME	SIGN	DATE
DRN.	TKROY/GC		05.12.2011
CHD.	TKR		05.12.2011
APPD.	SSG		05.12.2011

DIRECTORY :
FILE NO. :
SCALE

TITLE : TYPICAL CROSS SECTION OF CONVEYOR GALLERY & TUNNEL

BHEL DRAWING NO. IS-1-GA-660-100-M003 — REV. 4

SHEET NO. 1 OF 1 — NO.OF SHTS. 1

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ELECTRONIC FILE NAME

DRAWING NO

FORMAT SIZE A1

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm)

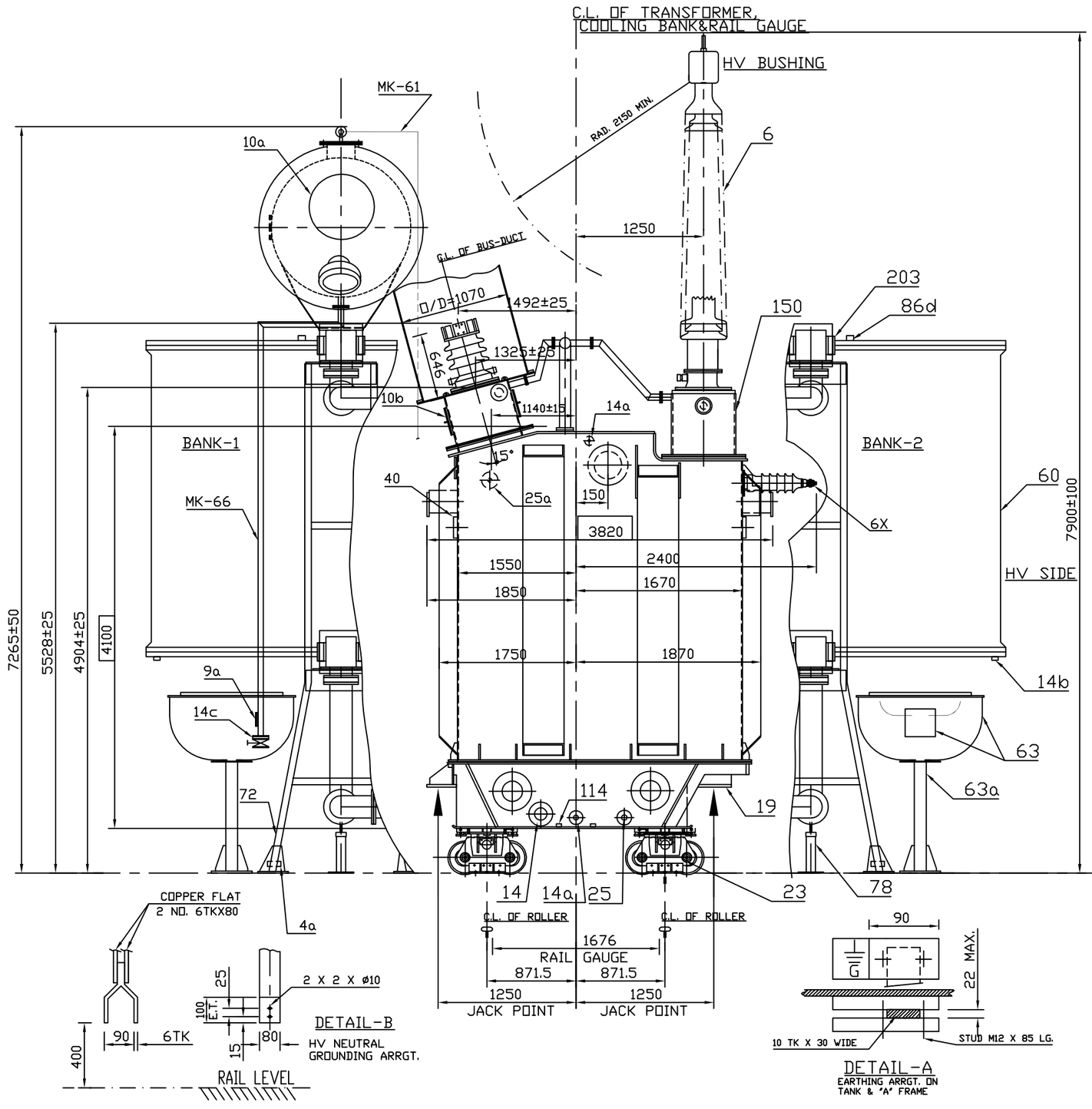
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REF.DRG.NO. 34590000262

SIGN.DATE

INVENTORY NO.



REV	DATE	ALT			REV	DATE	ALT		
		CKD					CKD		
		APPD					APPD		
ZONE					ZONE				

MDL DRG. NO.	BP-DG-374-301-001
PROJECT	2 x 250 MW, EXTENSION PROJECT AT BARAUNI TPS
LOA NO.	305/29/PROJ-4272/10, DT. 11/03/2011
TYPE OF PRODUCT	2 x 315 MVA, 16.5/240 KV, 3-PH, GENERATOR TRANSFORMER
NAME OF CUSTOMER	M/S BIHAR STATE ELECTRICITY BOARD (BSEB)

ADDITIONAL INFORMATION	W.O.-60110-A-509-01
STATUS OF DRAWING	'PR'
DISTRIBUTION OF PRINTS	TRE-1,TRM-3,TRX-1

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

TITLE: **OGA - END VIEW**

	NAME	SIGN	DATE
DRN.	AK		17.02.12
CHD.	KCJ		
APPD.	SNJ		

DRG. NO. **34590000632** REV. **00**

SHEET 03 OF 03

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm)

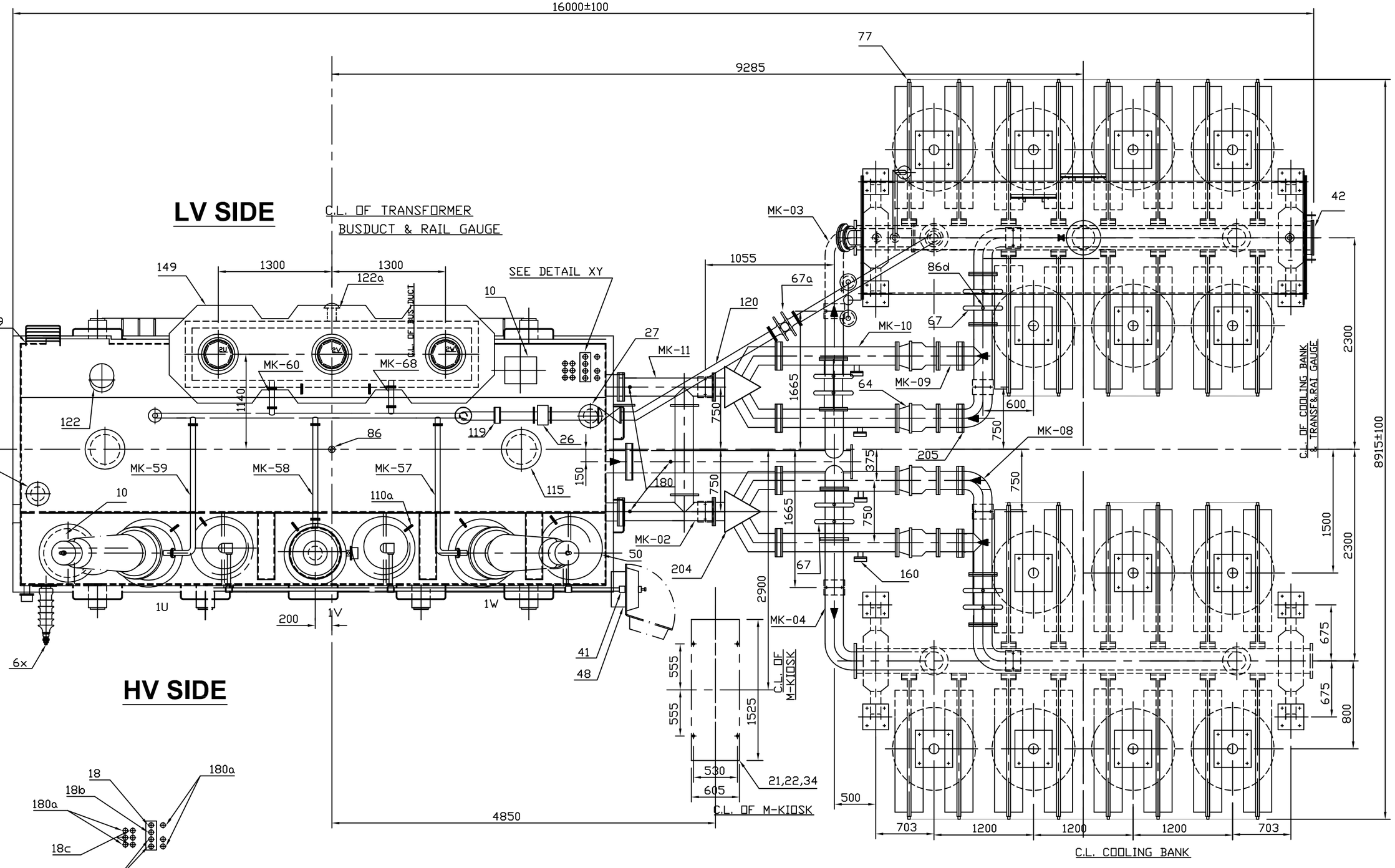
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REF.DRG.NO. 34590000262

SIGN.DATE

INVENTORY NO.



REV	DATE	ALT			REV	DATE	ALT		
		CKD					CKD		
		APPD					APPD		
ZONE					ZONE				

MDL DRG. NO.	**BP-DG-374-301-001**
PROJECT	2 x 250 MW, EXTENSION PROJECT AT BARAUNI TPS
LOA NO.	305/29/PROJ-4272/10, DT. 11/03/2011
TYPE OF PRODUCT	2 x 315 MVA, 16.5/240 KV, 3-PH, GENERATOR TRANSFORMER
NAME OF CUSTOMER	M/S BIHAR STATE ELECTRICITY BOARD (BSEB)

ADDITIONAL INFORMATION	W.O.-60110-A-509-01
STATUS OF DRAWING	'PR'
DISTRIBUTION OF PRINTS	TRE-1,TRM-3,TRX-1

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

TITLE: **OGA - PLAN VIEW**

	NAME	SIGN	DATE
DRN.	AK		17.02.12
CHD.	KCJ		
APPD.	SNJ		

DRG. NO. **34590000632** REV. **00**

SHEET 02 OF 03

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm)

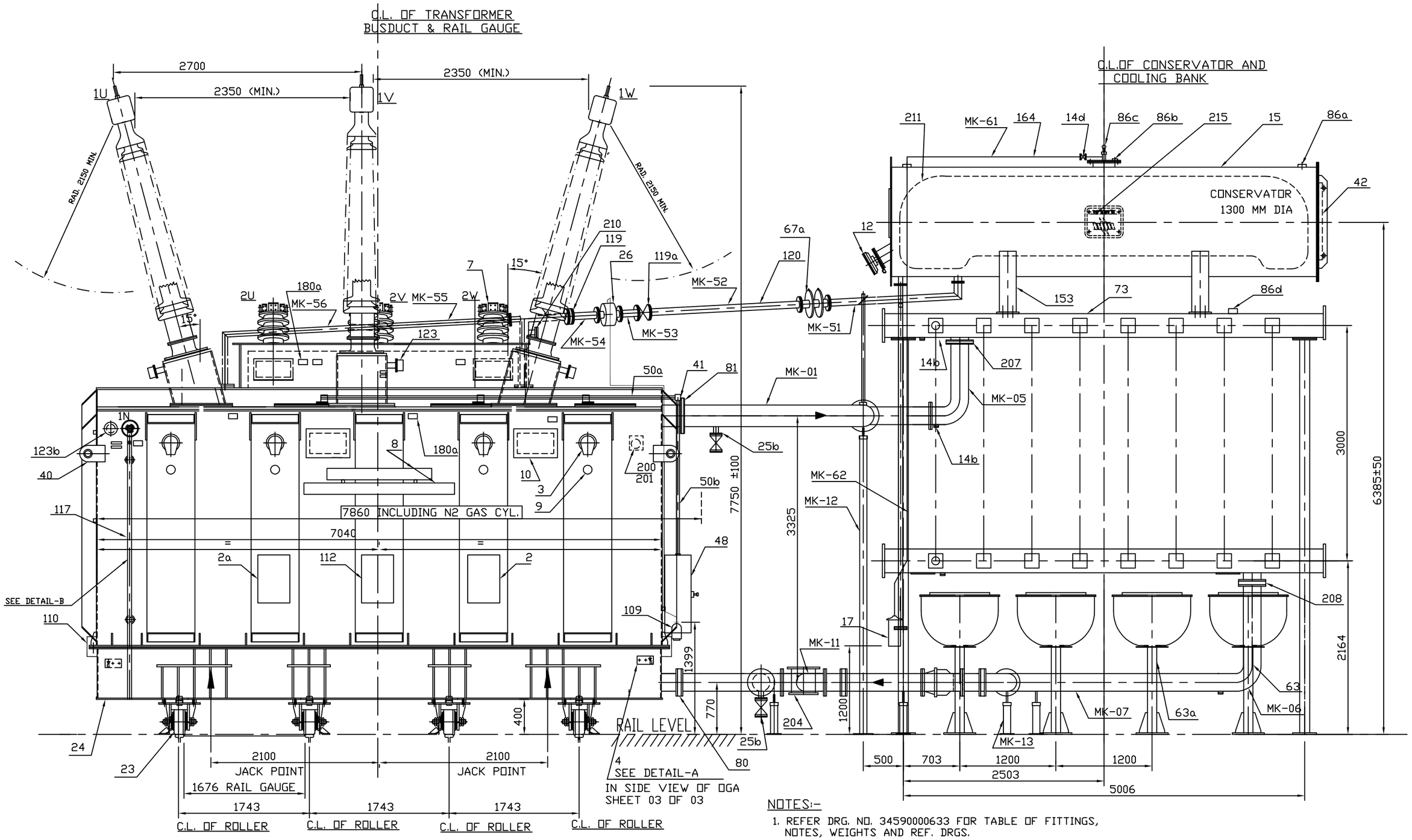
DRG. NO. 34590000632

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34590000262 REF.DRG.NO.

SIGN.DATE

INVENTORY NO.



NOTES:-

1. REFER DRG. NO. 34590000633 FOR TABLE OF FITTINGS, NOTES, WEIGHTS AND REF. DRGS.
2. DIMENSION SHOWN THUS ▭ ARE OVERALL SHIPPING DIMENSION.
3. DIM. 7860 IS INCLUDING N2 GAS CYLINDER BUT NOT SHOWN IN THIS DRG.

REV	DATE	ALT			REV	DATE	ALT		
		CKD					CKD		
		APPD					APPD		
ZONE					ZONE				

MDL DRG. NO.	**BP-DG-374-301-001**
PROJECT	2 x 250 MW, EXTENSION PROJECT AT BARAUNI TPS
LOA NO.	305/29/PROJ-4272/10, DT. 11/03/2011
TYPE OF PRODUCT	2 x 315 MVA, 16.5/240 KV, 3-PH, GENERATOR TRANSFORMER
NAME OF CUSTOMER	M/S BIHAR STATE ELECTRICITY BOARD (BSEB)

ADDITIONAL INFORMATION
W.O.-60110-A-509-01
STATUS OF DRAWING 'PR'
DISTRIBUTION OF PRINTS
TRE-1,TRM-3,TRX-1

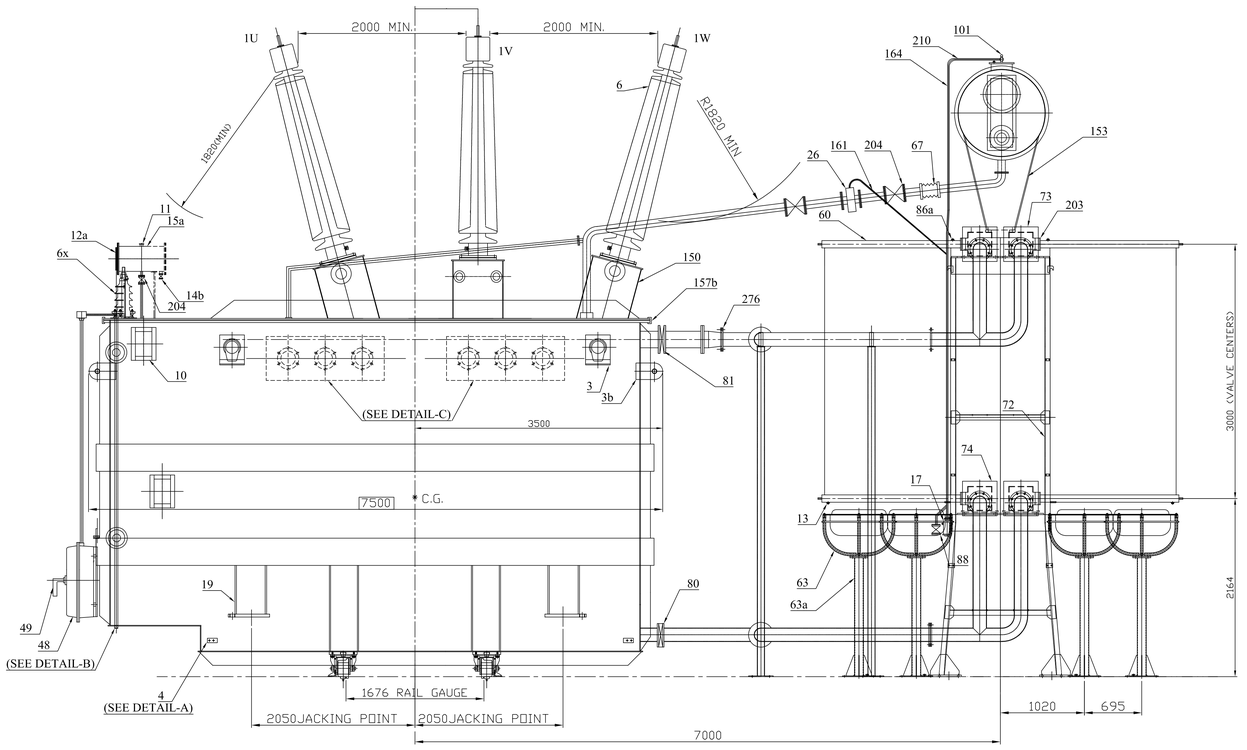
भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

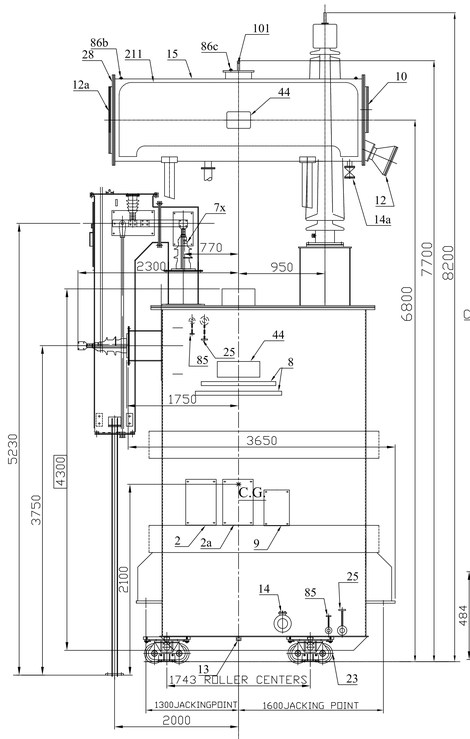
DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

TITLE **OGA - ELEVATION**

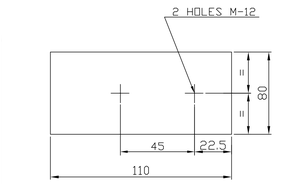
	NAME	SIGN	DATE
DRN.	AK		17.02.12
CHD.	KCJ		
APPD.	SNJ		

DRG. NO. **34590000632** REV. **00**
SHEET 01 OF 03

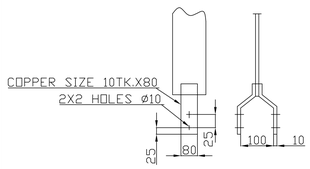




C. LN OF TRANSFORMER.

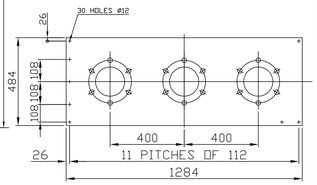


DETAIL-A



DETAIL-B

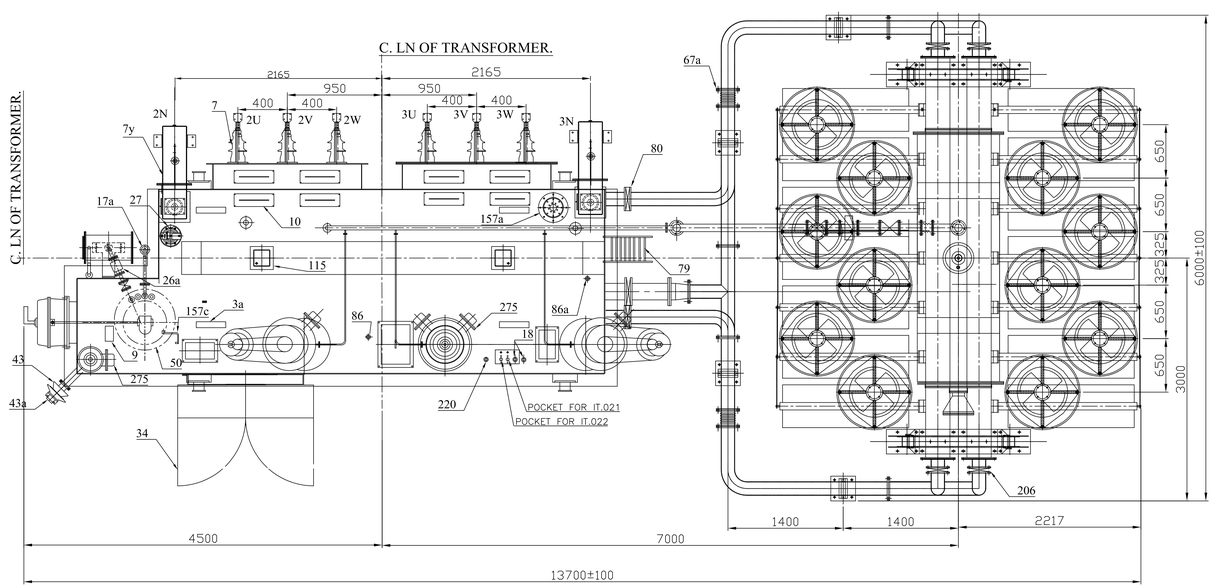
FOR NEUTRAL GROUNDING ARRGT.

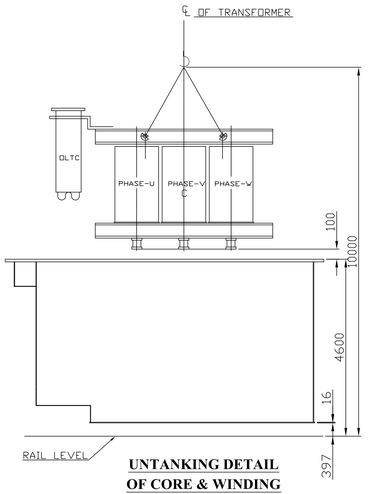


DETAIL-C
LV BUS DUCT MTG. FLANGE

TABLE OF FITTINGS

ITEM NO.	DESCRIPTION	QTY.
2	COMBINED RATING & DIAGRAM PLATE (HINDI & ENGLISH)	01NO.
2a	VALVE SHEDULE PLATE	01NO.
3	LIFTINGS LUGS	04NOS.
3a	LIFTINGS LUGS FOR COVER	04NOS.
3b	LASHING LUGS	04NOS.
4	EARTHING TERMINAL ON TANK	02NOS.
6	H.V. LINE TERMINALS 245 KV, 1250 AMP.	03NOS.
6x	H.V.N TERMINALS 36 KV, 630 AMP.	01NO.
7	L.V. BUSHING 17.5 KV, 3150 AMPS.	06NOS.
7X	L.V.N BUSHING 17.5 KV, 3150 AMPS.	02NOS.
7Y	L.V.N CABLE BOX	02NOS.
8	NAME PLATE (HINDI & ENGLISH)	02NOS.
9	OIL FILLING INSTRUCTION PLATE	01NO.
10	INSPECTION COVERS ON TANK, COVER, LV TURRET & MAIN CONSERVATOR	15NOS.
11	OIL FILLING HOLES ON OLTC CONSERVATOR	01NO.
12	MAGNETIC OIL GAUGE WITH LOW OIL LEVEL ALARM FOR MAIN CONSERVATOR	01NO.
12a	PRYSMETIC OIL GAUGE FOR MAIN CONS. & OLTC CONSERVATIR	02NO.
13	DRAIN PLUG ON TANK,RADIATORS	16NOS.
14	DRAIN VALVE ON TANK (100 NB. B/F)	01NO.
14a	DRAIN VALVE ON MAIN CONSERVATOR (50 NB. B/F)	01NO.
14b	DRAIN VALVE ON OLTC CONSERVATOR (15 NB.)	01NO.
15	OIL CONSERVATOR (AIR CELL TYPE)	01NO.
15a	OLTC OIL CONSERVATOR 300 DIA. FOR OIL.T.C.	01NO.
17	DEHYDRATING BREATHER FOR MAIN CONSERVATOR	01NO.
17a	DEHYDRATING BREATHER FOR OLTC CONSERVATOR	01NO.
18	THERMOMETER POCKETS WITH ORDINARY THERMOMETER ON TANK COVER + RTD	01+01NO.
19	JACKING PADS	04NOS.
21	OTI PERFECT CONTROL/PRESE MEASURE MAKE (140mm DIAL SIZE)	01NO.
22	WTI PERFECT CONTROL/PRESE MEASURE MAKE (140mm DIA SIZE)	01NO.
23	FLANGE BI-DIRECTIONAL ø 200 TWIN WITH STOPPER ARRGT.	04NOS.
25	FILTER VALVE ON TANK (50 NB. B/F)	02NOS.
26	BUCHHOLZ RELAY (80NB)	01NO.
26a	OIL SURGE RELAY FOR OLTC	01NO.
27	PRESSURE RELIEF DEVICE	01NO.
28	END COVER FOR MAIN CONSERVATOR & OLTC CONSERVATOR	01+01NO.
34	MARSHALLING BOX	01NO.
43	33 KV, POST INSULATOR FOR HV NEUTRAL GROUNDING STRIPS	02NOS.
43a	HV NEUTRAL GROUNDING STRIPS	01NO.
44	BILANGUAL COMPANY'S MONOGRAM (ON TANK & MAIN CONSERVATOR)	02NOS.
48	MOTOR DRIVING GEAR	01NO.
49	HAND OPERATING HANDLE	01NO.
50	ON LOAD TAP CHANGER	01NO.
60	RADIATORS	14NOS.
63	FAN & MOTOR	12NOS.
63a	FAN SUPPORT	12NOS.
67	FLEXIBLE JOINT 80 NB	01NO.
67a	FLEXIBLE JOINT 150 NB	04NOS.
72	'A' FRAME	02NOS.
73	TOP HEADER	01NO.
74	BOTTOM HEADER	01NO.
77	RADIATOR TIE BAR	24NOS.
79	LADDER WITH SAFETY FLAP	01NO.
80	OIL INLET VALVE 150 NB	02NOS.
81	OIL OUTLET VALVE 200 NB	01NO.
85	SAMPLING VALVE (15 NB) ON TANK	02NOS.
86	AIR RELEASE VALVE (15 NB) ON COVER	02NOS.
86a	AIR RELEASE PLUG ON RADIATORS, HEADERS,	16NOS.
86b	AIR RELEASE PLUGES (3/4" BSP) ON MAIN CONSERVATOR	02NOS.
68c	AIR RELEASE PLUG (1/4" BSP) ON MAIN CONSERVATOR	01NO.
88	BUCHHOLZ RELEASE COCK (6 NB)	01NO.
101	PRESSURE GAUGE ON MAIN CONSERVATOR	01NO.
115	LOCKING OF CORE ASSY TO TANK COVER	02NOS.
150	HV TURRET (DETACHABLE)	03NOS.
153	CONSERVATOR SUPPORT FOR MAIN CONSERVATOR	02NOS.
157a	EARTHING CONNECTION BETWEEN CORE TO END FRAME & END FRAME TO TANK	01NO.
157b	EARTHING CONNECTION BETWEEN TANK & TANK COVER	02NOS.
157c	EARTHING CONNECTION BETWEEN TAP CHANGER TO TANK COVER	01NO.
161	BUCHHOLZE GAS RELEASE PIPE	01NO.
164	BREATHER PIPE	01NO.
203	RADIATOR VALVE (80 NB BUTTERFLY)	28NOS.
204	CONSERVATOR VALVE (80 NB FOR MAIN CONS. & 25 NB FOR OLTC CONS.)	02+01NO.
206	VALVE FOR DISCONNECTING RADIATOR BANK	02NOS.
210	VALVE (15 NB) FOR BREATHER CONNECTION ON MAIN CONSERVATOR	01NO.
211	FLEXIBLE SEPERATOR (AIR CELL)	01NO.
220	RTD POCKET	01NO.
275	CT TERMINAL BOX FOR HV & HVN	07NOS.
276	REDUSER	01NO.





UNTANKING DETAIL OF CORE & WINDING

DIRECTION OF WITHDRAWAL

TABLE OF REFERENCE DRAWINGS

SRL. NO.	DESCRIPTION	BHEL DRG.NO.
01	OUT LINE GENERAL ARRANGEMENT	0 458 00 50 130
02	RATING & DIAGRAM PLATE (HINDI & ENGLISH)	1 458 19 50 483
03	VALVE SHEDULE PLATE	1 458 19 50 484
04	FOUNDATION PLAN OF TRANSFORMER	2 458 00 50 459
05	OIL FILLING INSTRUCTION PLATE	2 458 19 50 491
06	245kV 1250 AMPS. H.V.BUSHING	3 458 00 50 736
07	17.5 KV, 3150 AMPS. LV & LVN BUSHING	3 458 00 50 737
08	36KV 2000AMPS. HV N BUSHING	3 458 00 50 738
09	FOUNDATION PLAN 320 ø SINGLE ROLLER	3 458 00 50 739
10	LVN CABLE BOX.	2 458 00 50

APPROXIMATE WEIGHT

DESCRIPTION	WT.IN KG.
CORE & WINDINGS (INCLUDING OIL ABSORBED)	47000
TANK+FITTINGS (INCLUDING RADITORS) + ACCESSORIES	20000
OIL IN KG.	34000
TOTAL WEIGHT	100000
SHIPPING WEIGHT	72000

MIN. CLEARANCES

	PHASE TO PHASE	PHASE TO EARTH
H.V.	2000	1820
L.V.	165	140

NOTES:-

1. WHEN REFERING THIS DRG. STATE 50 MVA & W.O.NO.70222A17100
2. DIMENSIONS MARKED THUS ▭ ARE OVER ALL SHIPPING DIMENSIONS EXCLUSIVE OF PACKING.
3. PVC, SWA, PVC ARMOURED CABLE WIRING UPTO MARSHALLINGBOX ARE SUPPLIED BY BHEL, BUT NOT SHOWN IN THIS DRG. FOR CLARITY.
4. FOUNDATION BOLTS, NUTS & WASHERS ETC. ARE SUPPLIED BY BHEL.
5. OUT SIDE PAINTING SHALL BE SYNTHETIC ENAMAL PAINT SHADE NO. 631 OF IS:5

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SIGN & DATE | REF. DRG. NO. PDW014424. DWG | INVENTORY NO.

REV	DATE	ALTERED	CHECKED

CONSULTANT:- STEAG ENERGY SERVICES (INDIA) PVT. LTD.
LOA NO:-305/29/PROJ-4272/10

ADDITIONAL INFORMATION WO. 70222A17100
STATUS OF DRAWING U
DISTRIBUTION OF PRINTS TRE-1, TRP-1, BAY1&2-2, BAY9-4,

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 50/25-25 MVA, 220/6.9-6.9 KV ONAF/ONAN COOLED SYSTEM TRANSFORMER M/S:- BSEB BARAUNI

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE
DRN	PAWAN		04.10.12
CHD	S.S.ARORA		
APPD	C.P.SINGH		

NO. OF VAR: 01

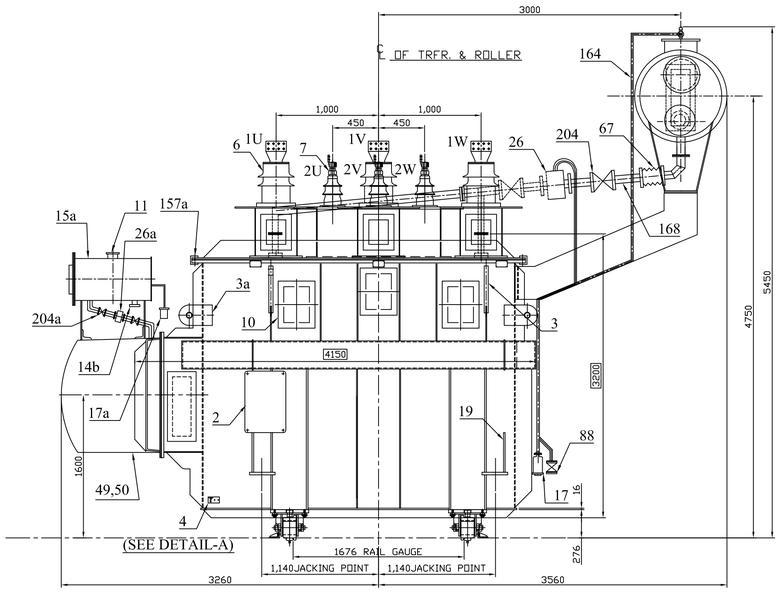
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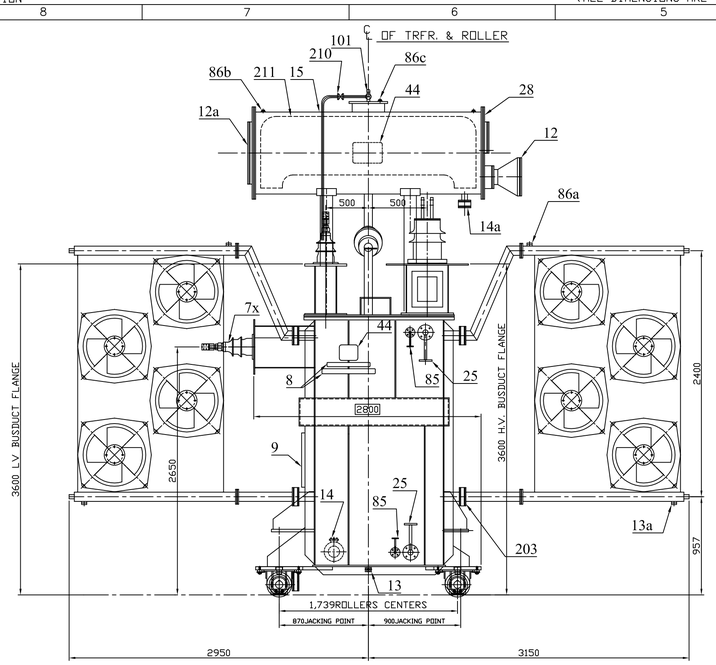
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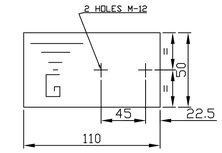
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SIZE A0

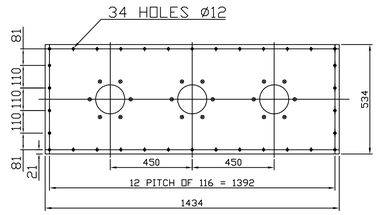
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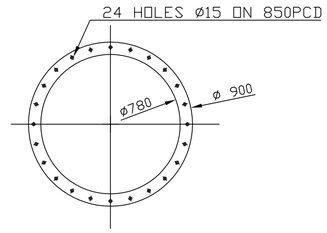




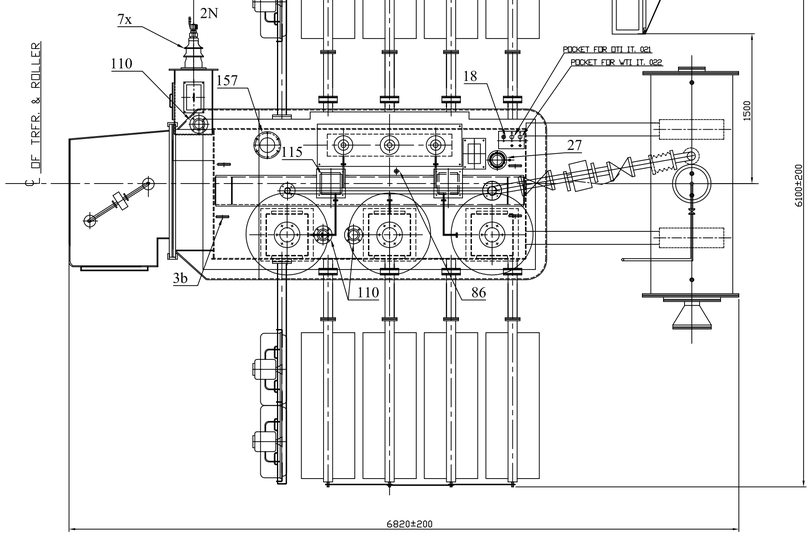
DETAIL-A

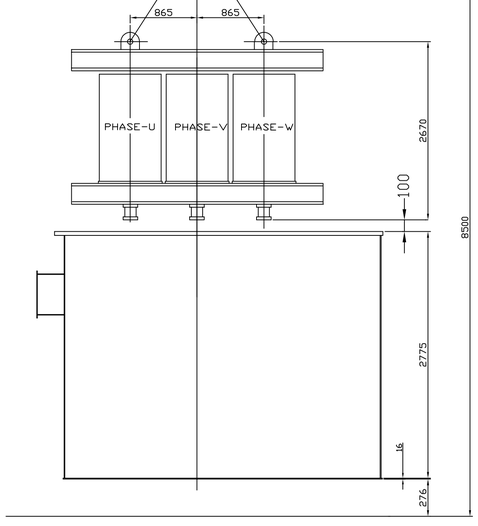


L.V. BUSDUCT FLANGE DETAIL
DETAIL-D



H.V. BUSDUCT FLANGE DETAIL
DETAIL-C





UNTANKING DETAIL

DIRECTION OF WITH DRAWAL FOR UAT 8A & 9A

DIRECTION OF WITH DRAWAL FOR UAT 8B & 9B

TABLE OF FITTINGS

ITEM NO.	DESCRIPTION	QTY.
2	COMBINED RATING & DIAGRAM PLATE (HINDI & ENGLISH)	01NO
3	LIFTINGS LUGS	04NOS
3a	LIFTINGS LUGS FOR COVER	04NOS.
4	EARTHING TERMINAL	04NOS.
6	H.V. LINE TERMINALS 24 KV, 8000 AMP.	03NOS.
7	L.V.LINE TERMINAL 17.5 KV, 3150 AMPS.	03NOS.
7x	L.V.NEUTRAL TERMINAL 17.5 KV, 3150 AMP.	01NO.
8	NAME PLATE (HINDI & ENGLISH)	02NOS.
9	OIL FILLING INSTRUCTION PLATE	01NO.
10	INSPECTION COVERS	13NOS.
11	OIL FILLING HOLES ON O.L.T.C. CONSERVATOR	01NO.
12	MAGNETIC OIL GAUGE (WITH LOW OIL LEVEL ALARM)	01NO.
13	DRAIN PLUG 1"BSP	01NO.
13a	DRAIN PLUG 1"BSP	08NOS.
14	DRAIN VALVE ON TANK (100 NB. B/F)	01NO.
14a	DRAIN VALVE ON MAIN CONSERVATOR	01NO.
14b	DRAIN VALVE ON O.L.T.C. CONSERVATOR	0NO.
15	OIL CONSERVATOR AIR CELL TYPE	01NO.
15a	O.L.T.C. CONSERVATOR	01NO.
17	DEHYDRATING BREATHER FOR MAIN CONSERVATOR	01NO.
17a	DEHYDRATING BREATHER FOR O.L.T.C. CONSERVATOR	01NO.
18	THERMOMETER POCKETS (WITH ALCOHAL THERMOMETER)	01NO.
19	JACKING LUGS	04NOS.
21	OIL TEMPERATURE INDICATOR	01NO.
22	WINDING TEMPERATURE INDICATOR WITH REPEATOR	01NO.
23	FLANGE BI-DIRECTIONAL ø 200 SINGLE ROLLER	04NOS.
25	FILTER VALVE ON TANK (50 NB. B/F)	07NOS.
26	BUCHHOLZ RELAY (80NB)	01NO.
26a	OIL SURGE RELAY	01NO.
27	PRESSURE RELIEF VALVE	01NO.
28	END COVER FOR MAIN CONSERVATOR	01NO.
44	BILINGUAL COMPANY'S MONOGRAM	04NOS.
49	HAND OPERATING HANDLE	01NO.
50	TAP CHANGER CTR MAKE	01NO.
57	MARSHALLING KIOSK (GROUNDING MOUNTED)	01NO.
60	RADIATORS	08NOS.
63	FAN WITH MOTOR (6 RUNS + 2 STANDBY)	08NOS.
67	FLEXIBLE JOINT	01NO.
70	FAN SUPPORT	02NOS.
77	RADIATOR TIE BAR	12NOS.
79	LADDER WITH SAFETY FLAP	01NO.
80	OIL INLET VALVE (150NB BUTTERFLY) ON TANK	04NOS.
81	OIL OUTLET VALVE (200 NB BUTTERFLY) ON COVER	04NOS.
85	SAMPLING VALVE (15 NB) ON TANK	02NOS.
86	AIR RELEASE VALVE (15 NB) ON COVER	01NO.
86a	AIR RELEASE PLUG ON RADIATORS	08NOS.
86b	AIR RELEASE PLUGES (3/4" BSP) ON MAIN CONS.	02NOS.
68c	AIR RELEASE PLUG (1/4" BSP) ON MAIN CONS.	01NO.
88	BUCHHOLZ RELEASE COCK (6 NB)	01NO.
101	PRESSURE GAUGE ON MAIN CONSERVATOR	01NO.
110	C.T. TERMINAL BOX	03NOS.
115	HOLE FOR CLAMPING CORE AND COIL TO TANK COVER	02NOS.
150	HV TURRET (DETACHABLE)	03NOS.
151	LV TURRET (DETACHABLE)	01NO.
157a	EARTHING CONNECTION BETWEEN CORE TO END FRAME	01NO.
157b	EARTHING CONNECTION BETWEEN TANK TO TANK COVER	02NOS.
164	BREATHER PIPE	01NO.
203	RADIATOR VALVE (80 NB BUTTERFLY)	16NOS.
204	CONSERVATOR VALVE (80 NB FOR MAIN CONS.)	02NOS.
204a	CONSERVATOR VALVE (25 NB FOR OLTC CONS.)	01NO.
210	VALVE FOR BREATHER CONNECTION ON MAIN CONS.	01NO.
211	FLEXIBLE SEPERATOR (AIR CELL)	01NO.
212	SHOCK RECORDER (NOT IN VIEW)	01NO.
213	DRAIN/LINE COLLECTION FOR PRV (NOT IN VIEW)	01NO.

APPROXIMATE WEIGHT

DESCRIPTION	WT.IN KG.
CORE & WINDINGS (INCLUDING OIL ABSORBED)	20000
TANK+FITTINGS (INCLUDING RADITORS) + ACCESSORIES	9500
OIL IN KG.	13000
TOTAL WEIGHT	42500
SHIPPING WEIGHT	30000

TABLE OF REFERENCE DRAWINGS

SRL. NO.	DESCRIPTION	DRG.NO.
01	OUT LINE GENERAL ARRANGEMENT	1 456 00 50 818
02	RATING & DIAGRAM PLATE (HINDI & ENGLISH)	1 456 19 5 1328
03	FOUNDATION PLAN OF TRANSFORMER	2 456 00 50 876
04	OIL FILLING INSTRUCTION PLATE	2 456 19 50 712
05	24 KV, 8000 AMPS. H.V. BUSHING	3 456 00 50 811
06	17.5 kV, 3150 AMPS. L.V & L.V.N. BUSHING	3 456 00 50 812
07	FOUNDATION PLAN 200 ø SINGLE ROLLER	3 456 00 50 813

NOTES:-

1. WHEN REFERING THIS DRG. STATE 20 MVA & W.O.NO.70223A18000
2. DIMENSIONS MARKED THUS [ ] ARE OVER ALL SHIPPING DIMENSIONS EXCLUSIVE OF PACKING.
3. PVC, SWA, PVC ARMOURED CABLE WIRING HAVING FLAME RETARDENT LOW SMOKE (FRLS)CHARACTERISTICS UPTO MARSHALLING KIOSK ARE SUPPLIED BY BHEL, BUT NOT SHOWN IN THIS DRG. FOR CLARITY.
4. FOUNDATION BOLTS, NUTS & WASHERS ETC. ARE SUPPLIED BY BHEL.
5. OUT SIDE PAINTING SHALL BE SYNTHETIC ENAMEL PAINT TO SHADE NO. 632 OF I.S.5

REV	DATE	ALTERED	CHECKED
REV	DATE	ALTERED	CHECKED
REV 02	DATE 19/02/13	ALTERED DRAWING IS REVISED TO INCORPORATE STEAG'S & BHEL PEM's COMMENTS.	CHECKED
REV 01	DATE 10/01/13	ALTERED DRAWING IS REVISED TO INCORPORATE STEAG'S & BHEL PEM's COMMENTS.	CHECKED

ADDITIONAL INFORMATION W.O. 70223A18000

STATUS OF DRAWING U

DISTRIBUTION OF PRINTS TRE-1, TRP-1, BAY1&2-3, BAY9-4,

CONSULTANT:- STEAG ENERGY SERVICES (INDIA) PVT. LTD.

LOA NO:-305/29/PROJ-4272/10

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 20/16 MVA,16.5/6.9 KV ONAF/ONAN COOLED UNIT AUXILIARY TRANSFORMER; M/S:- BSEB BARAUNI (2X250MW UNIT-8&9)

BHARAT HEAVY ELECTRICALS LTD. JHANSI

	NAME	SIGN	DATE
DRN	PAWAN		27.09.12
CHD	S.S.ARORA		
APPD	K.SINGH		

NO. OF VAR: –

DEPT: TRE; CODE: 406; GRADE OF UN. TOL. DIM.: ±1/2; SCALE: –; WEIGHT (KG): –; REF. TO ASSY. NO.: ITEM NO: –; NO. OF ITEM: –

TITLE: OUT LINE GENERAL ARRGT.

CARD CODE

DRAWING NO. 1 456 00 50 818 REV. 02

SHEET NO. 01 NO. OF SHEETS 01

SIZE A1

REF. DRG. NO. POW114416. DWG

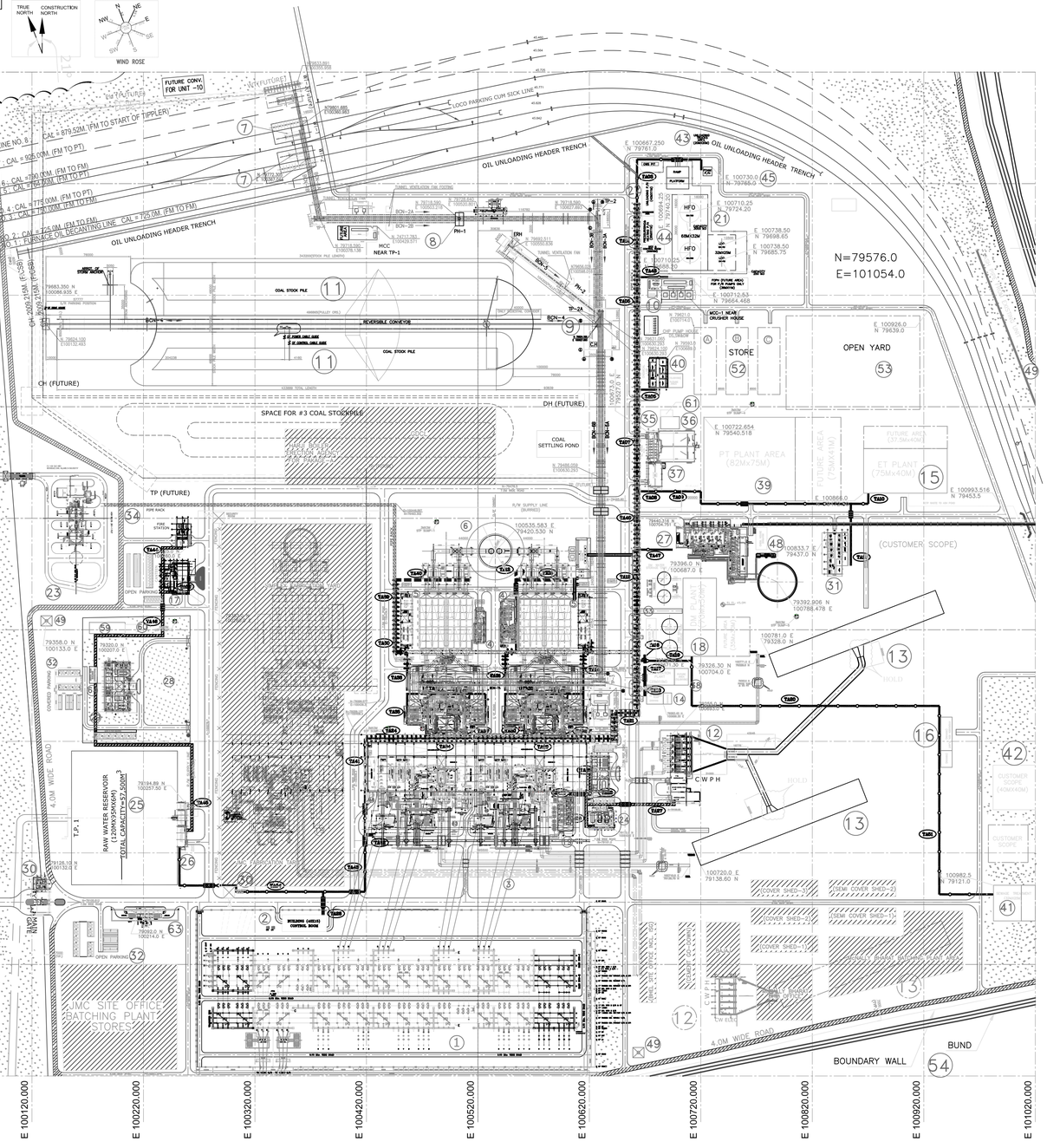
SIGN. & DATE

INVENTORY NO.

DRAWING NO. PE-DG-374-100-E013

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It must not be used directly or indirectly

ELECTRONIC FILE NAME



CABLE TRAY & LOADING

SL.NO.	CABLE PATH SECTION NO.	NO. OF CABLE TRAY/ PIPE	CABLE TRAY LOAD (Kg.)	TYP. ARRANG. TYPE	STRUCTURE TYPE
1.	TA01	1X3X600W	80Kg/Tray/Mtr.	Z	CABLE TRESTLE
2.	TA02	1350W X 1000D	-	O	CABLE TRAY TRENCH
3.	TA03	1X3X600W	-	B	CABLE TRAYS PEDESTAL
4.	TA04	2X2X600W	-	C	CABLE TRAYS PEDESTAL
5.	TA05	1X6X600W	-	Y	CABLE TRESTLE
6.	TA06	1X2X600W	-	A	CABLE TRAYS PEDESTAL
7.	TA07	1X8X600W	-	X	CABLE TRESTLE
8.	TA08	2X3X600W	-	D	CABLE TRAYS PEDESTAL
9.	TA09	2X3X600W	-	D	CABLE TRAYS PEDESTAL
10.	TA10	1X3X600W	-	B	CABLE TRAYS PEDESTAL
11.	TA11	2X2X600W	-	C	CABLE TRAYS PEDESTAL
12.	TA12	2X7X600W	-	V	CABLE TRESTLE
13.	TA13	8 PIPE 200mm dia	-	G	PIPE DUCT BANK
14.	TA14	1X4X600W	-	P	BRACKET ARRANGEMENT
15.	TA15	8 PIPE 200mm dia	-	G	PIPE DUCT BANK
16.	TA16	2X3X600W	-	D	CABLE TRAYS PEDESTAL
17.	TA17	20 PIPE 200mm dia	-	J	PIPE DUCT BANK
18.	TA18	12 PIPE 200mm dia	-	H	PIPE DUCT BANK
19.	TA19	2X4X600W	-	E	CABLE TRAYS PEDESTAL
20.	TA20	2X3X600W	-	D	CABLE TRAYS PEDESTAL
21.	TA21	2X8X600W	-	U	CABLE TRESTLE
22.	TA22	2000W X 1600D	-	L	CABLE TRAY TRENCH
23.	TA23	40 PIPE 200mm dia	-	K	PIPE DUCT BANK
24.	TA24	1X4X600W	-	R	CABLE TRESTLE
25.	TA25	1350W X 700D	-	M	CABLE TRAY TRENCH
26.	TA26	2000W X 1000D	-	N	CABLE TRAY TRENCH
27.	TA27	2000W X 1000D	-	N	CABLE TRAY TRENCH
28.	TA28	16 PIPE 200mm dia	-	I	PIPE DUCT BANK
29.	TA29	2X8X600W	-	T	CABLE TRESTLE
30.	TA30	2X4X600W	-	Q	BRACKET ARRANGEMENT
31.	TA31	1X4X600W	-	P	BRACKET ARRANGEMENT
32.	TA32	2X4X600W	-	Q	BRACKET ARRANGEMENT
33.	TA33	1X4X600W	-	P	BRACKET ARRANGEMENT
34.	TA34	2X6X600W	-	S	CABLE TRESTLE
35.	TA35	2X4X600W	-	Q	BRACKET ARRANGEMENT
36.	TA36	1X4X600W	-	P	BRACKET ARRANGEMENT
37.	TA37	1X4X600W	-	P	BRACKET ARRANGEMENT
38.	TA38	2X3X600W	-	AA	CABLE TRESTLE
39.	TA39	1X3X300W	-	AB	CABLE TRESTLE
40.	TA40	8 PIPE 200mm dia	-	G	PIPE DUCT BANK
41.	TA41	2X2X600W	-	C	CABLE TRAYS PEDESTAL
42.	TA42	16 PIPE 200mm dia	-	I	PIPE DUCT BANK
43.	TA43	2X4X600W	-	E	CABLE TRAYS PEDESTAL
44.	TA44	1350W X 700D	-	M	CABLE TRAY TRENCH
45.	TA45	2000W X 1000D	-	N	CABLE TRAY TRENCH
46.	TA46	1350W X 1000D	-	O	CABLE TRAY TRENCH
47.	TA47	2X2X600W	-	C	CABLE TRAYS PEDESTAL
48.	TA48	2X3X600W	-	D	CABLE TRAYS PEDESTAL
49.	TA49	2X6X600W	-	W	CABLE TRESTLE
50.	TA50	2X3X600W	-	AA	CABLE TRESTLE
51.	TA51	1X3X600W	-	B	CABLE TRAYS PEDESTAL

LEGEND:-

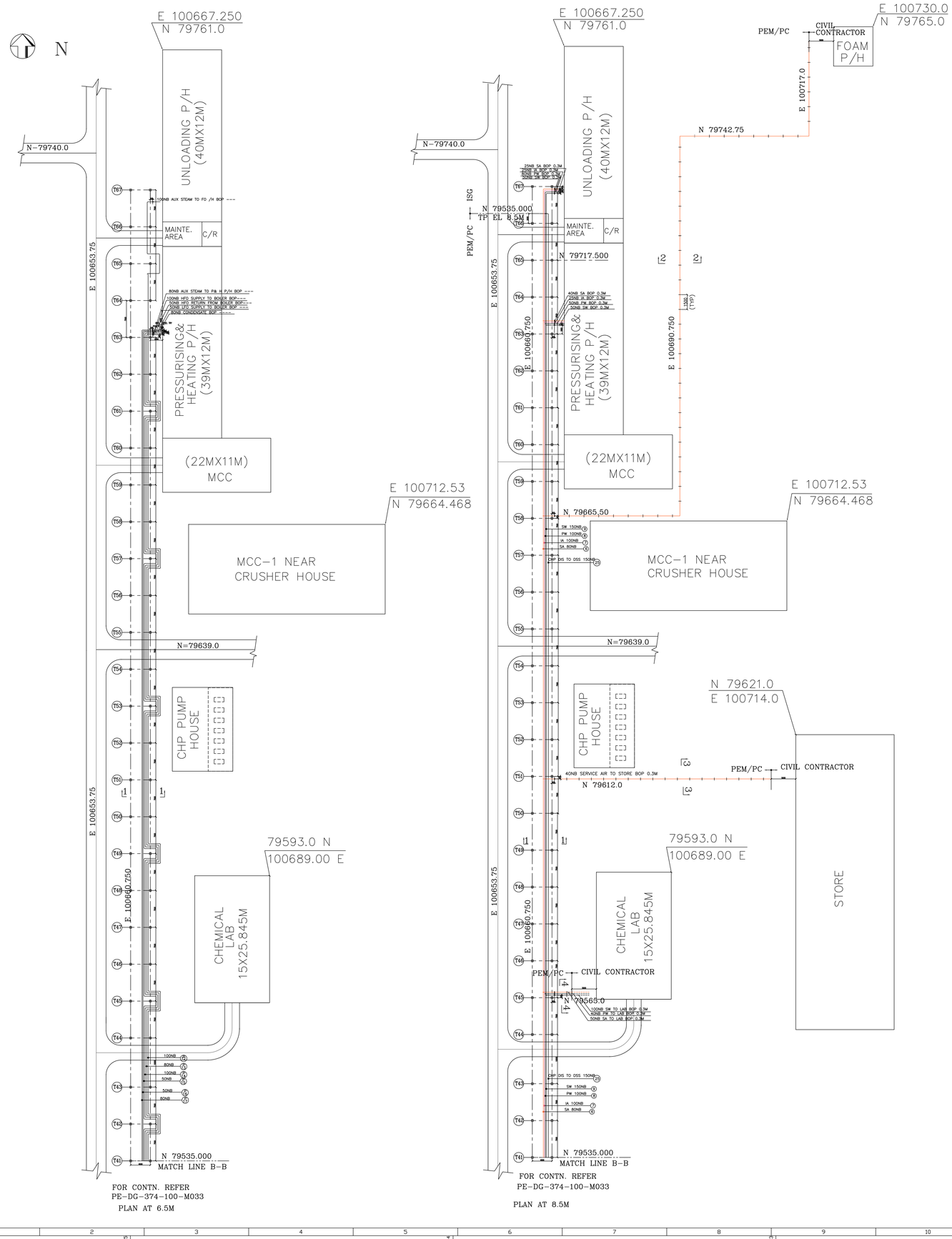
- CABLE TRESTLE
- CABLE PEDESTAL
- CABLE TRAYS BRACKET ARRANGEMENT
- PIPE DUCT BANK FOR CABLES
- ROAD CROSSING
- TA01 — CABLE TRAY SECTION NUMBERS (TYP.)
- CABLE TRAY TRENCH

1	220 KV. SWITCHYARD	33	FIRE WATER PUMP HOUSE & TANK
2	SWITCH YARD CONTROL ROOM	34	FIRE STATION
3	C.W. PIPE CORRIDOR	35	CLARIFIED WATER P/H
4	VACUUM PUMP CUM COMPRESSOR HOUSE	36	FILTER WATER TANK
5	E.S.P CONTROL ROOM	37	CLARIFIED STORAGE TANK
6	CHIMNEY	38	CHLORINATION PLANT
7	WAGON TIPPLER	39	PRE- TREATMENT PLANT
8	PENT HOUSE	40	CHEMICAL LAB
9	CRUSHER HOUSE	41	SEWAGE TREATMENT PLANT
10	CHP MCC-1	42	DIESEL PUMP HOUSE(CUSTOMER SCOPE)
11	COAL STOCK PILE	43	FUEL OIL TRUCK UNLOADING AREA
12	C.W. PUMP HOUSE	44	FUEL OIL PRESSURISING & HEATING PUMP HOUSE
13	COOLING TOWER	45	FOAM PUMP HOUSE
14	CW TREATMENT PLANT	46	ACW PUMP HOUSE
15	EFFLUENT TREATMENT PLANT(E.T.P.)	47	BUFFER HOPPER
16	HYDROGEN GENERATION PLANT	48	AHP CLARIFIER & CHEMICAL HOUSE
17	CANTEEN (20M x 20M x 5M)	49	WATCH TOWER (STANDARD)
18	D.M.PLANT	50	RAIN WATER HARVESTING SUMP (CUSTOMER SCOPE)
19	COMPRESSOR HOUSE	51	HEAVY VEHICLE MAINTENANCE WORKSHOP & GARAGE (CUSTOMER SCOPE)
20	SERVICE BUILDING (30M X 15M)		
21	FUEL OIL DYKE AREA	52	STORE (60M x 20M X 3)
22	UNLOADING PUMP HOUSE	53	OPEN YARD (120M X 84M)
23	ASH SILOS & AHP MCC ROOM	54	BUND (CUSTOMER SCOPE)
24	DG ROOM	55	LOCO SHED (CUSTOMER SCOPE)
25	RAW WATER RESERVOIR	56	GANGA RIVER WATER SCHEME (CUSTOMER SCOPE)
26	RAW WATER PUMP HOUSE	57	ASH DYKE AREA (CUSTOMER SCOPE)
27	ASH SLURRY P/H CUM MCC CONTROL ROOM	58	MARSHALLING YARD (CUSTOMER SCOPE)
28	GREEN VERGE (CUSTOMER SCOPE)	59	TRAINING CENTRE (CUSTOMER SCOPE)
29	ADMINSTRATIVE BUILDING (40Mx20M)	60	HEALTH/FIRST AID CENTRE (CUSTOMER SCOPE)
30	TIME OFFICE & SECURITY (10Mx10M)	61	POTABLE WATER CHLORINATION SYSTEM
31	WORK SHOP	62	TRANSFORMER YARD
32	CAR PARKING SHED & OPEN AREA(50Mx20M+50Mx20M)	63	WEIGH BRIDGE

REFERENCE DRAWINGS:-

SL.NO.	DESCRIPTION	DRG. NO.
1.	PLOT PLAN	PE-DG-374-100-M001
2

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING No. PE-DG-374-100-M034
CUSTOMER'S DRAWING No.
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COMPUTER FILE NAME:



PIPE DETAILS:-

PIPE Nos.	NB	DESCRIPTION	PIPE WT (Kg/M)	SUPPLY SCOPE
1	150	BOILER/DEAERATOR FILLING	50	BHEL PC
2	65	WASH WATER TO ETP UNIT-8	15	MAX/VENDOR
3	80	BOILER BLOW DOWN TO ETP UNIT-8	20	MAX/VENDOR
4	65	WASH WATER TO ETP UNIT-9	15	MAX/VENDOR
5	80	BOILER BLOW DOWN TO ETP UNIT-9	20	MAX/VENDOR
6	80	SERVICE AIR	20	BHEL PC
7	100	INSTRUMENT AIR	25	BHEL PC
8	100	POTABLE WATER	25	BHEL PC
9	150	SERVICE WATER	50	BHEL PC
10	100	HVAC	25	BHEL PC
11	150	CONDENSATE MAKEUP	50	BHEL PC
12	100	AUXILIARY STEAM TO FO PUMP UP TO TP	25	BHEL PC
13	80	AUXILIARY STEAM TO HEATING & PUMPING UNIT UP TO TP	20	BHEL PC
14	100	HFO SUPPLY TO BOILER	25	BHEL PC
15	50	HFO RETURN	12	BHEL PC
16	50	LFO SUPPLY	12	BHEL PC
17	80	CONDENSATE	20	BHEL PC
18	250/200/150	CW BLOWDOWN TO CHLORINATION PLANT/CMB/ ASH WATER SUMP/FIRE WATER TANK	100/70/50	BHEL PC
19	500	CW FOREBAY M/UP	270	BHEL PC
20	300	EMERGENCY M/UP TO FIRE WATER TANK	125	BHEL PC
21	250	TO APH WASHING FROM CLARIFIED WATER P/H	100	BHEL PC
22	200	SEAL WATER TO AHP FROM CLARIFIED WATER P/H	70	BHEL PC
23	150	FROM CHLORINATION PLANT TO CW FOREBAY	50	BHEL PC
24	100	REGENERATION WASTE FROM DM PLANT TO ETP	25	MAX/VENDOR
25	150	CHP PUMP DISCHARGE TO DUST SUPPRESSION SYSTEM FROM CLARIFIED WATER P/H	50	BHEL PC

PIPE WEIGHT INCLUDES FLUID WEIGHT

NOTES:-

1. FOR NOTES & REF DWGS REFER DWG NO. PE-DG-374-100-M032.

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB No. 374	2x250 MW BARAUNI THERMAL POWER STATION UNIT # 8 & 9
STATUS CONTRACT	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

REV	DATE	ALTD	CHD	APPD

DEPT		NAME	SIGN	DATE
CIDG	DRN	RP		25.02.13
	DESN	RP		25.02.13
M	CHD	RP		25.02.13
	APPD	LKJ		25.02.13

TITLE: LAY OUT OF YARD PIPING (FROM CHEMICAL LAB TO UNLOADING P/H)

MPL	C	MSE	I	MAX	E	DEPT.	SCALE 1:625	DRAWING No. PE-DG-374-100-M034
						SIGN		
						DATE		SHEET 01 OF 01 REV 00

SIZE-A0

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING No. PE-DG-374-100-M033
CUSTOMER'S DRAWING No.
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COMPUTER FILE NAME:

N

FOR CONTN. REFER
PE-DG-374-100-M034
MATCH LINE B-B

N 79535.000

100673.0 E
79527.0 N

N 79523.551

N 79482.302

N 79470.5

E 100653.75

E 100652.0

CLARIFIED WATER P/H

C OF ROAD

TO CMB 200NB (T6)

N 79453.5

ISG PIPE RACK

200NB (T6)
CW BLOWDOWN TO ASH WATER SUMP

FOR CONTN. REFER
OVERALL LAYOUT PLAN FOR ASH HANDLING SYSTEM
MB/C-1160/082098

DM WATER STORAGE TANK

79396.0 N
100687.0 E

DM TANK-1

DM TANK-2

BOILER FILL PUMP

DM WATER SUPPLY PUMPS 16000

DM PLANT REGENERATION PUMPS

100NB (T5)
80NB (T6)
100NB (T4)
50NB (T6)
50NB (T6)
80NB (T7)
250NB (T5)

E 100658.750

N 79363.000

MATCH LINE A-A
FOR CONTN. REFER
PE-DG-374-100-M032
PLAN AT 6.5M

VIEW4-4

50NB (P3) 400NB (P8) 50NB (P7) 50NB (P6) 100NB (P4)

FGL

300

VIEW5-5

100NB 200NB 80NB 65NB 80NB 65NB 50NB 50NB 100NB

BOP 0.3 M
BOP RL 45.8 M
FGL RL 45.0 M

FOR CONTN. REFER
PE-DG-374-100-M034
MATCH LINE B-B

N 79535.000

100673.0 E
79527.0 N

E 100660.750

E 100653.75

CLARIFIED WATER P/H

C OF ROAD

HVAC 100NB (T1)
SW 150NB (T2)
PW 100NB (T3)
IA 100NB (T7)
SA 80NB (T6)
200NB (T2)
250NB (T4)

79540.518 N
100722.654 E

PT PLANT AREA
82X75M

FROM 6.5M

100NB SW BOP 0.3M
50NB PW BOP 0.3M
50NB SA BOP 0.3M

65NB WASH WATER TO ET PLANT BOP 0.3M
80NB BOILER B DN TO ET PLANT BOP 0.3M
200NB CW BLOWDOWN TO ET PLANT BOP 0.3M
100NB REGEN WASTE TO ET PLANT BOP 0.3M

FOR DETAIL REFER MAUX VENDOR DRG. NO.
PE-DG-374-XXX

N 79463.4

N 79453.5

79440.316 N
100669.291 E

ASH SLURRY P/H

ASH PIPE PEDESTALS (ISG)

79437.0 N
100833.7 E

CHEM. HOUSE
20Mx10M

WORK SHOP

HUME PIPE

100866.0 E

ET PLANT/CMB
75X40M

79472.5 N

E 100870.9

N 79423.000

200NB SEAL WATER TO AHP (G2)

ISG PIPE RACK

HVAC 100NB (T1)
SW 150NB (T2)
PW 100NB (T3)
IA 100NB (T7)
SA 80NB (T6)
80NB (A)
65NB (A)
80NB (A)
65NB (A)
100NB (T5)
250NB (T4)

FOR CONTN. REFER
MB/C-1160/082098
OVERALL LAYOUT PLAN FOR ASH HANDLING SYSTEM

DM WATER STORAGE TANK

79396.0 N
100687.0 E

79396.3 N
100704.0 E

DM TANK-1

DM TANK-2

DM PLANT
(70Mx30M)

BOILER FILL PUMP

DM WATER SUPPLY PUMPS 16000

DM PLANT REGENERATION PUMPS

150NB BOILER FILL/DEAERATOR FILL (T1)
150NB COND. M/UP TO COND.
FOR CONTI. REFER DRG. NO.
PE-DG-374-163-M001
150NB (T1)
150NB (T1)

PEM/PC — CIVIL CONTRACTOR

N 79370.0

E 100668.35

100NB REG WASTE FROM DM PLANT TO ETP BOP 0.3M
50NB IA TO DM PLANT BOP 0.3M
40NB PW TO DM PLANT BOP 0.3M
50NB SW TO DM PLANT BOP 0.3M

N 79363.000

MATCH LINE A-A
FOR CONTN. REFER
PE-DG-374-100-M032
PLAN AT 8.5M

ISG SCOPE

100NB (T7)
100NB (T6)
150NB (T5)
100NB (T4)
150NB (T3)
150NB (T1)

EL8.5M
LOAD 2.8T /M
(APPROX.)

EL7.5M
LOAD 0.5T /M
(APPROX.)

EL6.5M
LOAD 1.0T /M
(APPROX.)

ISG SCOPE

6000

VIEW 1-1

80NB (6)
80NB (6)
100NB (7)
100NB (8)
150NB (9)
100NB (T1)
150NB (T2)
200NB (T2)

EL8.5M
LOAD 1.8T /M
(APPROX.)

EL7.5M
LOAD 0.5T /M
(APPROX.)

EL6.5M
LOAD 1.0T /M
(APPROX.)

MB 150

6000

VIEW 2-2

80NB (6)
100NB (7)
100NB (8)
150NB (9)
100NB (T1)
150NB (T2)
200NB (T2)

EL8.5M
LOAD 1.0T /M
(APPROX.)

EL7.5M
LOAD 0.5T /M
(APPROX.)

EL6.5M
LOAD 0.8T /M
(APPROX.)

MB 150

6000

VIEW 3-3

PIPE DETAILS:-

PIPE Nos.	NB	DESCRIPTION	PIPE WT (Kg/M)	SUPPLY SCOPE
1	150	BOILER/DEAERATOR FILLING	50	BHEL PC
2	65	WASH WATER TO ETP UNIT-8	15	MAX/VENDOR
3	80	BOILER BLOW DOWN TO ETP UNIT-8	20	MAX/VENDOR
4	65	WASH WATER TO ETP UNIT-9	15	MAX/VENDOR
5	80	BOILER BLOW DOWN TO ETP UNIT-9	20	MAX/VENDOR
6	80	SERVICE AIR	20	BHEL PC
7	100	INSTRUMENT AIR	25	BHEL PC
8	100	POTABLE WATER	25	BHEL PC
9	150	SERVICE WATER	50	BHEL PC
10	100	HVAC	25	BHEL PC
11	150	CONDENSATE MAKEUP	50	BHEL PC
12	100	AUXILIARY STEAM TO FO PUMP UP TO TP	25	BHEL PC
13	80	AUXILIARY STEAM TO HEATING & PUMPING UNIT UP TO TP	20	BHEL PC
14	100	HFO SUPPLY TO BOILER	25	BHEL PC
15	50	HFO RETURN	12	BHEL PC
16	50	LFO SUPPLY	12	BHEL PC
17	80	CONDENSATE	20	BHEL PC
18	250/200/150	CW BLOWDOWN TO CHLORINATION PLANT/CMB/ ASH WATER SUMP/FIRE WATER TANK	100/70/50	BHEL PC
19	500	CW FOREBAY M/UP	270	BHEL PC
20	300	EMERGENCY M/UP TO FIRE WATER TANK	125	BHEL PC
21	250	TO APH WASHING FROM CLARIFIED WATER P/H	100	BHEL PC
22	200	SEAL WATER TO AHP FROM CLARIFIED WATER P/H	70	BHEL PC
23	150	FROM CHLORINATION PLANT TO CW FOREBAY	50	BHEL PC
24	100	REGENERATION WASTE FROM DM PLANT TO ETP	25	MAX/VENDOR
25	150	CHIP PUMP DISCHARGE TO DUST SUPPRESSION SYSTEM FROM CLARIFIED WATER P/H	50	BHEL PC

PIPE WEIGHT INCLUDES FLUID WEIGHT

NOTES:-

1. FOR NOTES & REF DWGS REFER DWG NO. PE-DG-374-100-M032.

REV	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	APPD

CUSTOMER: BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB No. 374
STATUS CONTRACT
DISTRIBUTION
TD
No.OFT

2x250 MW BARAUNI THERMAL POWER STATION
UNIT # 8 & 9

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
M	DRN	RP		25.02.13
	DSN	RP		25.02.13
	CHD	RP		25.02.13
	APPD	LKJ		25.02.13

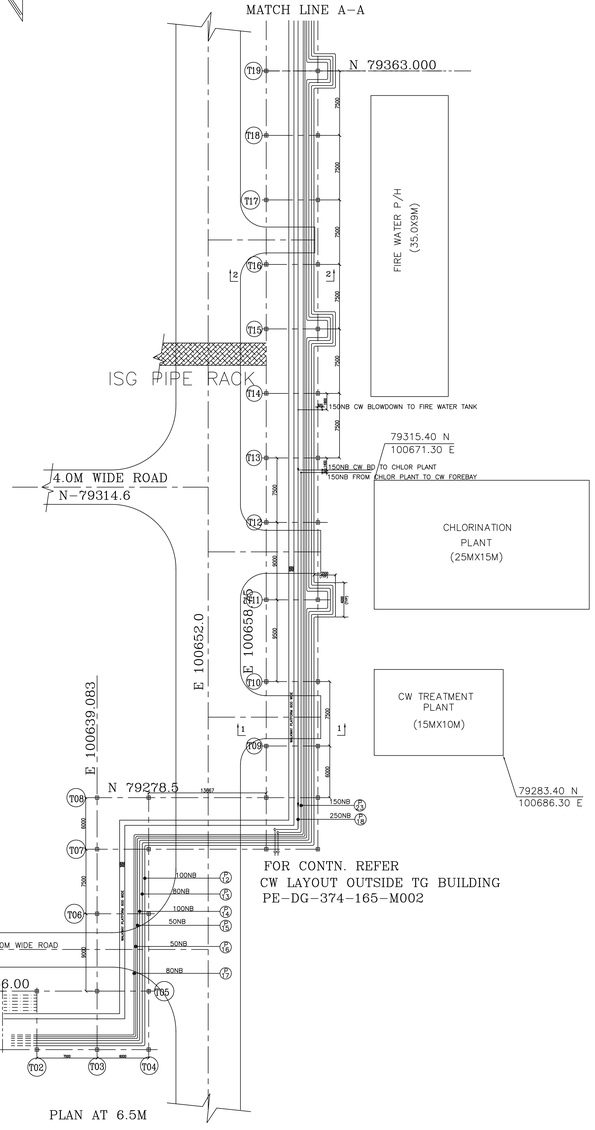
TITLE: LAY OUT OF YARD PIPING (DM TANK TO CLARIFIED WATER P/H)

MPL	C	MSE	I	MAX	E	DEPT.	SCALE 1:500	DRAWING No. PE-DG-374-100-M033
						SIGN		
						DATE		SHEET 01 OF 01 REV 00

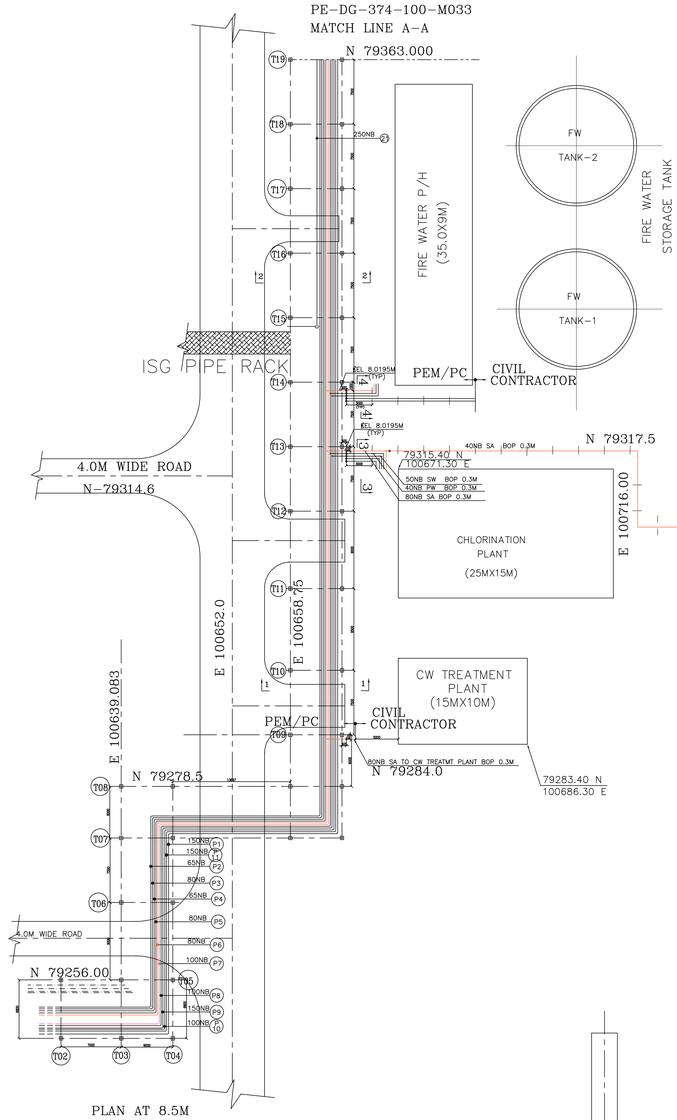
SIZE-A0

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING No. PE-DG-374-100-M032
CUSTOMER'S DRAWING No.
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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 interests of the Company.
COMPUTER FILE NAME:

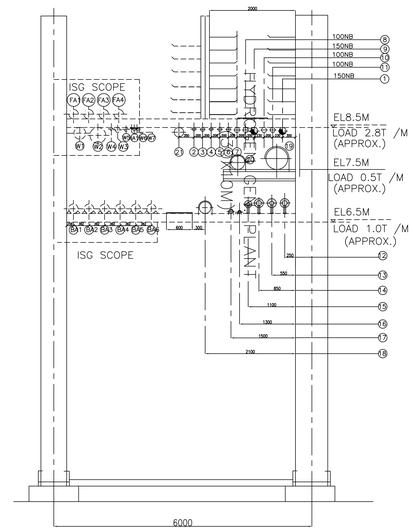




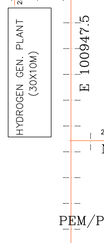
PLAN AT 6.5M



PLAN AT 8.5M



VIEW 2-2



PIPE DETAILS:-

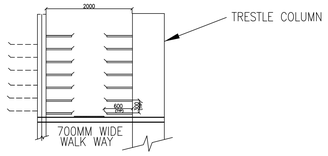
PIPE Nos.	NB	DESCRIPTION	PIPE WT (Kg/M)	SUPPLY SCOPE
1	150	BOILER/DEAERATOR FILLING	50	BHEL PC
2	65	WASH WATER TO ETP UNIT-8	15	MAX/VENDOR
3	80	BOILER BLOW DOWN TO ETP UNIT-8	20	MAX/VENDOR
4	65	WASH WATER TO ETP UNIT-9	15	MAX/VENDOR
5	80	BOILER BLOW DOWN TO ETP UNIT-9	20	MAX/VENDOR
6	80	SERVICE AIR	20	BHEL PC
7	100	INSTRUMENT AIR	25	BHEL PC
8	100	POTABLE WATER	25	BHEL PC
9	150	SERVICE WATER	50	BHEL PC
10	100	HVAC	25	BHEL PC
11	150	CONDENSATE MAKEUP	50	BHEL PC
12	100	AUXILIARY STEAM TO FO PUMP UP TO TP	25	BHEL PC
13	80	AUXILIARY STEAM TO HEATING & PUMPING UNIT UP TO TP	20	BHEL PC
14	100	HFO SUPPLY TO BOILER	25	BHEL PC
15	50	HFO RETURN	12	BHEL PC
16	50	LFO SUPPLY	12	BHEL PC
17	80	CONDENSATE	20	BHEL PC
18	450/200/150	CW BLOWDOWN TO CHLORINATION PLANT/CMB/ ASH WATER SUMP/FIRE WATER TANK	100/70/50	BHEL PC
19	500	CW FOREBAY M/UP	270	BHEL PC
20	300	EMERGENCY M/UP TO FIRE WATER TANK	125	BHEL PC
21	250	TO APH WASHING FROM CLARIFIED WATER P/H	100	BHEL PC
22	200	SEAL WATER TO AHP FROM CLARIFIED WATER P/H	70	BHEL PC
23	150	FROM CHLORINATION PLANT TO CW FOREBAY	50	BHEL PC
24	100	REGENERATION WASTE FROM DM PLANT TO ETP	25	MAX/VENDOR
25	150	CHP PUMP DISCHARGE TO DUST SUPPRESSION SYSTEM FROM CLARIFIED WATER P/H	50	BHEL PC

PIPE WEIGHT INCLUDES FLUID WEIGHT

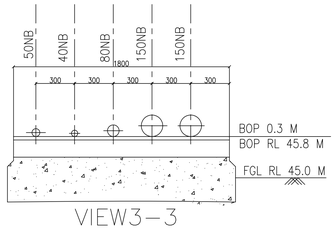
ISG ASH PIPE DETAILS:-

PIPE Nos.	NB	DESCRIPTION	PIPE WT (Kg/M)	SUPPLY SCOPE
BA1/BA2/ BA4/BA5	200	BOTTOM ASH SLURRY	52	ISG
BA3/BA6	200	OVERFLOW FROM BA OVERFLOW TANK	35	ISG
W1	250	LP WATER PIPE	43	ISG
W2	350	HP WATER PIPE	56	ISG
W3	100	ECO WATER SUPPLY	20	ISG
W4	50	SEAL WATER SUPPLY	7	ISG
W5	65	DRAIN PIPE FROM SILO AREA DRAIN SUMP	10	ISG
W6/W7	65	FA DRAIN	10	ISG
FA1/FA2/ FA3/FA4	200	FLY ASH SLURRY	52	ISG
IA1	25	INSTRUMENT AIR	10	ISG

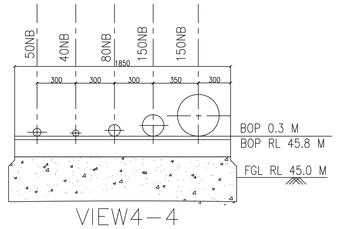
PIPE WEIGHT INCLUDES FLUID WEIGHT



TYPICAL ARRANGEMENT OF CABLE TRAY



VIEW3-3



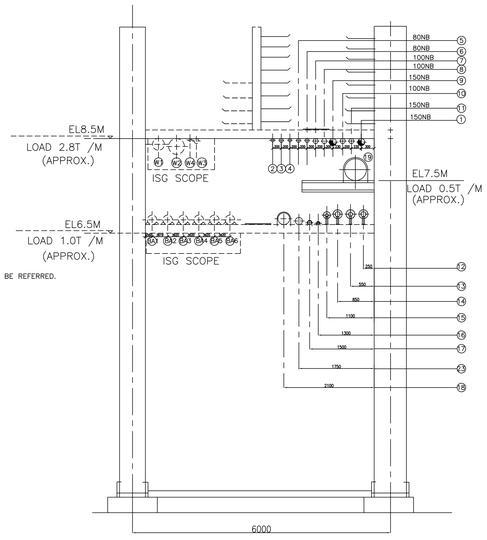
VIEW4-4

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS ARE IN METRES.
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M.
3. THE Nos. & SIZES OF TRAYS MARKED ARE TENTATIVE . FOR DETAILS CABLE TRAY LAYOUT DWGS TO BE REFERRED.
4. SERVICE AND POTABLE WATER PIPES TO BLDGS./ FACILITIES SHALL BE TERMINATED AT 5.0M FROM THE BLDGS. FURTHER CONNECTION IS IN VENDOR/ CIVIL CONTRACTOR'S SCOPE.
5. CROSS-BEAMS AT REGULAR INTERVAL OF 2.5M/ 3M SHALL BE PROVIDED ON TRESTLE FOR SUPPORT OF PIPES.
6. PIPE ROUTING SHOWN IN THIS DRG. CAN BE MODIFIED TO SUIT SITE CONDITIONS. FOR OTHER DETAILS OF PIPING viz. INSTRUMENT TAG Nos., MATERIAL, WORKING/DESIGN PARAMETERS, OD & THICKNESS etc. RESPECTIVE P&ID TO BE REFERRED.
7. FOR DETAILS OF FIRE FIGHTING PIPES AND CABLING REFER RESPECTIVE DRAWINGS.
8. CAGE LADDER SHALL BE PROVIDED AT SUITABLE LOCATIONS FOR PIPE/CABLE APPROACH.
9. BASEPLATE LEVEL OF THE TRESTLE COLUMNS SHALL BE BELOW THE PAVING LEVEL OF (-)0.200M IN MAIN PLANT AREA & 0.300M ABOVE GROUND LEVEL IN OTHER AREA
10. INSTRUMENT STUBS & TERMINAL POINT VALVES SHALL BE PROVIDED AS PER RESPECTIVE P & ID AT SUITABLE LOCATION BY ERECTION AGENCY
11. ALL COUNTER FLANGE FOR VALVES UNO ARE SUPPLIED BY PIPING CENTRE.
12. DETAILS/REQUIREMENT OF VARIOUS BUILDINGS/FACILITIES SHALL BE AS PER RESPECTIVE PACKAGES.
13. NECESSARY CLEARANCE FOR PIPES AND CABLES TO BE TAKEN CARE OF WHILE DESIGNING STRUCTURE/ COLUMN
14. WIDTH OF COLUMN SHALL NOT BE MORE THAN 300MM.
15. AT ROAD CROSSING PIPE WITH CULVERT / HUME PIPE TO BE PROVIDED.
16. SUITABLE ARRANGEMENT SHALL BE PROVIDED BY BHEL / PC AT ALL LOCATIONS WHERE THERE IS CONTACT OF SS PIPE WITH CS SUPPORT / U BOLT.

REFERENCE DRAWINGS:-

1.	PLOT PLAN	: PE-DG-374-100-M001	PEM
2.	CW & ACW SYSTEM P&ID	: PE-DG-374-165-N001	PEM
3.	PLANT WATER P&ID	: PE-DG-374-172-N001	PEM
4.	INSTRUMENT AIR P&ID	: PE-DG-374-555-A051	PEM
5.	SERVICE AIR P&ID	: PE-DG-374-555-A052	PEM
6.	YARD PIPING LAYOUT	: PE-DG-374-100-M031	PEM
7.	YARD PIPING LAYOUT	: PE-DG-374-100-M033	PEM
8.	OVERALL LAYOUT PLAN FOR ASH HANDLING SYSTEM	: MB/C-1160/082098	ISG



VIEW 1-1

REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB No. 374	2x250 MW BARAUNI THERMAL POWER STATION UNIT # 8 & 9
STATUS CONTRACT	
DISTRIBUTION	

TD
No.OF?

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

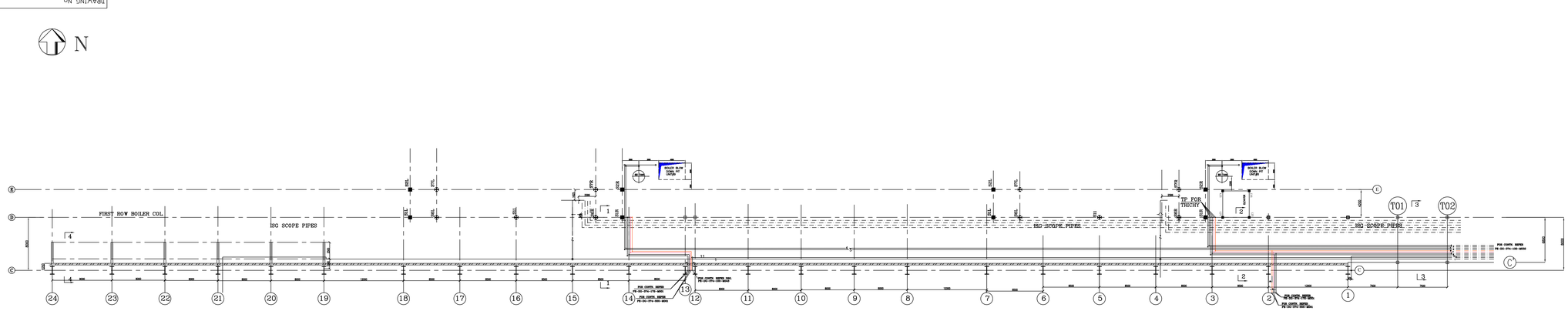
DEPT	NAME	SIGN	DATE
CODE	DRN RP		25.02.13
M	DESN RP		25.02.13
	CHD RP		25.02.13
	APPD LKJ		25.02.13

TITLE: LAY OUT OF YARD PIPING (UPTO FIRE WATER P/H)

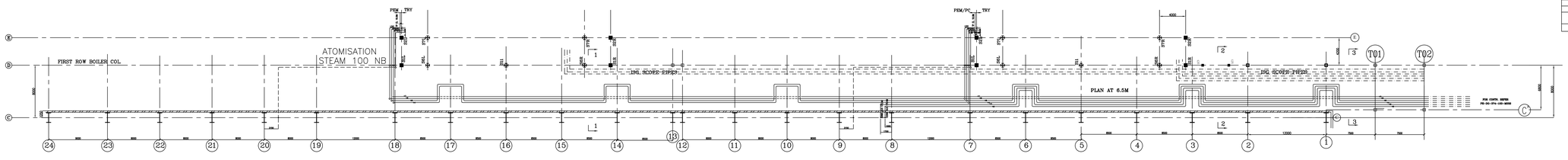
MPL	C	MSE	I	MAX	E	DEPT.	SCALE 1:500	DRAWING No. PE-DG-374-100-M032
						SIGN		
						DATE		SHEET 01 OF 01 REV 00

SIZE-A0

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING No. PE-DG-374-100-M031
CUSTOMER'S DRAWING No.



PLAN EL 8.5M



PLAN AT 6.5M

PIPE DETAILS:–

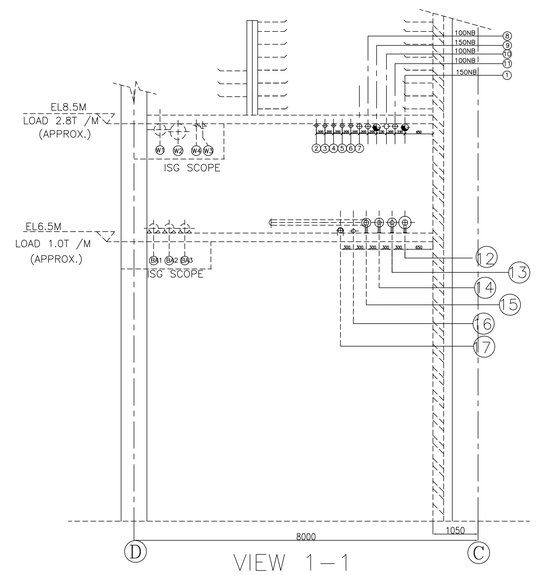
PIPE Nos.	NB	DESCRIPTION	PIPE WT (KG/M)	SUPPLY SCOPE
1	150	BOILER/DEAERATOR FILLING	50	BHEL PC
2	65	WASH WATER TO ETP UNIT–8	15	MAX/VENDOR
3	80	BOILER BLOW DOWN TO ETP UNIT–8	20	MAX/VENDOR
4	65	WASH WATER TO ETP UNIT–9	15	MAX/VENDOR
5	80	BOILER BLOW DOWN TO ETP UNIT–9	20	MAX/VENDOR
6	80	SERVICE AIR	20	BHEL PC
7	100	INSTRUMENT AIR	25	BHEL PC
8	80	POTABLE WATER	25	BHEL PC
9	150	SERVICE WATER	50	BHEL PC
10	100	HVAC	25	BHEL PC
11	150	CONDENSATE MAKEUP	50	BHEL PC
12	100	AUXILIARY STEAM TO FO PUMP UP TO TP	25	BHEL PC
13	80	AUXILIARY STEAM TO HEATING & PUMPING UNIT UP TO TP	20	BHEL PC
14	100	HFO SUPPLY TO BOILER	25	BHEL PC
15	50	HFO RETURN	12	BHEL PC
16	50	LFO SUPPLY	12	BHEL PC
17	80	CONDENSATE	20	BHEL PC
18	250/200/150	CW BLOWDOWN TO CHLORINATION PLANT/CMB/ ASH WATER SUMP/FIRE WATER TANK	100/70/50	BHEL PC
19	500	CW FOREBAY M/UP	270	BHEL PC
20	300	EMERGENCY M/UP TO FIRE WATER TANK	125	BHEL PC
21	250	TO APH WASHING FROM CLARIFIED WATER P/H	100	BHEL PC
22	200	SEAL WATER TO AHP FROM CLARIFIED WATER P/H	70	BHEL PC
23	150	FROM CHLORINATION PLANT TO CW FOREBAY	50	BHEL PC
24	100	REGENERATION WASTE FROM DM PLANT TO ETP	25	MAX/VENDOR
25	150	CWP PUMP DISCHARGE TO SCST SUPPRESSION SYSTEM FROM CLARIFIED WATER P/H	50	BHEL PC

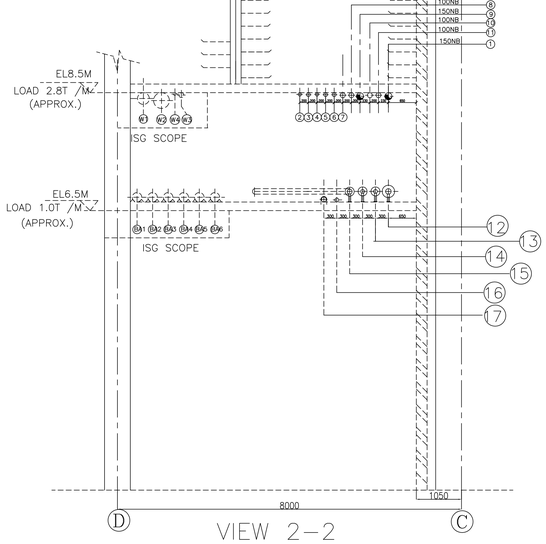
PIPE WEIGHT INCLUDES FLUID WEIGHT

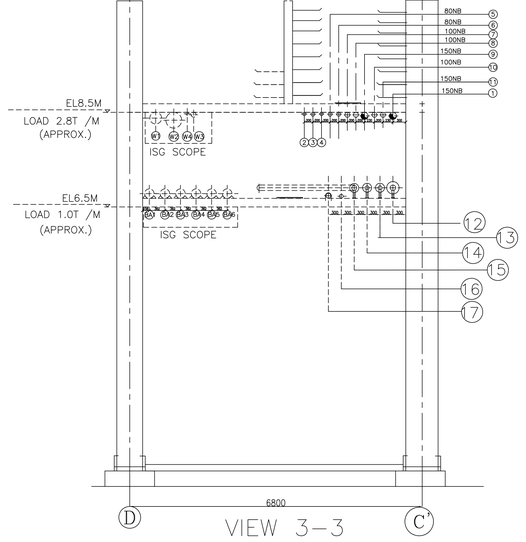
ISG ASH PIPE DETAILS:–

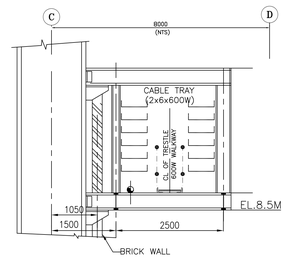
PIPE Nos.	NB	DESCRIPTION	PIPE WT (KG/M)	SUPPLY SCOPE
BA1/BA2/ BA4/BA5	200	BOTTOM ASH SLURRY	52	ISG
BA3/BA6	200	OVERFLOW FROM BA OVERFLOW TANK	35	ISG
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W3	100	ECO WATER SUPPLY	20	ISG
W4	50	SEAL WATER SUPPLY	7	ISG
W5	65	DRAIN PIPE FROM SLO AREA DRAIN SUMP	10	ISG
W6/W7	65	FA DRAIN	10	ISG
FA1/FA2/ FA3/FA4	200	FLY ASH SLURRY	52	ISG
IA1	25	INSTRUMENT AIR	10	ISG

PIPE WEIGHT INCLUDES FLUID WEIGHT









REFERENCE DRAWINGS:–

1.	PLOT PLAN	: PE–DG–374–100–M001	PEM
2.	CW & ACW SYSTEM P&ID	: PE–DG–374–165–N001	PEM
3.	PLANT WATER P&ID	: PE–DG–374–172–N001	PEM
4.	INSTRUMENT AIR P&ID	: PE–DG–374–555–A051	PEM
5.	SERVICE AIR P&ID	: PE–DG–374–555–A052	PEM
6.	YARD PIPING LAYOUT	: PE–DG–374–100–M031	PEM
7.	YARD PIPING LAYOUT	: PE–DG–374–100–M033	PEM
8.	OVERALL LAYOUT PLAN FOR ASH HANDLING SYSTEM	: MB/C–1160/082098	ISG

NOTES:–

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS ARE IN METRES.
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M.
3. THE Nos. & SIZES OF TRAYS MARKED ARE TENTATIVE , FOR DETAILS CABLE TRAY LAYOUT DWGS TO BE REFERRED.
4. SERVICE AND POTABLE WATER PIPES TO BLDGS./ FACILITIES SHALL BE TERMINATED AT 5.0M FROM THE BLDGS. FURTHER CONNECTION IS IN VENDOR/ CIVIL CONTRACTOR'S SCOPE.
5. CROSS–BEAMS AT REGULAR INTERVAL OF 2.5M/ 3M SHALL BE PROVIDED ON TRESTLE FOR SUPPORT OF PIPES.
6. PIPE ROUTING SHOWN IN THIS DRG. CAN BE MODIFIED TO SUIT SITE CONDITIONS. FOR OTHER DETAILS OF PIPING viz. INSTRUMENT TAG Nos., MATERIAL, WORKING/DESIGN PARAMETERS, OD & THICKNESS etc. RESPECTIVE P&ID TO BE REFERRED.
7. FOR DETAILS OF FIRE FIGHTING PIPES AND CABLING REFER RESPECTIVE DRAWINGS.
8. CAGE LADDER SHALL BE PROVIDED AT SUITABLE LOCATIONS FOR PIPE/CABLE APPROACH.
9. BASEPLATE LEVEL OF THE TRESTLE COLUMNS SHALL BE BELOW THE PAVING LEVEL OF (–)0.200M IN MAIN PLANT AREA & 0.300M ABOVE GROUND LEVEL IN OTHER AREA
10. INSTRUMENT STUBS & TERMINAL POINT VALVES SHALL BE PROVIDED AS PER RESPECTIVE P & ID AT SUITABLE LOCATION BY ERECTION AGENCY
11. ALL COUNTER FLANGE FOR VALVES UNO ARE SUPPLIED BY PIPING CENTRE.
12. DETAILS/REQUIREMENT OF VARIOUS BUILDINGS/FACILITIES SHALL BE AS PER RESPECTIVE PACKAGES.
13. NECESSARY CLEARANCE FOR PIPES AND CABLES TO BE TAKEN CARE OF WHILE DESIGNING STRUCTURE/ COLUMN
14. WIDTH OF COLUMN SHALL NOT BE MORE THAN 300MM.
15. AT ROAD CROSSING PIPE WITH CULVERT / HUME PIPE TO BE PROVIDED.
16. SUITABLE ARRANGEMENT SHALL BE PROVIDED BY BHEL / PC AT ALL LOCATIONS WHERE THERE IS CONTACT OF SS PIPE WITH CS SUPPORT / U BOLT.
17. DETAILS OF ISG PIPES & CABLES TO BE REFERRED FROM ISG DWG No.: MB/C–1160/082098

REV	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	APPD

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES(INDIA) PVT. LTD.
JOB No. 374	2x250 MW BARAUNI THERMAL POWER STATION UNIT # 8 & 9
STATUS CONTRACT	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
M	DRN	RP		28.02.13
	DESN	RP		28.02.13
	CHD	RP		28.02.13
	APPD	LKJ		28.02.13

TITLE: LAY OUT OF YARD PIPING (ALONG C–D BAY)

MPL	C	MSE	I	MAX	E	DEPT.	SCALE 1:500	DRAWING No. PE–DG–374–100–M031
						SIGN		
						DATE		SHEET 01 OF 01 REV 00

SIZE–A0

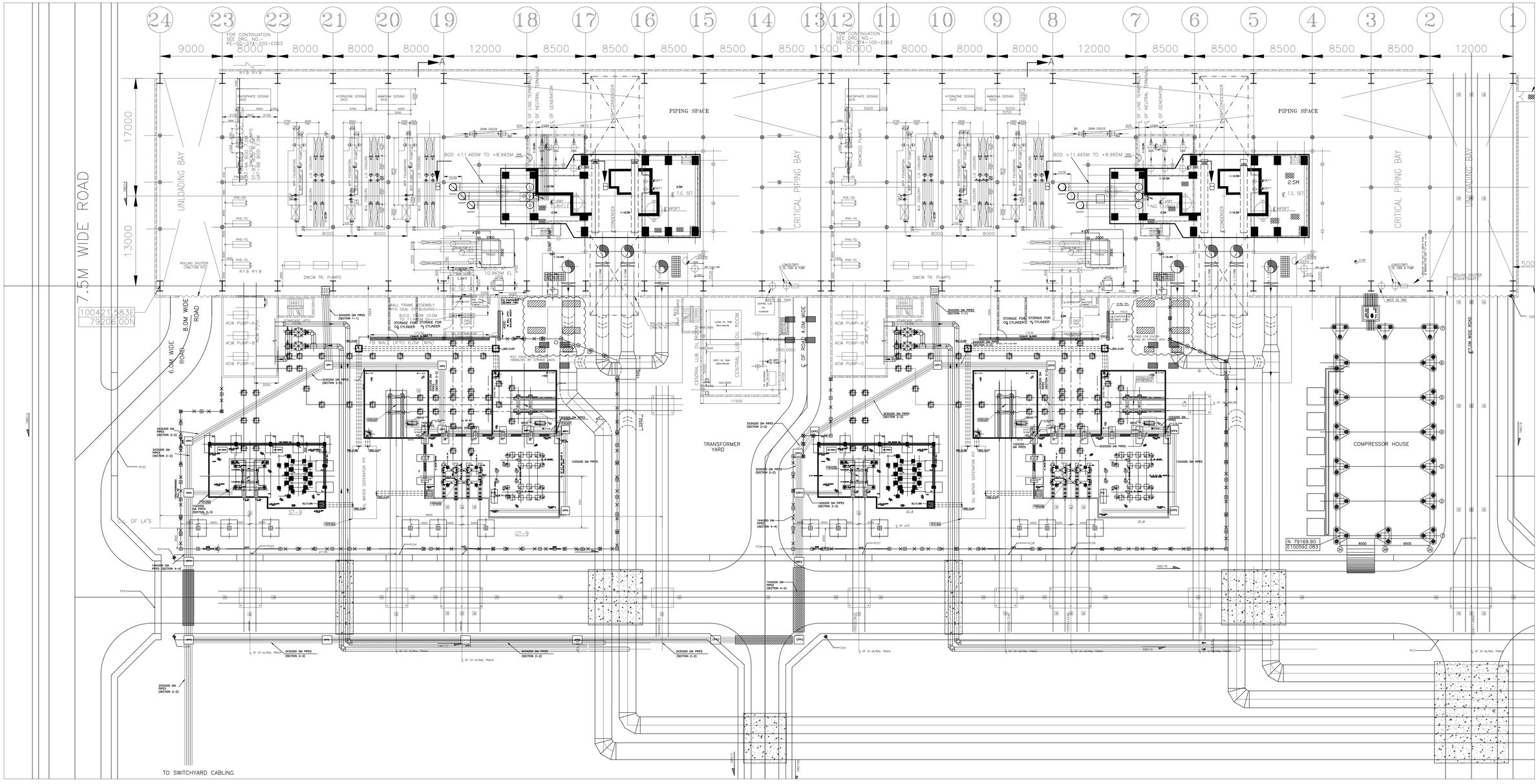
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COMPUTER FILE NAME:

DRAWING NO. PE-DG-374-622-C003

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

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CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	
PRINT SCALE IN METRE SCALE 0 5 10 15 20	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JNC		25.04.13
	DESN	ANSHU		25.04.13
	CHD	DKM		25.04.13
	APPD	AKS		25.04.13

TITLE: TRANSFORMER YARD LAYOUT (PROGRESSIVE PRINT)

REV.	DATE	ALTD	CHD	APPD

DEPT. | SCALE | PE-DG-374-622-C003

SIGN | DATE | SH 1 OF 1 | REV. 0

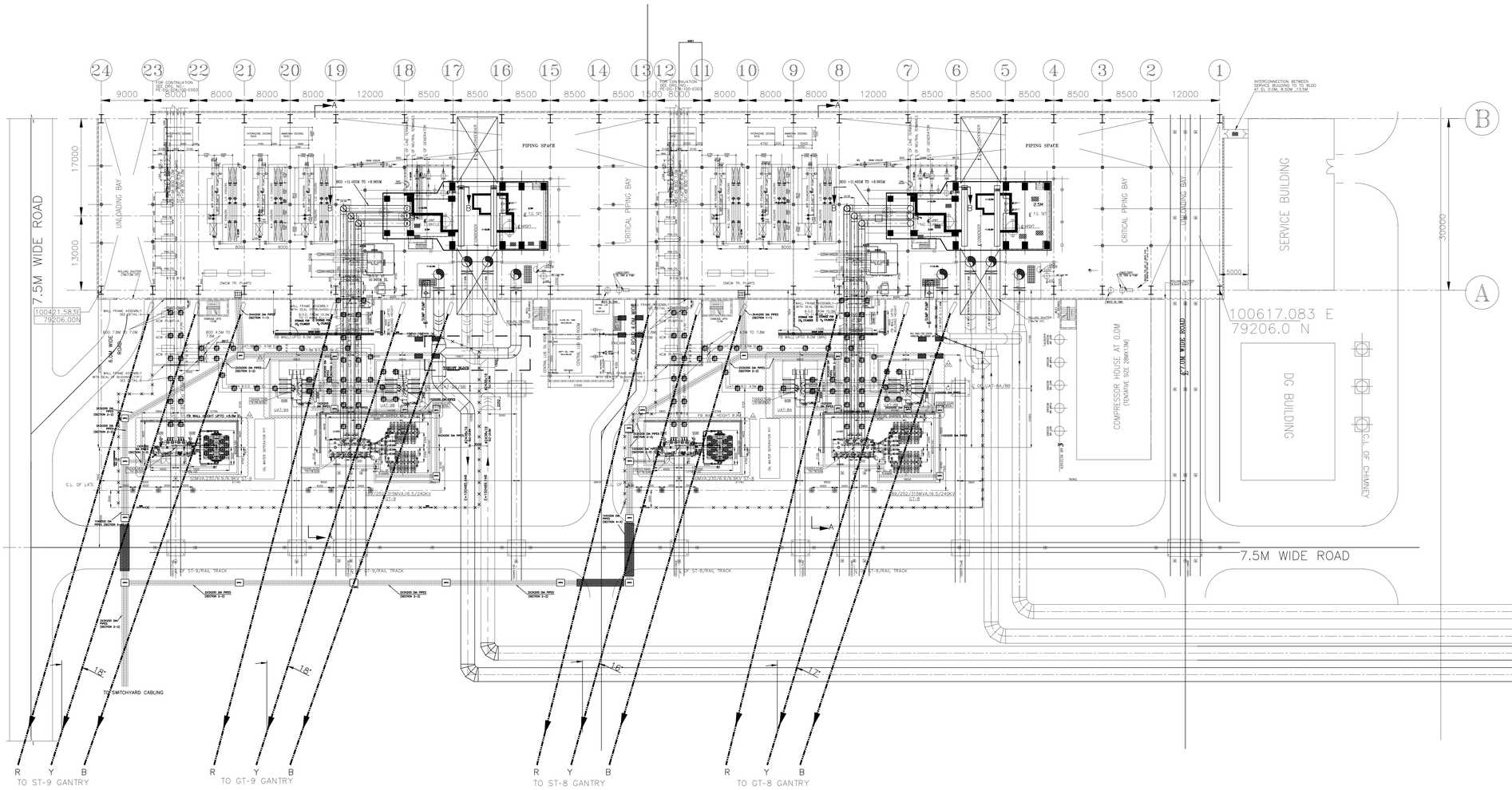
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it must not be used directly or indirectly in any way detrimental to the interest of the company.

DRAWING No. PE-DG-374-100-E001

CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM



LEGEND:-

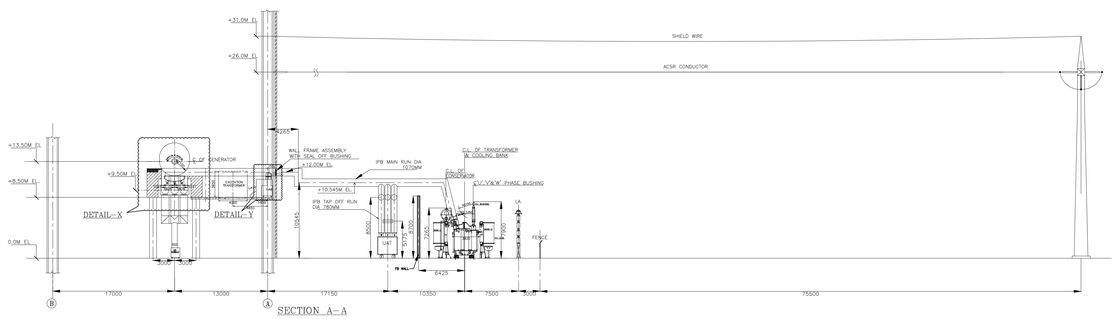
- LA — LIGHTNING ARRESTOR
- FENCING
- REMOVABLE FENCING
- FIRE BARRIER WALL
- CABLE TRENCH
- DUCT BANK
- MOORING POST
- JACKING POINT
- SEAL OFF BUSHING
- GATE FOR MANUAL ENTRY

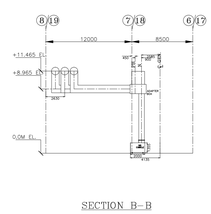
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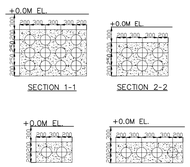
SL. NO.	TITLE	DWG. NO.	SOURCE
1.	PLOT PLAN	PE-DG-374-100-M001	BHEL-PEM-MPL
2.	MAIN PLANT EQUIPMENT LAYOUT AT 0.0M	PE-DG-374-100-M002	BHEL-PEM-MPL
3.	T.G. HALL EQUIPMENT PLAN AT 0.0M	PE-DG-374-100-M003	BHEL-PEM-MPL
4.	ELECTRICAL SINGLE LINE DIAGRAM	PE-DG-374-565-E001	BHEL-PEM-ELECT
5.	GENERATOR OUTLINE	0-139-12-31403	BHEL-HARDWAR
6.	OGA OF GENERATOR TRANSFORMER	34590000632	BHEL-BHOPAL
7.	OGA OF STATION TRANSFORMER	0 458 0050 130	BHEL-JHANSI
8.	OGA OF UNIT AUXILARY TRANSFORMER	1 456 00 50 818	BHEL-JHANSI
9.	FOUNDATION PLAN (GENERATOR TRANSFORMER)	34590000634	BHEL-BHOPAL
10.	FOUNDATION PLAN (STATION TRANSFORMER)	2 458 00 50 459	BHEL-JHANSI
11.	FOUNDATION PLAN (UAT)	2 456 00 50 876	BHEL-JHANSI
12.	LAYOUT PLAN OF 220KV SWITCHYARD	TB-0-345-510-002	BHEL-TBG
13.	ELECT. EQUPT. LAYOUT IN SWGR. ROOM	PE-DG-374-100-E003	BHEL-PEM-ELECT
14.	CW PIPING DRAWING	PE-DG-374-165-M002	BHEL-PEM-MPL

NOTES:-

1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS ARE IN METERS.
2. ALL ELEVATIONS ARE MARKED W.R.T. TG HALL FINISHED GROUND FLOOR EL(+)0.0M WHICH CORRESPONDS TO RL(+)45.5M.
3. TOP OF RAIL TRACK SHALL BE AT 0.0M (i.e. RL +45.5 M.) WHILE PAVED LEVEL IN TRANSFORMER YARD IS (-) 0.100M (i.e. +45.4 M.)
4. THIS DRAWING IS TO BE REFERRED FOR LAYOUT OF TRANSFORMERS AND ASSOCIATED EQUIPMENTS. LAYOUT OF MECHANICAL PLANTS/ FACILITIES/ PIPING IN TRANSFORMER YARD SHOWN IS INDICATIVE AND FOR INTERFACE PURPOSE ONLY. FOR DETAILED LAYOUT ARRANGEMENT OF SUCH MECHANICAL PLANTS/ FACILITIES/ PIPING LOCATED IN TRANSFORMER YARD, RELEVANT LAYOUT DRAWINGS SHALL BE REFERRED.
5. FIRE BARRIER WALLS SHALL BE 350 MM THICK BRICKWORK OR 200 MM THICK CONCRETE, AND SHALL PROJECT MINIMUM 600 MM ABOVE THE HIGHEST OIL CONTAINING PART OF THE TRANSFORMER.
6. APPROXIMATE TOTAL QUANTITY OF OIL AND TOTAL WEIGHT OF EACH TRANSFORMER IS AS UNDER:
   TOTAL QUANTITY OF OIL FOR EACH GENERATOR TRANSFORMER–71500 L
   TOTAL QUANTITY OF OIL FOR EACH STATION TRANSFORMER–39100 L
   TOTAL QUANTITY OF OIL FOR EACH UNIT AUXILIARY TRANSFORMER–15000 L
   TOTAL WEIGHT INCLUDING OIL OF EACH GENERATOR TRANSFORMER–284200 KG
   TOTAL WEIGHT INCLUDING OIL OF EACH STATION TRANSFORMER–100000 KG
   TOTAL WEIGHT INCLUDING OIL OF EACH UNIT AUXILIARY TRANSFORMER–42500 KG
7. SPB & IPB LAYOUT SHOWN IN THIS DRAWING IS FOR THE PURPOSE OF ESTABLISHING GENERAL ROUTING AND LAYOUT. FOR DETAILED LAYOUT, AND DETAILS OF CUTOUTS IN CLADDING/ WALL FOR BUS DUCT ENTRY, FOUNDATION SUPPORTS ETC., MANUFACTURER'S DRAWINGS SHALL BE APPLICABLE.
8. FOLLOWING CIVIL DETAILS SHALL BE DECIDED SEPARATELY BY CIVIL.
   a) SOAK PIT INVERT LEVEL OF TRANSFORMERS, FOUNDATIONS FOR TRANSFORMERS/ RAIL TRACKS/ RADIATORS/ COOLERS SHALL BE AS PER TRANSFORMER FOUNDATION PLANS AND OTHER PIPE SUPPORT ARRANGEMENT. INVERT LEVEL OF SOAK PIT SHALL BE FIXED IN LINE WITH TRANSFORMER OIL QUANTITY AND QUANTITY OF WATER SPRAY (TO BE INDICATED SEPARATELY BY FIRE FIGHTING SYSTEM ENGINEER).
   b) DRAINAGE SYSTEM FROM SOAK PITS OF INDIVIDUAL TRANSFORMERS TO COMMON OIL WATER SEPERATOR PIT/ BURNT–OIL PIT (INCLUDING EXACT LOCATION AND DIMENSIONS OF THE PIT). ROOF SHALL BE PROVIDED FOR THE BURNT–OIL PIT. ACCESS MANHOLES, ACCESS LADDER INTO THE PIT & PROVISION FOR SUMP PUMPS SHALL BE SUITABLY ENSURED FOR BOTH TYPES OF PITS.
   c) MOORING POSTS AND JACKING POINTS (SUITED TO RESPECTIVE TRANSFORMER JACKING REQUIREMENTS AT DIFFERENT RAIL TRACK CROSSINGS).
   d) FENCING DETAILS.
   e) CABLE PITS/ CABLE PULL PITS/ CABLE TRENCHES.
9. FIRE FIGHTING SPRAY WATER QUANTITIES FOR TRANSFORMERS SHALL BE FIXED ACCORDING TO STATUTORY REQUIREMENTS BASED ON OGAs OF RESPECTIVE TRANSFORMER.
10. DETAILS OF FIRE FIGHTING PIPING LAYOUT IN TRANSFORMER YARD SHALL BE INDICATED SEPARATELY IN FIRE FIGHTING SYSTEM DRAWINGS, FOR WHICH THIS DRAWING SHALL BE THE REFERENCE.
11. FOR NEUTRAL GROUNDING EQUIPMENT ONLY SPACE PROVISION IS INDICATED PRESENTLY. FINAL DETAILS OF FOUNDATION/ SUPPORT ARRANGEMENT SHALL BE AS PER APPROVED OGA.
12. TOP OF FOUNDATION FOR LA's SHALL BE AT 0.0M EL AND THE SUPPORTING STRUCTURE SHALL BE REMOVABLE TYPE TO FACILITATE WITHDRAWAL OF TRANSFORMER WHENEVER REQUIRED.

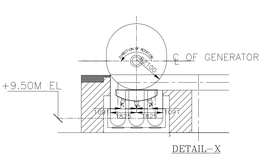


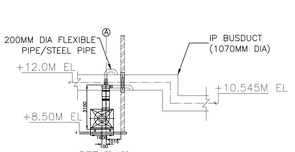


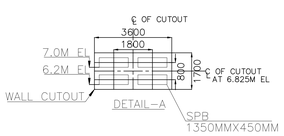


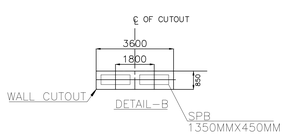
CABLE PULL PIT DETAILS

TYPE	SIZE
CPP1	1500LX1600WX1200D
CPP2	1500LX1300WX950D
CPP3	1500LX1600WX700D
CPP4	1500LX1000WX950D
CPP5	1500LX1000WX700D









REV	DATE	ALTD	CHD	APPD
02	19.12.12	SK/HSL	AA/SKG	KRB
01	DRAWING REVISED INLINE WITH THE FINAL O.O.A OF ST AND UAT.			

REV	DATE	ALTD	CHD	APPD
01	16.04.12	SK/HSL	AA/SKG	KKK
01	DRAWING REVISED INLINE WITH CUSTOMER COMMENT DATED 06.03.12			

CUSTOMER
CUSTOMER'S CONSULTANT
JOB No. 374
STATUS CONTRACT
DISTRIBUTION
TG
NuDFT

BIHAR STATE ELECTRICITY BOARD

STEAG ENERGY SERVICES (INDIA) PVT. LTD.

2 X 250 MW BARAUNI THERMAL POWER PROJECT (EXTENSION UNITS 8 & 9)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
E	DRN	HSL	--SD--	16.02.12
	DCSN	HSL/AA	--SD--	16.02.12
	CHD	SKG	--SD--	16.02.12
	APPD	KKK	--SD--	16.02.12

TITLE
TRANSFORMER YARD & BUS DUCT LAYOUT

DEPT. SCALE 1:274 DRAWING No. PE-DG-374-100-E001
SIGN
DATE
SHEET 1 OF 1 REV 02

SIZE-A0

COMPUTER FILE NAME:

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm.

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED

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REF. DRG. NO. COMPUTER NO.

SIGN. & DATE

INVENTORY NO.

TYPICAL UPS SCHEME FOR PLC'S

CUSTOMER: BIHAR STATE ELECTRICITY BOARD

PROJECT: 2 X 250 MW BARAUNI THERMAL POWER STATION
UNIT #8 & #9

CONSULTANT :

STEAG ENERGY SERVICES (INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE
DRN.	RAVITEJA J		06.05.13
CHD.	AMIT KUMAR		07.05.13
APPD.	KUMAR GUNJAN		07.05.13

NO.OF VAR. NA

DEPT.	UNTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PED	GR.		NTS	NA	NA	NA	NA
CODE 450	C/M/F						

TITLE: TYPICAL UPS SCHEME FOR PLC's

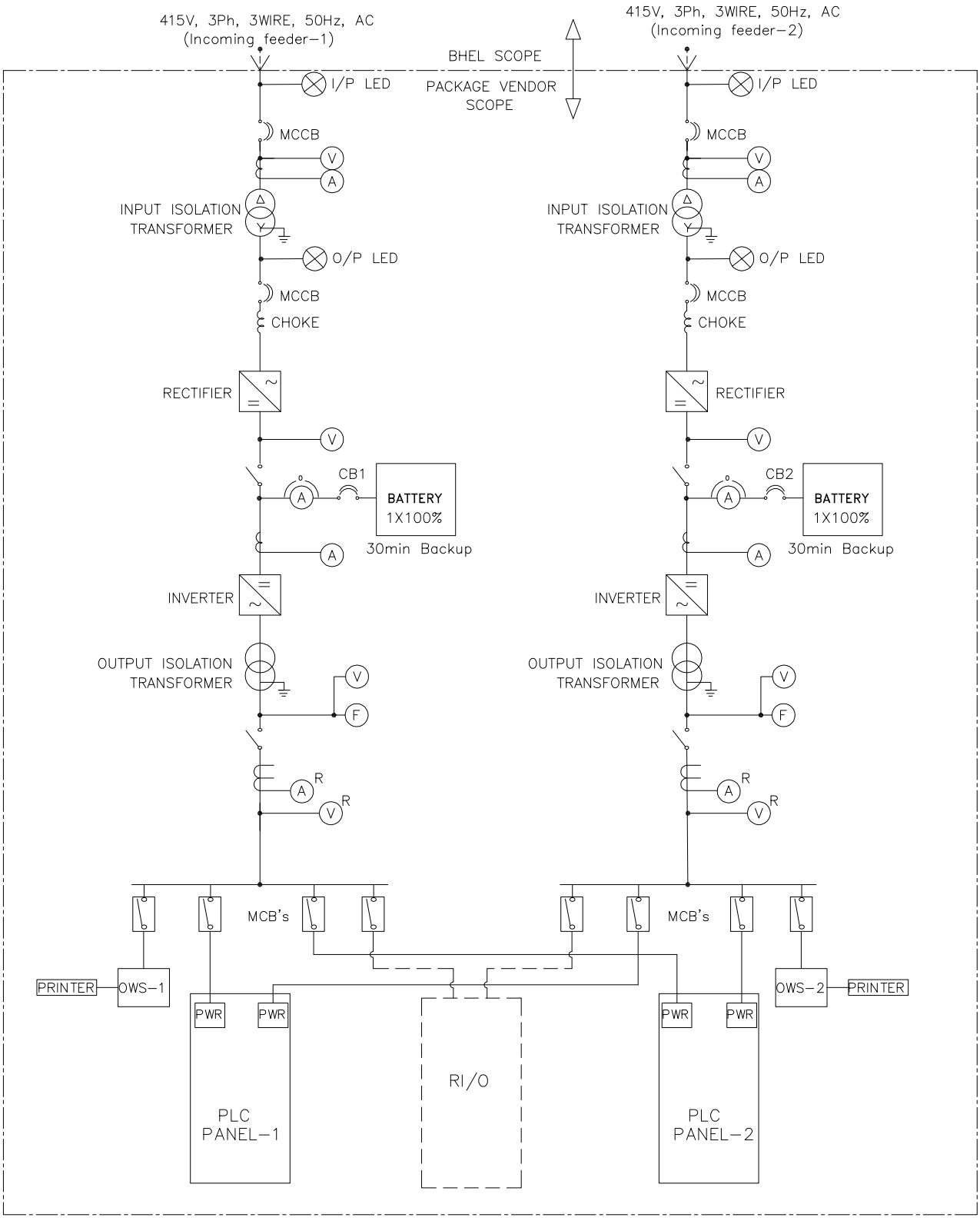
CARD CODE NA

DRG. NO. 4-38101-03202

REV. 00

CUST. DRG. NO.

SHT. No 01 NO. OF SHT. 02



LEGENDS:

- MOULDED CASE CIRCUIT BREAKER
- LOAD BREAK ISOLATOR
- HRC FUSE
- CURRENT TRANSFORMER
- MBS – MANUAL BYPASS SWITCH
- KVA – KVA MEASUREMENT
- kW – kW MEASUREMENT
- V – VOLTMETER
- A – AMMETER
- F – FREQUENCY METER
- R – REMOTE INDICATION ALSO

BHARAT HEAVY ELECTRICALS LTD., HYDERABAD

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 1-38101-05622

SH. OF

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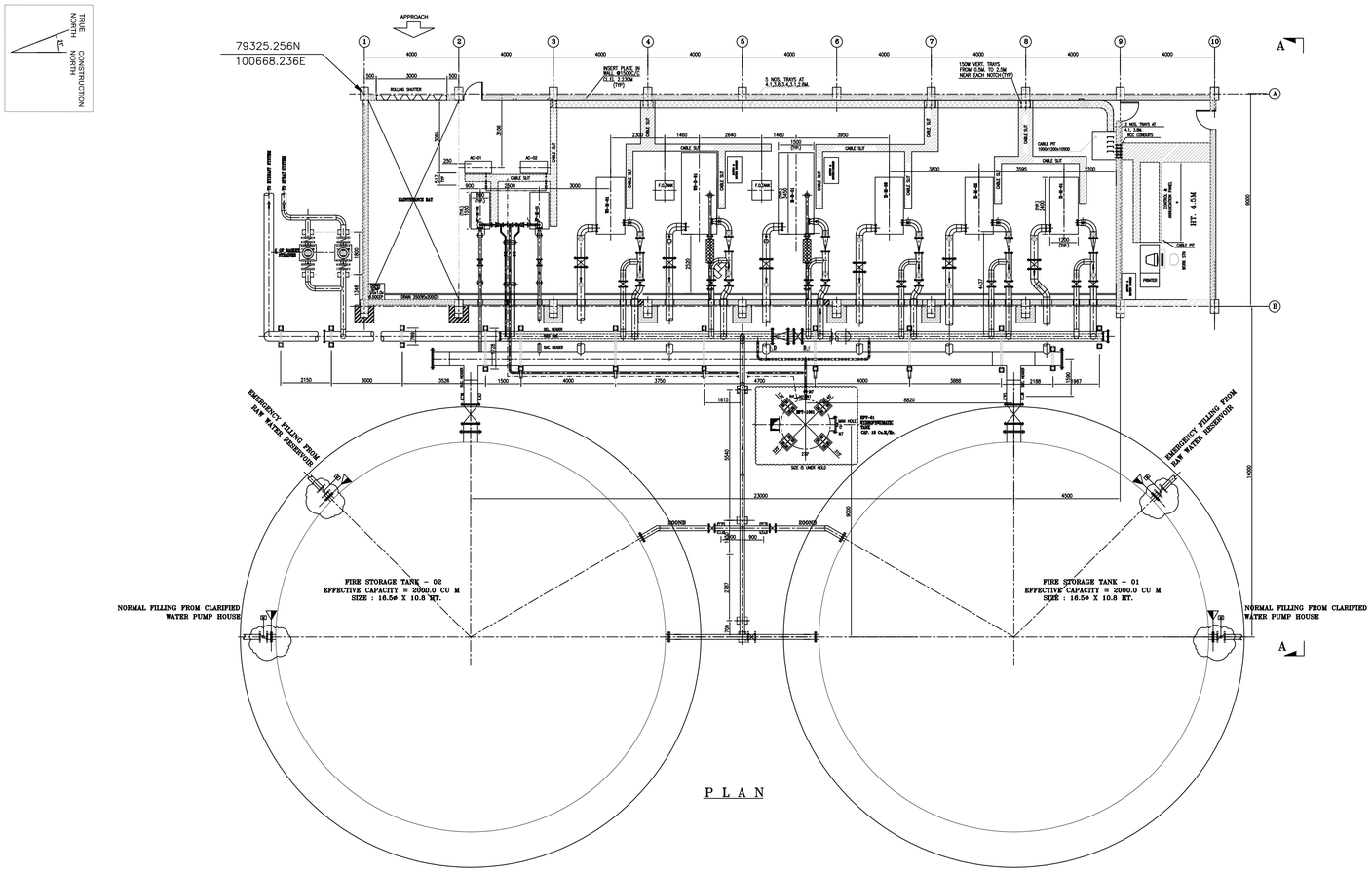
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

COMPUTER FILE NAME 1381010562 2-S00-R00

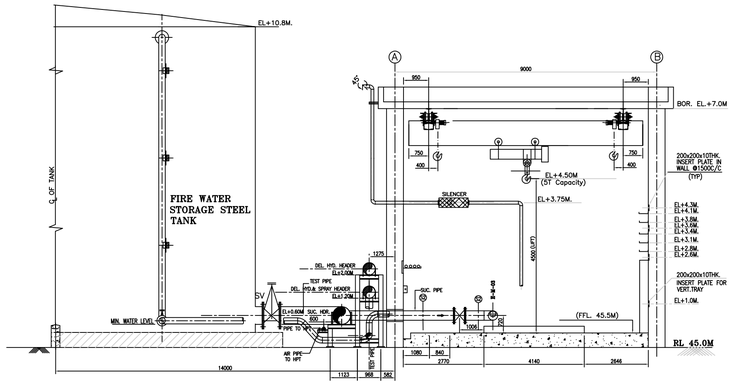
REF. DRG. NO.

SIGN. AND DATE

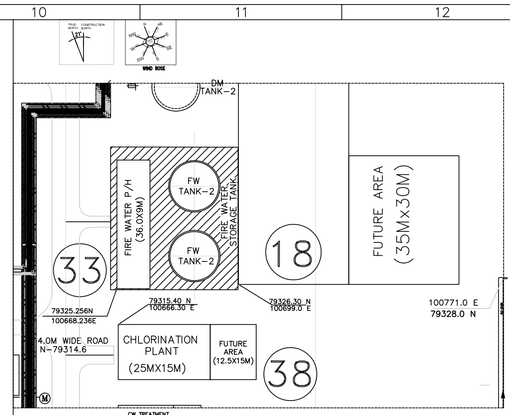
INVENTORY NO



PLAN



SECTION : AA



KEY PLAN

NOTES:--

1. ALL DIMENSIONS ARE IN mm. & ELEVATION ARE IN Mtrs.
2. LOCATIONS AND DIMENSIONS OF CONTROL PANELS AND TRENCHES AROUND IT ARE INDICATIVE ONLY.
3. FOLLOWING(S) WORK ARE IN THE SCOPE OF BHEL.
   a) CIVIL WORK OF FIRE WATER STORAGE TANK .
   b) CABLE TRENCHES.
   c) RCC PEDESTAL FOR PIPE SUPPORTS AND EQUIPMENT FOUNDATION IN AND AROUND PUMP HOUSE
4. EL+0.00 CORRESPONDS TO RL.45.5M
5. FOUNDATION DETAILS OF PUMPS & OTHER FIRE FIGHTING EQUIPMENTS WITHIN PUMP HOUSE ARE KEPT ON HOLD.
6. DIMENSIONS INDICATED IN THE DRG. ARE AS PER DATA BASE & MINOR CHANGES MAY OCCUR DURING DETAIL ENGG.

STORAGE CAPACITY AS PER TAC

WATER REQUIREMENT FOR HYDRANT SYSTEM (2 HRS. PUMPING CAPACITY, TAC CLAUSE 7.3.6) (HYDRANT MANUAL)	: (3x410)x2	= 2460 M^3
WATER REQUIREMENT FOR SPRAY SYSTEM (2.5 HRS. PUMPING CAPACITY, TAC CLAUSE 7.3.6) (RULES FOR WATER SPRAY)	: (1x410)x2.5	= 1025 M^3
TOTAL WATER REQUIRED		= **3485 M^3**
TOTAL STORED CAPACITY (ABOVE TOP OF PUMP CASING)	: (3.142/4(16^2)x(10.325−1.332))x2	= **3814.46 M^3**

LEGND- TABLE-1

Sr. No.	SYMBOL	DESCRIPTION
1		FIRE WATER LINE
2		CONCENTRIC REDUCER
3		ECCENTRIC REDUCER
4		BUTTERFLY VALVE NORMALLY OPEN (BFV)
5		BUTTERFLY VALVE NORMALLY CLOSED (BFV)
6		SLUICE VALVE NORMALLY CLOSED (SV)
7		SLUICE VALVE NORMALLY OPEN (SV)
8		GLOBE VALVE NORMALLY CLOSED (GV)
9		NON RETURN VALVE
10		PRESSURE GAUGE
11		PRESSURE SWITCH
12		PIPE SUPPORT (PS)
13	DEL	DELIVERY
14	SUC	SUCTION
15		BASKET STRAINER (BS)
16		MOTORISED VALVE

SCOPE

BHEL (PESD) | BHEL (PEM)

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	K AMIT	–SD–	22.04.13	–N.A.–
CHD.	K GUNJAN	–SD–	22.04.13	
APPD.	K GUNJAN	–SD–	22.04.13	

NAME OF CUSTOMER/PROJECT: BIHAR STATE ELECTRICITY BOARD
2 X 250 MW BARAUNI THERMAL POWER STATION
UNIT #8 & #9

NAME OF CONSULTANT: STEAG ENERGY SERVICES(INDIA) PVT. LTD.

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
	ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE

REV.	DATE	ALTERED
01	24.04.13	ALTERED SKB/K AMIT CHD/APPD K GUNJAN TANK AND PIPE SUPPORT LOCATING DIMENSIONS HAS BEEN UPDATED.

DEPT.	I.T.D.	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE.	415	~~C/M/F~~	1:125			–N.A.–	–N.A.–

TITLE: EQUIPMENT & PIPING LAYOUT INSIDE AND AROUND FIRE WATER PUMP HOUSE

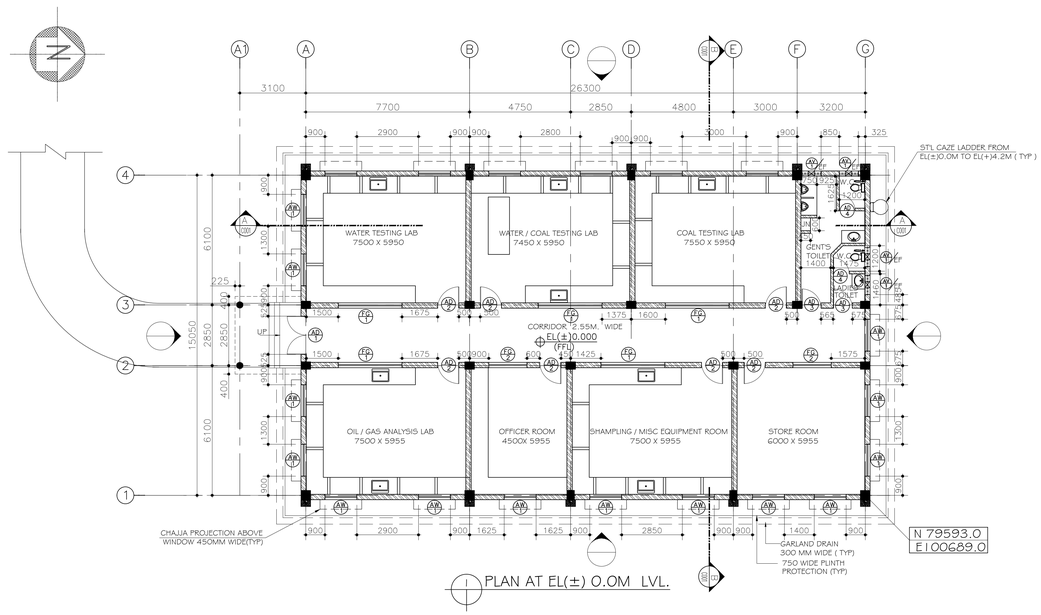
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DRAWING NO. 1-38101-05622 REV. 01

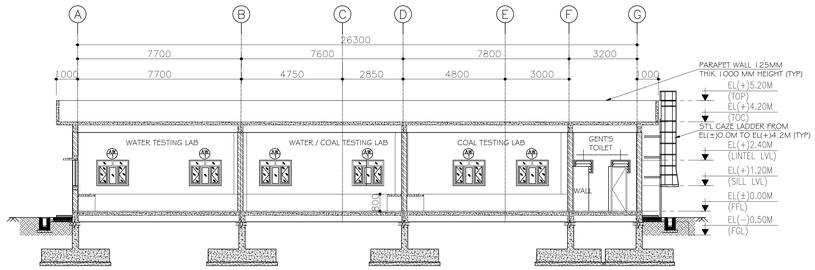
SHT. No 1 NO. OF SHT. 1

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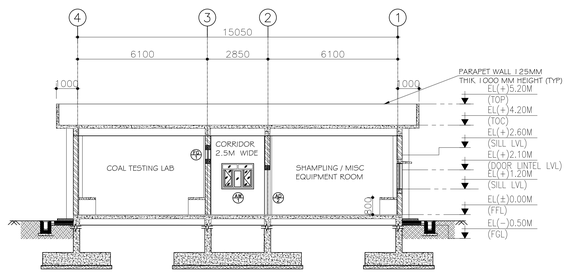
DRAWING NO. PE-DG-374-663-C001



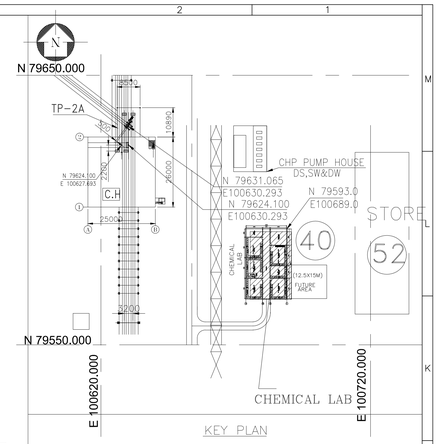
1 PLAN AT EL(±) O.OM LVL.



3 SECTION A-A
(SCALE 1:100)



4 SECTION B-B
(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)45.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

SCHEDULE OF JOINERY

SYMBOL	Nos.	SILL LVL AT EL....	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
AP	01	(+)0.000	1800	2100	ALUMINUM FRAMED WITH FLUSH DOOR – DOUBLE SHUTTER
AP	07	(+)0.000	1000	2100	ALUMINUM FRAMED WITH FLUSH DOOR – SINGLE SHUTTER
AP	02	(+)0.000	1000	2100	PVC DOOR – SINGLE SHUTTER
EP	02	(+)0.000	750	2100	PVC DOOR – SINGLE SHUTTER
AW	20	(+)1.200	1500	1200	ALUMINUM FRAMED GLAZED OPENABLE WINDOW
FW	05	(+)2.600	3000	450	ALUMINUM FRAMED FIXED GLAZED WINDOW
FW	02	(+)2.600	1800	450	ALUMINUM FRAMED FIXED GLAZED WINDOW
AV	04	(+)1.800	900	600	ALUMINUM FRAMED LOUVERED VENTILATOR
EF	04	(+)2.650	300ø		EXHAUST FAN

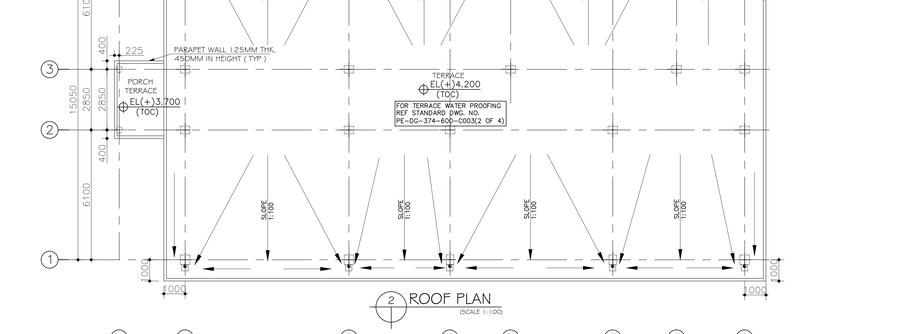
LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- JN – JANITOR ROOM
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

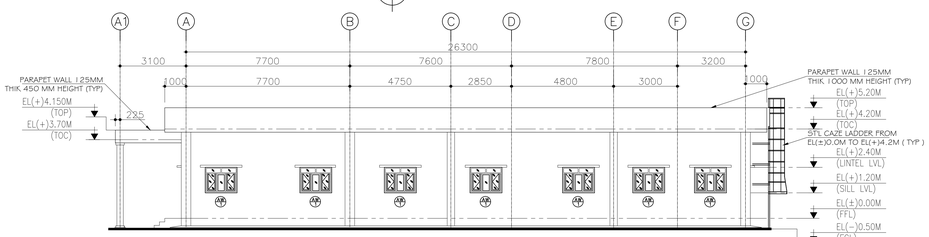
REFERENCE DRAWINGS

SL No.	DRAWING No.	TITLE
INPUT		
1.	PE-DG-374-100-M001	PLOT PLAN
2.	PE-DG-374-175-A001	LAYOUT FOR CHEMICAL LABORATORY BUILDING
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOOR'S
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOW'S
STRUCTURAL DRAWING		
1	PE-DG-374-663-C002	CHEMICAL LABORATORY BUILDING
2	PE-DG-374-663-C003	CHEMICAL LABORATORY BUILDING

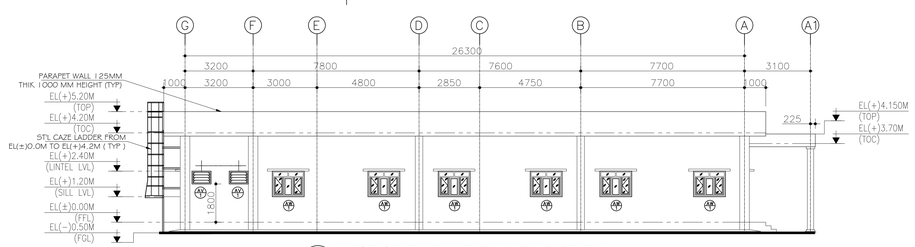
SERIAL NUMBER	ROOMS	FLOORS: IPS/CEMENT CONCRETE) WITH NON-METALLIC HARDENER (OPTIONAL)	FLOORS: IPS/CEMENT CONCRETE) WITH TOPPING FLOORING	FLOORS: 10MM THICK POLISHED VITRIFIED CERAMIC TILES FLOORS	FLOORS: CERAMIC TILES	FLOORS: HEAVY DUTY CERAMIC TILES	SKIRTING: IPS/CEMENT CONCRETE) WITH NON-METALLIC HARDENER	SKIRTING: 2 COATS OF SMOOTH FINISH PLASTIC EMULSION PAINT OF BERGER OF PARIS BALANCE HEIGHT	SKIRTING: IPS (CEMENT CONCRETE) WITH NON-METALLIC FLOOR HARDENER	SKIRTING: 10MM THICK POLISHED VITRIFIED CERAMIC TILES FINISHED	SKIRTING: HEAVY DUTY CERAMIC TILES	INTERNAL WALLS DADO: ACID/ALKALI RESISTANT GLAZED TILES UPTO A HEIGHT OF 1.45 M	INTERNAL WALLS DADO: 5MM GLAZED TILES UPTO A HEIGHT AS PER IS:777	INTERNAL WALLS PAINTING: GRANITE STONE TOP SLAB (SEAT FORM)	INTERNAL WALLS PAINTING: 2 COATS OF PLASTIC EMULSION PAINT OVER 2MM THICK PLASTER OF PARIS PUNNING	CEILING: OIL BOUND DISTEMPER	CEILING: COLOR COATED ALUMINIUM FALSE CEILING (LUXALON OR EQUIVALENT)	CEILING: OIL BOUNDED DISTEMPER	CEILING: WHITE WASHING	EXTERNAL WALL
	EL(±)0.00M																			CEMENT BASED WATER PROOF PAINT
1	WATER TESTING LAB					●					●				●	●	●			
2	WATER / COAL TESTING LAB					●					●				●	●	●			
4	COAL TESTING LAB					●					●				●	●	●			
5	TOILET				●								●			●	●			
6	OIL / GAS ANALYSIS LAB					●					●				●	●	●			
7	OFFICER ROOM			●						●					●	●	●			
8	SHAMPLING / MISC EQUIPMENT ROOM		●				●								●		●			
9	STORE ROOM	●							●						●		●			
10	CORRIDOR					●					●				●		●			



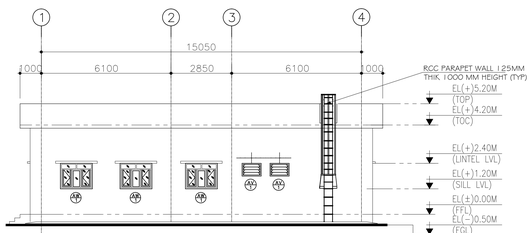
2 ROOF PLAN
(SCALE 1:100)



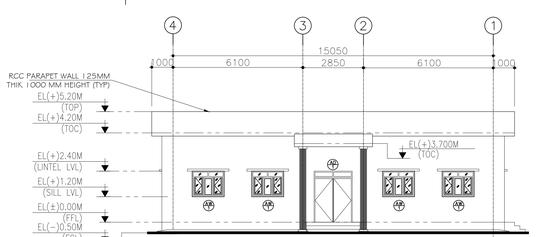
5 EAST SIDE ELEVATION ALONG GRID- I
(SCALE 1:100)



6 WEST SIDE ELEVATION ALONG GRID-4
(SCALE 1:100)



7 NORTH SIDE ELEVATION ALONG GRID-4
(SCALE 1:100)



8 SOUTH SIDE ELEVATION ALONG GRID-4
(SCALE 1:100)

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

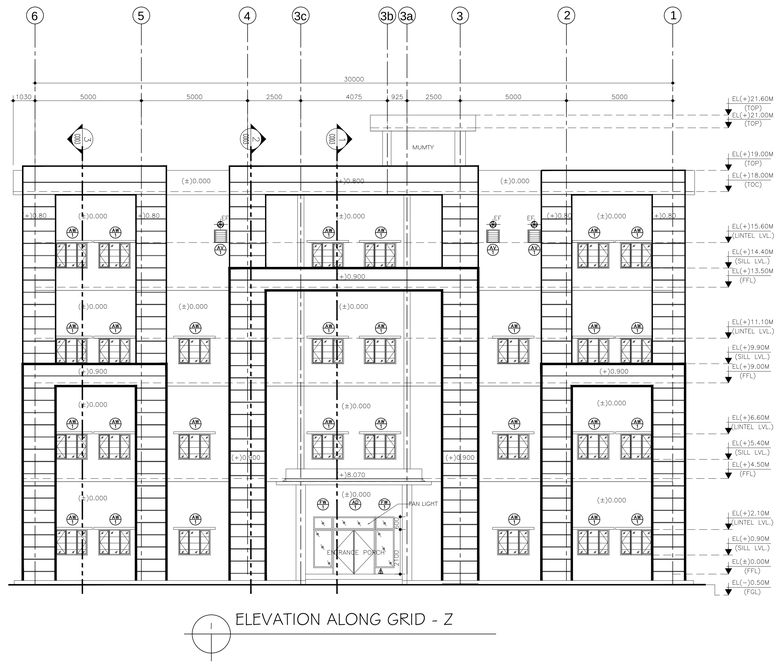
DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		01.01.2013
	DESN	AMIT R		01.01.2013
	CHD	DK MISHRA		01.01.2013
	APPD	DK MISHRA		01.01.2013

TITLE: CHEMICAL LABORATORY
ARCHITECTURAL PLAN(±)0.00M, ROOF PLAN, SECTIONS & ELEVATIONS

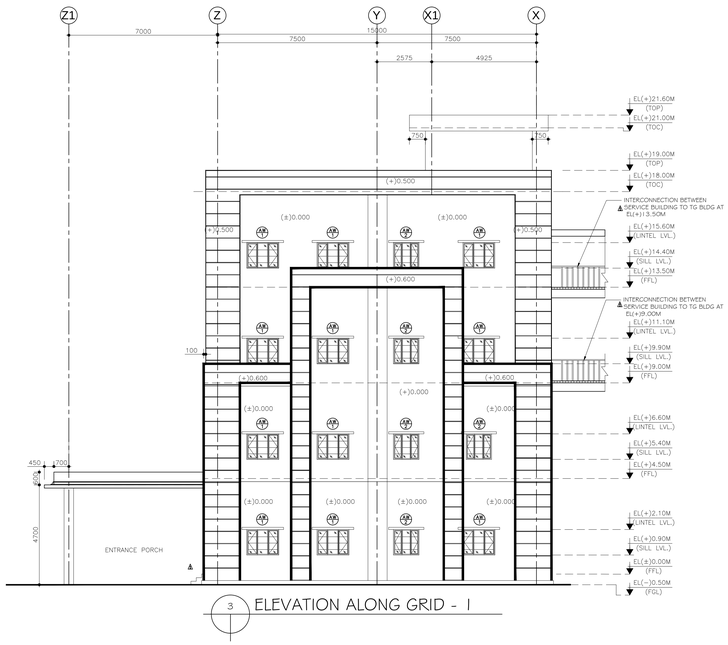
DEPT.	SCALE	DRAWING NO.
SIGN		PE-DG-374-663-C001
DATE		SHEET 1 OF 1 REV. 0

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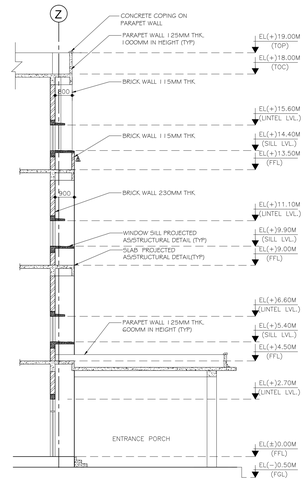
DRAWING NO. PE-DG-347-640-C003



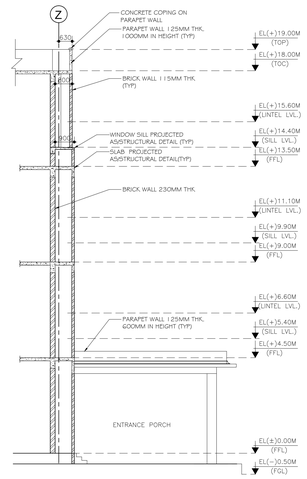
1 ELEVATION ALONG GRID - Z



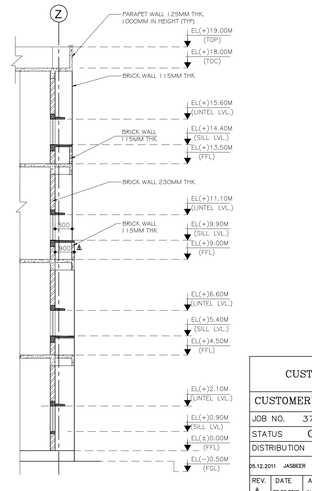
3 ELEVATION ALONG GRID - 1



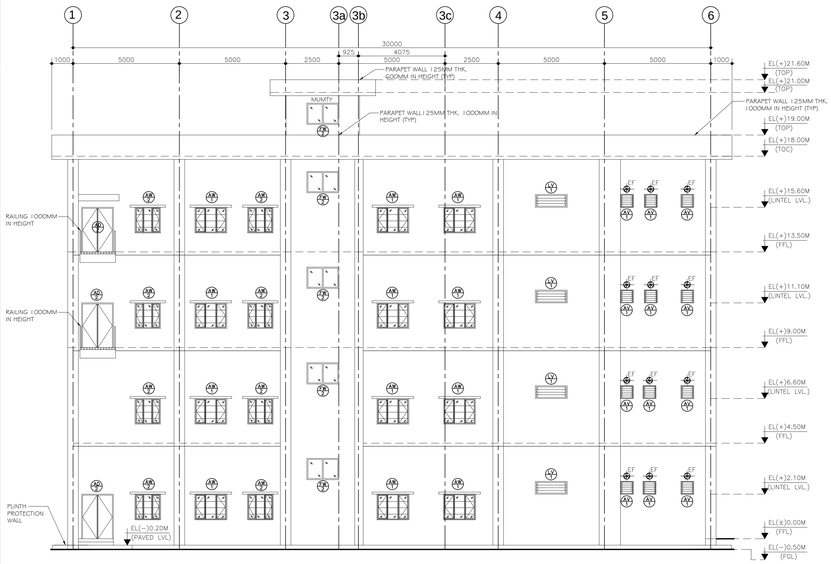
5 SECTION DETAIL AT - 1



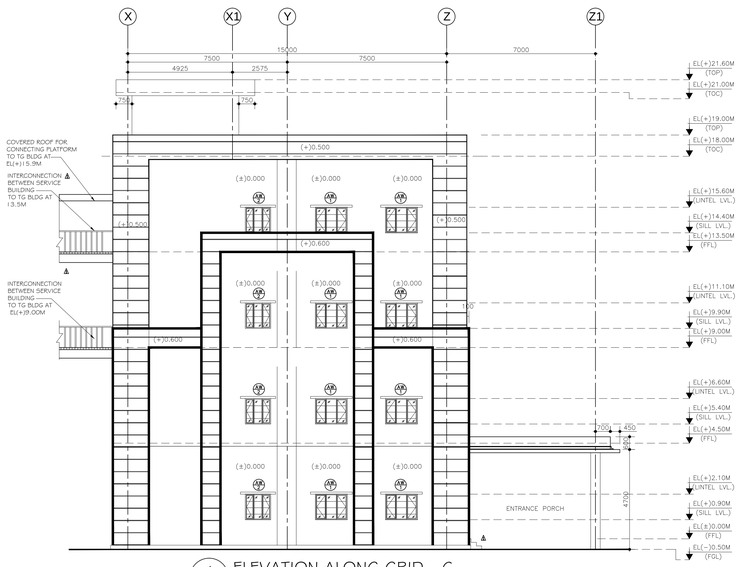
6 SECTION DETAIL AT -2



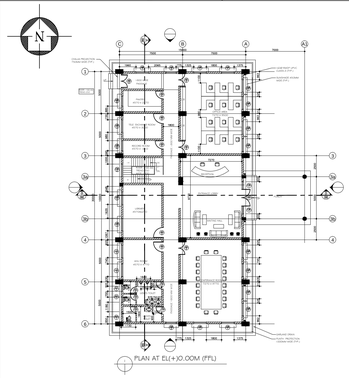
7 SECTION DETAIL AT -3



2 ELEVATION ALONG GRID - X



4 ELEVATION ALONG GRID - 6



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
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3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

EXTERNAL FINISH SCHEDULE:-

1. ALL PLASTERED/CONCRETE SURFACES SHALL BE PAINTED WITH TEXTURED PAINT OF APPROVED COLOUR (SANDTEX MAT (OR) EQUIVALENT) WITH A COMBINATION OF RESIN BONDED GRANULAR FINISH (VINERATEX (OR) EQUIVALENT)

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- 115 THK BRICK WALL FULL HEIGHT
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS.
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-100-MSK01	SERVICE BUILDING - PLAN AT EL (±)0.0M, EL(+)4.5M, EL (+)9.0M LVL.
STANDARD DRAWING		
1 (SH 1 OF 4)	PE-DG-374-600-C001	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2 (SH 2 OF 4)	PE-DG-374-600-C001	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3 (SH 3 OF 4)	PE-DG-374-600-C001	STANDARD DETAIL OF DOOR'S
4 (SH 4 OF 4)	PE-DG-374-600-C001	STANDARD DETAIL OF WINDOW'S
ARCHITECTURAL DRAWING		
1 (SH 1 OF 2)	PE-DG-374-640-C001	SERVICE BUILDING ARCHITECTURAL PLANS EL(±)0.0M, EL(+)4.5MLVL.
2 (SH 2 OF 2)	PE-DG-374-640-C001	SERVICE BUILDING ARCHITECTURAL PLANS EL(+)9.0M & EL(+)13.5M LVL.
3	PE-DG-374-640-C002	SERVICE BUILDING ARCHITECTURAL SECTION'S

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD
A	03.08.2012	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			

05.12.2011 JASBEER AMIT R DKM

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

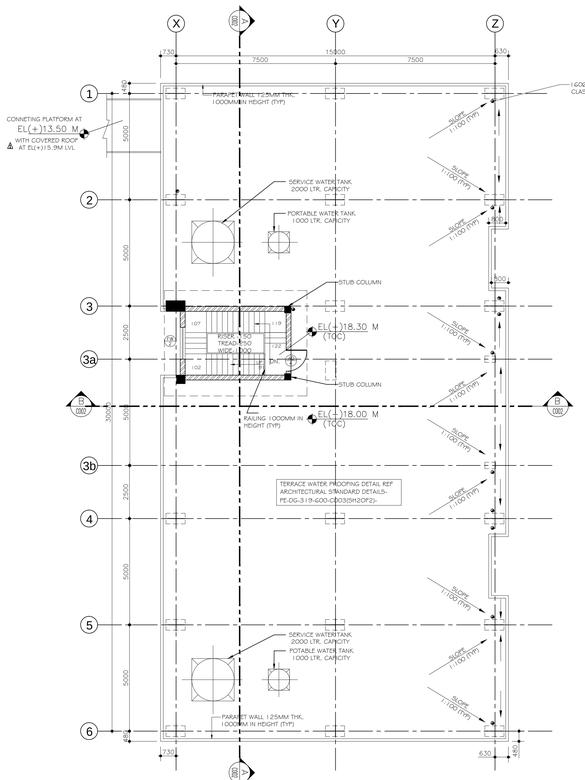
DEPT CODE	NAME	SIGN	DATE
DRN	JASBEER		24.05.2012
DESN	AMIT R		24.05.2012
C CHD	DK MISHRA		24.05.2012
APPD	DK MISHRA		24.05.2012

TITLE: SERVICE BUILDING ARCHITECTURAL ELEVATIONS

DEPT. | SCALE | DRAWING NO. PE-DG-374-640-C003
SIGN | DATE | SHEET 1 OF 1 | REV. 1

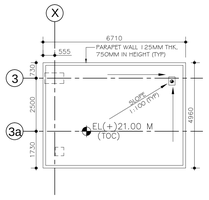
DRAWING NO. PE-DG-347-640-C001

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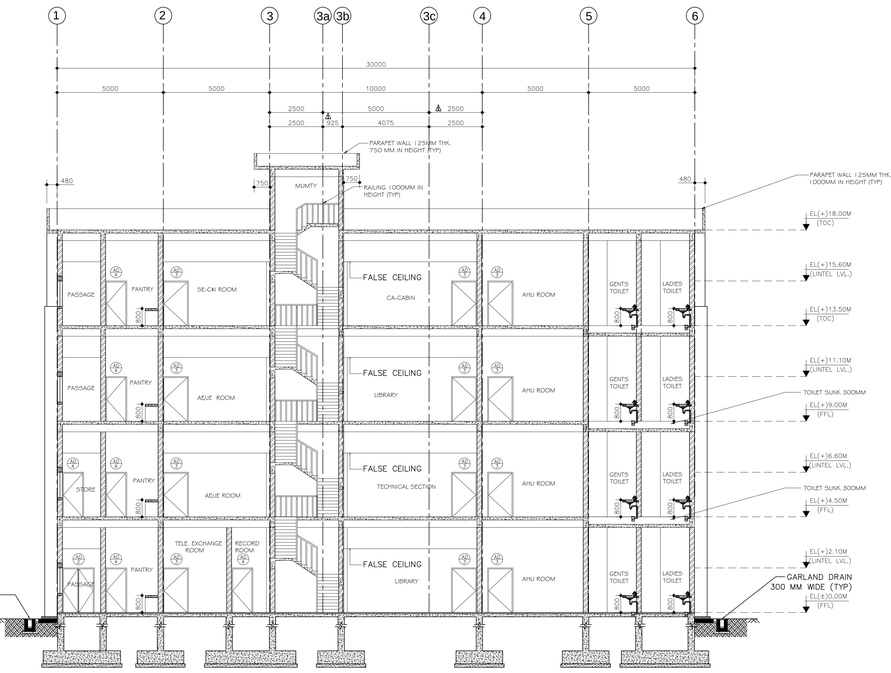
4 ROOF PLAN AT EL(+)18.00M (FFL)

(SCALE 1:100)

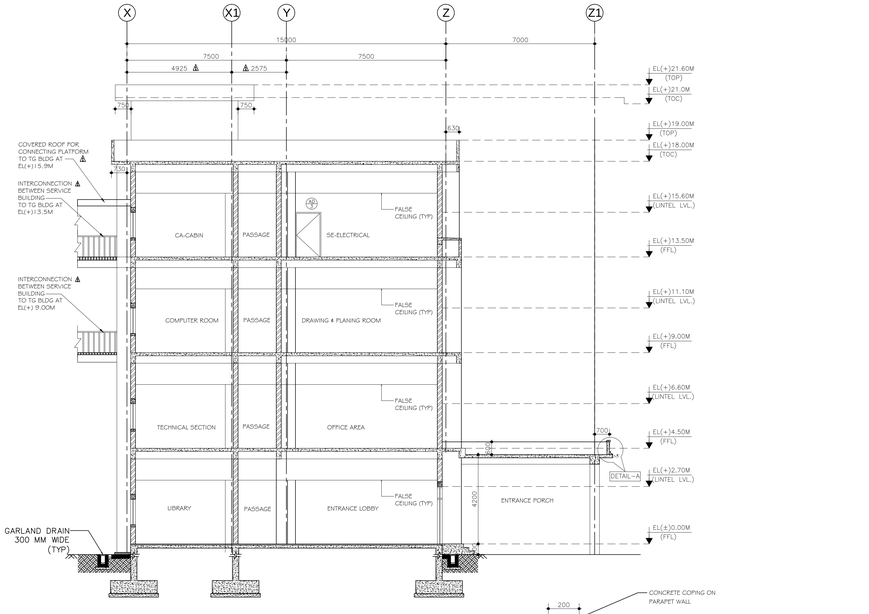


5 MUMTY ROOF PLAN AT EL(+)21.00M (TOC)

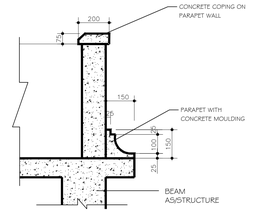
SERIAL NUMBER	ROOMS	FLOORS										SKIRTING					INTERNAL WALLS							CEILING		FALSE CEILING		EXTERNAL WALL
																	DADO					PAINTING						
		40THK(AVG) CONCRETE(M-30) WITH APPROPRIATE CONCRETE BED TOPPING FLOOR FINISH	10MM POLISHED VITRIFIED TILES	HEAVY DUTY CERAMIC TILES. 300MM THICK POLISHED GRANITE STONE	10MM THICK POLISHED GRANITE STONE	UNGLAZED CERAMIC TILES.	CERAMIC TILES FLOOR COVERING WITH ANTISTATIC PROPERTIES ON 40MM THICK HIGH DENSITY PARTICLE BOARD	10MM THICK VITRIFIED TILES 2'0" X2'0" 10MM THICK	10MM THICK VITRIFIED FLOOR TILES 600 X 600 AND SKIRTING TILES	10MM THICK VITRIFIED TILES	50MM THICK IN-SITU CEMENT CONCRETE FLOOR HARDENER	UNGLAZED CERAMIC TILES.	HEAVY DUTY CERAMIC TILES.	MIRROR POLISHED VITRIFIED TILES 100MM	PRE-CAST TERRAZZO TILES	IPS (CEMENT CONCRETE) WITH CEMENT BASED FLOOR HARDNER	CERAMIC TILES UPTO 2100MM HEIGHT ABOVE FINISHED FLOOR LEVEL	10MM THICK GLAZED TILES UPTO 2100MM HEIGHT ABOVE FINISHED FLOOR LEVEL	5MM GLAZED TILES UPTO 450MM (2-3"T) HEIGHT, PLASTERING AS TILE	GRANITE STONE TOP SLAB 20MM THICK	OIL BOUND DISTEMPER	ACRYLIC EMULSION PAINT OVER PLASTER OF PARIS PUNNING	COLOR COATED ALUMINIUM FALSE CEILING (LUVALON OR EQUIVALENT)	OIL BOUNDED DISTEMPER	COLOR COATED ALUMINIUM FALSE CEILING (LUVALON OR EQUIVALENT)	12 MM THK. GYPSUM FALSE CEILING.	CEMENT BASED WATER PROOF PAINT
	SERVICE BUILDING EL(±)0.00M LVL																											
1	ENTRANCE LOBBY			●								●										●					●	
2	CONFERENCE ROOM		●											●								●					●	
3	LIBRARY				●							●										●					●	
4	OFFICE AREA		●											●								●					●	
5	TELE. EXCHANGE ROOM				●									●									●			●		
	SERVICE BUILDING EL(+)4.50M LVL																											
7	TECHNICAL SECTION		●											●								●					●	
8	AE & JE ROOM		●											●								●					●	
9	EE CABIN		●											●								●					●	
10	OFFICE AREA		●											●								●					●	
	SERVICE BUILDING EL(+)9.00M LVL																											
11	AE/JE ROOM		●											●								●					●	
12	STAFF ROOM		●											●								●					●	
13	LIBRARY				●							●										●					●	
14	CONFERENCE ROOM		●											●								●					●	
15	TRAINING HALL		●											●								●					●	
			●											●								●					●	
	SERVICE BUILDING EL(+)13.50M LVL																											
16	SE- C&I ROOM		●											●								●					●	
17	SE- CIVIL		●											●								●					●	
18	SE- ELECTRICAL		●											●								●					●	
19	CA - CABIN		●											●								●					●	
20	SE - MECH.		●											●								●					●	
21	STENO ROOM		●											●								●					●	
22	CONFERENCE ROOM		●											●								●					●	
	SERVICE BUILDING COMMON AREA																											
23	AHU ROOM	●									●											●						
24	PANTRY								●								●					●			●			
25	TOILET							●									●					●			●		●	
26	PASSAGE/CIRCULATION SPACE/ CORRIDOR		●									●										●					●	
⚠ 27	CONCRETE STAIRCASE								●										●			●			●			
28	STAIRCASE MUMTY								●													●			●			



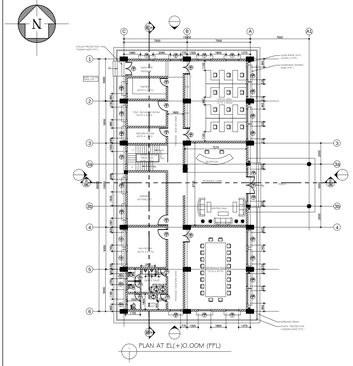
SECTION AT A-A



SECTION AT B-B



CONCRETE MOULDING DEATIL - A



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)24.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
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5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

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1. ALL PLASTERED/CONCRETE SURFACES SHALL BE PAINTED WITH TEXTURED PAINT OF APPROVED COLOUR (SANDTEX MAT (OR) EQUIVALENT) WITH A COMBINATION OF RESIN BONDED GRANULAR FINISH (VINERATEX (OR) EQUIVALENT)

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- 115 THK BRICK WALL FULL HEIGHT
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

NOTE*:-ALL TOILET SUNKEN BY 300MM

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-100-MSK01	SERVICE BUILDING - PLAN AT EL (±)0.0M, EL(+)4.5M, EL (+)9.0M LVL.
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOOR'S
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOW'S
ARCHITECTURAL DRAWING		
1	PE-DG-374-640-C001 (SH 1 OF 2)	SERVICE BUILDING ARCHITECTURAL PLANS EL(±)0.0M, EL(+)4.5M LVL.
2	PE-DG-374-640-C001 (SH 2 OF 2)	SERVICE BUILDING ARCHITECTURAL PLANS EL(+)9.0M & EL(+)13.5M LVL.
3	PE-DG-374-640-C003	SERVICE BUILDING ARCHITECTURAL ELEVATION'S

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	
STATUS CONTRACT	
DISTRIBUTION	

2X250MW BARAUNI THERMAL POWER STATION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE	NAME	SIGN	DATE
DRN	JASBEER		24.05.2012
DESN	AMIT R		24.05.2012
CHD	DK MISHRA		24.05.2012
APPD	DK MISHRA		24.05.2012

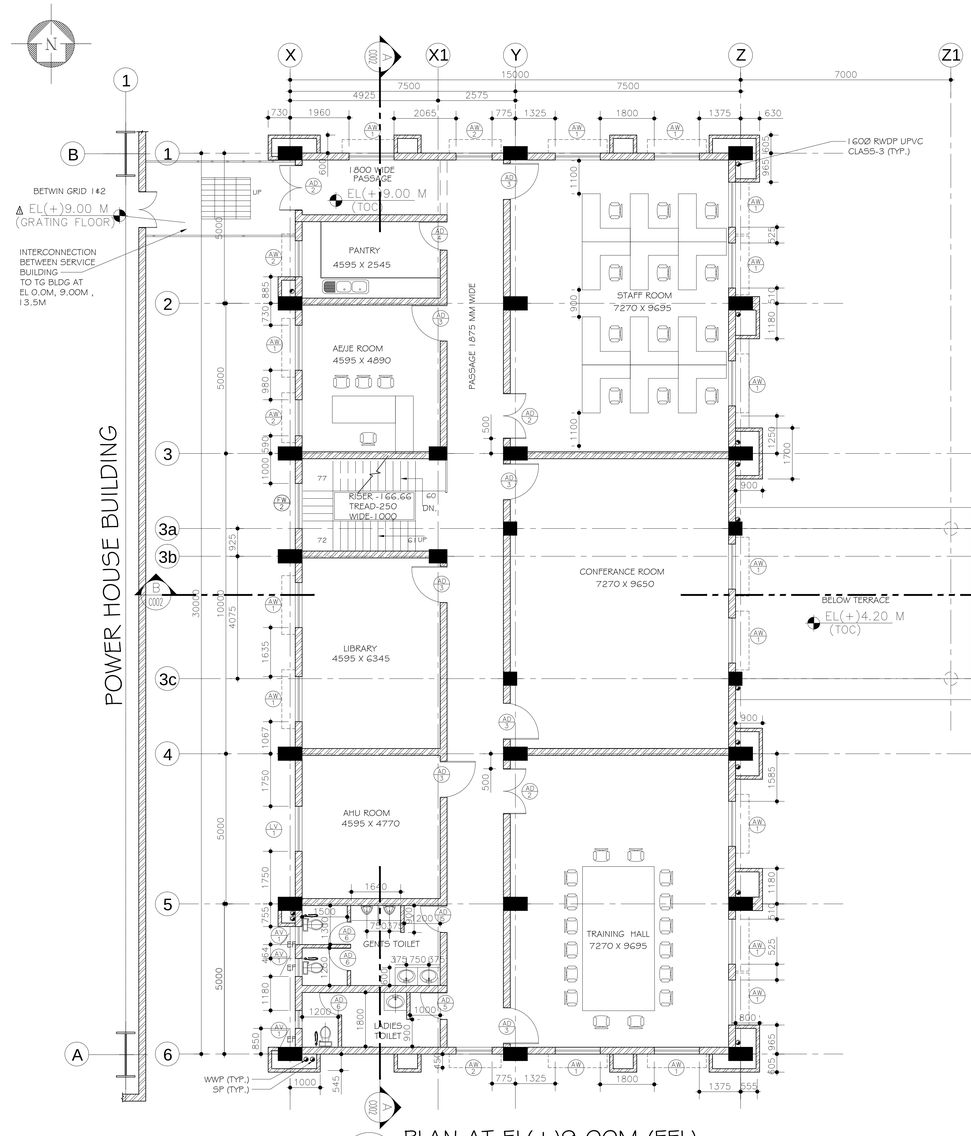
REV.	DATE	ALTD	CHD	APPD
A	23.08.2012	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			

TITLE
SERVICE BUILDING
ARCHITECTURAL ROOF PLAN, SECTIONS & FINISHING SCHEDULE

DEPT.	SCALE	DRAWING NO.
SIGN		PE-DG-374-640-C002
DATE		SHEET 1 OF 1 REV. 1

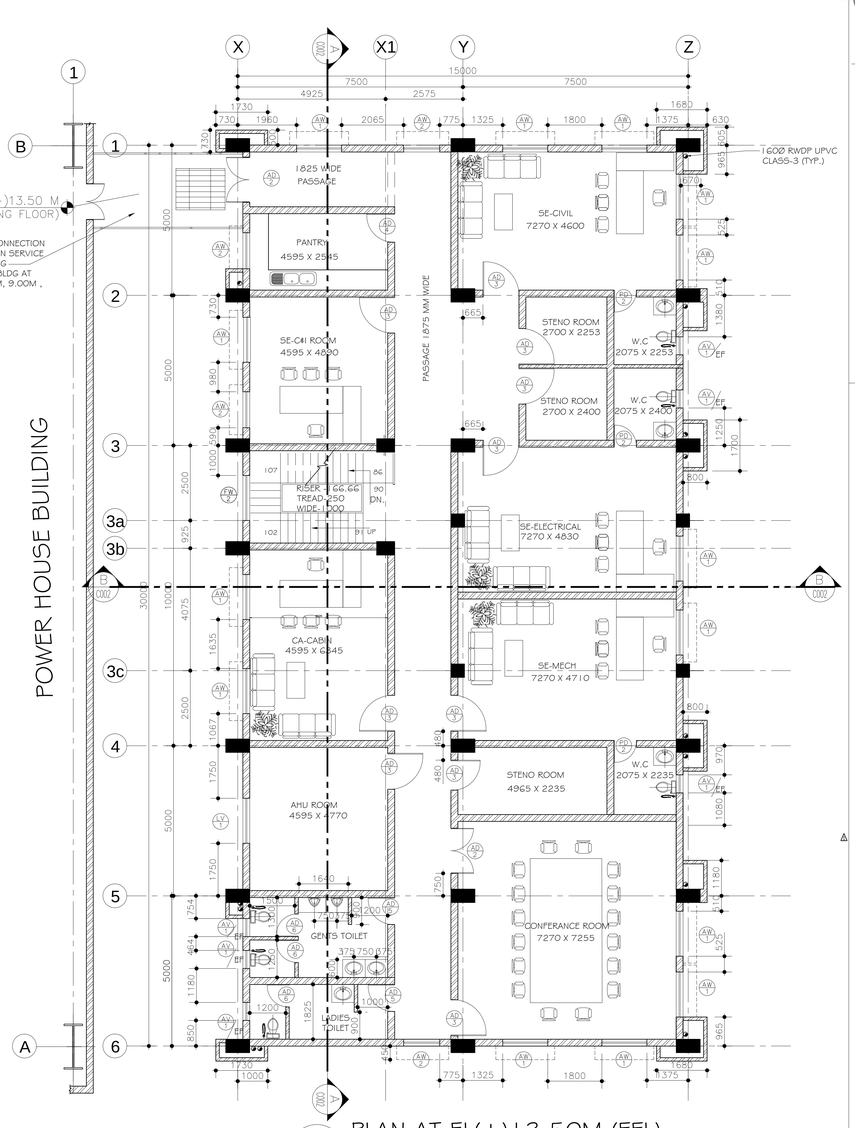
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DRAWING NO. PE-DG-347-640-C001



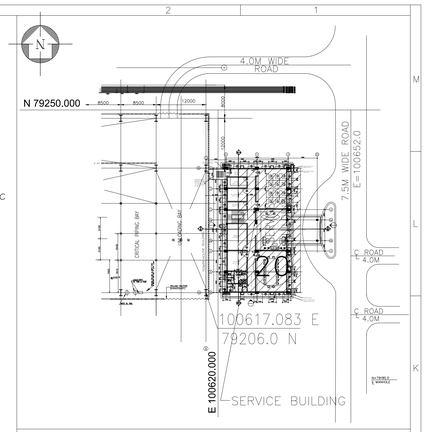
3 PLAN AT EL(+)9.00M (FFL)

(SCALE 1:100)



4 PLAN AT EL(+)13.50M (FFL)

(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
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LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- GRATING FLOOR
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
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REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
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1	PE-DG-374-100-MSK01	SERVICE BUILDING - PLAN AT EL (±)0.0M, EL(+)4.5M, EL (+)9.0M LVL.
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOOR'S
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOW'S
ARCHITECTURAL DRAWING		
1	PE-DG-374-640-C001 (SH 1 OF 2)	SERVICE BUILDING ARCHITECTURAL PLANS EL(±)0.0M, EL(+)4.5MLVL.
2	PE-DG-374-640-C002	SERVICE BUILDING ARCHITECTURAL ROOF PLAN, SECTION'S & FINISHING SCHEDULE
3	PE-DG-374-640-C003	SERVICE BUILDING ARCHITECTURAL ELEVATION'S

DOOR OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL....	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
AD/2	01	(±)0.000	2000	2700	ALUMINIUM FRAME WITH GLAZED DOOR –DOUBLE SHUTTER AS/DETAIL
AW/1	02	(+)0.300	900	2400	ALUMINUM FRAMED FIXED GLAZED WINDOW AS/DETAIL
AD/3	04	(±)0.000	1500	2100+600	FULLY GLAZED DOOR WITH ALUMINIUM FRAME –DOUBLE SHUTTER
	04	(+)4.500			
	03	(+)9.000			
	02	(+)13.500			
AD/4	04	(±)0.000	1200	2100	ALUMINIUM FRAME WITH GLAZED DOOR – SINGLE SHUTTER
	05	(+)4.500			
	07	(+)9.000			
	10	(+)13.500			
AD/5	02	(±)0.000	1000	2100	ALUMINIUM FRAME WITH PANELLED DOOR–SINGLE SHUTTER
	02	(+)4.500			
	01	(+)9.000			
	01	(+)13.500			
	01	(+)18.300			
PD/1	02	(±)0.000	900	2100	PVC DOOR –SINGLE SHUTTER
	02	(+)4.500			
	02	(+)9.000			
	02	(+)13.500			
PD/2	03	(±)0.000	750	2100	PVC DOOR –SINGLE SHUTTER
	03	(+)4.500			
	03	(+)9.000			
	06	(+)13.500			

WINDOW OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL....	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
AW/1	14	(+)0.900	1500	1200	GLAZED OPENABLE – WINDOW WITH ALUMINUM FRAME
	15	(+)5.400			
	16	(+)9.900			
	14	(+)14.40			
AW/2	04	(+)0.900	1200	1200	GLAZED OPENABLE – WINDOW WITH ALUMINUM FRAME
	04	(+)5.400			
	04	(+)9.900			
	04	(+)14.40			
FW/2	01	(+)2.783	1500	1000	ALUMINUM FRAMED FIXED GLAZED WINDOW
	01	(+)7.283			
	01	(+)11.783			
	01	(+)16.283			
LV/1	01	(+)19.50	1500	600	ALUMINIUM LOUVERED VANTILATOR
	01	(+)2.100			
	01	(+)6.600			
	01	(+)11.100			
	01	(+)15.600			
AV/1	3	(+)2.100	600	600	POWDER COATED ALUMINUM FRAMED FIXED LOUVERED VENTILATOR
	3	(+)6.600			
	03	(+)11.100			
	6	(+)15.600			
EF	03	(+)2.950(℄)	300ø		EXHAUST FAN
	03	(+)7.450(℄)			
	03	(+)11.950(℄)			
	06	(+)16.450(℄)			

NOTE-:ALL TOILET SUNKEN BY 300MM

REV.	DATE	ALTD	CHD	APPD
A	23.08.2012	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			

REV.	DATE	ALTD	CHD	APPD
A	24.05.2012	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			
	05.12.2011	JASBEER	AMIT R	DKM

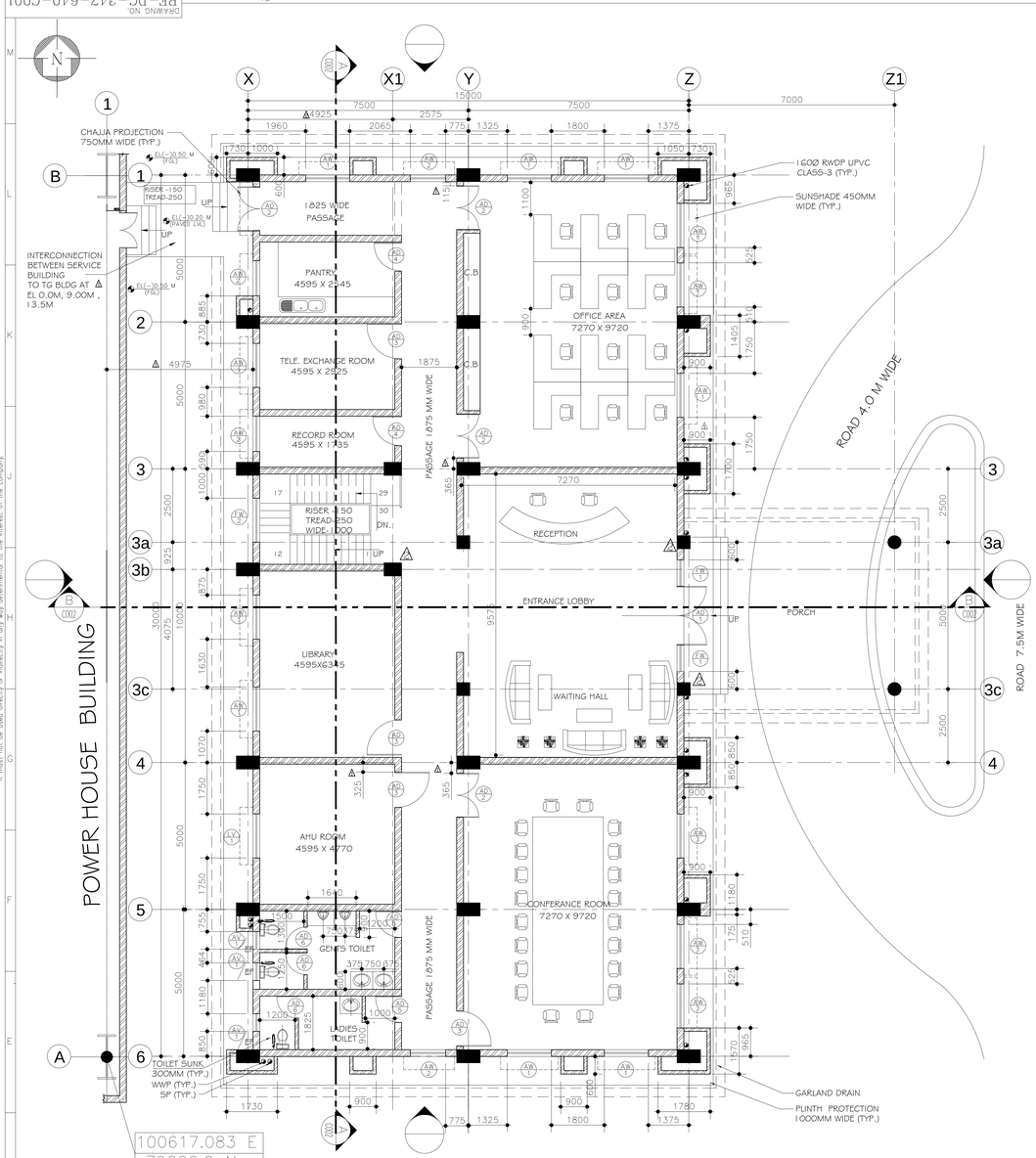
CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO.	374
STATUS	CONTRACT
DISTRIBUTION	
	2X250MW BARAUNI THERMAL POWER STATION
BHARAT HEAVY ELECTRICALS LTD	POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		07.01.2011
	DSGN	AMIT R		07.01.2011
	CHD	DK MISHRA		07.01.2011
	APPD	DK MISHRA		07.01.2011

TITLE: SERVICE BUILDING
ARCHITECTURAL PLANS EL(+)9.0M & EL(+)13.5M LVL.

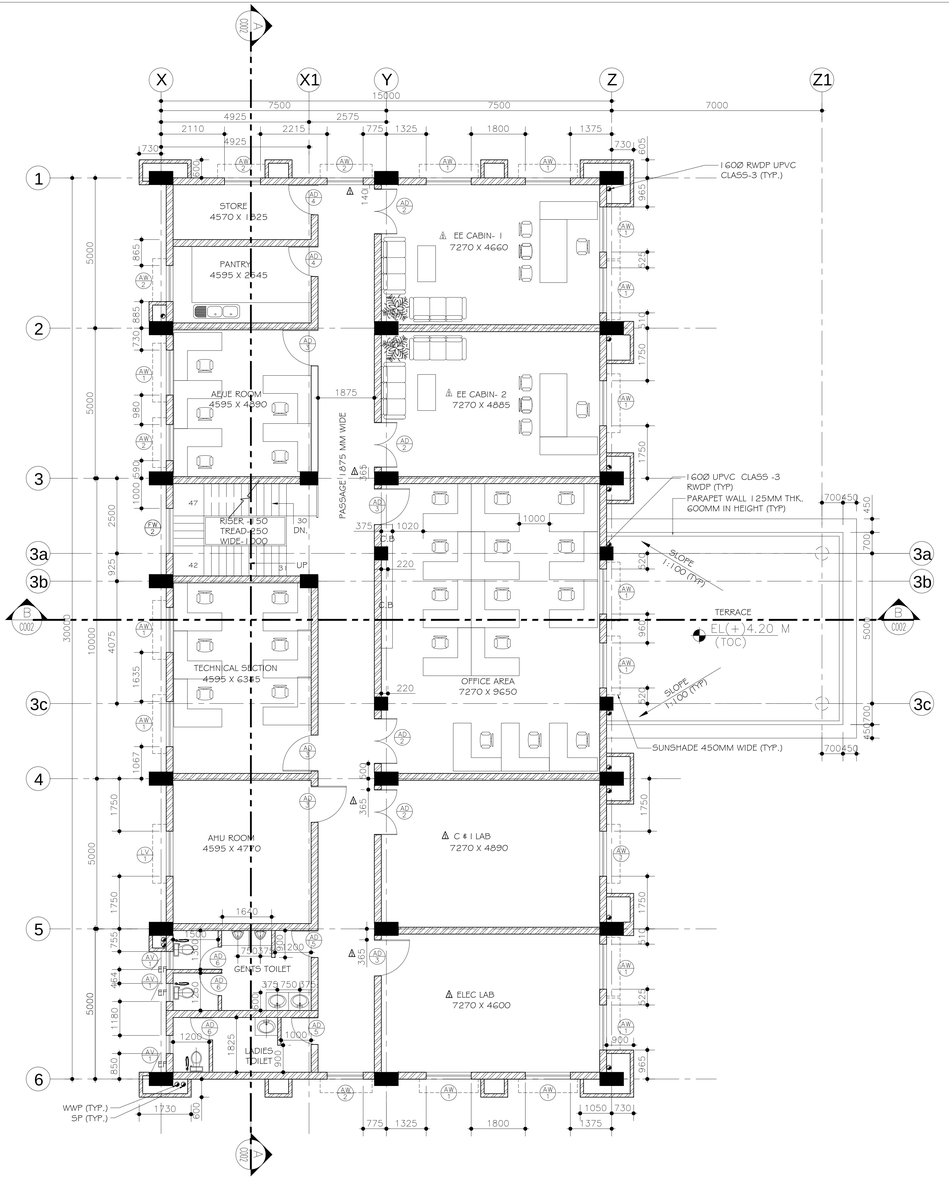
DEPT. | SCALE | DRAWING NO. PE-DG-374-640-C001
SIGN | DATE | SHEET 2 OF 2 | REV. 2

DRAWING NO. PE-DG-347-640-C001



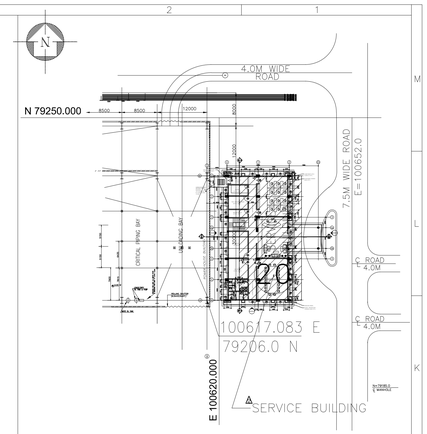
1 PLAN AT EL(+)0.00M (FFL)

(SCALE 1:100)



2 PLAN AT EL(+)4.50M (FFL)

(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)24.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

EXTERNAL FINISH SCHEDULE:-

1. ALL PLASTERED/CONCRETE SURFACES SHALL BE PAINTED WITH TEXTURED PAINT OF APPROVED COLOUR (SANDTEX MAT (OR) EQUIVALENT) WITH A COMBINATION OF RESIN BONDED GRANULAR FINISH (VINERATEX (OR) EQUIVALENT)

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL

FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

Sl. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-100-MSK01	SERVICE BUILDING - PLAN AT EL (±)0.0M, EL(+)4.5M, EL (+)9.0M LVL.
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
ARCHITECTURAL DRAWING		
1	PE-DG-374-640-C001 (SH 2 OF 2)	SERVICE BUILDING ARCHITECTURAL PLANS EL(+)9.0M & EL(+)13.5M LVL.
2	PE-DG-374-640-C002	SERVICE BUILDING ARCHITECTURAL ROOF PLAN, SECTIONS & FINISHING SCHEDULE
3	PE-DG-374-640-C003	SERVICE BUILDING ARCHITECTURAL ELEVATIONS

DOOR OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL...,	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
AD/1	01	(±)0.000	2000	2700	ALUMINIUM FRAME WITH GLAZED DOOR –DOUBLE SHUTTER AS/DETAIL
FW/1	02	(+)0.300	900	2400	ALUMINUM FRAMED FIXED GLAZED WINDOW AS/DETAIL
AD/2	04	(±)0.000	1500	2100	FULLY GLAZED DOOR WITH ALUMINIUM FRAME –DOUBLE SHUTTER
	04	(+)4.500			
	03	(+)9.000			
	02	(+)13.500			
AD/3	04	(±)0.000	1200	2100	ALUMINIUM FRAME WITH GLAZED DOOR – SINGLE SHUTTER
	05	(+)4.500			
	07	(+)9.000			
	10	(+)13.500			
AD/4	02	(±)0.000	1000	2100	ALUMINIUM FRAME WITH PANELLED DOOR–SINGLE SHUTTER
	02	(+)4.500			
	01	(+)9.000			
	01	(+)13.500			
	01	(+)18.300			
AD/5	02	(±)0.000	900	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER
	02	(+)4.500			
	02	(+)9.000			
	02	(+)13.500			
AD/6	03	(±)0.000	750	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER
	03	(+)4.500			
	03	(+)9.000			
	06	(+)13.500			

WINDOW OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL...,	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
AW/1	14	(+)0.900	1500	1200	GLAZED OPENABLE – WINDOW WITH ALUMINUM FRAME
	15	(+)5.400			
	17	(+)9.900			
	15	(+)14.40			
AW/2	04	(+)0.900	1200	1200	GLAZED OPENABLE – WINDOW WITH ALUMINUM FRAME
	04	(+)5.400			
	04	(+)9.900			
	04	(+)14.40			
FW/2	01	(+)2.783	1500	1000	ALUMINUM FRAMED FIXED GLAZED WINDOW
	01	(+)7.283			
	01	(+)11.783			
	01	(+)16.283			
	01	(+)19.50			
AV/1	01	(+)2.100	1500	600	ALUMINIUM LOUVERED VENTILATOR
	01	(+)6.600			
	01	(+)11.100			
	01	(+)15.600			
AV/2	3	(+)2.100	600	600	POWDER COATED ALUMINUM FRAMED FIXED LOUVERED VENTILATOR
	3	(+)6.600			
	03	(+)11.100			
	6	(+)15.600			
EF	03	(+)2.950(℄)	300ø		EXHAUST FAN
	03	(+)7.450(℄)			
	03	(+)11.950(℄)			
	06	(+)16.450(℄)			

NOTE-:ALL TOILET SUNKEN BY 300MM

REV.	DATE	ALTD	CHD	APPD
Δ	23.08.2012	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			

REV.	DATE	ALTD	CHD	APPD
Δ	24.05.2012	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	
05.12.2011 JASBEER AMIT R DKM	BHARAT HEAVY ELECTRICALS LTD, POWER SECTOR, PROJECT ENGINEERING MANAGEMENT, NEW DELHI

DEPT CODE	NAME	SIGN	DATE
DRN	JASBEER		07.01.2011
DESN	AMIT R		07.01.2011
C CHD	DK MISHRA		07.01.2011
APPD	DK MISHRA		07.01.2011

TITLE: SERVICE BUILDING
ARCHITECTURAL PLANS EL(±)0.0M, EL(+)4.5M LVL

DEPT. | SCALE | SIGN | DATE

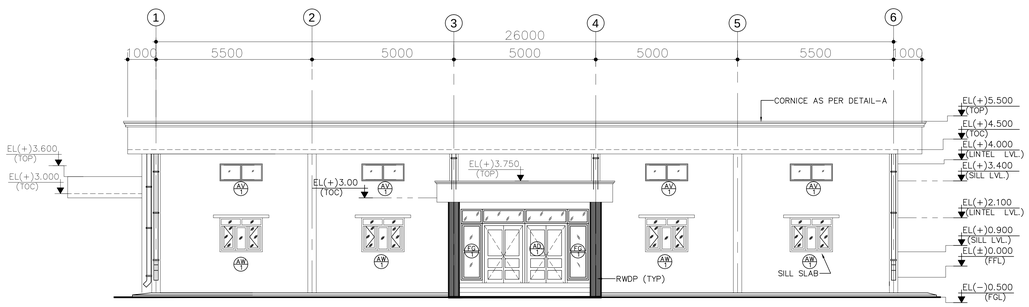
DRAWING NO. PE-DG-374-640-C001

SHEET 1 OF 2 | REV. 2

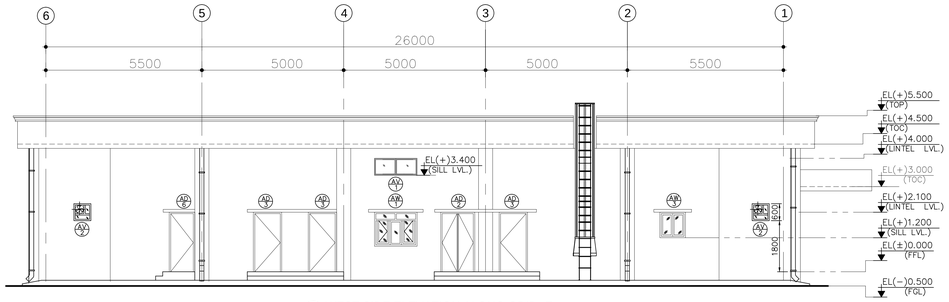
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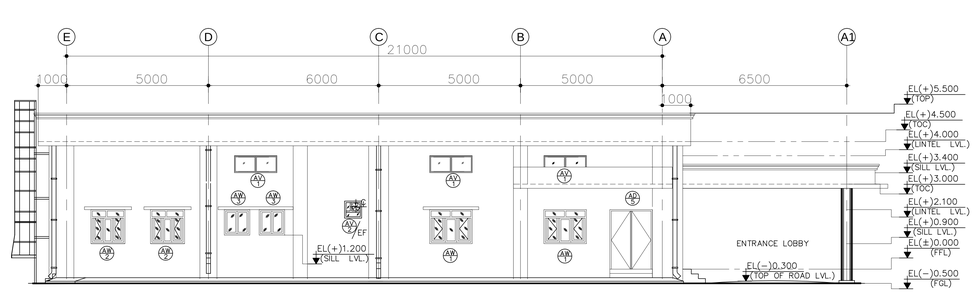
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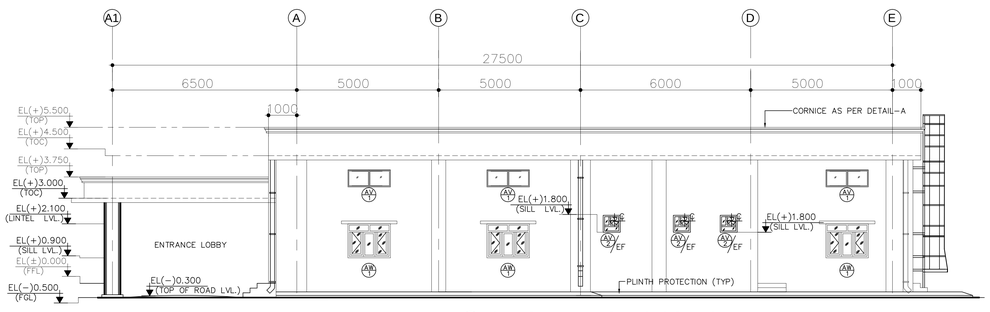
1 EAST SIDE ELEVATION ALONG GRID- A'



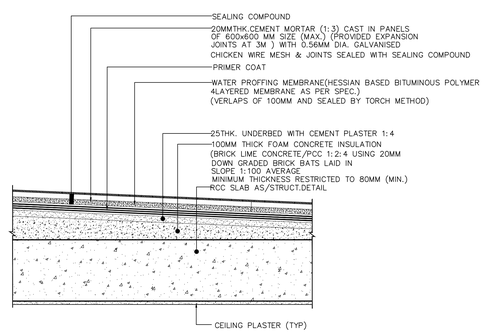
2 WEST SIDE ELEVATION ALONG GRID- E



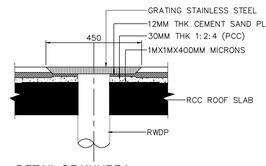
3 SOUTH SIDE ELEVATION ALONG GRID- 1



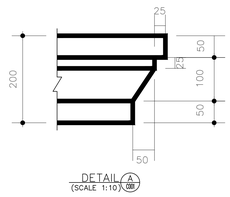
4 NORTH SIDE ELEVATION ALONG GRID- 6



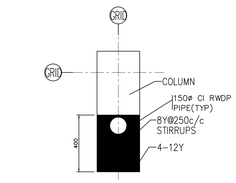
(DETAIL-C) TYPICAL DETAILS OF ROOF WATER PROOFING AND TREATMENT BUILT-UP



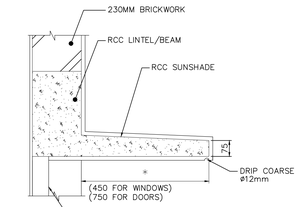
DETAIL OF KHURRA
(SCALE: 1:10)



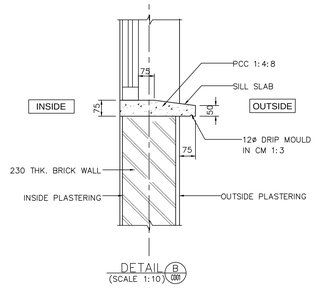
DETAIL A (SCALE 1:10)



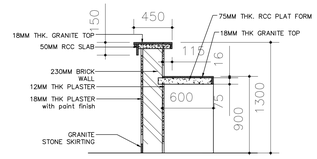
TYP.DETAIL OF RAIN WATER DOWN PIPE ENCASEMENT



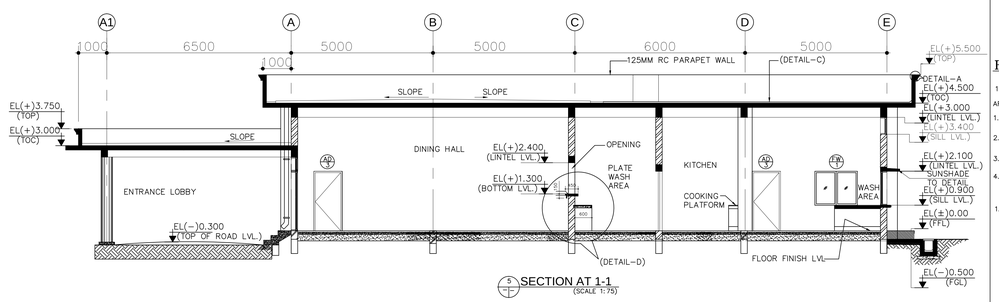
(DETAIL-D)TYPICAL DETAILS OF SUNSHADE



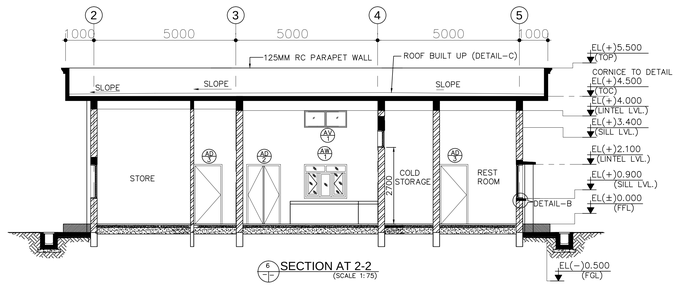
DETAIL B (SCALE 1:10)



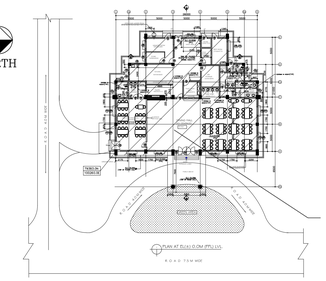
D DETAIL



5 SECTION AT 1-1 (SCALE 1:75)



6 SECTION AT 2-2 (SCALE 1:75)



NOTES:–

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
3. FOR TG COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.

LEGENDS.:–

- CONCRETE HATCH
- –BRICK WALL
- ℄ – CENTER LINE
- EF – EXHAUST FAN
- EL – ELEVATION
- FFL – FINISHED FLOOR LEVEL
- TYP – TYPICAL
- EL(+)X.XXX – LEVEL TAG
- TOC – TOP OF CONCRETE
- TOCP – TOP OF CHEQUERED PLATE
- TOP – TOP OF PARAPET
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRGS.:–

1. PE-DG-374-100-M001 R3A – PLOT PLAN

ARCHITECTURAL STANDARD DRAWINGS

1. PE-DG-374-600-C003(SH10F4)– ARCHITECTURAL STANDARD DETAILS-GENERAL FINISHES & MISC.DETAIL
2. PE-DG-374-600-C003(SH20F4)– ARCHITECTURAL STANDARD DETAILS-GENERAL FINISHES & MISC.DETAIL
3. PE-DG-374-600-C003(SH30F4)– ARCHITECTURAL STANDARD DETAILS OF DOORS
4. PE-DG-374-600-C003(SH40F4)– ARCHITECTURAL STANDARD DETAILS OF WINDOWS

ARCHITECTURAL DRAWINGS

1. PE-DG-374-610-C001(SH10F1)– ARCHITECTURAL PLAN AT EL(±)0.00M LVL. & ROOF PLAN AT EL(+)4.5M

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD		DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
1	21.09.2012	JASBEER	AMIT R	DKM

DRAWING REVISED AS PER COMMENT AND MOM DATED 28.06.2012

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO.	374
STATUS	CONTRACT
DISTRIBUTION	

2X250MW BARAUNI THERMAL POWER STATION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

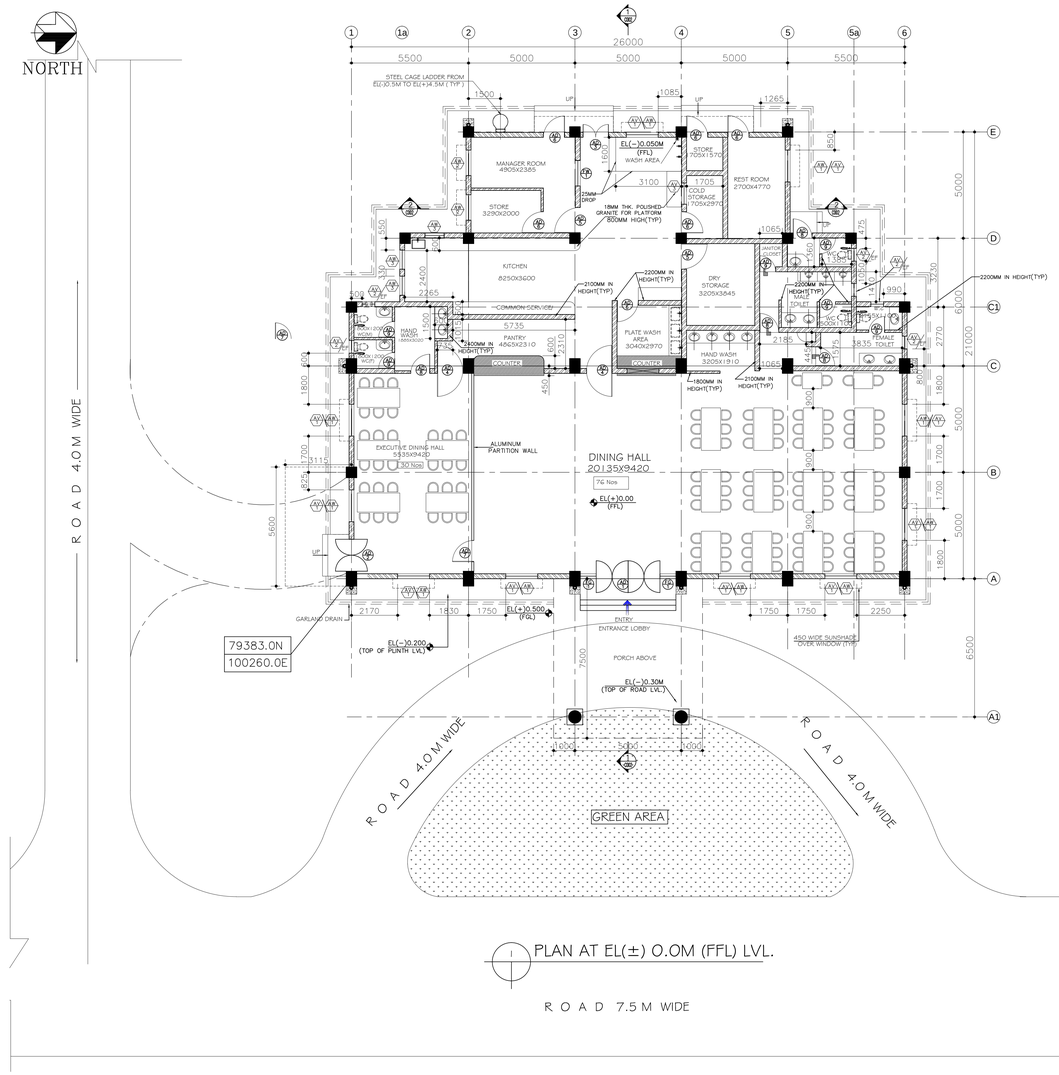
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C	DRN	JASBEER		17.05.2012
	DESN	AR		17.05.2012
	CHD	DKM		17.05.2012
	APPD	ANS		17.05.2012

TITLE: CANTEEN BUILDING
ARCHITECTURAL ELEVATIONS & SECTIONS

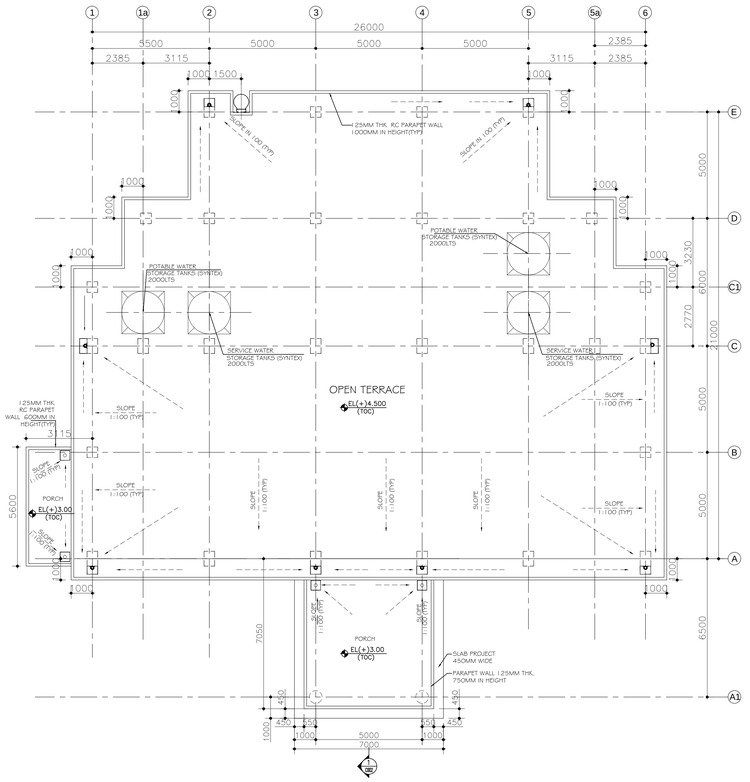
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SIGN		PE–DG–374–610–C002
DATE		SHEET 1 OF 1 REV. 1

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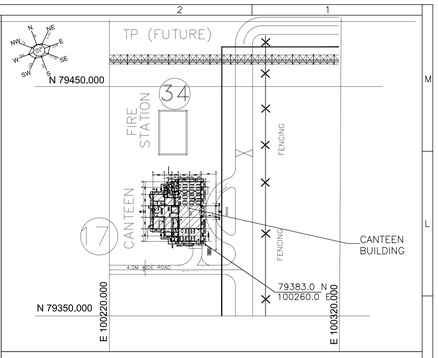
DRAWING NO. PE-DG-374-610-C001



1 PLAN AT EL(±) 0.0M (FFL) LVL.



2 ROOF PLAN AT EL(+) 4.5M (TOC) LVL.



NOTES:–

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION ± 0.00M WHICH CORRESPONDS TO RL(+) 45.5M
3. FOR TG COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.

LEGENDS.:–

- CONCRETE HATCH
- –BRICK WALL
- ℄ – CENTER LINE
- EF – EXHAUST FAN
- EL – ELEVATION
- FFL – FINISHED FLOOR LEVEL
- TYP – TYPICAL
- EL(+)X.XXX – LEVEL TAG
- – TILE DROP
- TOC – TOP OF CONCRETE
- TOCP – TOP OF CHEQUERED PLATE
- TOP – TOP OF PARAPET
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRGS.:–

1. PE-DG-374-100-M001 R3A – PLOT PLAN

ARCHITECTURAL STANDARD DRAWINGS

1. PE-DG-374-600-C003(SH10F4)– ARCHITECTURAL STANDARD DETAILS–GENERAL FINISHES & MISC.DETAIL
2. PE-DG-374-600-C003(SH20F4)– ARCHITECTURAL STANDARD DETAILS–GENERAL FINISHES & MISC.DETAIL
3. PE-DG-374-600-C003(SH30F4)– ARCHITECTURAL STANDARD DETAILS OF DOORS
4. PE-DG-374-600-C003(SH40F4)– ARCHITECTURAL STANDARD DETAILS OF WINDOWS

ARCHITECTURAL DRAWINGS

1. PE-DG-374-610-C002(SH10F1)– ARCHITECTURAL ELEVATIONS & SECTIONS

COVERED AREA:–

DINING & TOILET COVERED AREA	:–	315 SQMT.
KITCHEN+UTILITY SERVICE AREA	:–	183 SQMT.
TOTAL COVERED AREA	:–	315 SQMT+183SQMT =498 SQMT.
PORCH COVERED AREA	:–	52.5 SQMT
SMALL PORCH COVERED AREA	:–	16.0 SQMT

SCHEDULE OF JOINERY

SYMBOL	Nos.	SILL LVL AT EL...,	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
AD 1	01	(±)0.00	3000	2100+500	ALUMINUM FRAMED WITH FLUSH DOOR –DOUBLE SHUTTER (SWING TYPE) FAN LIGHT ABOVE DOOR
AD 2	01	(±)0.00	1500	2100	ALUMINUM FRAMED WITH FLUSH DOOR – DOUBLE SHUTTER (SWING TYPE)
AD 3	01	(±)0.00	1200	2100	ALUMINUM FRAMED WITH FLUSH DOOR – DOUBLE SHUTTER
AD 4	02	(±)0.00	1200	2100	ALUMINUM FRAMED WITH FLAP DOOR–BOTH SIDE OPENABLE – SINGLE SHUTTER –
AD 5	02	(±)0.00	1200	2100	ALUMINUM FRAMED WITH FLUSH DOOR– SINGLE SHUTTER –
AD 6	06	(±)0.00	1000	2100	ALUMINUM FRAMED WITH FLUSH DOOR – SINGLE SHUTTER
AD 7	01	(±)0.00	1000	2100	ALUMINUM FRAMED WITH FULLY GLAZED DOOR
AD 8	04	(±)0.00	1000	2100	ALUMINIUM FLUSH DOOR – SINGLE SHUTTER
AD 9	06	(±)0.00	750	2100	ALUMINIUM FLUSH DOOR – SINGLE SHUTTER
AW 1	10	(+)0.900	1500	1200	ALUMINUM FRAMED PARTLY OPENABLE/FIXED GLAZED WINDOW
AW 2	02	(+)0.900	1200	1200	ALUMINUM FRAMED PARTLY OPENABLE/FIXED GLAZED WINDOW
AW 3	03	(+)1.200	900	900	ALUMINUM FRAMED PARTLY OPENABLE/FIXED GLAZED WINDOW
FW 1	01	(+)0.900	1200	1200	ALUMINUM FRAMED FIXED GLAZED WINDOW
FG 1	02	(+)0.150	750	1950+500	ALUMINUM FRAMED FIXED GLAZED
AV 1	11	(+)3.400	1500	600	ALUMINUM FRAMED FIXED VENTILATOR
AV 2	06	(+)1.800	600	600	ALUMINUM FRAMED LOUVERED VENTILATOR
AV 3	01	(+)2.700	1000	600	ALUMINUM FRAMED FIXED VENTILATOR
EF	06	(+)2.200	300ø		EXHAUST FAN

SERIAL NUMBER	ROOMS	FLOORS: IPS(CEMENT CONCRETE) WITH NON–METALLIC HARDENER TOPPING FLOORING	FLOORS: POLISHED KOTA STONE	FLOORS: UNPOLISHED VITRIFIED TILES 7 TO 10MM THICK.	FLOORS: 10MM THICK POLISHED VITRIFIED CERAMIC TILES POLISHED.	FLOORS: PRE– CAST TERRAZZO TILES	FLOORS: 18MM THICK POLISHED GRANITE STONE FOR COUNTER PLATFORM.	SKIRTING: MARBLE SKIRTING	SKIRTING: 10MM THICK POLISHED VITRIFIED CERAMIC TILES POLISHED.	SKIRTING: POLISHED KOTA STONE SKIRTING	SKIRTING: IPS (CEMENT CONCRETE) WITH NON–METALLIC FLOOR HARDENER	INTERNAL WALLS – DADO: ACID/ALKALI RESISTANT TILES (UPTO 2.1M HEIGHT AS PER IS:4457	INTERNAL WALLS – DADO: COLOURED CERAMIC TILE UP TO 2.1M WITH BEVELLED EDGE FIXED WITH TOP 2 COATS OF OIL BOUND DISTEMPER OVER PLASTER OF PARIS FOR BALANCE HEIGHT.	INTERNAL WALLS – DADO: 6MM GLAZED TILES UPTO 450MM HEIGHTABOVE PLATFORM AS PER IS:777	INTERNAL WALLS – PAINTING: GRANITE STONE TOP SLAB (PLAT FORM)	INTERNAL WALLS – PAINTING: ACRYLIC EMULSION	INTERNAL WALLS – PAINTING: OIL BOUND DISTEMPER	CEILING: CHLORINATED PAINT ABOVE 2.1 M HEIGHT	CEILING: COLOR COATED ALUMINIUM FALSE CEILING (LUXALON OR EQUIVALENT)	CEILING: OIL BOUNDED DISTEMPER	CEILING: WHITE WASHING	CEILING: CHEMICAL RESISTANT CHLORINATED RUBBER PAINT	EXTERNAL WALL
	EL(±)0.00M																							WATER PROOF CEMENT BASE PAINT OVER PLASTERED SURFACE.
1	REST ROOM		●							●								●			●			
2	TOILET			●			●							●				●			●			
3	KITCHEN		●				●							●				●			●			
4	COMMON SERVICE/PANTRY		●				●							●				●			●			
5	DRY STORAGE		●											●				●			●			
6	COLD STORAGE		●											●				●			●			
7	PLATE WASH		●				●							●				●			●			
8	HAND WASH		●											●				●			●			
9	DINING HALL				●				●									●			●			
10	EXECUTIVE DINING HALL				●				●									●			●			
11	MANAGER ROOM		●							●								●			●			
12	STORE		●											●				●			●			
13	WASH AREA		●											●				●			●			

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD

	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
1	21.09.2012	JASBEER	AMIT R	DKM

DRAWING REVISED AS PER COMMENT AND MOM DATED 28.06.2012

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

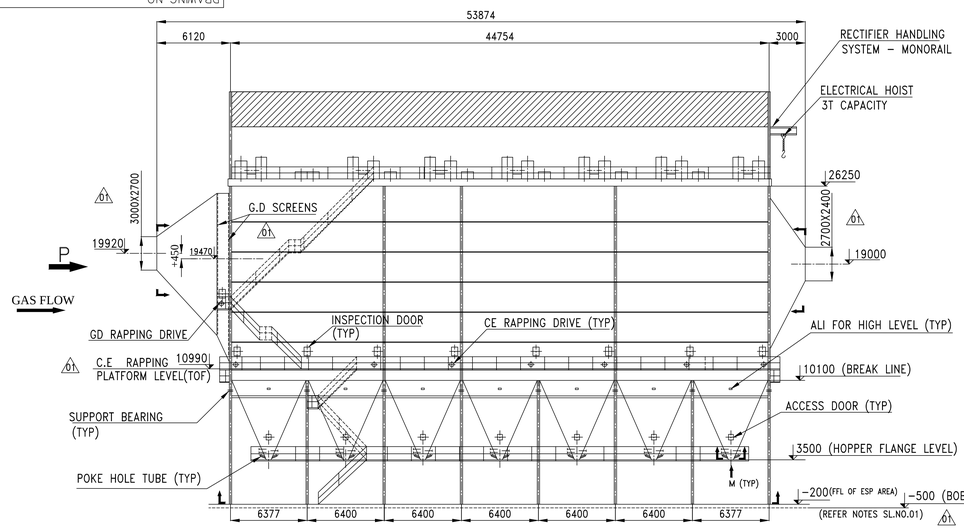
DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		17.05.2012
	DESN	AR		17.05.2012
	CHD	DKM		17.05.2012
	APPD	ANS		17.05.2012

TITLE: CANTEEN BUILDING
ARCHITECTURAL PLAN AT EL(±)0.00M LVL & ROOF PLAN AT EL(+)4.5M LVL

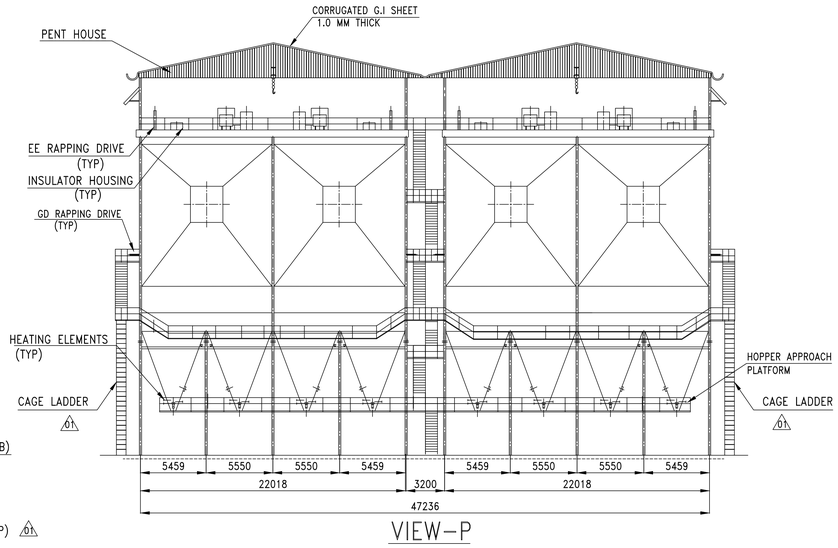
DEPT.	SCALE –1:100	DRAWING NO.
SIGN		PE–DG–374–610–C001
DATE		SHEET 1 OF 1 REV. 1

DRAWING NO. 1-00-111-22073/01

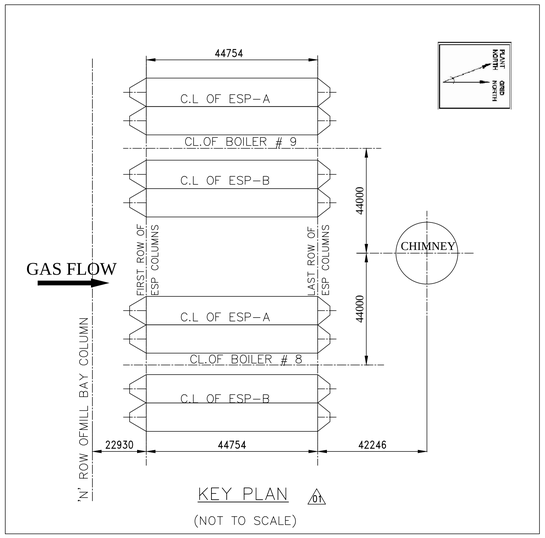
ALL DIMENSIONS ARE IN MILLIMETRES



ELEVATION

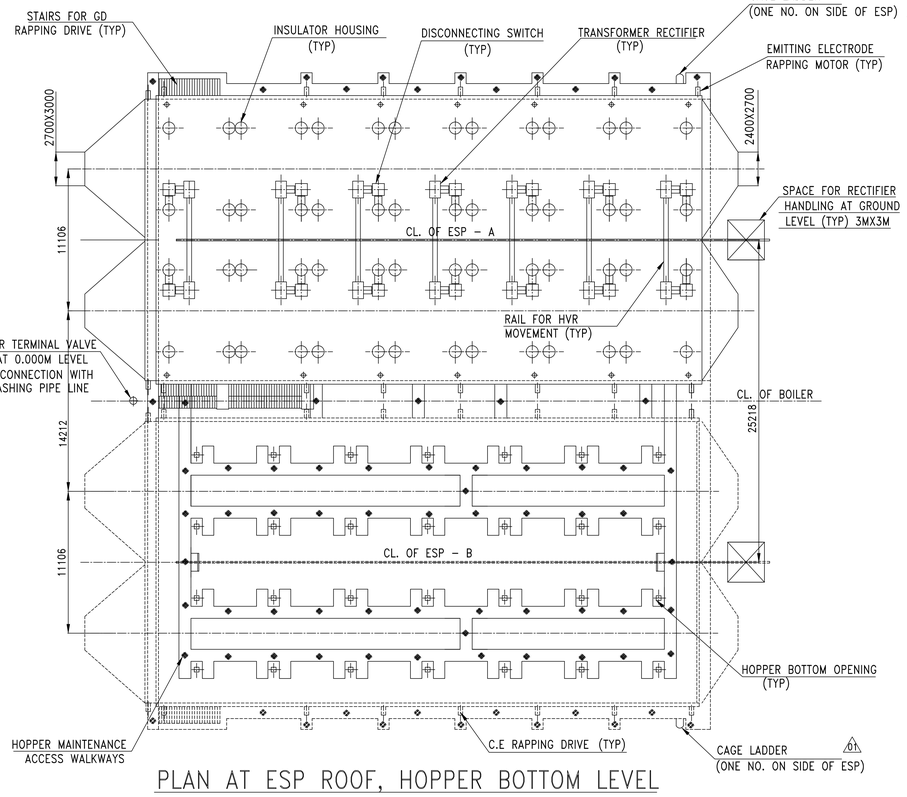


VIEW–P

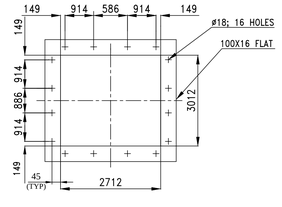


KEY PLAN

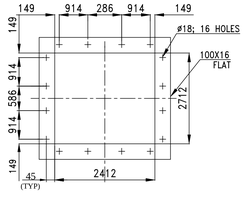
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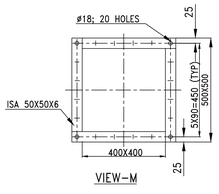
PLAN AT ESP ROOF, HOPPER BOTTOM LEVEL



ESP INLET FUNNEL FLANGE DETAILS (N.T.S)

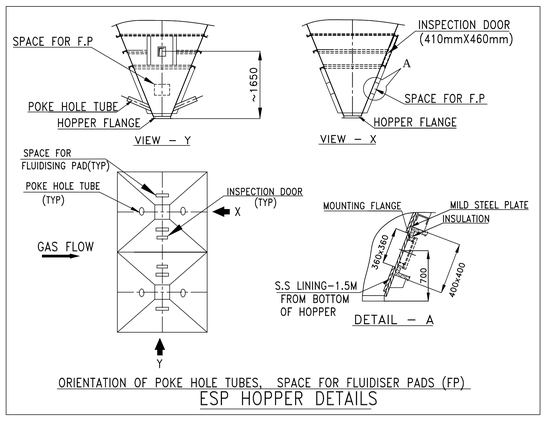


ESP OUTLET FUNNEL FLANGE DETAILS (N.T.S)



VIEW–M

ESP HOPPER OUTLET FLANGE (N.T.S)



ORIENTATION OF POKE HOLE TUBES, SPACE FOR FLUIDISER PADS (FP)

ESP HOPPER DETAILS

SALIENT FEATURES:

SL.No.	DESCRIPTION	DETAILS
01	ESP SIZE	2 NOS: FAA–7X45M–2X108150–2
02	NO. OF TRANSFORMER RECTIFIER (TR) SET PER BOILER	28
03	RATING OF TRANSFORMER RECTIFIER (TR) SET	95 KV (PEAK) /1200 mA (MEAN) (MINERAL OIL)
04	NO. OF CE RAPPING MOTORS PER BOILER	28
05	NO. OF EE RAPPING MOTORS PER BOILER	28
06	NO. OF GD RAPPING MOTORS PER BOILER	4
07	MATERIAL AND THICKNESS OF ESP CASING, HOPPER AND FUNNEL	6 mm THICK MILD STEEL PLATE CONFORMING TO IS 2062
08	MATERIAL AND THICKNESS OF ESP HOPPER LINING	1mm, STAINLESS STEEL LINING
09	MATERIAL AND THICK. OF COLLECTING ELECTRODES	1.25 MM; IS 513 Gr–DD or EQUIVALENT
10	MATERIAL AND THICK. OF EMITTING ELECTRODES	DIA 2.7 MM; 2RK–66 or EQUIVALENT
11	THERMAL INSULATION AND CLADDING THICKNESS	LRB MINERAL WOOL 50MM/0.71 PLAIN ALUMINIUM
12	EXTRA CASING HEIGHT, MM	700

NOTES:

[ ] INDICATES BHEL/RANIPET SCOPE OF SUPPLY.
ESP SIZE: FAA–7X45M–2X108150–2; NO OF ESP PER BOILER: 2.
BOB – BOTTOM OF BASE PLATE.
TOF – TOP OF FLOOR GRILL.

01. THE ELEVATION 0.000 M CORRESPONDS TO FINISHED FLOOR LEVEL (FFL) OF TG HALL. THE FINISHED FLOOR LEVEL (FFL) OF ESP AREA IS (–200 MM). BOB LEVEL OF ESP COLUMN IS (– 500 MM).

02. BHEL/RANIPET SCOPE OF SUPPLY IS BETWEEN ESP INLET FUNNEL FLANGE TO OUTLET FUNNEL FLANGE WHICH EXCLUDES:
* COMPLETE CIVIL DESIGN AND CIVIL WORKS FOR ESP COLUMNS, ESP CONTROL ROOM AND EARTHING PITS.
* COMPLETE FLY ASH HANDLING SYSTEM.

03. THE PERFORMANCE TEST POCKET ADAPTERS WILL BE SUPPLIED IN ESP SCOPE UNDER PGMA 78–961 WHICH ARE TO BE SUITABLY LOCATED IN THE STRAIGHT PORTIONS OF ESP INLET AND OUTLET DUCTS. THE REQUIRED APPROACH PLATFORM FOR THESE TEST POCKETS ARE TO BE PROVIDED IN THE DUCTING SYSTEM BY BHEL / TRICHY.

04. SUITABLE SPLITTERS WILL BE PROVIDED IN THE ESP INLET FUNNEL.

05.(A). SPACE PROVISION IS MADE IN THE BOTTOM POTION OF THE HOPPER FOR INSTALLING FLUIDISER PADS ON THE 2 SIDES IN FUTURE BY THE PURCHASER/ASH HANDLING SYSTEM VENDOR. FOR THIS PURPOSE, 400X400MM SPACE EACH IS PROVIDED ON THE OPPOSITE SIDES (2 SIDES) OF EACH HOPPERS. HOWEVER, FOR EASY FIXING OF FLUIDISING PADS AT A LATER DATE BY THE ASH HANDLING SYSTEM SUPPLIER, THE STAINLESS STEEL LINING INSIDE HOPPER TO THE EXTENT OF 360X360MM WILL BE CUT AT BHEL WORKS DURING MANUFACTURING. THE HOPPER WALL TO A DIMENSION OF 400X400MM SHALL BE CUT AT SITE BY THE ASH HANDLING SYSTEM VENDOR/ASH HANDLING SYSTEM EXECUTING AGENCY AT THE TIMEOF INSTALLING THE FLUIDISING PADS.

(B). STAINLESS STEEL LINING IS ENVISAGED INSIDE THE HOPPER FOR 1.5M HEIGHT FROM BOTTOM.

(C). THERMAL INSULATION SHALL BE APPLIED IN THE AREA OF FLUIDIZING PADS AFTER THE SAME IS INSTALLED BY THE ASH HANDLING SUPPLIER. IN CASE FLUIDIZING PADS, ARE NOT APPLICABLE FOR THIS CONTRACT OR THE FLUIDIZING PADS ARE ENVISAGED TO BE INSTALLED IN FUTURE, THERMAL INSULATION SHALL BE APPLIED IN THE SPACE EARMARKED FOR FLUIDIZING PADS AREA ALSO.

(D). IN CASE, ANY OF THE COMPONENTS OF ASH HANDLING SYSTEM IS TO BE SUPPORTED BELOW HOPPER, THE SUPPORT SHALL BE TAKEN FROM NEIGHBOURING COLUMN OR FROM THE GROUND.

(E). THE HOPPER WALLS SHALL NOT BE WELDED WITH STEEL MEMBERS FOR SUPPORTING OF ANY PIPE LINES, TRAYS ETC.,

(F). THE ASH HANDLING SUPPLIER SHALL HAVE TO PROVIDE AN EXPANSION JOINT AFTER THE HOPPER OUTLET FLANGE. THIS IS TO TAKE CARE OF THE MOVEMENT DUE TO THERMAL EXPANSION DURING THE OPERATION.

06. EACH HOPPER IS DESIGNED FOR 8 hrs ASH STORAGE CAPACITY.

07. EACH HOPPER IS PROVIDED WITH ONE NUMBER OF ASH LEVEL INDICATOR (HIGH LEVEL).

REV	DATE	ALTD	M.RAVICHANDRAN
01	24.08.11	CHD&APPD.	G.GUNASEKAR

ZONE	
B2	G.D SCREENS SHOWN IN ELEVATION AND
D5,D5 C9,C6	EMERGENCY LADDER SHOWN ON SIDE OF ESP AS PER CONSULTANT COMMENTS DT.12.08.11
C5,D9	ESP COLUMN BOB LEVEL REVISED.
C11	KEY PLAN ADDED.
	DRAWING UPDATED.

CAUTION: The information on this drawing is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

CUST NO: R368 & R369

CUSTOMER: Bihar State Electricity Board

CONSULTANT: steag

PROJECT: BARAUNI TPS Expansion Project
2 x 250 MW BOILER ; UNITS–8&9
810 TPH; 155 KG/SQ.CM(G); 540 deg.C

BHARAT HEAVY ELECTRICALS LTD.
UNIT: BOILER AUXILIARIES PLANT.
RANIPET – 632 406.

	NAME	SIGN	DATE
DRN	J.ABINAYA		30.06.11
CHD	G.GUNASEKAR		30.06.11
APPD	G.GUNASEKAR		30.06.11

TITLE: GENERAL ARRANGEMENT OF ELECTROSTATIC PRECIPITATOR

SCALE N.T.S.

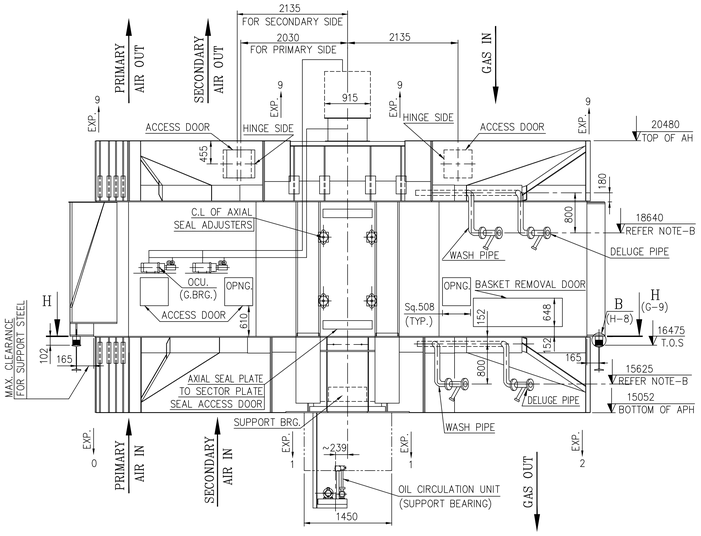
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SHEET 01 OF 01 REV 01

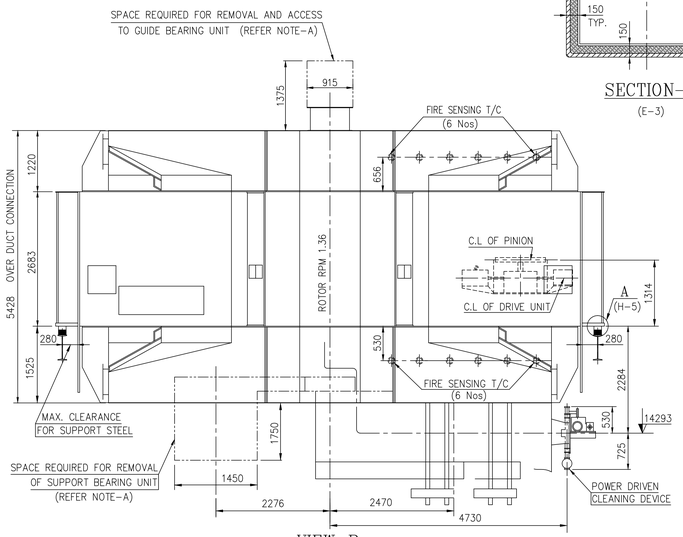
Size A1

DRAWING NO. 1-52-220-02423

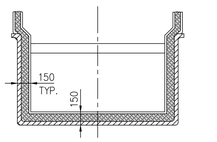
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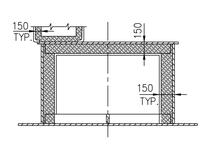
ELEVATION



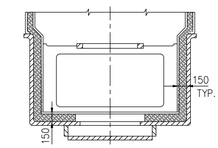
VIEW-R
(E-4)



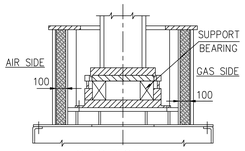
SECTION-GG
(E-3)



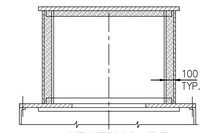
SECTION-KK
(F-2)



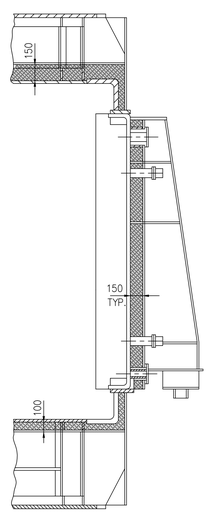
SECTION-FF
(E-3)



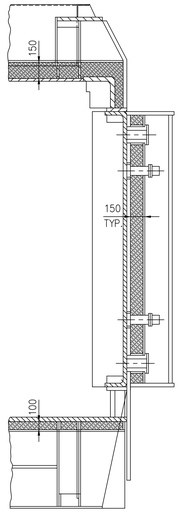
SECTION-NN
(E-6)



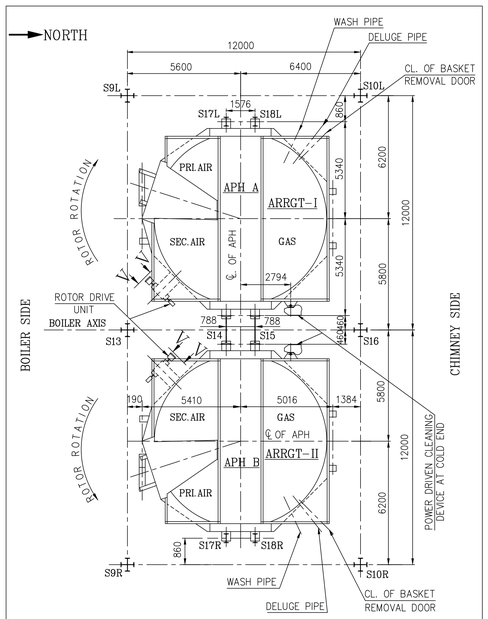
SECTION-PP
(D-6)



SECTION-LL
(F-1)

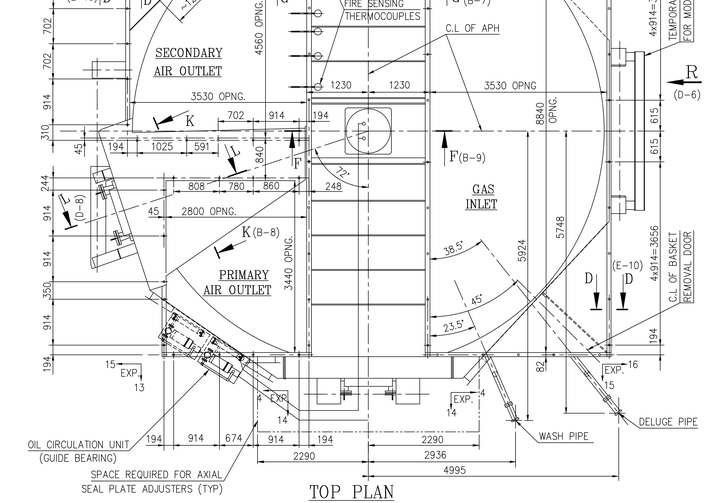


SECTION-MM
(D-3)

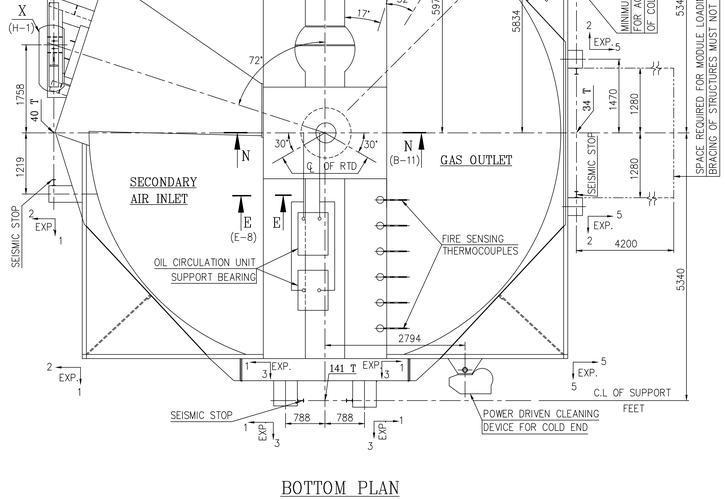


MOTOR ROTATES CLOCKWISE AS VIEWED FROM – V V FOR ARRGT–II
MOTOR ROTATES COUNTER CLOCKWISE AS VIEWED FROM – V V FOR ARRGT–I

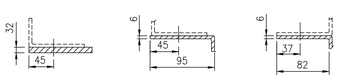
KEY PLAN



TOP PLAN
ARRANGEMENT–II



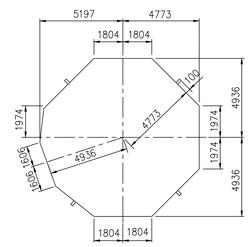
BOTTOM PLAN



SECTION–EE
(F-6)

SECTION–CC
(D-2)

SECTION–DD
(E-1,D-2 & F-4)



SECTION – HH
(C-4)

AIR PREHEATER DATA :

TOTAL WT OF ONE AIR PREHEATER IN Kgs	:	272000 Approx.
WEIGHT OF ONE MODULE ASSY. IN Kgs	:	16500 Approx.
HEAVIEST HOT/HOT INTER BASKET WT IN Kgs	:	700 Approx.
HEAVIEST COLD END BASKET WEIGHT IN Kgs	:	310 Approx.

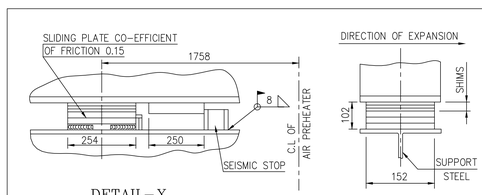
HEATING ELEMENTS DETAILS :

LAYER	TYPE	THICKNESS	HEIGHT	MATERIAL
HOT END	DU	0.63 mm	850 mm	CARBON STEEL
HOT INTER	DU	0.63 mm	850 mm	CARBON STEEL
COLD END	NF	1.21 mm	300 mm	CORTEN STEEL

REFERENCE DRAWINGS :

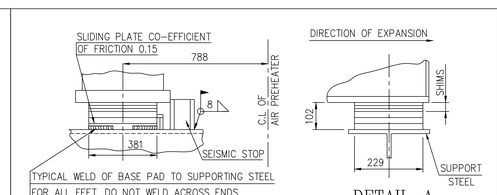
0-00-022-75923	GA OF BOILER SECTIONAL SIDE ELEVATION
0-00-022-75924	GA OF BOILER SECTION PLAN
2-00-114-22509	AIR PREHEATER C & I SCHEME DRAWING

THIS DRAWING IS TO BE READ ALONG WITH THE GAD NOTES DRAWING No : 3-52-220-02324



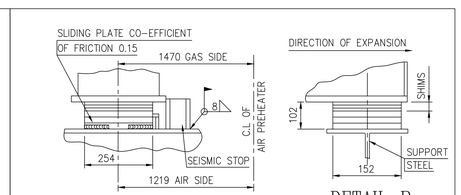
DETAIL–X
(E-5)

SIDE VIEW



SIDE VIEW

DETAIL–A
(C-7)



SIDE VIEW

DETAIL–B
(C-4)

NOTES :

1. All Elevations are refered to Power house ground floor Elevation ± 0.000.M
2. Boiler area finished floor level is 200mm below 0.0M

REV.	DATE	ALTERED / CHECKED

CUSTOMER No. : R368 & R369

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CUSTOMER: Bihar State Electricity Board

CONSULTANT: EVONIK ENERGY SERVICES (INDIA) PVT. LTD.

PROJECT: BARAUNI TPS Expansion Project
2 x 250 MW BOILER ; UNITS-8&9
810 TPH; 155 KG/SQ.CM(G); 540°C/540°C

BHARAT HEAVY ELECTRICALS LIMITED,
BOILER AUXILARIES PLANT UNIT; RANIPET–632 406
355–029

	NAME	SIGNATURE	DATE
DRN	K.P	-sd-	29.06.2011
CHD	G.B.HARIHARAN	-sd-	29.06.2011
APPD	K.PALANICHAMY	-sd-	29.06.2011

ALL DIMENSIONS IN MILLIMETRE

PROJECTION | SCALE N.T.S

TITLE: GENERAL ARRANGEMENT OF AIR PREHEATER 27.5 VIMT 2000

DRG.NO. 1-52-220-02423 | REV 00

Size A1

Project: 2 X 250 MW BSEB, BARAUNI

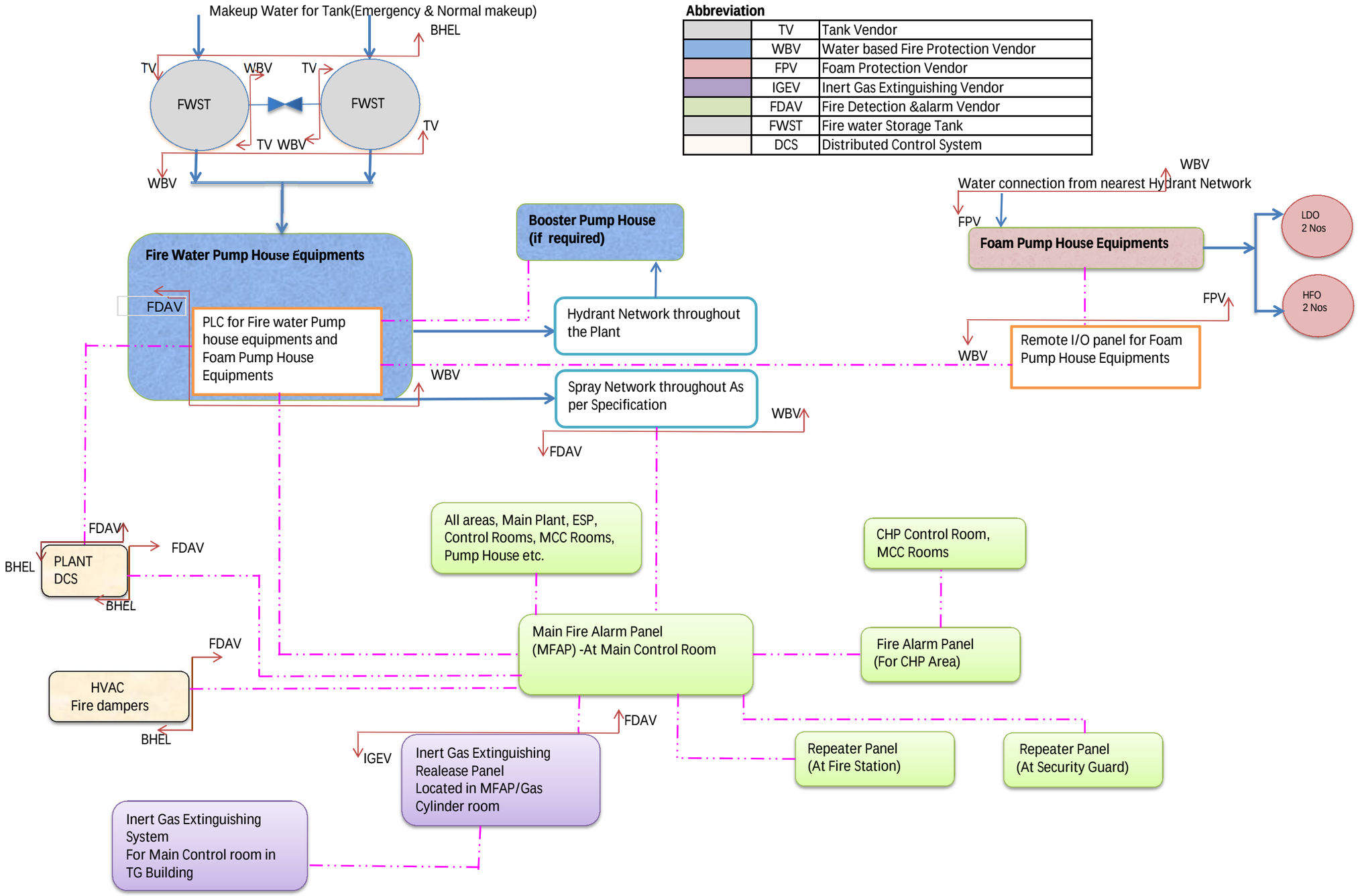
Interface between varoius packages for Fire Protection System

Doc. No. PEMC 03892, Rev -00

Date 08.05.2013

Abbreviation

	TV	Tank Vendor
	WBV	Water based Fire Protection Vendor
	FPV	Foam Protection Vendor
	IGEV	Inert Gas Extinguishing Vendor
	FDAV	Fire Detection &alarm Vendor
	FWST	Fire water Storage Tank
	DCS	Distributed Control System



Note:

1. Signal from Pressure Switch & SOV's in all the area shall be connected to MFAP. Cabling between the PS & SOV and MFAP shall in the scope of FDA Vendor.
2. Potential free contact for HVAC fire dampers shall be provided in MFAP, numbers shall be given in detail engineering.
3. Signal from Level Switchs in the Tank area shall be connected to MFAP. Cabling between the instruments and MFAP shall in the scope of FDA Vendor.

DRAWING NO: 0-00-022-75924

TG SIDE

CHIMNEY SIDE

BEAM BETWEEN M1–M2 & M5–M6 FOR DUCT SUPPORT BY BOP/BUNKER BUILDING SCOPE.

BEAM BETWEEN N1–N2 & N5–N6 FOR DUCT SUPPORT BY BOP/BUNKER BUILDING SCOPE.

ID SYSTEM DUCT SUPPORTS INSIDE THE MILL BAY ARE UNDER THE SCOPE OF MILL BAY DESIGNER AND HENCE CONCERNED LOADING TO BE RECEIVED FROM BHEL/TRICHY.

PEM/CONSULTANT TO CONFIRM THIS COLUMN IN PEM/BOP SCOPE. AS THE FLUE GAS DUCT TO ESP IS PASSING THROUGH THE MILL BAY COLUMN CONNECTING SUPPORT BEAMS SHALL BE IN THE SCOPE OF BUNKER BAY DESIGNER. PLEASE GET LOAD TRANSFER SKETCH FROM BHEL/TRICHY.

PEM/CONSULTANT TO CONFIRM THIS COLUMN IN PEM/BOP SCOPE. AS THE FLUE GAS DUCT TO ESP IS PASSING THROUGH THE MILL BAY COLUMN CONNECTING SUPPORT BEAMS SHALL BE IN THE SCOPE OF BUNKER BAY DESIGNER. PLEASE GET LOAD TRANSFER SKETCH FROM BHEL/TRICHY.

REFERENCE:-

1. REFER DRG 0-00-022-75923 FOR BOILER PARAMETERS, LEGEND, NOTES, REFERENCE DRAWINGS, UNIT DESCRIPTION & FINISHED FLOOR LEVEL.

REV	DATE	ALT'D	
03	18.08.2012	CHD&APPD	R.sasikala / V.Nagendran

ZONE
* FAN HANDLING COLUMNS FH8L&FH8R LEVEL RAISED FROM 10000 TO 25750 TO SUPPORT AH ELEMENT EXTENDED MONORAIL BEAM.
* DRAWING UPDATED.

REV	DATE	ALT'D	
02	21.04.2012	CHD&APPD	R.sasikala / V.Nagendran

ZONE
* BUNKER SHAPE CHANGED BY PEM.
* COAL PIPE ROUTING CHANGED AS PER THE PEM REQUEST TO AVOID INTERFERENCE WITH BUNKER.

REV	DATE	ALT'D	
01	08-08-11	CHD&APPD	K.Suresh / V.Nagendran

ZONE
* PURGE AIR DUCT FOR MILL UPDATED.
* CONSULTANT LOGO UPDATED.
* DRAWING UPDATED.

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CUSTOMER No. : 1248, 1249

CUSTOMER: Bihar State Electricity Board

CONSULTANT: STEAG Energy Services (India) Pvt. Ltd.

PROJECT: BARAUNI TPS Expansion Project
2 x 250 MW BOILER ; UNITS-8&9
810 TPH; 155 KG/SQ.CM(G); 540°C/540°C

BHARAT HEAVY ELECTRICALS LIMITED,
BOILER PLANT UNIT; TIRUCHIRAPALLI-620014
355-029

	NAME	SIGNATURE	DATE
DRN	R.SASIKALA	R.Sasikala	13.6.2011
CHD	V.NAGENDREN	V.Nagendiren	16.6.2011
APPD	N.MURUGAN	N.Murugan	16.6.2011

TITLE: GA OF BOILER SECTIONAL PLAN

ALL DIMENSIONS IN MILLIMETRE

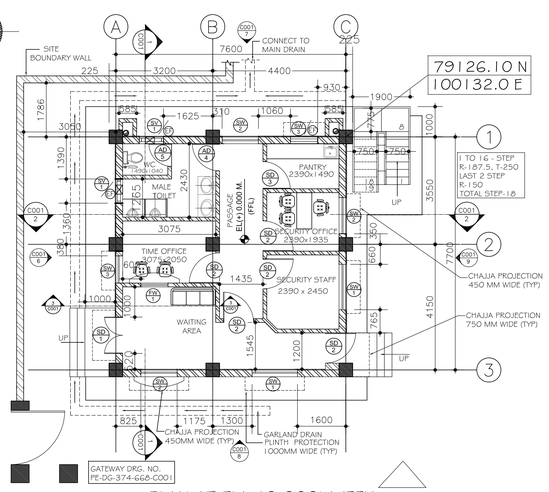
PROJECTION

SCALE 1:100

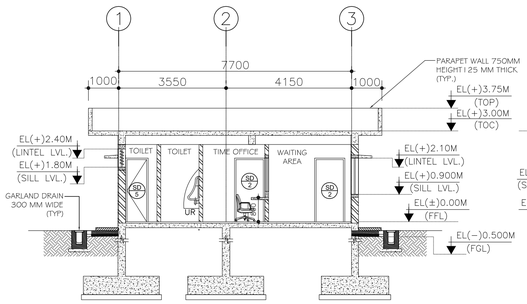
DRG.NO. 0-00-022-75924

REV 03

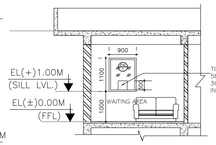
A0-SIZE



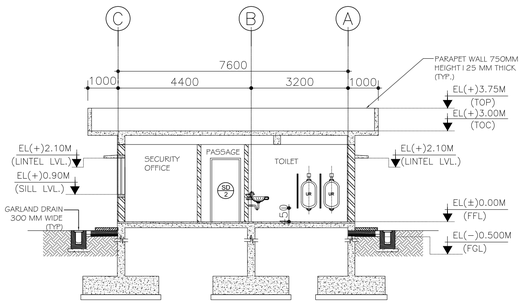
1 PLAN AT EL(±)0.000M (FFL)
(SCALE 1:100)



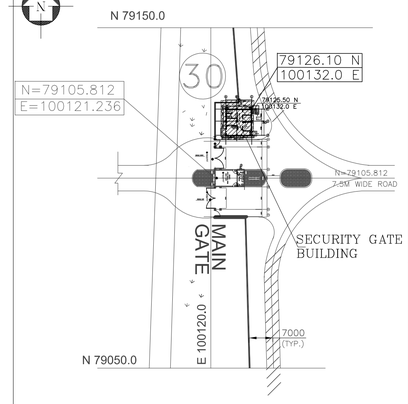
3 SECTION AT 1-1



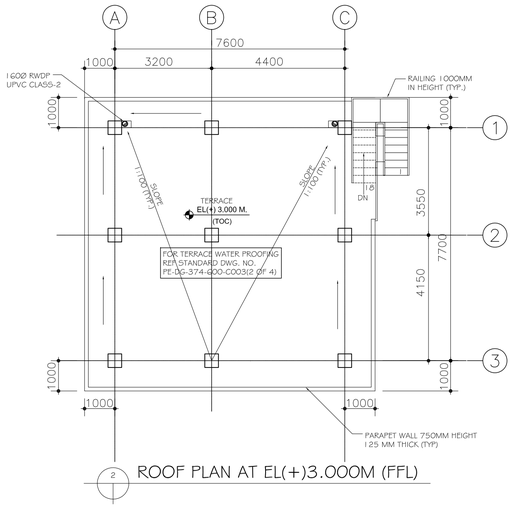
4 PART ELEVATIONAL SECTIONAL DETAIL AT 3-3



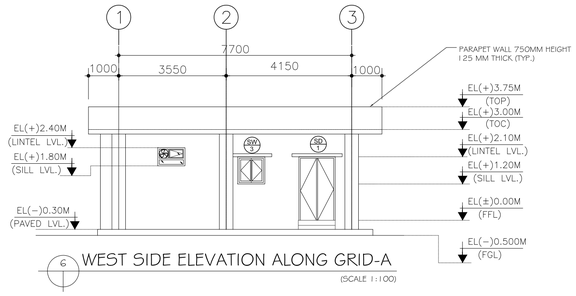
5 SECTION AT 2-2



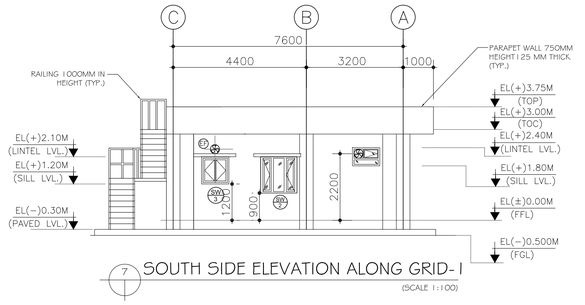
KEY PLAN



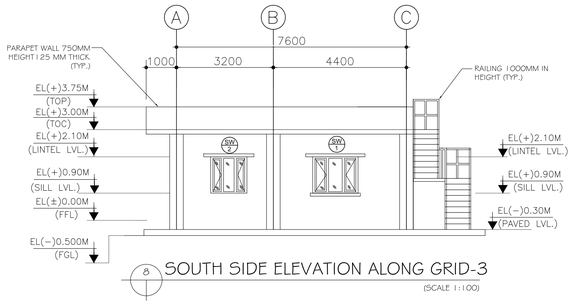
2 ROOF PLAN AT EL(+)3.000M (FFL)



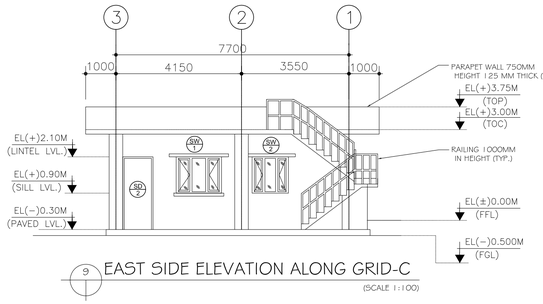
6 WEST SIDE ELEVATION ALONG GRID-A
(SCALE 1:100)



7 SOUTH SIDE ELEVATION ALONG GRID-1
(SCALE 1:100)



8 SOUTH SIDE ELEVATION ALONG GRID-3



9 EAST SIDE ELEVATION ALONG GRID-C
(SCALE 1:100)

DOOR /WINDOW SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL....,	WIDTH	HEIGHT	REMARKS
SD/1	01	(±)0.000	1200	2100	PRESSED STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–DOUBLE SHUTTER
SD/2	05	(±)0.000	1000	2100	PRESSED STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–SINGLE SHUTTER
SD/4	01	(±)0.000	900	2100	PRESSED STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–SINGLE SHUTTER
AD/4	01	(±)0.000	900	2100	ALUMINIUM FRAME WITH MDF SHUTTER –SINGLE SHUTTER
AD/A	01	(±)0.000	750	2100	ALUMINIUM FRAME WITH MDF SHUTTER –SINGLE SHUTTER
SW/1	02	(+)0.900	1500	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW
SW/2	02	(+)0.900	1200	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW
SW/3	02	(+)1.200	900	900	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW
FW/1	01	(+)1.000	900	1100	FIXED GLASS WINDOW WITH CUT GLASS SERVICE WINDOW FOR ISSUE GATE PASS
SV/1	02	(+)1.800	900	600	STEEL FRAMED OPENABLE GLAZED VENTILATOR
EF	02	(+)2.200(℄)	300ø		EXHAUST FAN
	01	(+)2.350(℄)			

SERIAL NUMBER	ROOMS	FLOORS						SKIRTING					INTERNAL WALLS: DADO					INTERNAL WALLS: PAINTING	CEILING		FALSE CEILING		EXTERNAL WALL
		IPS(CEMENT CONCRETE) WITH NON-METALLIC HARDENER TOPPING FLOORING	PVC TILES	10MM THICK VITRIFIED CERAMIC TILES	HEAVY DUTY CERAMIC TILES.	UNPOLISHED VITRIFIED TILES (DOUBLE CHARGE).	PRE-CAST TERRAZZO TILES	UNGLAZED CERAMIC TILES	HEAVY DUTY CERAMIC TILES.	PVC TILES	PRE-CAST TERRAZZO TILES	IPS (CEMENT CONCRETE) WITH NON-METALLIC FLOOR HARDENER	COLOURED CERAMIC TILE UP TO 2.1M WITH BORDER TILES IN WORK AREA	COLOURED CERAMIC TILE UP TO 2.1M WITH BORDER TILES BEYOND DESIRED	8MM GLAZED TILES (BPM) AS PER IS:777	GRANITE STONE TOP SLAB (ALL FLOOR)	ACRYLIC EMULSION PAINT OVER 2MM THICK PLASTER OF PARIS PUNNING	OIL BOUND DISTEMPER	COLOR COATED ALUMINIUM FALSE CEILING (LUXALON OR EQUIVALENT)	OIL BOUNDED DISTEMPER	FIRE RESISTANT PARTICLE BOARD	LUXALON OR EQUIVALENT	CEMENT BASED WATER PROOF PAINT
	SECURITY GATE HOUSE																						
1	SECURITY OFFICE						●				●							●		●			
2	TIME OFFICE						●				●							●		●			
3	SECURITY STAFF						●				●							●		●			
4	WAITING AREA				●				●									●		●			
10	PANTRY			●										●				●		●			
11	TOILET					●							●					●		●			
12	PASSAGE				●				●									●		●			
13	RCC STAIRCASE						●													●			

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)45.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
5	PE-DG-374-668-C001 (SH1OF2)	ARCHITECTURAL DETAIL OF GATEWAY &SECURITY GATE HOUSE PLAN
6	PE-DG-374-668-C001 (SH2OF2)	ARCHITECTURAL DETAIL OF GATEWAY &SECURITY GATE HOUSE ROOF PLAN,ELEVATION AND SECTION DETAILS
STRUCTURAL DRAWING		
1.	PE-DG-374-668-C005	STRUCTURAL DRAWING

AREA:- TOTAL COVED. AREA = 65 SQMT.

IMPORTANT NOTE:– THIS DRAWING SUPERCEDED ALL THE REVISION AND DCN ISSUED EARLIER.

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
R1	18.05.13	TASHEER	AR	DGM/AKS

R1 DRAWING REVISED AS PER CUTOMER COMMENTS
1) WAITING AREA/TIME OFFICE, ENTRANCE & EXIT TO BUILDING
2) EXTERNAL STAIRCASE ADDED IN PLAN ELEVATION DETAIL.

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CUSTOMER: BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374
STATUS CONTRACT
DISTRIBUTION
2X250MW BARAUNI THERMAL POWER STATION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DSN	JASVEER		13.08.2012
	DGN	AMIT R		13.08.2012
	CHD	DK MISHRA		13.08.2012
	APPD	AKS		13.08.2012

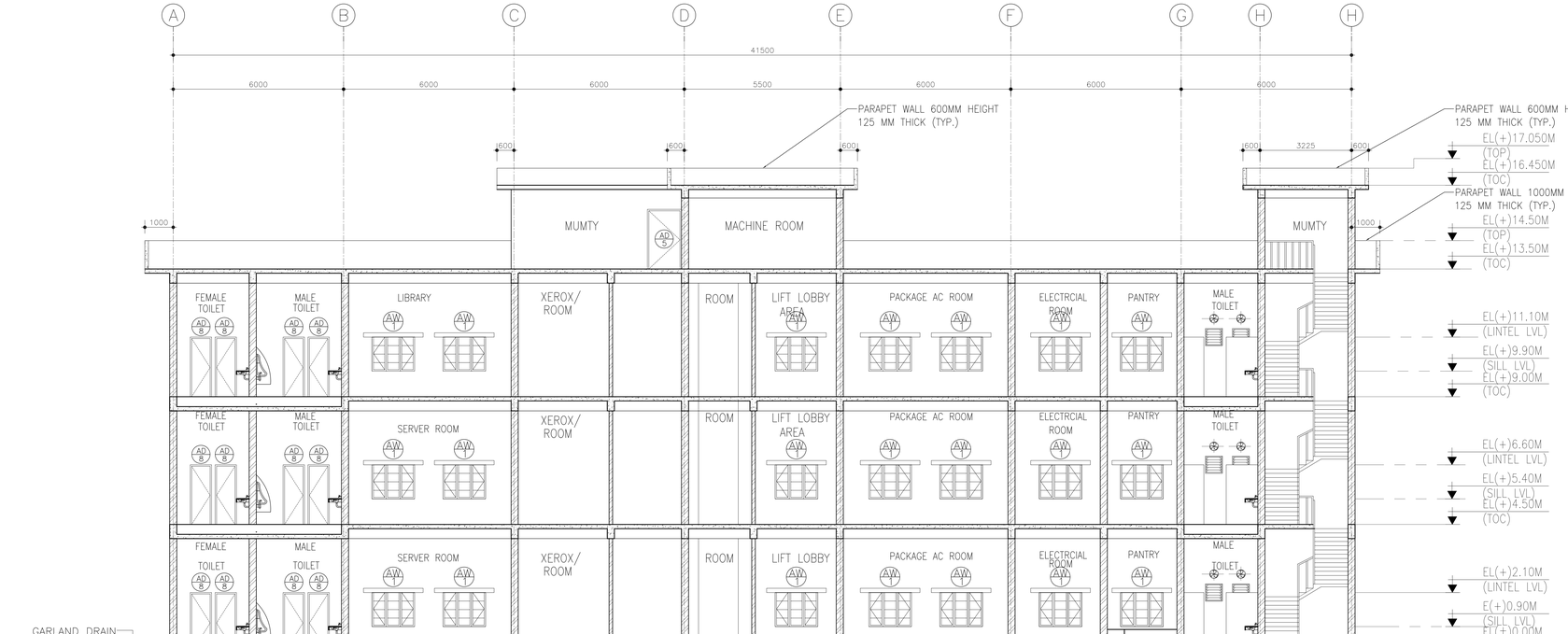
TITLE: SECURITY GATE BUILDING
ARCHITECTURAL PLANS EL(±)0.0M, ROOF PLAN, SECTIONS & ELEVATIONS

DEPT. | SCALE | DRAWING NO. PE-DG-374-668-C004
SIGN | DATE | SHEET 1 OF 1 | REV. 1

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

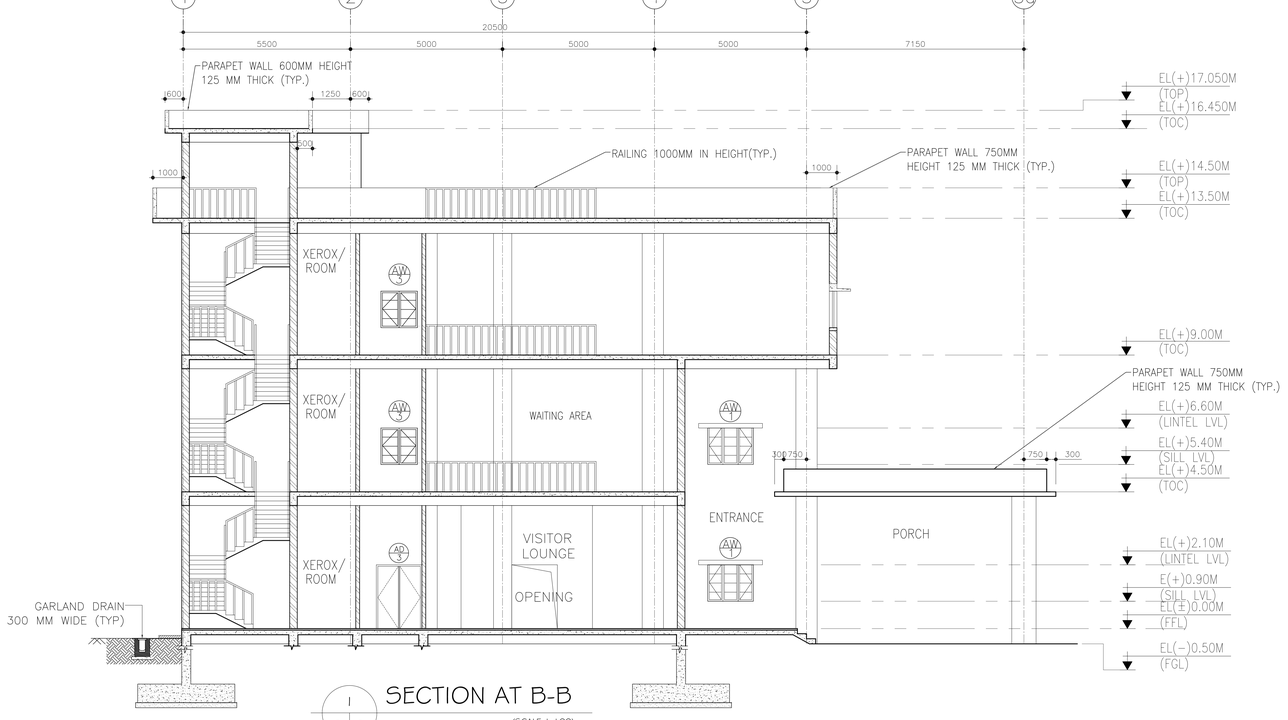
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DRAWING NO. PE-DG-347-641-C001



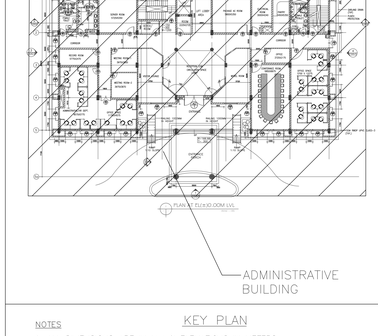
SECTION AT A-A

(SCALE 1:100)



SECTION AT B-B

(SCALE 1:100)



ADMINISTRATIVE BUILDING

KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)45.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2		
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
ARCHITECTURAL DRAWING		
1	PE-DG-374-641-C001 (SH 1OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL PLANS EL(±)0.0M
2	PE-DG-374-641-C001 (SH 2 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL PLANS EL(+)4.50M & EL(+)9.00M LVL.
3	PE-DG-374-641-C001 (SH 3 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL ROOF PLAN & FINISHING SCHEDULE
4	PE-DG-374-641-C003	ADMINISTRATIVE BUILDING ARCHITECTURAL ELEVATIONS

CUSTOMER: BIHAR STATE ELECTRICITY BOARD

CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

JOB NO. 374

STATUS CONTRACT

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD
	05.12.2011	JASBEER	AMIT R	DKM

2X250MW BARAUNI THERMAL POWER STATION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		10.01.2013
	DSGN	AMIT R		10.01.2013
	CHD	DK MISHRA		10.01.2013
	APPD	AK SINGH		10.01.2013

TITLE: ADMINISTRATIVE BUILDING
ARCHITECTURAL SECTIONS

DEPT. | SCALE | DRAWING NO. PE-DG-374-641-C002

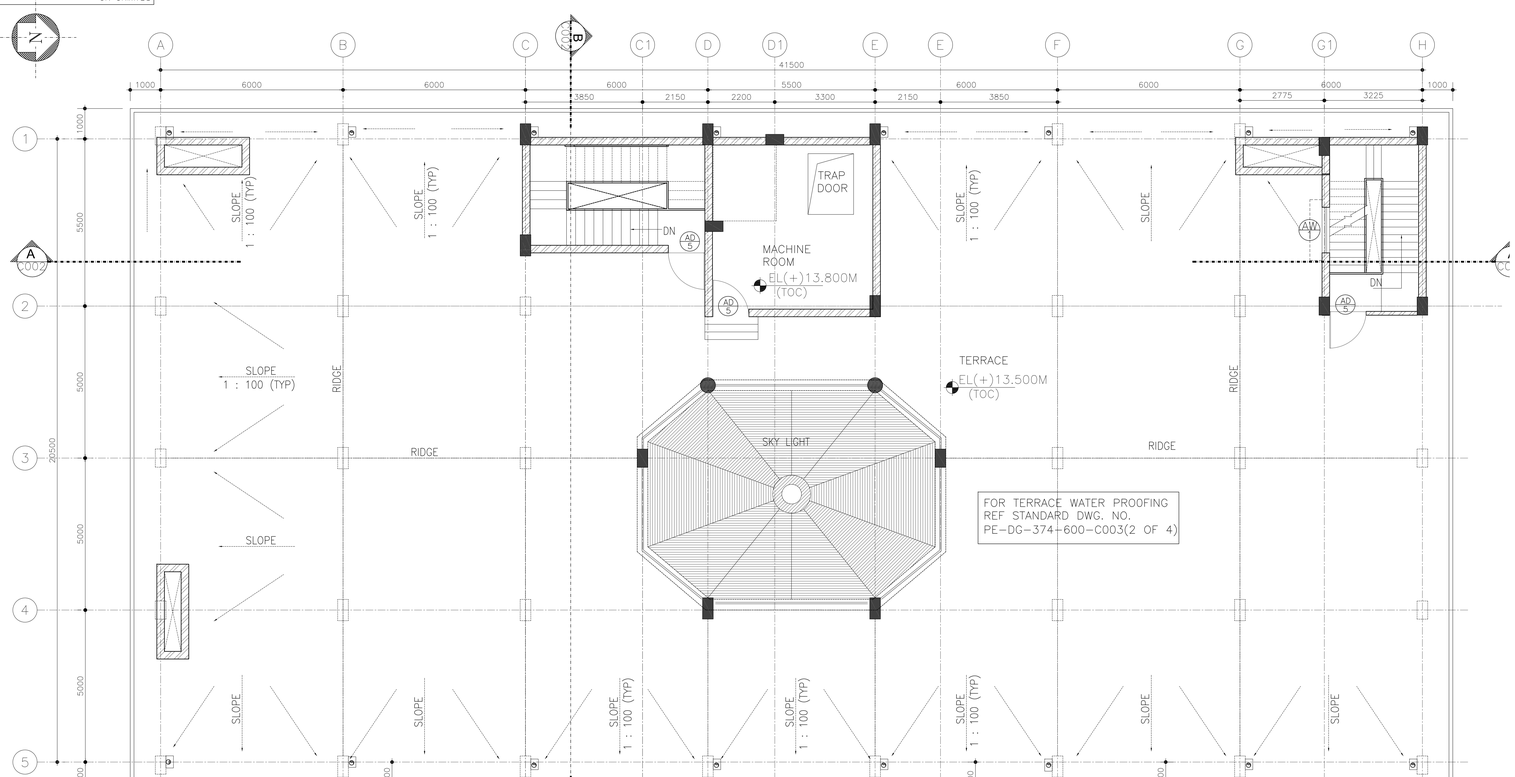
SIGN | DATE | SHEET 1 OF 1 | REV. 0

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PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

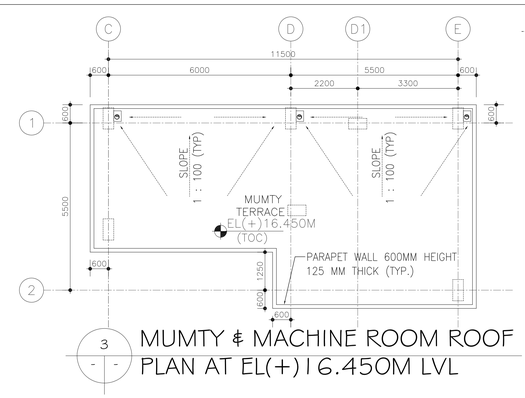
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DRAWING NO. PE-DG-347-641-C001

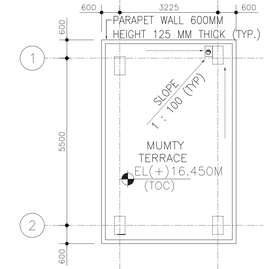


2 PLAN AT EL(+)13.50M LVL

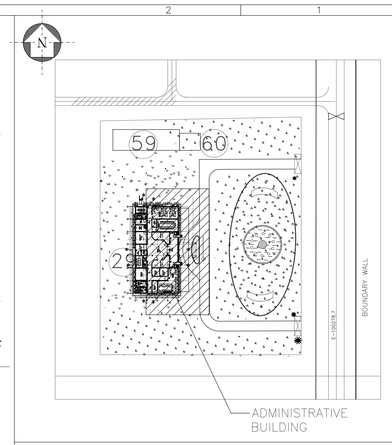
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3 MUMTY & MACHINE ROOM ROOF PLAN AT EL(+)16.450M LVL



4 MUMTY ROOF PLAN AT EL(+)16.450M LVL



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)45.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

EXTERNAL FINISH SCHEDULE:-

1. ALL PLASTERED/CONCRETE SURFACES SHALL BE PAINTED WITH TEXTURED PAINT OF APPROVED COLOUR (SANDTEX MAT (OR) EQUIVALENT) WITH A COMBINATION OF RESIN BONDED GRANULAR FINISH (VINERATEX (OR) EQUIVALENT)

LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2		
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
ARCHITECTURAL DRAWING		
1	PE-DG-374-641-C001 (SH 1OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL PLANS EL(±)0.0M
2	PE-DG-374-641-C001 (SH 2 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL PLANS EL(+)4.50M & EL(+)9.00M LVL
3	PE-DG-374-641-C002	ADMINISTRATIVE BUILDING ARCHITECTURAL SECTIONS
4	PE-DG-374-641-C003	ADMINISTRATIVE BUILDING ARCHITECTURAL ELEVATIONS

FINISHING SCHEDULE:

SERIAL NUMBER	ROOMS	FLOORS: 25MM THICK POLISHED GRANITE STONE	FLOORS: 18MM THICK POLISHED GRANITE STONE	FLOORS: CAST-IN-SITU TERRAZZO FLOORING FOR WORK AND ENTRANCE	FLOORS: CERAMIC TILES	SKIRTING: 10MM THICK VITRIFIED CERAMIC TILES IN COMBINATION OF MATCHING SHADES	SKIRTING: 10MM THICK VITRIFIED CERAMIC TILES IN COMBINATION OF MIRROR POLISHED	SKIRTING: 18MM THICK POLISHED GRANITE STONE	SKIRTING: GOLDAPEL CERAMIC TILE MATT FINISH OF 10 TO 12M HT. ACRYLIC EMULSION PAINT FOR THE REMAINING BALANCE HEIGHT.	SKIRTING: IPS (CEMENT CONCRETE) WITH NON-METALLIC HARDENER TROWEL FINISH & FLOATED FINISHING	INTERNAL WALLS – DADO: 10MM THICK VITRIFIED CERAMIC TILES IN COMBINATION OF MIRROR POLISHED	INTERNAL WALLS – DADO: 10MM THICK VITRIFIED CERAMIC TILES IN COMBINATION OF MIRROR POLISHED	INTERNAL WALLS – PAINTING: ACRYLIC EMULSION PAINT FOR THE REMAINING BALANCE HEIGHT	INTERNAL WALLS – PAINTING: GLAZED TILES UPTO 2.1M HEIGHT AS PER SI.NO.1	INTERNAL WALLS – PAINTING: GRANITE STONE TOP SLAB FOR COUNTER	INTERNAL WALLS – PAINTING: ACRYLIC EMULSION PAINT OVER 2MM THICK PLASTER OF PARIS FINISH	CEILING: OIL BOUND DISTEMPER	CEILING: COLOUR COATED ALUMINIUM FALSE CEILING (AVALON OR EQUIVALENT)	CEILING: OIL BOUNDED DISTEMPER	EXTERNAL WALL: WHITE WASHING
	EL(±)0.00M																				
1.	RECORD ROOM						●				●							●		●	CEMENT BASED WATER PROOF PAINT
2.	ADMINISTRATIVE/HR DEPT.						●				●							●		●	
3.	MEETING ROOM						●				●							●		●	
4.	OFFICE SPACE						●				●							●		●	
5.	VISITOR LOUNGE						●				●							●		●	
6.	RECEPTION						●				●								●	●	
7.	MODEL ROOM						●				●								●	●	
8.	CONFERANCE ROOM						●				●							●		●	
	EL(+)4.50M																				
9.	FINANCE DEPT.						●				●							●		●	
10.	CONFERANCE ROOM						●				●							●		●	
11.	WAITING AREA						●				●								●	●	
12.	WAITING AREA FOR VISITOR						●				●								●	●	
13.	MEETING ROOM						●				●							●		●	
14.	P.A. ROOM						●				●							●		●	
15.	SR. EXECUTIVE ROOM						●				●							●		●	
16.	MANAGER ROOM						●				●							●		●	
	EL(+)9.00M																				
17.	LIBRARY						●				●							●		●	
18.	SR. EXECUTIVE ROOM						●				●							●		●	
19.	ADMINISTRATIVE/HR DEPT.						●				●							●		●	
20.	MANAGER ROOM						●				●							●		●	
21.	MEETING ROOM						●				●							●		●	
22.	RECORD ROOM						●				●								●	●	
	EL(±)0.00M,EL(+)4.50M & EL(+)9.00M (COMMON AREA)																				
23.	TOILET				●									●				●		●	
24.	SERVER ROOM						●				●							●		●	
25.	LIFT LOBBY AREA		●					●										●		●	
26.	PACKAGE AC ROOM						●				●							●		●	
27.	ELECTRICAL ROOM						●				●							●		●	
28.	PANTRY				●									●				●		●	
29.	LIFT		●					●										●		●	
30.	ROOM						●				●								●	●	
31.	CORRIDOR		●					●										●		●	
32.	STAIR			●					●											●	

DOOR OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL....	MASONRY WIDTH	OPENING HEIGHT	REMARKS
AD1	01	(±)0.000	3000	2100	GLAZED DOORS WINDOW WITH ALUMINIUM FRAME– DOUBLE SHUTTER
AD2	01	(±)0.000	1800	2100	GLAZED DOORS WITH ALUMINIUM FRAME– SINGAL SHUTTER
AD3	02	(±)0.000	1500	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
AD4	02	(±)0.000	1500	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	03	(+)4.500			
	01	(+)9.000			
AD5	04	(±)0.000	1200	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	04	(+)4.500			
	06	(+)9.000			
AD6	08	(±)0.000	1000	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	12	(+)4.500			
	21	(+)9.000			
AD7	03	(±)0.000	900	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
	03	(+)4.500			
	03	(+)9.000			
AD8	05	(±)0.000	750	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
	07	(+)4.500			
	07	(+)9.000			

WINDOW OPENINGS SCHEDULE

AW1	21	(+)0.900	1500	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	20	(+)5.400			
	23	(+)9.900			
	01	(+)14.400			
AW2	02	(+)5.400	2000	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	02	(+)9.900			
AW3	01	(+)5.400	1200	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	3	(+)9.900			
AW4	01	(+)0.900	900	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	01	(+)5.400			
	01	(+)9.900			
AV1	10	(+)1.800	600	600	POWDER COATED ALUMINUM FRAMED VENTILATOR
	12	(+)6.300			
	14	(+)10.80			
EF	10	(+)1.800	330ø		EXHAUST FAN
	12	(+)6.300			
	14	(+)10.80			

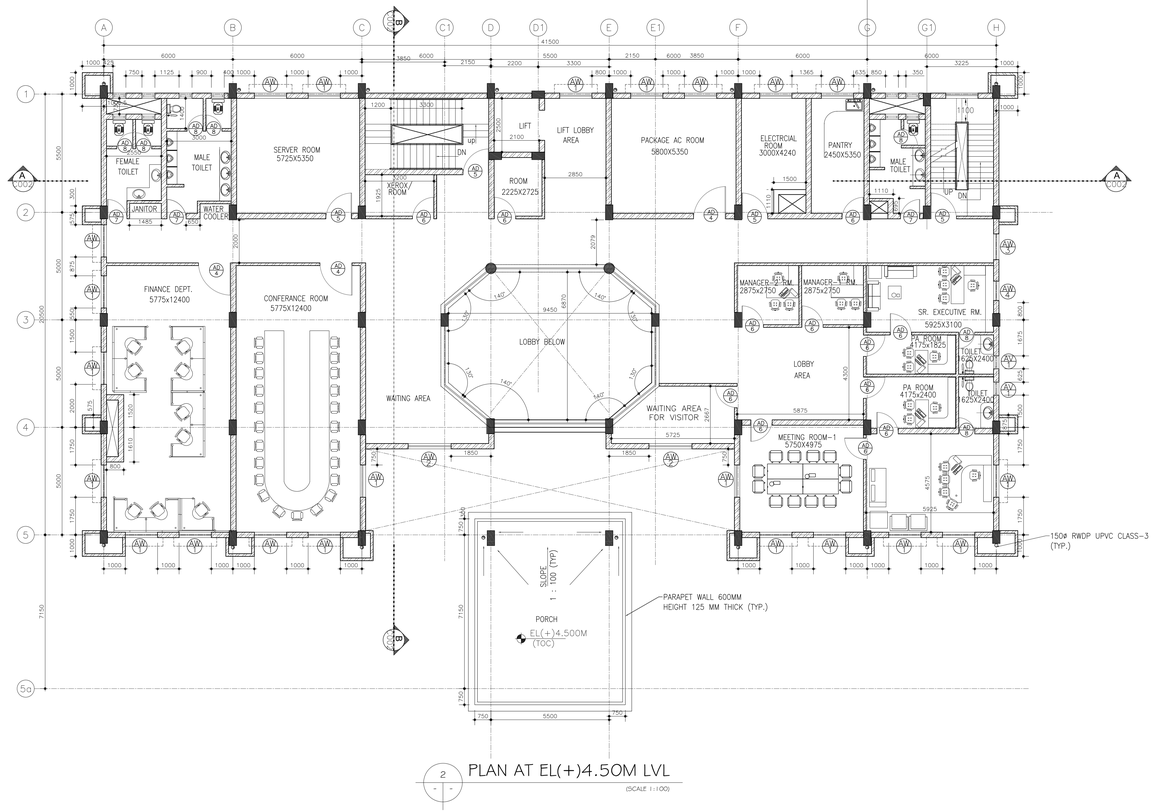
CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	
STATUS CONTRACT	2X250MW BARAUNI THERMAL POWER STATION
DISTRIBUTION	
05.12.2011 JASBEER AMIT R DKM	BHARAT HEAVY ELECTRICALS LTD, POWER SECTOR, PROJECT ENGINEERING MANAGEMENT, NEW DELHI
REV. DATE ALTD CHD APPD	TITLE: ADMINISTRATIVE BUILDING, ARCHITECTURAL ROOF PLAN & FINISHING SCHEDULE
	DEPT CODE C; DRN JASBEER 10.01.2013; DSGN AMIT R 10.01.2013; CHD DK MISHRA 10.01.2013; APPD AK SINGH 10.01.2013
	DEPT. SCALE; SIGN; DATE; DRAWING NO. PE-DG-374-641-C001; SHEET 3 OF 3; REV. 1

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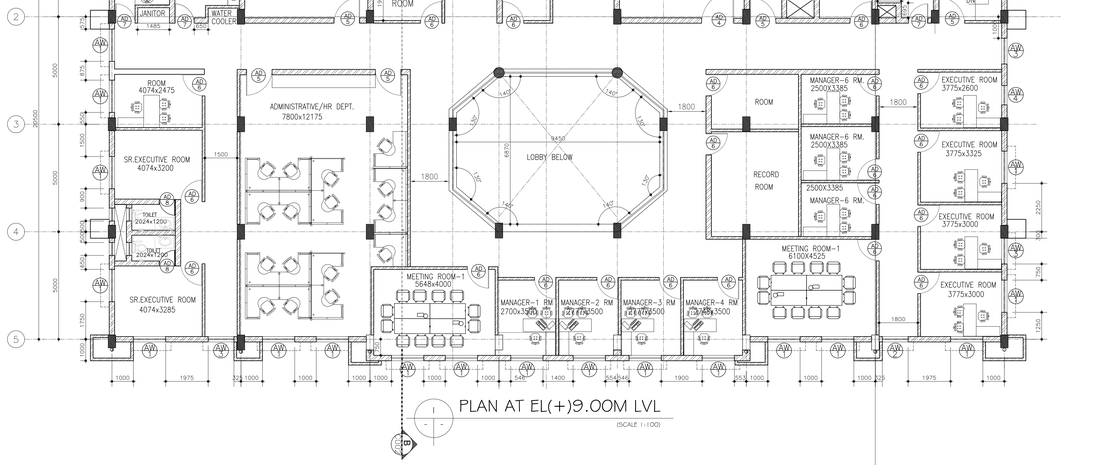
DRAWING NO. PE-DG-347-641-C001

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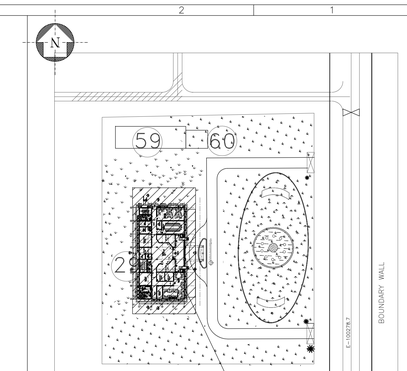
2 PLAN AT EL(+)4.5OM LVL

(SCALE 1:100)



1 PLAN AT EL(+)9.OOM LVL

(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
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DOOR OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL....	MASONRY WIDTH	OPENING HEIGHT	REMARKS
AD1	01	(±)0.000	3000	2100	GLAZED DOORS WINDOW WITH ALUMINIUM FRAME– DOUBLE SHUTTER
AD2	01	(±)0.000	1800	2100	GLAZED DOORS WITH ALUMINIUM FRAME– SINGAL SHUTTER
AD3	02	(±)0.000	1500	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
AD4	02	(±)0.000	1500	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	03	(+)4.500			
	01	(+)9.000			
AD5	04	(±)0.000	1200	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
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	06	(+)9.000			
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	21	(+)9.000			
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	03	(+)4.500			
	03	(+)9.000			
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	07	(+)4.500			
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	20	(+)5.400			
	23	(+)9.900			
	01	(+)14.400			
AW2	02	(+)5.400	2000	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	02	(+)9.900			
AW3	01	(+)5.400	1200	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	3	(+)9.900			
AW4	01	(+)0.900	900	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	01	(+)5.400			
	01	(+)9.900			
AV1	10	(+)1.800	600	600	POWDER COATED ALUMINUM FRAMED VENTILATOR
	12	(+)6.300			
	14	(+)10.80			
EF	10	(+)1.800	330ø		EXHAUST FAN
	12	(+)6.300			
	14	(+)10.80			

EXTERNAL FINISH SCHEDULE:–

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LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- EL – ELEVATION
- E/F – EXHAUST FAN
- FFL – FINISHED FLOOR LEVEL
- FGL – FORMED GROUND LEVEL
- RWDP – RAIN WATER DOWN TAKEN PIPE
- THK – THICKNESS
- TOC – TOP OF CONCRETE
- TYP – TYPICAL
- UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2		
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
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ARCHITECTURAL DRAWING		
1	PE-DG-374-641-C001 (SH 1 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL PLANS EL(±)0.0M,
2	PE-DG-374-641-C001 (SH 3 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL ROOF PLAN & FINISHING SCHEDULE
3	PE-DG-374-641-C002	ADMINISTRATIVE BUILDING ARCHITECTURAL SECTIONS
4	PE-DG-374-641-C003	ADMINISTRATIVE BUILDING ARCHITECTURAL ELEVATIONS

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD
1	08-01-2013	JASBEER	AMIT R	DKM
	Drawing revised as per customer comments			

05.12.2011 JASBEER AMIT R DKM

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		25.07.2012
	DESN	AMIT R		25.07.2012
	CHD	DK MISHRA		25.07.2012
	APPD	AK SINGH		25.07.2012

TITLE: ADMINISTRATIVE BUILDING
ARCHITECTURAL PLANS EL(+)4.5M & EL(+)9.00M LVL.

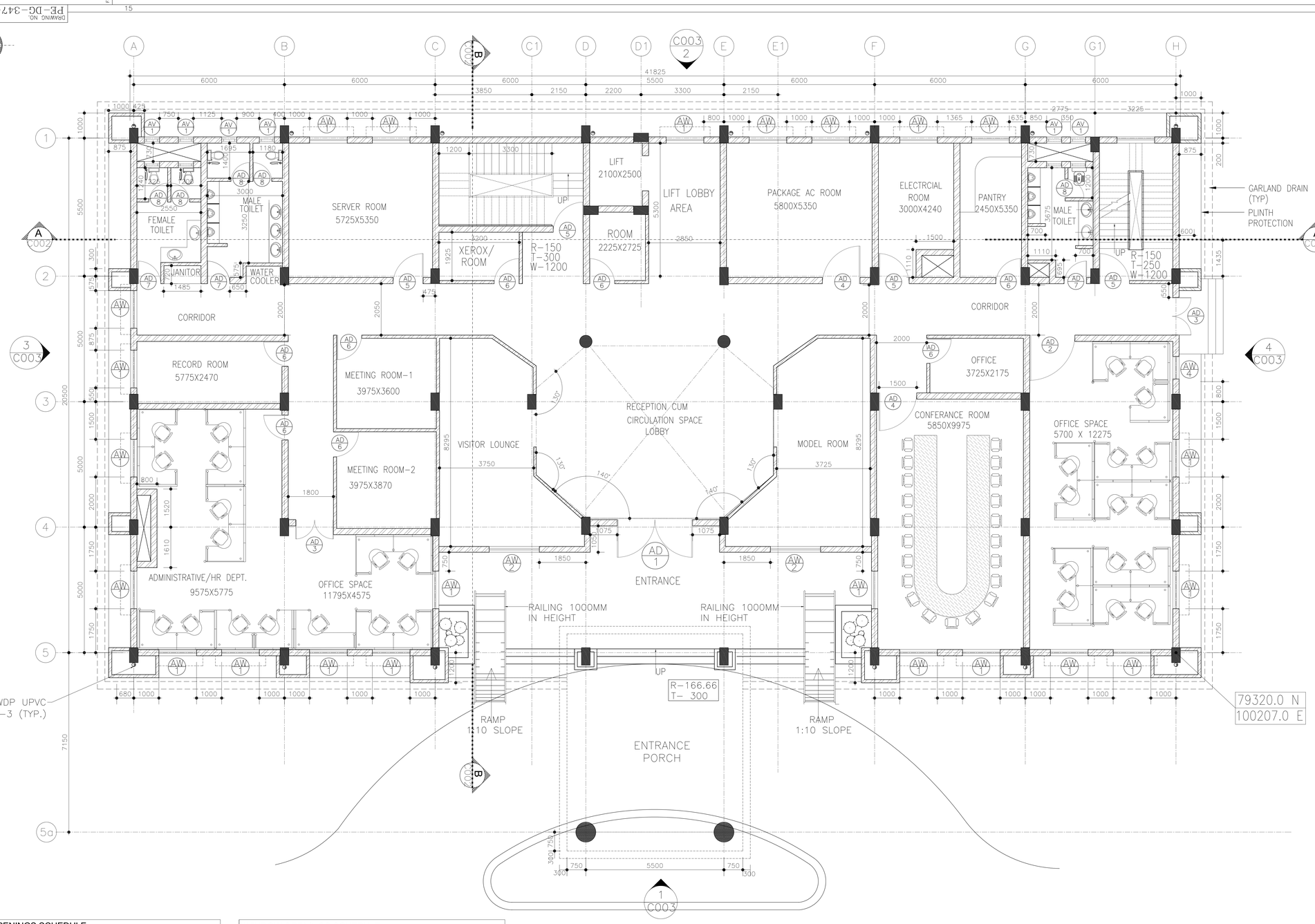
DEPT. | SCALE | DRAWING NO. PE-DG-374-641-C001
SIGN | DATE | SHEET 2 OF 3 | REV. 1

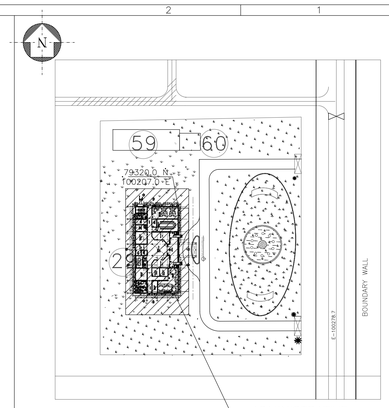
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DRAWING NO. PE-DG-347-641-C001

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2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
ARCHITECTURAL DRAWING		
1	PE-DG-374-641-C001 (SH 2 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL PLANS EL(+)4.50M & EL(+)9.00M LVL.
2	PE-DG-374-641-C001 (SH 3 OF 3)	ADMINISTRATIVE BUILDING ARCHITECTURAL ROOF PLAN & FINISHING SCHEDULE
3	PE-DG-374-641-C002	ADMINISTRATIVE BUILDING ARCHITECTURAL SECTIONS
4	PE-DG-374-641-C003	ADMINISTRATIVE BUILDING ARCHITECTURAL ELEVATIONS

DOOR OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL..,	MASONRY WIDTH	OPENING HEIGHT	REMARKS
AD/1	01	(±)0.000	3000	2100	GLAZED DOORS WINDOW WITH ALUMINIUM FRAME– DOUBLE SHUTTER
AD/2	01	(±)0.000	1800	2100	GLAZED DOORS WITH ALUMINIUM FRAME– SINGAL SHUTTER
AD/4	02	(±)0.000	1500	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
AD/3	02	(±)0.000	1500	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	03	(+)4.500			
	01	(+)9.000			
AD/6	04	(±)0.000	1200	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	04	(+)4.500			
	06	(+)9.000			
AD/5	08	(±)0.000	1000	2100	DOORS WITH ALUMINIUM FRAME– SINGLE SHUTTER
	12	(+)4.500			
	21	(+)9.000			
AD/7	03	(±)0.000	900	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
	03	(+)4.500			
	03	(+)9.000			
AD/8	05	(±)0.000	750	2100	ALUMINIUM DOOR– DOUBLE SHUTTER
	07	(+)4.500			
	07	(+)9.000			

WINDOW OPENINGS SCHEDULE

AW/1	21	(+)0.900	1500	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	20	(+)5.400			
	23	(+)9.900			
	01	(+)14.400			
AW/2	02	(+)5.400	2000	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	02	(+)9.900			
AW/3	01	(+)5.400	1200	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	3	(+)9.900			
AW/4	01	(+)0.900	900	1200	GLAZED, OPENABLE WINDOWS WITH ALUMINIUM FRAME
	01	(+)5.400			
	01	(+)9.900			
AV/1	10	(+)1.800	600	600	POWDER COATED ALUMINUM FRAMED VENTILATOR
	12	(+)6.300			
	14	(+)10.80			
EF	10	(+)1.800	330ø		EXHAUST FAN
	12	(+)6.300			
	14	(+)10.80			

PLAN AT EL(±)0.00M LVL

(SCALE 1:100)

CUSTOMER		BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	steag	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374		2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT		
DISTRIBUTION		

REV.	DATE	ALTD	CHD	APPD
1	09-01-2015	JASBEER	AMIT R	DKM
	drawing revised as per customer comments			

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		25.07.2012
	DESN	AMIT R		25.07.2012
	CHD	DK MISHRA		25.07.2012
	APPD	AK SINGH		25.07.2012

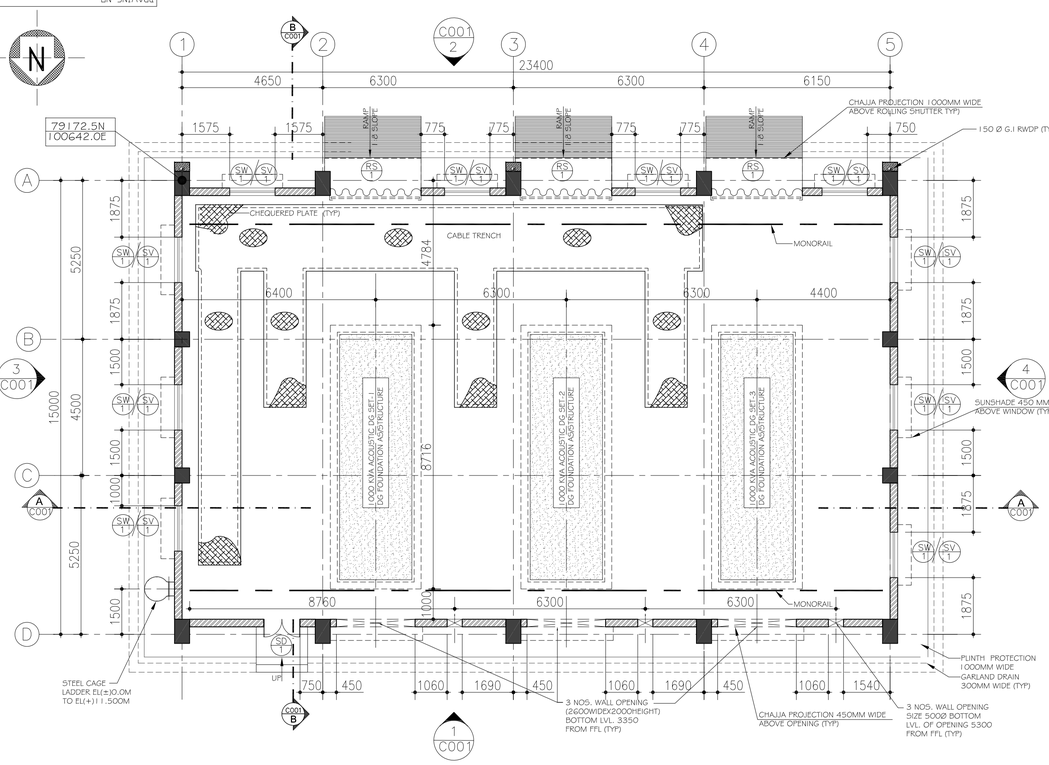
TITLE: ADMINISTRATIVE BUILDING
ARCHITECTURAL PLANS EL(±)0.0M.

DEPT. | SCALE | DRAWING NO. PE-DG-374-641-C001
SIGN | DATE | SHEET 1 OF 3 | REV. 1

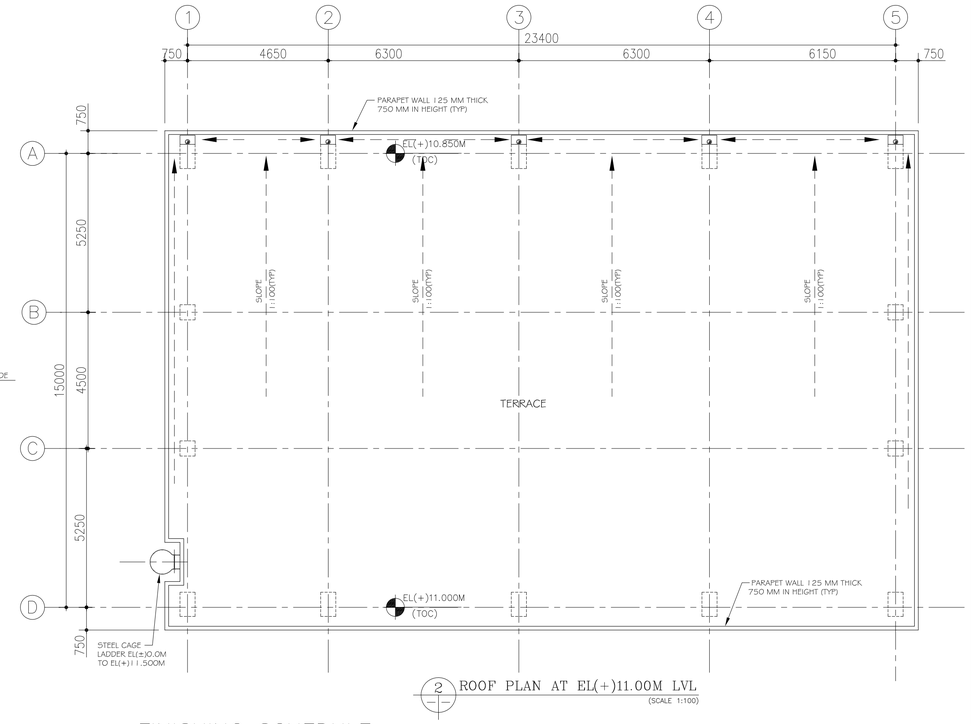
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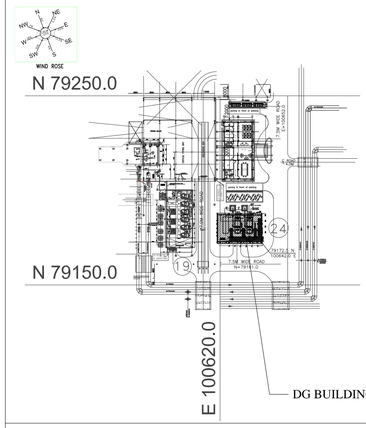
DRAWING NO PE-DG-374-642-C001



1 PLAN AT EL(±)0.00M LVL
(SCALE 1:100)



2 ROOF PLAN AT EL(+)11.00M LVL
(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)24.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

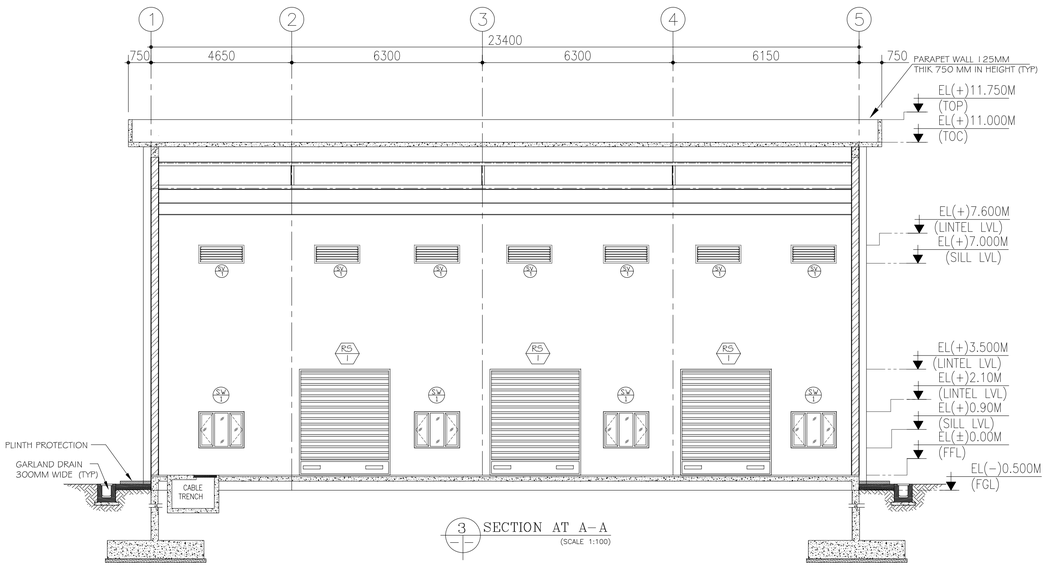
SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	IS-3-DG-662-800-A011 SH 1 OF 2	TYP. LAYOUT PLAN FOR DG ROOM FOR FOR 3x1000 KVA ACOUSTIC ENCLOSURE DG SET
3	IS-3-DG-662-800-A011 SH 2 OF 2	(TYP.) SECTIONAL SIDE VIEW FOR DG ROOM FOR 3x1000 KVA ACOUSTIC ENCLOSURE DG SET
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
STRUCTURAL DRAWING		
1.	PE-DG-374-642-C002	DG BUILDING GENERAL ARRANGEMENT OF PILING LAYOUT
ARCHITECTURAL DRAWING		
1.	PE-DG-374-642-C001 SH 2 OF 2	DG BUILDING– ARCHITECTURAL ELEVATIONS

DOOR /WINDOW OPENINGS SCHEDULE

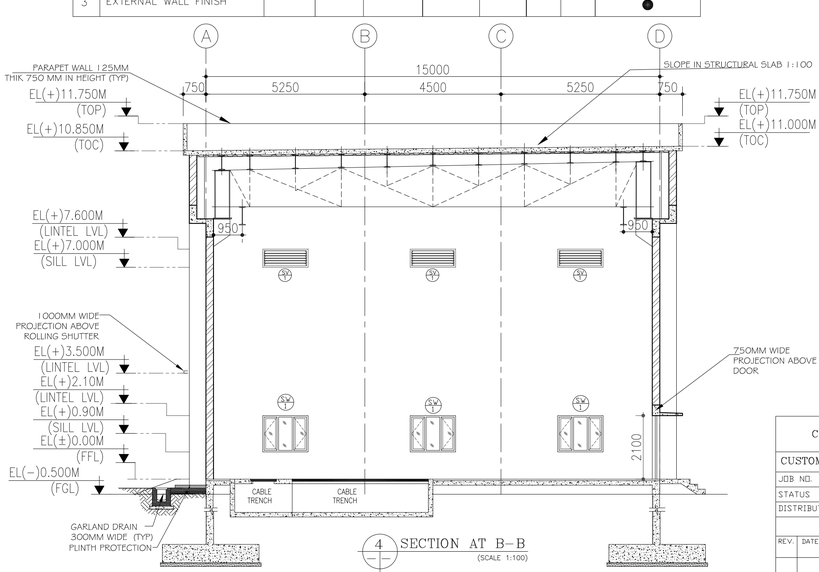
SYMBOL	Nos.	SILL LVL AT EL....,	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS	GLASS
RS 1	02	(±)0.000	3000	3500	MECHANICALLY OPERATED STEEL ROLLING SHUTTER	
SD 1	01	(±)0.000	1200	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–DOUBLE SHUTTER	
SW 1	10	(+)0.900	1500	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW	6MM THK. WIRED GLASS
SV 1	19	(+)7.000	1500	600	STEEL FRAME WITH STEEL VENTILATORS	

FINISHING SCHEDULE:

SERIAL NUMBER	ROOMS	FLOORS: IPS(CEMENT CONCRETE) WITH NON–METALLIC HARDENER TOPPING FLOORING	FLOORS: GRATING FLOOR	SKIRTING: IPS(CEMENT CONCRETE) WITH NON–METALLIC HARDENER TOPPING SKIRTING	INTERNAL WALLS PAINTING: ACRYLIC EMULSION PAINT OVER 2MM THICK PLASTER OF PARIS PUNNING	INTERNAL WALLS PAINTING: OIL BOUND DISTEMPER	CEILING: OIL BOUNDED DISTEMPER	CEILING: WHITE WASHING	EXTERNAL WALL: CEMENT BASED WATER PROOF PAINT
	EL(±)0.00M								
1	DG HALL	●		●		●		●	
2	CABLE TRECH		●						
3	EXTERNAL WALL FINISH								●



3 SECTION AT A–A
(SCALE 1:100)



4 SECTION AT B–B
(SCALE 1:100)

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

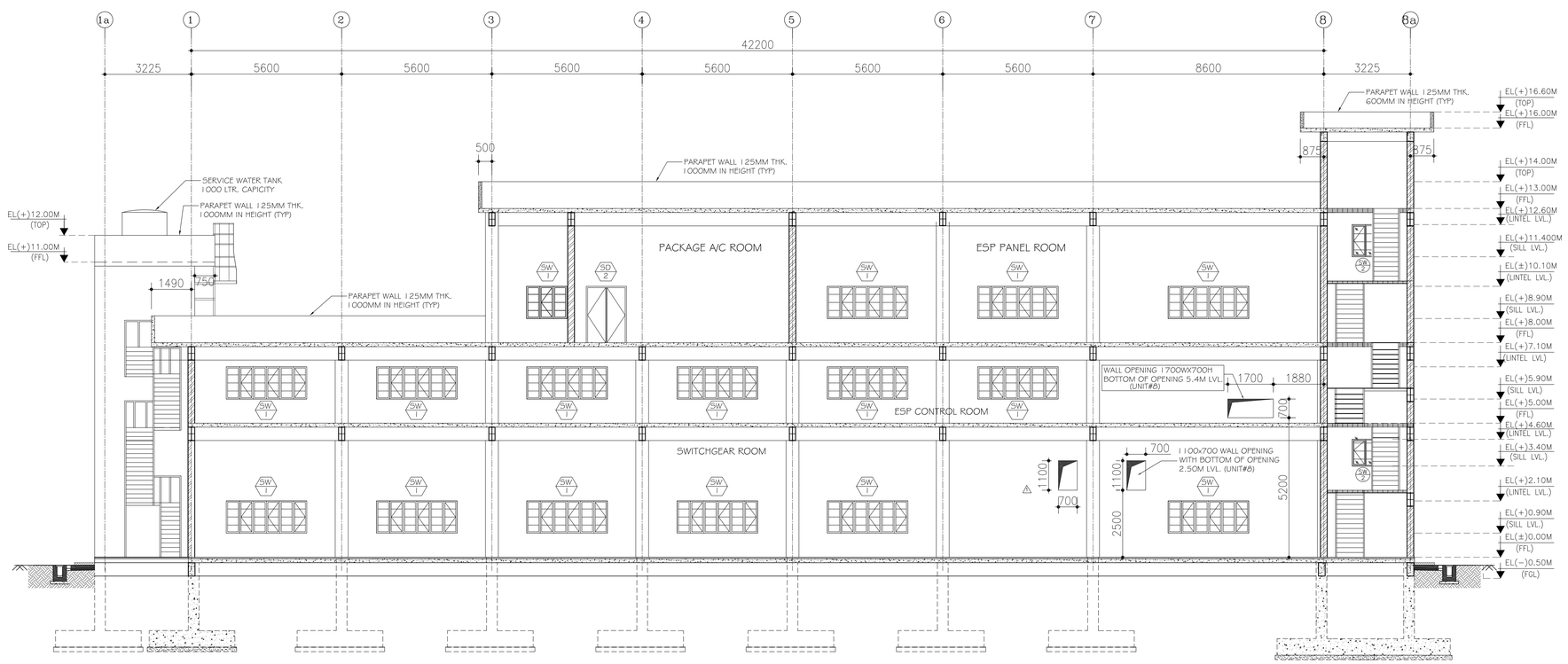
DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		17.04.2013
	DES'N	AMIT R		17.04.2013
	CHD	DK MISHRA		17.04.2013
	APPD	AKS		17.04.2013

TITLE
DG BUILDING
ARCHITECTURAL PLANS AT EL(+)0.00 LVL,ROOF PLAN & SECTION DETAILS

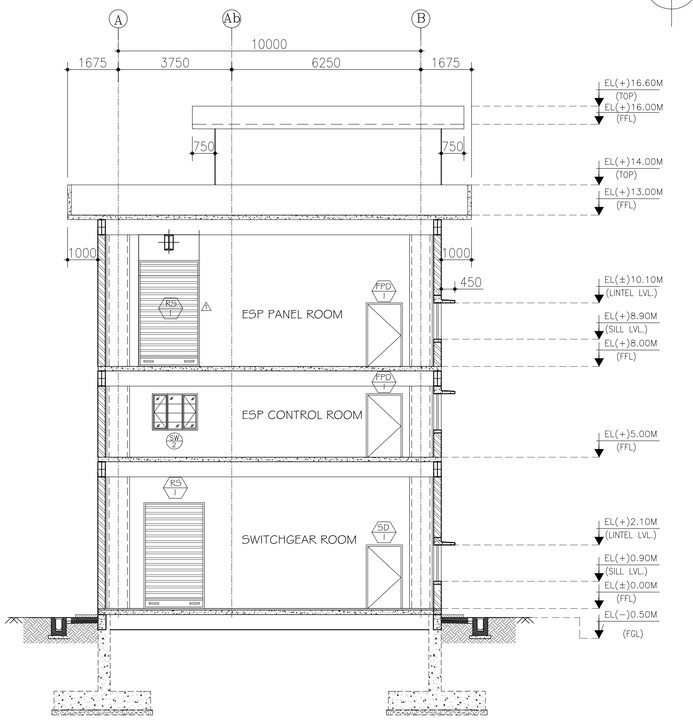
DEPT.	SCALE	DRAWING NO.
SIGN		PE-DG-374-642-C001
DATE		SHEET 1 OF 2 REV. 0

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DRAWING NO. PE-DG-374-619-C001



1 SECTION AT A-A
(SCALE 1:100)

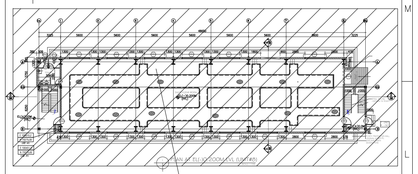


2 SECTION AT B-B
(SCALE 1:100)

FINISHING SCHEDULE:

SERIAL NUMBER	ROOMS	FLOORS					SKIRTING				INTERNAL WALLS: DADO		INTERNAL WALLS: PAINTING		CEILING				EXTERNAL WALL
		IPS(CEMENT CONCRETE) WITH NON-METALLIC HARDENER TOPPING FLOORING.	IPS(CEMENT CONCRETE) WITH METALLIC HARDENER TOPPING FLOORING	CAST-IN-SITU TERRAZZO FLOORING FOR RISER AND TREAD.	10MM THICK POLISHED VITRIFIED CERAMIC TILES POLISHED.	UNPOLISHED VITRIFIED TILES 7 TO 10MM THICK.	10MM THICK POLISHED VITRIFIED CERAMIC	COLOURED CERAMIC TILE MATT FINISH UP TO 1.2M HT. ACRYLIC EMULSION PAINT ON PLASTER OF PARIS BALANCE HEIGHT.	IPS (CEMENT CONCRETE) WITH NON-METALLIC FLOOR HARDENER	IPS(CEMENT CONCRETE) WITH METALLIC HARDENER TOPPING FLOORING	ACID/ALKALI RESISTANT TILES UPTO 2.1M HEIGHT AS PER IS:4457	COLOURED CERAMIC TILE	GRANITE STONE TOP SLAB (PLAT FORM)	ACRYLIC EMULSION PAINT OVER 2MM THICK PLASTER OF PARIS	OIL BOUND DISTEMBER	COLOR COATED ALUMINIUM FALSE CEILING (LUXALON OR EQUIVALENT)	OIL BOUNDED DISTEMPER	WHITE WASHING	GYPSUM FALSE CEILING.	CEMENT BASED WATER PROOF PAINT
	EL(−)0.200M																		
1	SWITCHGEAR ROOM		●												●		●		
2.	TOILET					●						●			●		●		
	EL(+)5.000M																		
1.	ESP CABLE VAULT	●													●				
2.	STORE	●							●						●		●		
	EL(+)8.000M																		
1.	PACKAGE A/C ROOM	●													●			●	
2.	ESP PANEL ROOM				●									●					●
3	TOILET					●						●			●		●		
	COMMON AREA																		
1.	STAIR CASE														●		●		

NOTE-:ALL TOILET SUNKEN BY 300MM



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)24.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. UNLESS NOTED OTHERWISE WINDOW / DOOR/ ROLLING SHUTTER LOCATION SHALL BE AT CENTER BETWEEN GRIDS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

Sl. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-100-E008	ELECTRICAL EQUIPMENT AND CABLE TRAY LAYOUT IN ESP CONTROL ROOM
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
STRUCTURAL DRAWING		
1.	PE-DG-374-619-C004	ESP CONTROL ROOM PILING LAYOUT
2.	PE-DG-374-619-C005	ESP CONTROL ROOM –GA & RC DETAIL OF PILECAP, PEDESTAL & PLINTH BEAM
3.	PE-DG-374-619-C010	ESP CONT ROOM– FRAMING ELEVATIONS SH1 (DETAILS OF COLUMNS ,BASE PLATE & BRACINGS)
4.	PE-DG-374-619-C011	ESP CONT ROOM– FRAMING ELEVATIONS SH2 (DETAILS OF COLUMNS ,BASE PLATE & BRACINGS)
5.	PE-DG-374-619-C012	ESP CONT ROOM– FRAMING ELEVATIONS SH3 (DETAILS OF WALL BEAMS)
ARCHITECTURAL DRAWING		
1.	PE-DG-374-619-C001 (SH – 1 OF 2)	ESP CONTROL BUILDING ARCHITECTURAL PLANS EL(−)0.2M, EL(+)5.0M LVL. (UNIT# 8)
2.	PE-DG-374-619-C001 (SH – 2 OF 2)	ESP CONTROL BUILDING ARCHITECTURAL PLANS EL(+)8.0M, EL(+)13.0M LVL.
3.	PE-DG-374-619-C003	ESP CONTROL BUILDING ARCHITECTURAL ELEVATIONS

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO.	374
STATUS	CONTRACT
DISTRIBUTION	
	2X250MW BARAUNI THERMAL POWER STATION
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI

REV.	DATE	ALTD	CHD	APPD
1	01.05.13	JASBEER	AMIT R	DKM

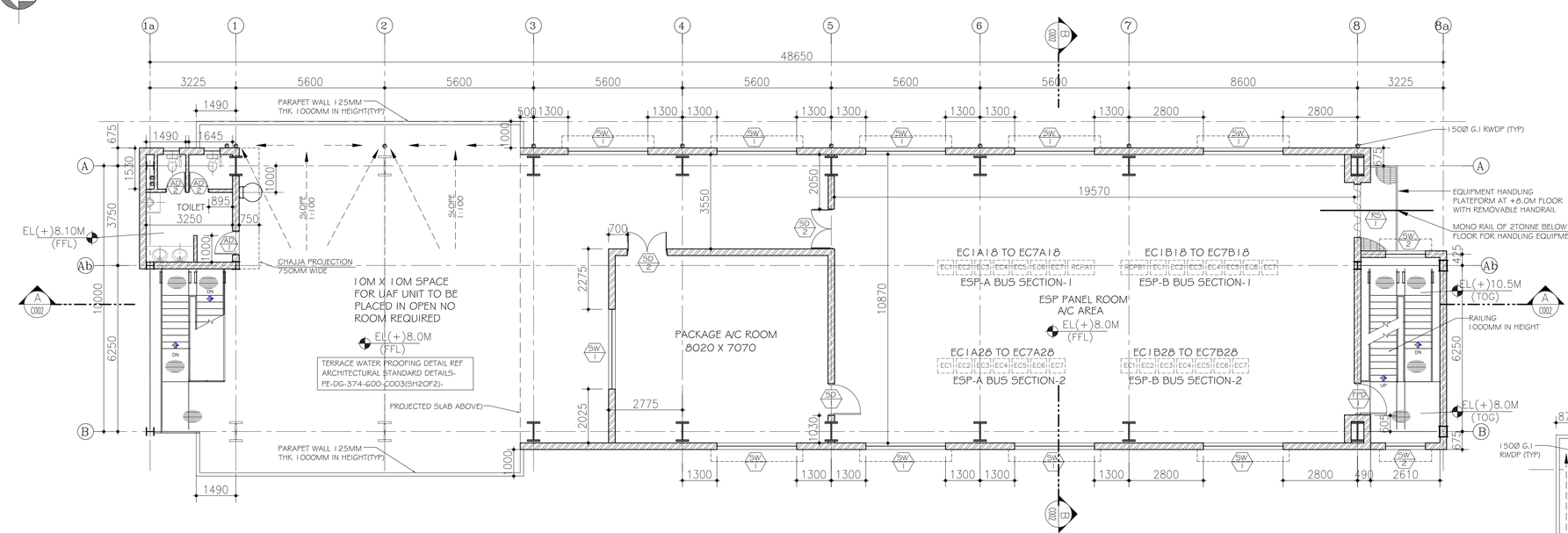
DRAWING REVISED AS PER COMMENT RECEIVED ON DATED-22.10.2012

DEPT CODE	NAME	SIGN	DATE
C	DRN JASBEER		09.10.2012
	DESN AMIT R		09.10.2012
	CHD DK MISHRA		09.10.2012
	APPD DK MISHRA		09.10.2012

TITLE
ESP CONTROL BUILDING
ARCHITECTURAL SECTIONS & FINISHING SCHEDULE (UNIT#8/UNIT#9)

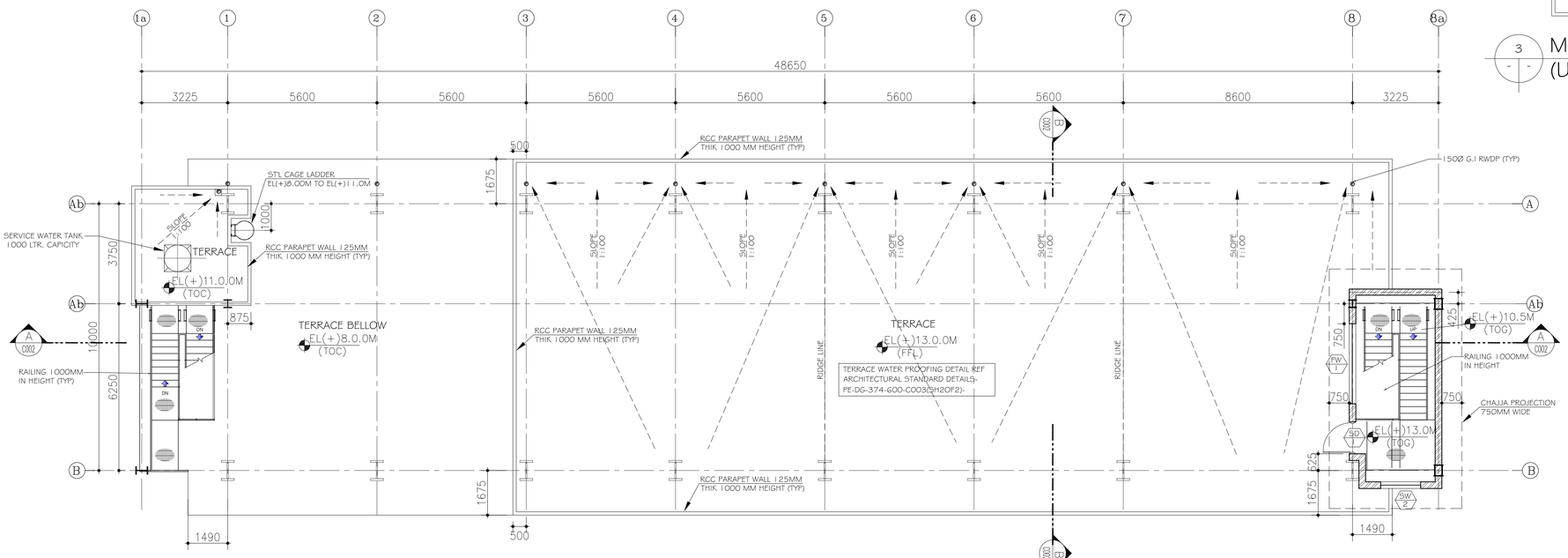
DEPT. | SCALE | DRAWING NO. PE-DG-374-619-C002
SIGN
DATE
SHEET 1 OF 1 | REV. 1

DRAWING NO. PE-DG-374-619-C001



PLAN AT EL(+)8.00M LVL (UNIT#8)/(UNIT#9)

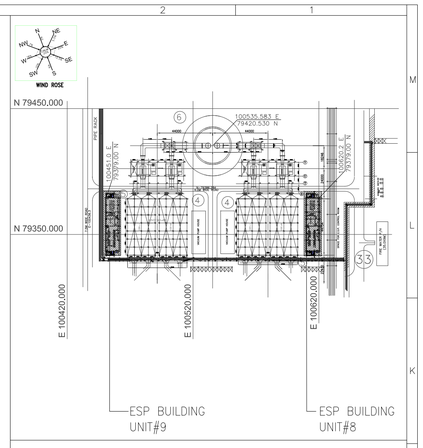
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PLAN AT EL(+)13.00M LVL (UNIT#8)/(UNIT#9)

(SCALE 1:100)

MUMTY ROOF PLAN (UNIT#8)/(UNIT#9)



NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)24.5M ABOVE MSL.
3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
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6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-100-E008	ELECTRICAL EQUIPMENT AND CABLE TRAY LAYOUT IN ESP CONTROL ROOM
STANDARD DRAWING		
1.	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
STRUCTURAL DRAWING		
1.	PE-DG-374-619-C004	ESP CONTROL ROOM PILING LAYOUT
2.	PE-DG-374-619-C005	ESP CONTROL ROOM –GA & RC DETAIL OF PILECAP, PEDESTAL & PLINTH BEAM
3.	PE-DG-374-619-C010	ESP CONT ROOM– FRAMING ELEVATIONS SH1 (DETAILS OF COLUMNS ,BASE PLATE & BRACINGS)
4.	PE-DG-374-619-C011	ESP CONT ROOM– FRAMING ELEVATIONS SH2 (DETAILS OF COLUMNS ,BASE PLATE & BRACINGS)
5.	PE-DG-374-619-C012	ESP CONT ROOM– FRAMING ELEVATIONS SH3 (DETAILS OF WALL BEAMS)
ARCHITECTURAL DRAWING		
1.	PE-DG-374-619-C001 (SH – 1 OF 2)	ESP CONTROL BUILDING ARCHITECTURAL PLANS EL(–)0.2M, EL(+)5.0M LVL, (UNIT# 8)
2.	PE-DG-374-619-C002	ESP CONTROL BUILDING ARCHITECTURAL SECTIONS
3.	PE-DG-374-619-C003	ESP CONTROL BUILDING ARCHITECTURAL ELEVATIONS

DOOR /WINDOW OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL....	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS	GLASS
SD	01	(±)0.000	2000	3000	ELECTRICALLY OPERATED STEEL ROLLING SHUTTER	
	01	(+)8.000				
SD	02	(±)0.000	1200	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–SINGLE SHUTTER	
	01	(+)5.000				
	01	(+)8.000				
	01	(+)13.000				
SD	02	(+)8.000	1500	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–DOUBLE SHUTTER	
FD	01	(±)0.000	1200	2100	FIRE PROOF STEEL DOOR – SINGLE SHUTTER	
	02	(+)5.000				
	01	(+)8.000				
AD	01	(±)0.000	900	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER	
	01	(+)8.000				
AD	02	(±)0.000	750	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER	
	02	(+)8.000				
FW	13	(+)0.900	3000	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW	4MM THK. CLEAR FLOAT GLASS
	12	(+)5.900				
	10	(+)8.900				
SW	01	(+)0.900	1500	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW	4MM THK. CLEAR FLOAT GLASS
	01	(+)3.400				
	03	(+)5.900				
	01	(+)8.900				
	01	(+)11.400				
	01	(+)14.200				
FW	01	(+)13.900	3000	1200	STEEL FRAME WITH STEEL GLAZED FIXED WINDOW	5.5MM THK. CLEAR FLOAT GLASS
AV	02	(+)1.800	900	600	POWDER COATED ALUMINIUM FRAMED FIXED GLAZED VENTILATOR	4MM THK. GROUND GLASS
	02	(+)9.800				
	02	(+)14.800				
EF	02	(+)2.200(℄)	300ø		EXHAUST FAN	
	02	(+)10.200(℄)				

NOTE-:ALL TOILET SUNKEN BY 300MM

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD
1	01.05.13	JASBEER	AMIT R	DKM

DRAWING REVISED AS PER COMMENT RECEIVED ON DATED–22.10.2012

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		06.10.2012
	DESN	AMIT R		06.10.2012
	CHD	DK MISHRA		06.10.2012
	APPD	DK MISHRA		06.10.2012

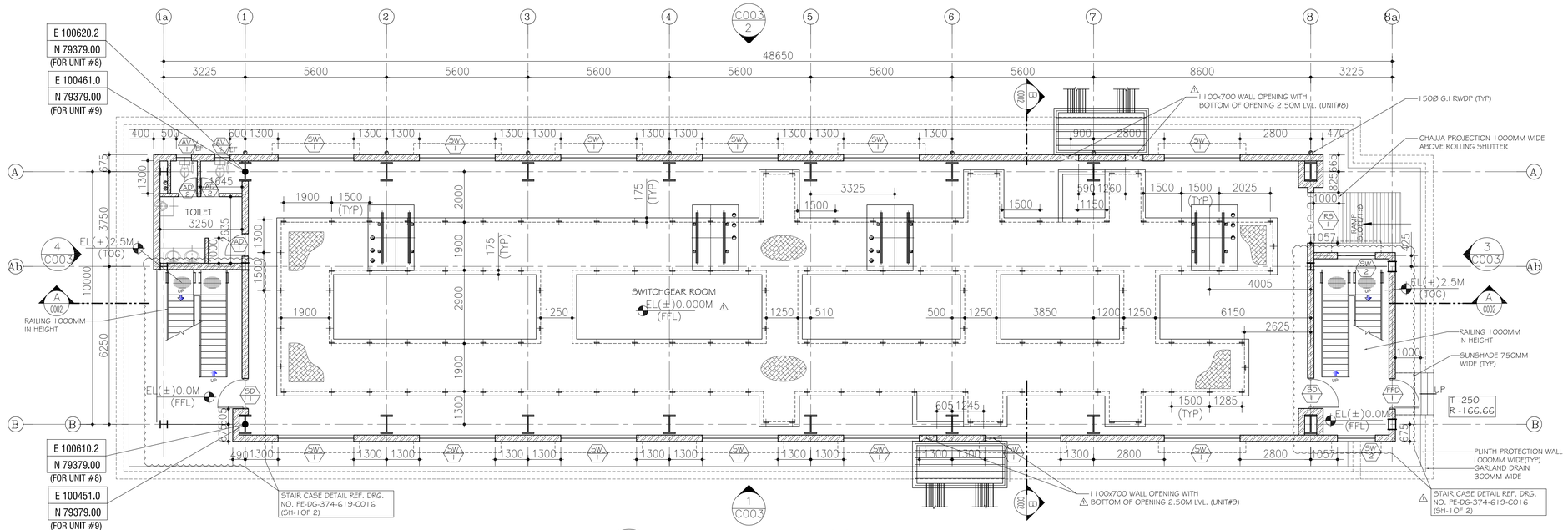
TITLE: **ESP CONTROL BUILDING**
ARCHITECTURAL PLANS EL(+)8.0M, EL(+)13.0M LVL. (UNIT # 8 & UNIT # 9)

DEPT. | SCALE | DRAWING NO. PE-DG-374-619-C001
SIGN
DATE | SHEET 2 OF 2 | REV. 1

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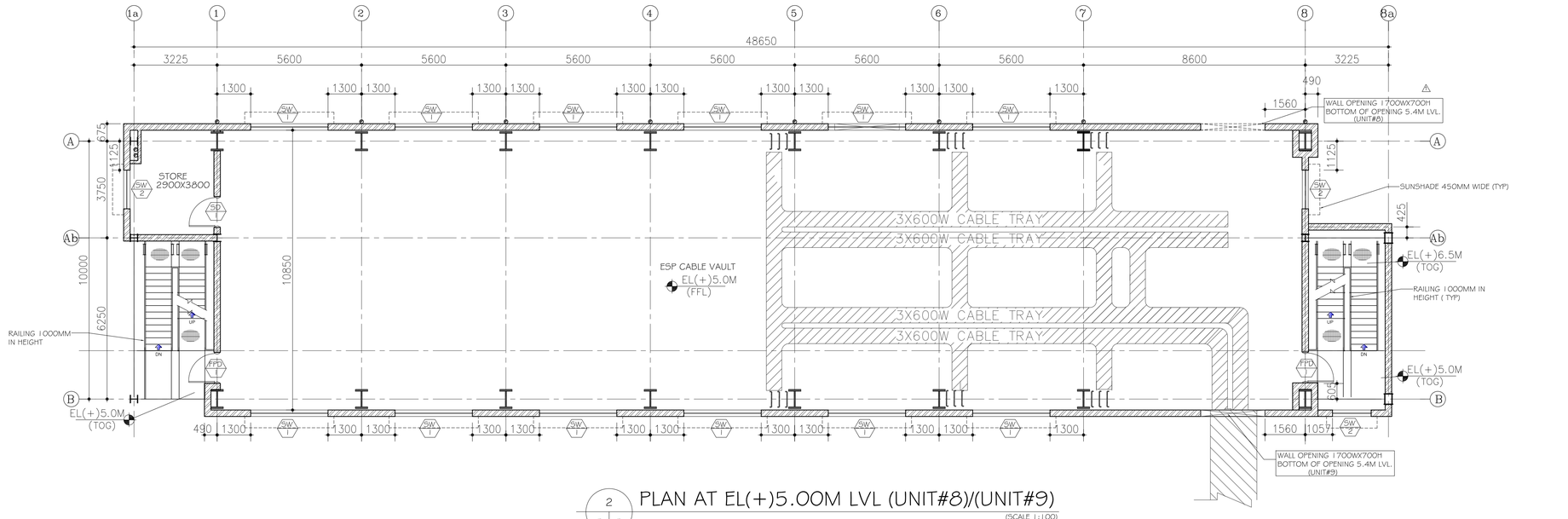
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DRAWING NO. PE-DG-374-619-C001



PLAN AT EL(±)0.000M LVL (UNIT#8)/(UNIT#9)

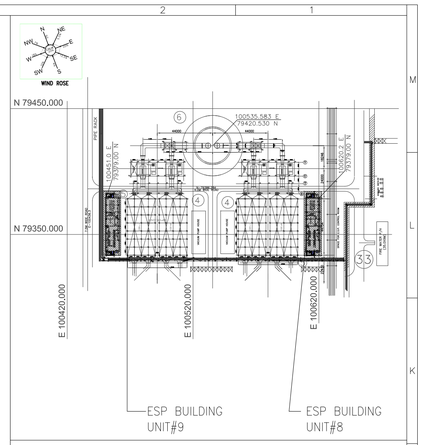
(SCALE 1:100)



PLAN AT EL(+)5.00M LVL (UNIT#8)/(UNIT#9)

(SCALE 1:100)

NOTE-:ALL TOILET SUNKEN BY 300MM



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO THE FFL OF POWER HOUSE BUILDING AS EL(+)0.0M WHICH CORRESPONDS TO RL(+)24.5M ABOVE MSL.
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LEGEND

- 230 THK BRICK WALL
- 115 THK BRICK WALL
- GRATING FLOOR
- CHEQUERED PLATE

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

Sl. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-100-E008-R2	ELECTRICAL EQUIPMENT AND CABLE TRAY LAYOUT IN ESP CONTROL ROOM
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
STRUCTURAL DRAWING		
1.	PE-DG-374-619-C004	ESP CONTROL ROOM PILING LAYOUT
2.	PE-DG-374-619-C005	ESP CONTROL ROOM –CA & RC DETAIL OF PILECAP, PEDESTAL & PLINTH BEAM
3.	PE-DG-374-619-C010	ESP CONT ROOM– FRAMING ELEVATIONS SH1 (DETAILS OF COLUMNS ,BASE PLATE & BRACINGS)
4.	PE-DG-374-619-C011	ESP CONT ROOM– FRAMING ELEVATIONS SH2 (DETAILS OF COLUMNS ,BASE PLATE & BRACINGS)
5.	PE-DG-374-619-C012	ESP CONT ROOM– FRAMING ELEVATIONS SH3 (DETAILS OF WALL BEAMS)
ARCHITECTURAL DRAWING		
1.	PE-DG-374-619-C001 (SH – 2 OF 2)	ESP CONTROL BUILDING ARCHITECTURAL PLANS EL(+)8.0M, EL(+)13.0M LVL
2.	PE-DG-374-619-C002	ESP CONTROL BUILDING ARCHITECTURAL SECTIONS
3.	PE-DG-374-619-C003	ESP CONTROL BUILDING ARCHITECTURAL ELEVATIONS

DOOR /WINDOW OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL...	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS	GLASS
RS	01	(±)0.000	2000	3000	ELECTRICALLY OPERATED STEEL ROLLING SHUTTER	
	01	(+)8.000				
SD	02	(±)0.000	1200	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER-SINGLE SHUTTER	
	01	(+)5.000				
	01	(+)8.000				
	01	(+)13.000				
SD	02	(+)8.000	1500	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER–DOUBLE SHUTTER	
FD	01	(±)0.000	1200	2100	FIRE PROOF STEEL DOOR – SINGLE SHUTTER	
	02	(+)5.000				
	01	(+)8.000				
AD	01	(±)0.000	900	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER	
	01	(+)8.000				
AD	02	(±)0.000	750	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER	
	02	(+)8.000				
AW	13	(+)0.900	3000	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW	4MM THK. CLEAR FLOAT GLASS
	12	(+)5.900				
	10	(+)8.900				
AW	01	(+)0.900	1500	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW	4MM THK. CLEAR FLOAT GLASS
	01	(+)3.400				
	03	(+)5.900				
	01	(+)8.900				
	01	(+)11.400				
	01	(+)14.200				
FW	01	(+)13.900	3000	1200	STEEL FRAME WITH STEEL GLAZED FIXED WINDOW	5.5MM THK. CLEAR FLOAT GLASS
AV	02	(+)1.800	900	600	POWDER COATED ALUMINUM FRAMED FIXED GLAZED VENTILATOR	4MM THK. GROUND GLASS
	02	(+)9.800				
	02	(+)14.800				
EF	02	(+)2.200(℄)	300ø		EXHAUST FAN	
	02	(+)10.200(℄)				

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD
A	01.05.13	JASBEER	AMIT R	DKM

DRAWING REVISED AS PER COMMENT RECEIVED ON DATED–22.10.2012

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE	NAME	SIGN	DATE
DRN	JASBEER		06.10.2012
DESN	AMIT R		06.10.2012
CHD	DK MISHRA		06.10.2012
APPD	DK MISHRA		06.10.2012

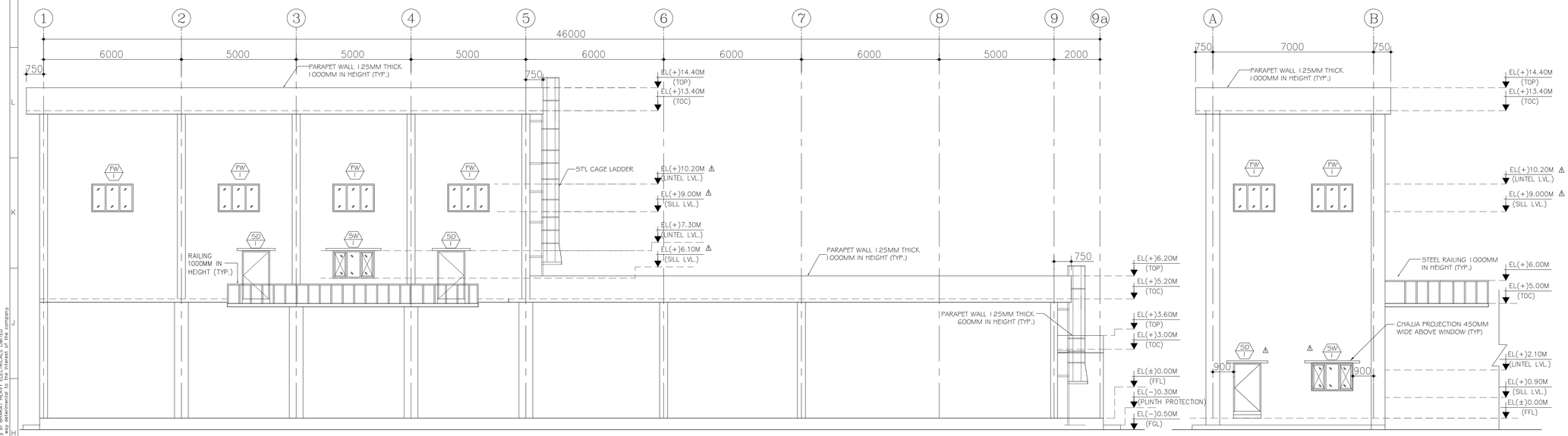
TITLE: ESP CONTROL BUILDING
ARCHITECTURAL PLANS EL(-)0.2M, EL(+)5.0M LVL. (UNIT # 8 & UNIT#9)

DEPT. SCALE
SIGN
DATE

DRAWING NO. PE-DG-374-619-C001
SHEET 1 OF 2 REV. 1

DRAWING NO. PE-DG-374-654-C007

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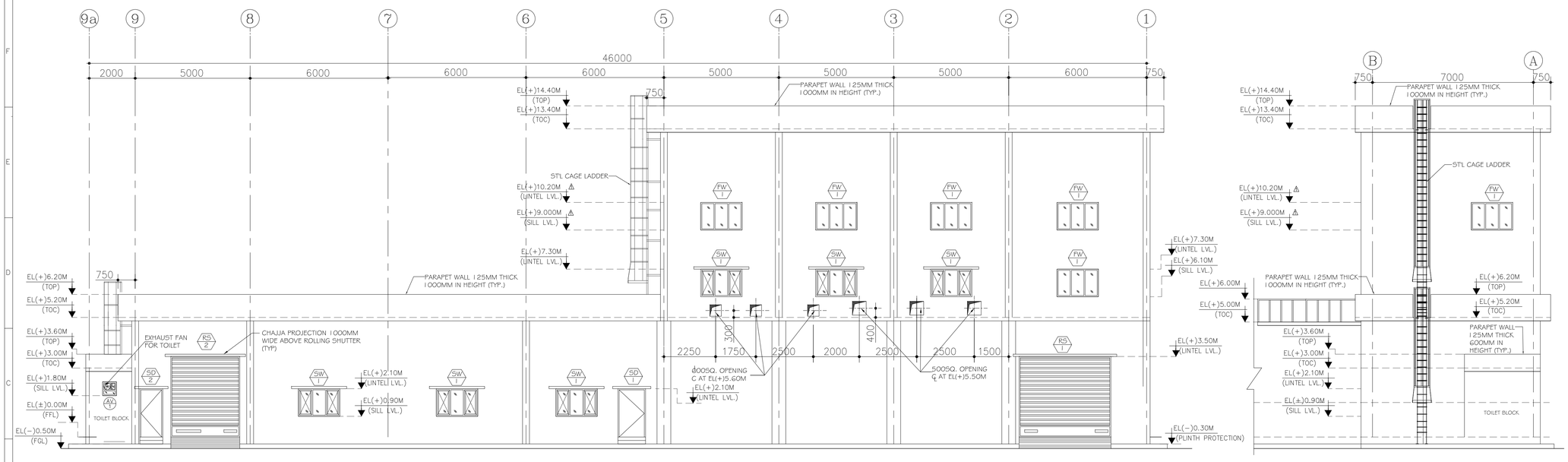


WEST SIDE ELEVATION ALONG GRID-B

(SCALE 1:100)

NORTH SIDE ELEVATION ALONG GRID-1

(SCALE 1:100)

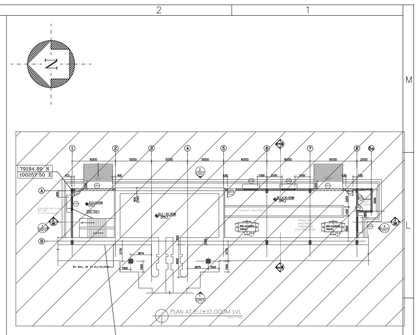


EAST SIDE ELEVATION ALONG GRID-A

(SCALE 1:100)

SOUTH SIDE ELEVATION ALONG GRID-8

(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
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3. FOR COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
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5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
6. ANY DISCREPANCY IN THE DRAWINGS SHOULD BE INFORMED TO DESIGN OFFICE BEFORE EXECUTION .

LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-172-N004	MECHANICAL GA OF RWPH
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
STRUCTURAL DRAWING		
1.	PE-DG-374-654-C001	RAW WATER RESERVOIR LAYOUT
2.	PE-DG-374-654-C002	RAW WATER RESERVOIR SECTIONS
3.	PE-DG-374-654-C003	RAW WATER PUMP HOUSE GA & LAYOUT DETAIL
4.	PE-DG-374-654-C004	RAW WATER RESERVOIR PILING & GROUND IMPROVEMENT DETAILS
ARCHITECTURAL DRAWING		
1.	PE-DG-374-654-C005	RAW WATER PUMP HOUSE ARCHITECTURAL PLANS EL(±)0.0M, EL(+)5.2M,VL.
2.	PE-DG-374-654-C006	RAW WATER PUMP HOUSE ARCHITECTURAL ROOF PLANS EL(+)13.4 M, SECTIONS & FINISHING SCHEDULE

CUSTOMER: BIHAR STATE ELECTRICITY BOARD

CUSTOMER'S CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

JOB NO. 374

STATUS CONTRACT

DISTRIBUTION

2X250MW BARAUNI THERMAL POWER STATION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		08.11.2012
	DESN	AMIT R		08.11.2012
	CHD	DK MISHRA		08.11.2012
	APPD	DK MISHRA		08.11.2012

REV.	DATE	A.LTD	CHD	APPD
A	23.04.13	JASBEER	AMIT R	DKM

DRAWING REVISED AS PER COMMENT

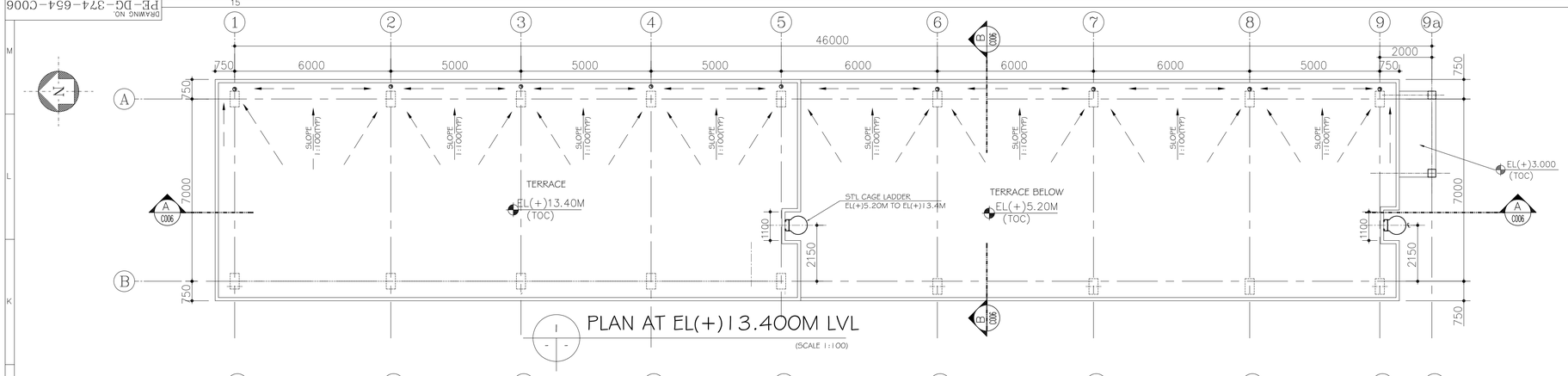
TITLE: RAW WATER PUMP HOUSE
ARCHITECTURAL ELEVATIONS

DRAWING NO. PE-DG-374-654-C007

SHEET 1 OF 1 REV. 1

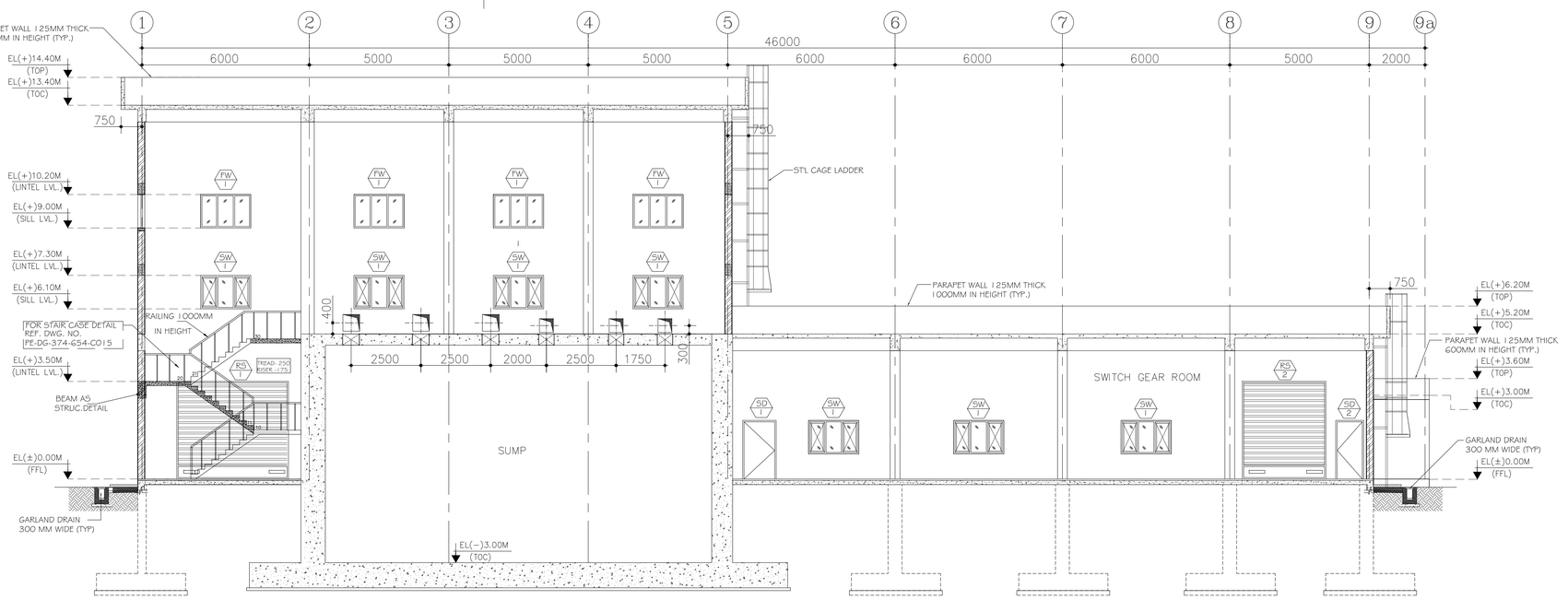
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DRAWING NO. PE-DG-374-654-C006



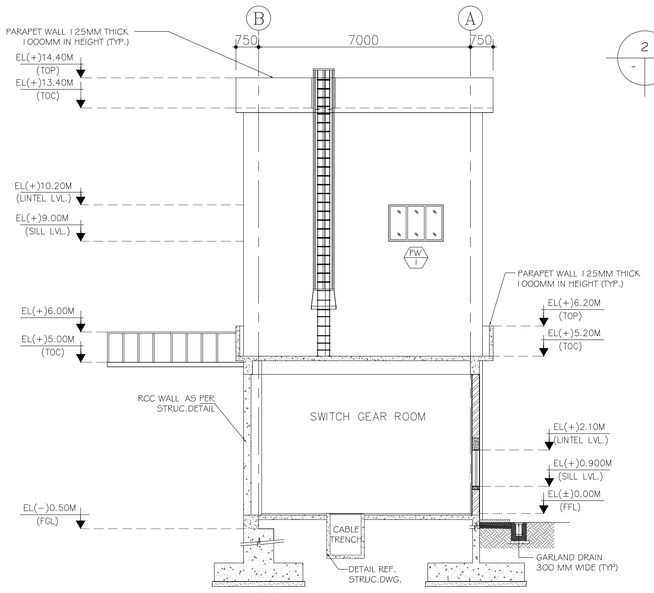
PLAN AT EL(+)13.400M LVL

(SCALE 1:100)



SECTION AT A-A

(SCALE 1:100)

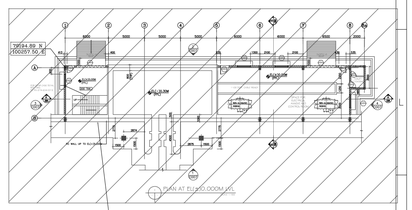


SECTION AT B-B

(SCALE 1:100)

FINISHING SCHEDULE:

SERIAL NUMBER	ROOMS	FLOORS					SKIRTING				INTERNAL WALLS				CEILING			EXTERNAL WALL
											DADO		PAINTING					
		IPS(CEMENT CONCRETE) WITH NON-METALLIC HARDENER TOPPING FLOORING	IPS(CEMENT CONCRETE) WITH METALLIC HARDENER TOPPING FLOORING	CAST-IN-SITU TERRAZZO FLOORING FOR RISER AND TREAD.	10MM THICK POLISHED VITRIFIED CERAMIC TILES POLISHED.	CERAMIC TILES	10MM THICK POLISHED VITRIFIED CERAMIC TILES	CERAMIC TILE MATT FINISH UPTO 2.2M H FLOOR EXCLUSION (PAINT DADO PLASTER OF PARIS BALANCE HEIGHT.	IPS (CEMENT CONCRETE) WITH NON-METALLIC FLOOR HARDENER	IPS(CEMENT CONCRETE) 150MM IN HEIGHT	ACID/ALKALI RESISTANT TILES UPTO 2.1M HEIGHT AS PER IS:4457	5MM GLAZED TILES UPTO 2.1 M HEIGHT AS PER IS.777	GRANITE STONE TOP SLAB (PLAT FORM)	ACRYLIC EMULSION PAINT OVER 2MM THICK PLASTER OF PARIS	OIL BOUND DISTEMBER	PRE-COATED COLOR/ AL LINEAL FALSE CEILING IN APPROVED PATTERN	OIL BOUNDED DISTEMPER	WHITE WASHING	GYPSUM FALSE CEILING.	CEMENT BASED WATER PROOF PAINT
	EL(±)0.000M																			
1.	MAINTENANCE BAY		●							●					●		●			
2.	SWITCH GEAR ROOM	●								●					●		●			
3.	TOILET					●						●			●		●			
	EL(+)5.200M																			
1.	P/H PLATFORM	●							●						●		●			
2.	CONCRETE STAIRCASE			●				●									●			



KEY PLAN

NOTES

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5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
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LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
UNO – UNLESS NOTED OTHERWISE

REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
1	PE-DG-374-100-M001	PLOT PLAN
2	PE-DG-374-172-N004	MECHANICAL GA OF RWPH
STANDARD DRAWING		
1	PE-DG-374-600-C001 (SH 1 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
2	PE-DG-374-600-C001 (SH 2 OF 4)	GENERAL NOTES & STD. DETAIL FOR ARCH. WORK
3	PE-DG-374-600-C001 (SH 3 OF 4)	STANDARD DETAIL OF DOORS
4	PE-DG-374-600-C001 (SH 4 OF 4)	STANDARD DETAIL OF WINDOWS
STRUCTURAL DRAWING		
1.	PE-DG-374-654-C001	RAW WATER RESERVOIR LAYOUT
2.	PE-DG-374-654-C002	RAW WATER RESERVOIR SECTIONS
3.	PE-DG-374-654-C003	RAW WATER PUMP HOUSE GA & LAYOUT DETAIL
4.	PE-DG-374-654-C004	RAW WATER RESERVOIR PILING & GROUND IMPROVEMENT DETAILS
ARCHITECTURAL DRAWING		
1.	PE-DG-374-654-C005	RAW WATER PUMP HOUSE ARCHITECTURAL PLANS EL(±)0.0M, EL(+)5.2M LVL.
2.	PE-DG-374-654-C007	RAW WATER PUMP HOUSE ARCHITECTURAL ELEVATIONS

CUSTOMER	BIHAR STATE ELECTRICITY BOARD
CUSTOMER'S CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. 374	2X250MW BARAUNI THERMAL POWER STATION
STATUS CONTRACT	
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD
1	23.04.13	JASBEER	AMIT R	DKM

DRAWING REVISED AS PER COMMENT.

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
C	DRN	JASBEER		08.11.2012
	DESN	AMIT R		08.11.2012
	CHD	DK MISHRA		08.11.2012
	APPD	DK MISHRA		08.11.2012

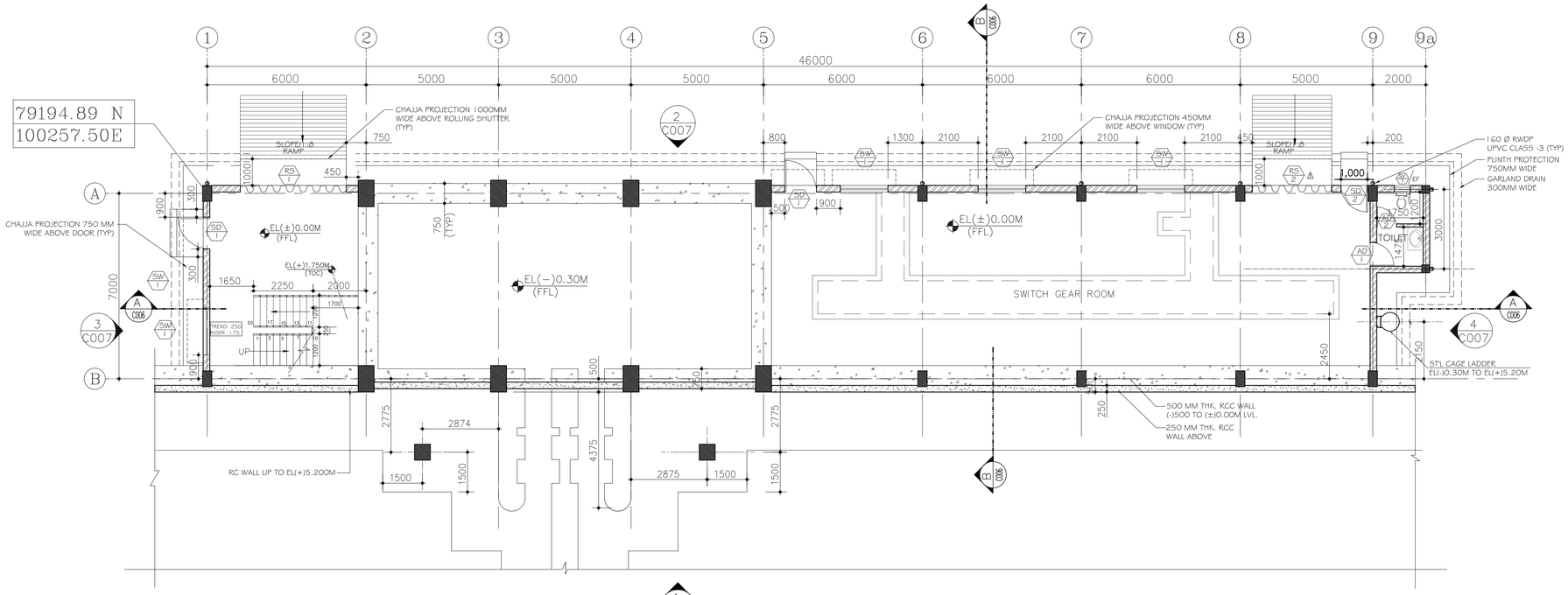
TITLE: RAW WATER PUMP HOUSE
ARCHITECTURAL ROOF PLANS EL(+)13.4 M, SECTIONS & FINISHING SCHEDULE

DEPT. | SCALE
SIGN
DATE

DRAWING NO. PE-DG-374-654-C006
SHEET 1 OF 1 | REV. 1

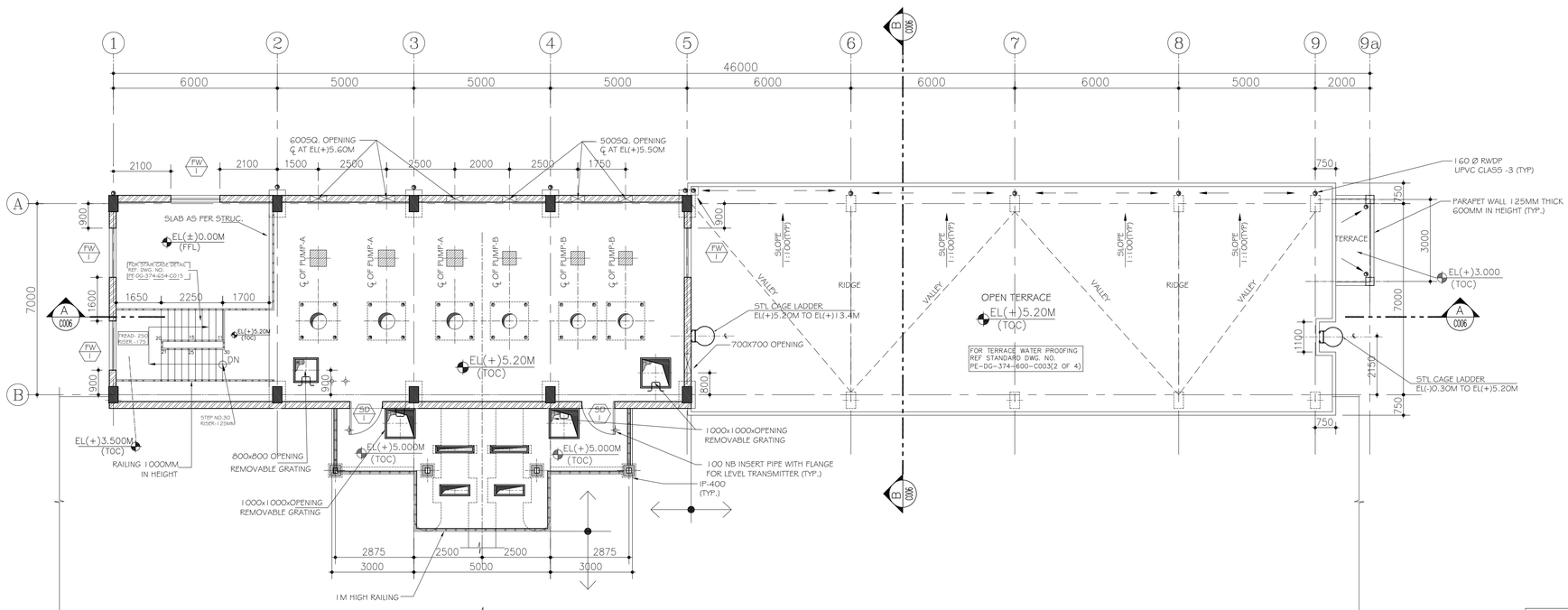
DRAWING NO. PE-DG-374-654-C005

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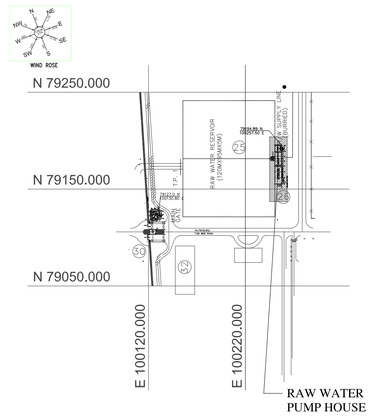
PLAN AT EL(±)0.000M LVL

(SCALE 1:100)



PLAN AT EL(+)5.200M LVL

(SCALE 1:100)



KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
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LEGEND

- 250 THK BRICK WALL
- 125 THK BRICK WALL
- GRATING FLOOR

EL – ELEVATION
E/F – EXHAUST FAN
FFL – FINISHED FLOOR LEVEL
FGL – FORMED GROUND LEVEL
RWDP – RAIN WATER DOWN TAKEN PIPE
THK – THICKNESS
TOC – TOP OF CONCRETE
TYP – TYPICAL
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REFERENCE DRAWINGS

SL. No.	DRAWING No.	TITLE
INPUT DRAWING		
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2	PE-DG-374-172-N004	MECHANICAL GA OF RWPH
STANDARD DRAWING		
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STRUCTURAL DRAWING		
1.	PE-DG-374-654-C001	RAW WATER RESERVOIR LAYOUT
2.	PE-DG-374-654-C002	RAW WATER RESERVOIR SECTIONS
3.	PE-DG-374-654-C003	RAW WATER PUMP HOUSE GA & LAYOUT DETAIL
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1.	PE-DG-374-654-C006	RAW WATER PUMP HOUSE ARCHITECTURAL ROOF PLANS EL(+)13.4 M, SECTIONS & FINISHING SCHEDULE
2.	PE-DG-374-654-C007	RAW WATER PUMP HOUSE ARCHITECTURAL ELEVATIONS

DOOR /WINDOW OPENINGS SCHEDULE

SYMBOL	Nos.	SILL LVL AT EL..,	MASONRY OPENING WIDTH	MASONRY OPENING HEIGHT	REMARKS
RS	01	(±)0.000	4000	3500	ELECTRICALLY OPERATED STEEL ROLLING SHUTTER
RS	01	(±)0.000	3000	3500	ELECTRICALLY OPERATED STEEL ROLLING SHUTTER
SD	02	(±)0.000	1200	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER-SINGLE SHUTTER
	02	(+)5.200			
SD	01	(±)0.000	1000	2100	STEEL DOOR FRAME WITH DOUBLE PLATE FLUSH SHUTTER-DOUBLE SHUTTER
AD	01	(±)0.000	900	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER
AD	01	(±)0.000	750	2100	ALUMINIUM FLUSH DOOR –SINGLE SHUTTER
SW	04	(+)0.900	1800	1200	STEEL FRAME WITH STEEL GLAZED OPENABLE WINDOW
SW	04	(+)6.100			
FW	1	(+)6.100	1500	1200	STEEL FRAME WITH FIXED GLASS WINDOW
	11	(+)9.000	1500	1200	
AV	01	(+)1.800	900	600	STEEL FRAME WITH STEEL VENTILATORS
EF	01	(+)2.200(℄)	330ø		EXHAUST FAN

CUSTOMER		BIHAR STATE ELECTRICITY BOARD		
CUSTOMER'S CONSULTANT		STEAG ENERGY SERVICES (INDIA) PVT. LTD.		
JOB NO. 374		2X250MW BARAUNI THERMAL POWER STATION		
STATUS CONTRACT				
DISTRIBUTION		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI		
REV.	DATE	ALTD	CHD	APPD
A	23.04.13	JASBEER	AMIT R	DKM
	DRAWING REVISED AS PER COMMENT			

DEPT CODE	NAME	SIGN	DATE
DRN	JASBEER		08.11.2012
DESN	AMIT R		08.11.2012
C CHD	DK MISHRA		08.11.2012
APPD	DK MISHRA		08.11.2012

TITLE: RAW WATER PUMP HOUSE
ARCHITECTURAL PLANS EL(±)0.0M, EL(+)5.2M LVL.

DEPT. | SCALE | DRAWING NO. PE-DG-374-654-C005
SIGN | DATE | SHEET 1 OF 1 | REV. 1