OPEN TENDER

Tender Enquiry No HMBP/PUR/2022/961927/EL-6356 **Date:18 /08/2022**

NOTICE INVITING TENDER

Sub: E-tendering with E-price bids for Design**,** Engineering**,** Manufacture **/** Fabrication, Inspection & Shop Testing, Painting of electrics, at manufacturers shop, supply to Stores/HMBP, unloading & Storage and reconservation at site ,erection, installation and commissioning of all necessary electrics and automation system of complete package of electrics of WAGON HANDLING SYSTEM on **TURNKEY** basis.

SL No.	Description
1	**Introduction**
2	**Instruction for online bid submission**
3	**Annexure-A (Enquiry Schedule, important Points and Commercial Terms & Conditions)**
4	**Annexure-B (Commercial Check List)**
5	**Annexure-C (** Template for Price format/BOQ for online submission by the bidder)
6	**Annexure- D (Format of EMD BG)**
7	**Annexure- E (Format of Security Deposit)**
8	**Annexure- F (Format of PBG)**
10	**Annexure-G (Technical Specification)**

Tenders are invited on line through website. Tenders are to be submitted strictly as per guidelines furnished in the website of http://etenders.gov.in here under:

INSTRUCTION TO BIDDERS (ITB)

1.0 Tender Summary :

Tender Ref No.	**PUR/HMBP/2022/961927/EL-6356** Dated 18.08.22	
Earnest Money Deposit (**Exempted for NSIC/SSI/MSME registered firms**) (Mandatory)	Rs. 3,00,000/- in favor of "Heavy Engineering Corporation Limited "Payable at Ranchi.(To be submitted in form of DD/BG) to the undersigned through courier/By Hand)	
Tender document cost (Mandatory)	Rs. 1500/- in favor of "Heavy Engineering Corporation Limited "Payable at Ranchi.(To be submitted in form of DD" to the undersigned through courier/By Hand)	
Mode of Tender:	E-tender with e-price bid	
Type of tender	Two Bids System i.e I) Techno-Commercial Bid II) Price Bid	
Last date and time for on-line submission of tender	08.09.22	UPTO 13 Hrs (IST)
Due date and time for on line opening of tender :	09.09.22	AT 15 Hrs (IST)
(Under unforeseen circumstances and if the due date falls on holiday, the tender will be opened on the next full working day at same time		

NOTE: HEC reserves the right to extend / change the schedule of any activity by intimating the bidders through a notification on the e-tender portal.

Instructions for Online Bid Submission

The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app.

REGISTRATION

(i) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: *https://etenders.gov.in/eprocure/app*) by clicking on the link "Online bidder Enrollment" on the CPP Portal which is free of charge.

(ii) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

(iii) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

(iv) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.

(v) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to *ensure that they do not lend their DSC's to others which may lead to misuse.*

(vi) Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.

SEARCHING FOR TENDER DOCUMENTS

i) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as Organization Name, Form of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.

ii) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

iii) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

i) Bidder should take into account any corrigendum published on the tender document before submitting their bids.

ii) Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of *each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.*

iii) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

iv) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use

"My Space" or ''Other Important Documents'' area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

Note: My Documents space is only a repository given to the Bidders to ease the uploading process. If Bidder has uploaded his Documents in My Documents space, this does not automatically ensure these Documents being part of Technical Bid.

SUBMISSION OF BIDS

i) Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

ii) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

iii) Bidder has to select the payment option as "offline" to pay the tender fee as applicable and enter details of the instrument.

iv) Bidder should prepare the tender fee as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the concerned official, latest by as specified in the tender documents. The details of the DD / any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the uploaded bid will be rejected.

v) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. If the price bid has been given as a standard BOQ format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BOQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

vi) The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

vii) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid openers public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.

viii) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

ix) Upon the successful and timely submission of bids (i.e. after Clicking "Freeze Bid Submission" in the portal), the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

x) The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

ASSISTANCE TO BIDDERS

i) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

ii) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 **CPP Portal** Helpdesk.

Note: For any query related to registration and processing on the Portal please visit FAQ available at

https://etenders.gov.in/eprocure/app?page=FAQFrontEnd&service=page

You may call the Helpdesk. The 24 x 7 Help Desk Numbers are
0120-4200462, 0120-4001002, 0120-4001005, 0120-6277787
E-Mail: support-eproc@nic.in

Annexure-A

Enquiry Schedule

Subject: The scope of this tender covers Design**,** Engineering**,** Manufacture **/** Fabrication, Inspection & , Shop Testing, Painting of electrics, at manufacturers shop, supply to Stores/HMBP, unloading & Storage and reconservation at site ,erection, installation and commissioning of all necessary electrics and automation system of complete package of electrics of WAGON HANDLING SYSTEM on **TURNKEY** basis as per Annexure-G of NIT.

Sl. No.	Item Description	Total Quantity
1	Supply of complete package of electrical equipments including design, engineering, manufacture, assembly with commissioning spare and Tool &Tackle for both wagon pusher & Wagon Tippler on TURNKEY basis as per Clause No. 4.0* of Annexure-G of NIT	01 lot
2	Installation**,** Erection& commissioning, testing and training along with free issue items and for those items have to be supply by successful bidder for both wagon pusher & Wagon Tippler as per Technical specification of NIT .	01 lot
Note: Scope of supply & work shall be as per enclosed technical specification &drawings however supplier shall be accountable & responsible for the completeness of the system as a whole and any item /Material /Activity which has not been covered by the Scope of work & supply of specification shall be within the scope of the supplier, if it is required for the successful installation & commissioning in line with our approved Drawings & Bill of Material for which NO extra cost shall be payable**.**		

Note:

1. Procurement shall be done on PACKAGE BASIS hence all items under the scope of this Tender Document must be quoted by the bidder.
2. Procurement shall be done of package basis i.e. L1 bidder shall be determined on landed cost of " sum of total overall value of all items as per scope of supply , Works , Services & Terms & conditions of NIT" and order placement shall be done on overall L1 bidder.
3. If the supplier observes that this specification document contains any anomalies, ambiguities, flaws, errors or omissions, the supplier shall immediately bring these to the attention of the purchaser.
4. Detailed Scope & Technical Specification of this tender shall be exactly as per " Annexure-G"

Qualifying Criteria:

a) **Validity of offer** should be minimum 120 days from the date of opening of tender. The offer with a lower validity period other than 120 days will not be acceptable and such offer shall be ignored without assigning any reason.

b) Bidder must have executed similar material handling projects) in steel plants (PSU's & Reputed private Companies) and have to furnish three purchase orders along with Execution certificate.(commissioning certificate) of same PO.

c) Bidder must furnish balance sheet of last three consecutive financial years(2018-19,2020-21,2021-22)

d) **Earnest Money Deposit & Tender document cost:** EMD & tender document cost has to be furnished as per NIT of this tender .If not submitted, your offer can be summarily rejected and no further correspondence shall be done.

Note: No EMD / Tender Document Cost shall be required under the following cases, if the firm is registered with National Small Industries Corporation / Small Scale Industries / Micro, Small-scale Enterprises (MSE), as per Government directive. Necessary documentary evidence to be submitted.

e) The firm should have executed the projects for Steel Plant with Drive system (Yaskawa make VFD) & PLC system.

Commercial terms and conditions:

1. Offers to be submitted on FOR HMBP Stores basis. The rate quoted shall be inclusive of all packing & forwarding, freight and transit insurance charges. **If quoted on Ex Work's basis then Freight charge to be clearly notified otherwise offer may not be accepted.**

2. **The Price quoted by the tenderer should be exclusive of GST**. The rate and nature of GST applicable should be shown separately GST will be paid to the seller at the rate at which it is liable to be assessed or has actually been assessed on the date of supply provided the transaction of sale is legally liable to GST and within the delivery period.
3. The rates quoted must be firm and the offers made must remain open for acceptance for minimum 120 days from the date of opening of the tender.

4. **Payment terms shall be as under:**

For supply of total materials	90% of basic order value of supply part along with 100% taxes & duties shall be released through RTGS within 60 days of receipt of materials along with Guarantee certificate ,test certificate inspection certificate /CRV(To be issued by HEC) ,EDGP(if applicable),original invoice & Performance bank guarantee of 10% order value to be valid till full guarantee period from any nationalized bank only in HEC's Format." **Submission of bills:** Following documents are required to be submitted for processing of payment after receipt of material at our stores/HMBP: i. Copies of Receipted Lorry Consignment Note. ii. Pre-receipted Invoice. iii. Copies of Packing List & Delivery Challan including originals. iv. Copies of Inspection Certificate including originals. v. Dispatch clearance issued by PURCHASER. vi. Original copy i.e GST Invoice vii. Documentary evidence regarding handing over of Transportercopy of GST Invoice to the Site /Stores of PURCHASER. viii. Material Test Certificate. ix. Certificate from the supplier that the contents in each case arenot less than those entered in the invoice and packing list and the quality of goods are guaranteed as new and as per the relevant technical specification. **Balance 10%** of supply part along with 100% payment for erection & commissioning along with 100% taxes shall be released within 30 days after submission of successful commissioning certificate issued by HEC/VSP. i.
FOR erection & commissioning Charges	100% payment for erection & commissioning charges along with 100% GST shall be released within 30 days after submission of following documents: a. Successful commissioning certificate issued by In charge /Services/HMBP/HEC or his representative. b. Tax Invoice.

Note:

i. **For payment all the processing charges by the bank shall be on account of the firm.**
ii. **Any other payment terms other than NIT payment terms shall be loaded with bank interest rate (Presently 1% per month i.e. 12% per annum (Maximum) as per the rules of the company for L1 consideration only.**

5. **DELIVERY SCHDULE: Schedule for drawing submission, Delivery of materials & "Erection & Commissioning" at site:**

Drawing/Documents submission for approval after placement of PO as per technical specification.	Total drawings as per clause No. 13 of technical specification shall be furnished within 21 working days from the date of receipt of PO
Delivery of materials	Firm will raise inspection call within 3 months maximum from the date of approval of drawings /manufacturing Clearance from HEC. Material shall be delivered to Stores/HMBP within 15 days after issuing dispatch clearance.
Erection & commissioning at site as per Technical specification	Within 3 months maximum from the date of intimation from HEC/VSP for site availability..

Note: After receiving comments on drawings, revised drawing incorporating comments shall be submitted within maximum 2-3 working days until there is some extraordinary situation. For submission of drawingsto HEC and thereafter getting approval from MECON, It shall be the prime responsibility of the firm. HEC shall provide all sort of support.

6. Full particulars i.e. specification, literature and / or drawing wherever applicable has to be submitted along with the quotation. The '**Brand'** and '**Make**' name must be indicated.
7. **Earnest Money Deposit -** Earnest money **Rs.3,00,000 /- (Three Lakhs Only)** will have to be deposited in form of demand draft / bank guarantee (format is enclosed at annexure-D)from any nationalized bank Payable on the State Bank of India, Ranchi Hatia Branch, in favor of Heavy Engineering Corporation Ltd. Ranchi. - 4. . (Scan copy of DD to be uploaded along with techno-commercial bid & original DD to be sent through courier / submitted to purchase department.
   Tender Cost - **Rs. 1500 /- (Fifteen hundred Only)** will have to be deposited in form of demand draft Payable on the State Bank of India, Ranchi Hatia Branch, in favor of Heavy Engineering Corporation Ltd. Ranchi. - 4. . (Scan copy of DD to be uploaded along with techno-commercial bid & original DD to be sent through courier / submitted to purchase department

   Note: No EMD / Tender Document Cost shall be required under the following cases, if the firm is registered with:

a) National Small Industries Corporation / Small Scale Industries / Micro, Small-scale Enterprises (MSE), as per Government directive. Necessary documentary evidence to be submitted.

8. The Corporation does not pledge itself to accept the lowest or any tender and reserves to itself the right of accepting the whole or any part of tender or portion of the quantity offered and you shall supply the same at the rate quoted.
9. Supplies will be subject to Inspection by our Inspection wing / or inspection Agencies prescribed by us.
10. Order placed as a result of this tender will be subject to the Corporation's General Terms and Conditions of contract which can be down loaded from our website (www.hecltd.com).
11. Corporation reserves the right to call for and examine at any time the books of accounts and other documents and papers of the firm for the purpose of ascertaining whether any excess payments has been made or the firm likely to be received / received undue benefit out of execution of the particular contract.
12. **The final quantity may vary at the time of finalization of tender; however the proper clarification / confirmation shall be taken from the firms.**

13. Delivery: The time for and the date of delivery of the Stores stipulated in the acceptance of tender shall be deemed to be the essence of the contract and delivery must be completed not later than the dates specified therein as per clause no. 6 of Annexure-A terms .Otherwise:

a) The purchaser to recover from the contractor a sum of 0.5 % per week (completed week) of the price of the stores(upto maximum 10 %) as liquidated damages, which the contractor has failed to deliver as aforesaid or,
b) The purchaser may procure the undelivered stores / similar items from elsewhere, without notice to the contractor at the risk of the contractor without canceling the contract in respect of the consignment not yet due for delivery or,
c) To cancel the contract or a portion thereof.

Tenderers registered with National Small Industries Corporation/ Small Scale Industries/ Micro, Small scale Industry (MSE) for the tendered item will be exempted from submission of EMD. The tenderer should enclose an authenticated copy / notarized copy of their valid registration certificate with NSIC, MSE for grant of exemption.

In case Bidder is covered under MSME criteria, it is mandatory to quote UAM/UDYAM no in Bid Documents.

HEC is registered on TReDS governed by RBI Guidelines and our registration no is HE0000320. All MSME firms are advised to be get registered on RXIL (Receivable exchange of India-Mumbai)

14. **Inspection Clause : -** Inspection Shall be arranged by Sr DGM, I/c/QCA , HMBP/HEC or his representative(s), however, HEC reserves the right to inspect after receipt of material at HMBP and if it is not found confirming to our specification, the material shall be rejected and firm have to replace it at no extra cost.
15. **Guarantee/Warranty Clause** – The supplied materials shall be under guarantee for 12 months from the date of installation / commissioning & final acceptance of customer or 18 months from the date of receipt of last consignment of materials at consignee's end whichever is earlier.

16. **Security Deposit-** 5% of the basic P.O. value to be deposited by the successful bidder within 21 days after placement of order by HEC which shall remain with HEC till the completion of order by the firm. This clause is mandatory and has to be accepted by all bidders. **If Security deposit clause is not accepted then the offer of the bidder may not be considered.(Format is enclosed at annexure-E)**
17. **Performance bank guarantee (BG format annexure F):** The successful bidder has to submit the performance bank guarantee of **10% of total basic order value of materials (Set wise)** valid till full guarantee period after supply of the material. (In case order placed on the firm).
    This clause is mandatory and has to be accepted by all bidders. **If PBG clause is not accepted then the offer of the bidder may not be considered.**
18. **Liquidated Damages (LD) Clause:** For late delivery, LD shall be levied @0.5 % per week (completed week) of the price of the stores (upto maximum 10 %) as liquidated damages.
19. **Risk Purchase Clause:** The time for and the date of delivery of the Stores stipulated in the acceptance of tender shall be deemed to be the essence of the contract and delivery must be completed no later than the dates specified therein. Otherwise, The purchaser may procure the undelivered stores / similar items from elsewhere, without notice to the contractor at the risk of the contractor without canceling the contract in respect of the consignment not yet due for delivery, or May cancel the contract or a portion thereof, and if so desired, to purchase or authorise the purchase of stores not so delivered or others of as similar description at the risk and cost of the contractor.
20. **General conditions of the contract :**Unless otherwise specified in the Terms & Conditions above, this order shall be governed by General conditions of contract of purchase of HEC Ltd, which is available in the web site of HEC.(www.hecltd.com)
    Special Note:

    Please indicate whether your firm covered under MSES/MSES owned by SC/ST or MSE Owned by Women covered under SSI separately in Techno-commercial bid.
    Please upload the form of Terms & Conditions duly filled in and signed by the tenderer along with your offer in technical (part-1) bid.

21. Law Governing contract-
    (1)This contract shall be governed by the laws of India for the being in force.
    (2)Irrespective of the place of delivery, the place of payment under the contract, the contract shall be deemed to have been made at the place from which the acceptance of tender has been issued.
    (3)Jurisdiction of Courts: For any or all types of disputes arising out of the contract, the exclusive jurisdiction of the court (s) shall be Ranchi in the State of Jharkhand alone.
    (4)Marking of Stores: The marking of the stores must comply with the requirements of the laws relating to Merchandise Marks for the time being in force in India.
22. **RESOLUTION OF DISPUTE(s) by ARBITRATION**
    The parties to the contract at the first instance shall endeavor to settle by mutual discussion all the questions of disputes all differences arising out of , or relating thereto, all in connection with this contract In the event of failure of settlement , the aggrieved party with prior written permission of other party , shall refer the unresolved dispute(s) or differences(s) to the chairman-cum-managing director of the company(HEC) for adjudication by a sole arbitrator to be appointed with mutual consent by him (CMD of the company) who(sole arbitrator) shall adjudicate the matter in accordance with the arbitration and conciliation act ,1996(For short “ACT”) and publish the award. The party shall have no objection if the sole arbitrator so appointed is an Ex- Employee of HEC, superannuated almost three years ago from the date of reference .If the sole arbitrator for any reason , whatsoever , becomes unable to proceed with the arbitration , the chairman-CUM-Managing Director of the company , with mutual consent of both the parties, shall appoint his successor arbitrator who may proceed with the reference from the stage it was left by the predecessor or subject to the provisions of the Act . The venue of the arbitration proceeding shall be at Ranchi in the State of Jharkhand alone.

    The other provisions of arbitration & Conciliation act , 1996 , (As amended from time to time) especially as per the provisions of schedule V and schedule VII and sections 6 , 11(2), 12(5) should be considered during the appointment of sole arbitrator .

23. **Mode of dispatch:**

By Road to the consignee at In-charge stores /HMBP/HEC Ltd. Ranchi. For the consignments dispatched by road, the supplier shall ensure that the following are observed by them:

i) All dispatches must be affected only on receipt of written dispatch clearance from the purchaser.

ii) Material shall be dispatched to In-charge stores/HMBP/HEC Ltd, Ranchi.

iii) Care shall be taken to avoid damages during transit to ensure that all the packages are firmly secured.

24. **PACKING, FORWARDING & SHIPMENT-**

a. **The supplier has to ensure proper packing so that material reaches destination without damage.**
b. **The supplier shall notify the purchaser of the date of each shipment from his works and the expected date of arrival at the site for information.**

25. **"This procurement of goods/services under the reference tender is covered under public procurement policy 2017, revised 16.09.2020 and here in after any further revisions."**

Annexure B

(To be filled by bidder and scan copy of the same to be uploaded along with Techno-commercial bid)

Sl No.	Terms & Conditions	Desired BY HEC	Bidders Comment (Accepted / Not accepted)	Remarks
1	**All Items of NIT to be quoted by bidder**	**Must be quoted on package basis , otherwise offer may not be evaluated .**		
2	Price Term (Ex-Works / FOR HMBP)	FOR HMBP Stores, HEC Ltd, Ranchi-4		
3	**Packing and Fwd. charge .**	**To be included in quoted price.**		
4	GST Registration certificate	To be furnished		
5	TAXES (GST)	% of Applicable Taxes to be indicated Extra		
6	Payment Terms	To be confirm in line with NIT Clause No.4 of NIT's commercial terms and conditions.		
7	Validity of Offer	Minimum 120 days from the date of opening of tender		
8	Price Variation Clause	Prices will be firm till the execution of order. (To be confirmed)		
9	Delivery Schedule	To be confirm in line with NIT Clause No.5 of NIT's commercial terms and conditions.		
10	Inspection	Supplier should submit inspection call after receipt of PO and inspection of material will be done by as per clause no of 8 of technical specification.		
11	Freight Charges	**To be included in quoted price**		
12	Guarantee/Warranty as per NIT Clause No. 15 of commercial terms and conditions.	**To be provided** (12 months from the date of installation/ commissioning & final acceptance of customer or 18 months from the date of receipt & acceptance of materials at consignee's end whichever is earlier)		
13	Security Deposit for 5% of PO value as per NIT Clause No. 16 of commercial terms and conditions.	To be deposited by successful bidder within 21 days after placement of order by HEC. **This clause is mandatory and has to be accepted by all bidders. . If Security deposit clause is not accepted then the offer of the bidder shall not be considered.**		
14	Performance bank guarantee for 10% of order value as per clause No. 17 of annexure-I	Bank Guarantee for performance from any nationalized bank in favor of HEAVY ENGINEERING CORPORATION LIMITED, Ranchi **as** per tender enquiry. **This clause is mandatory and has to be accepted by the bidder. If PBG clause is not accepted then the offer of the bidder shall not be considered.**		
15	EMD of Rs. 3,00,000.00 (Mandatory) & **Tender document cost of Rs 1500/-(Mandatory)**	DD from any nationalized bank in favor of HEAVY ENGINEERING CORPORATION LIMITED, payable at Ranchi (Exempted for NSIC/SSI/MSME registered firms hence furnish valid NSIC/SSI/MSME certificate to avail exemption.)		
16	L/D Clause Acceptable (Yes/No) as per NIT Clause No. 18 of commercial terms and conditions.	**Must be Accepted (As per NIT)**		

17	Acceptance of Risk Purchase Clause (Yes/No) as per NIT Clause No. 19 of commercial terms and conditions.	**Must be Accepted (As per NIT)**		
18	GCC of HEC (available in tender section at HEC website : www.hecltd.com)	To be accepted as per NIT		
19	Confirmation of Supplying the materials as per Enquiry Schedule	YES/ NO		
20	All NIT conditions are acceptable	Yes/No, if no then state the clause wise deviation		
21	If firm is owned by SC/ST Entrepreneurs	To be indicated		
22	UAM (Udyog Aadhar No)/UDYAM No if registered under MSME	To be mentioned by bidder if applicable		
23	Materials shall be manufactured & supplied in line with in adherence of QMS/EMS/OHSAS	To be confirmed		

Annexure-C

Format of Price Bid

Bidders are requested to note that they should necessarily upload their financial bids in the format **provided on e-tender portal and upload the same in e-tender portal** and no other format is acceptable. If the price bid has been given as a standard BOQ format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BOQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

Annexure-D

Format of EMD Bank Guarantee

BANK GURANTEE FOR EARNEST MONEY DEPOSIT

NO. **Dated:**

TO

SDGM/PURCHASE /MM DIVISION
HEAVY MACHINE BUILDING PLANT
HEAVY ENGINEERING CORPORATION LTD.
RANCHI-834004, JHARKHAND
INDIA

Dear Sirs,

In consideration of your agreeing to accept the Earnest money deposit of Rs.----------(Rs----------) furnishable to you by M/s----------(Hereinafter Referred to As Contractor) In terms of the Enquiry No. ---------- ----------Dtd. **----------** for Supply of ---------- (Hereinafter Referred to as the Contract) in the form of a Bank Guarantee in the Manner hereinafter contained we ----------, having registered office at ----------do hereby covenant and agree with you as follows.

1. We hereby undertake to indemnify you up to a sum of Rs. ---------- (Rs. ---------- only) against any loss or damage caused to or suffered by you or that may be caused to or suffered by you by reason of any breach or breaches on the part of the contractor of any of the terms and conditions contained in the said contract and in the event the Contractor shall make any default or defaults in carrying out any of the works under the said contract or otherwise in the observance and performance of any of the terms and conditions relating thereto in accordance with the true intent and meaning thereof, we shall forthwith on demand and without any protest or demur pay to you such sum or sums not exceeding in total the said sum of Rs.---------- (Rs. ----------*amount*----------only) as may be claimed by you as your losses and/or damages, costs, charges or expenses by reason of such default or defaults on the part of the contractor.

2. Notwithstanding anything to the contrary contained in this guarantee your decision as to whether the contractor has made any such default or defaults and the amount or amounts to which you are entitled by reasons thereof will be binding on us and we shall not be entitled to ask you to establish your claim or claims or damages or losses suffered by you but will pay the amount demanded by you under this guarantee forthwith on your demand without any protest or demur.

3. This guarantee shall continue and hold good until it is released by you on the application by the contractor after expiry of the related warranty period of the said contract and after the contractor have discharged all their obligations under the said contract and produced a certificate of due completion of the work under the said contract and submitted a “NO Demand Certificate” provided always that this guarantee shall in no event remain in force after the date of---------- without prejudice to your claim or claims arisen and demanded from or otherwise notified to us in writing before the expiry of six months from the said date which will be enforceable against us not withstanding that the same is or are enforced after the said date.

4. We----------, further undertake to extend the validity of this beyond the period prescribed in clause 3 or as extended from time to time for such further period as may be required in writing before the Expiry of this and upon such extension(s), all terms and conditions of this shall remain in full force till the expiry of this extended period(s).

5. You will have the fullest liberty without affecting this guarantee from time to time to vary any of the terms and conditions of the said contract or extend the time of performance of the contractor or to postpone for any time or from time to time any of your rights or powers against the contractor and either to enforce or

forbear to enforce any of the terms and conditions of the said contract and we shall not be released from our liability under this guarantee by the exercise of your liberty with reference to matters aforesaid or by reason of any time being given to the contractor or any other forbearance, act or omission on your part or any indulgence by you to the contractor or by any other variation or modification of the said contract or any other act, matter or things whatsoever, which, under the law relating to sureties, would but for the provisions hereof, have the effect of so releasing us from our liability hereunder provided always that nothing herein contained will enlarge our liability hereunder beyond the limit of Rs. ----------(Rs.----------) as aforesaid or extend the period of the guarantee beyond the said Date of ----------unless expressly agreed to by us in writing in terms of clause 4 hereof.

6. This guarantee shall not in any way be affected by your taking or varying or giving up any securities from the contractor or any other person, firm or company on its behalf or by the winding up, dissolution, insolvency or death as the case may be of the contractor.

7. In order to give full effect to the guarantee herein contained, you shall be entitled to act as if we are your principal debtors in respect of all your claims against the contractor hereby guaranteed by us as aforesaid and we hereby expressly waive all our rights of suretyship and other rights, if any, which are in any ways inconsistent with any of the provisions of this guarantee.

8. Subject to the maximum limit of our liability as aforesaid this guarantee will cover all your claim or claims against the contractor from time to time arising out of or in relation to the said contract and in respect of which your claim in writing is lodged on us before expiry of six months from the date of expiry of this guarantee.

9. Any notice by way of demand or otherwise hereunder shall be in writing and may be sent by special Courier or Telefax to us or our Local Address as aforesaid.

10. This guarantee and the powers & provisions herein contained are in addition to and not by way of limitation or substitution for any other guarantee or guarantees heretofore given to you by us whether jointly with others or alone and now existing uncancelled and that this guarantee is not intended to and shall not revoke or limit such guarantee or guarantees.

11. This guarantee shall not be affected by any change in the constitution of the contractor or us nor shall it be affected by any change in your constitution or by any Amalgamation or absorption thereof or therewith but will ensure for the benefit or and be available to and enforceable by the absorbing or amalgamated company or concern.

12. This guarantee is irrevocable during the period of its currency and shall not be revoked without your previous consent in writing.

13. We further agree and undertake to pay you the amount demanded by you in writing irrespective of any dispute or controversy between you and the contractor or any reference to arbitration of the said dispute/controversy pending or a civil suit filed by the contract or in respect of the dispute or controversy.

14. Not withstanding anything contained herein above our liability under this guarantee is restricted to Rs.---------- (Rs. ----------only) and this guarantee shall remain in force until ----------unless a written claim is lodged on us for payment under this guarantee within six months from the date of expiry of this guarantee . i.e. On or before----------all your rights under this guarantee shall be forfeited and we shall be deemed to have released and discharged from all liabilities there under, irrespective of whether or not the original guarantee is returned to us.

15. We have power to issue this guarantee in your favour under the memorandum and articles of association of the bank and the undersigned has full power to execute this guarantee under the power of Attorney Granted to them by the Bank.

FOR AND ON BEHALF OF

Annexure-E

Format of BANK GUARANTEE of Security Deposit

TO,
M/S HEAVY ENGINEERING CORPORATION LIMITED
PLANT PLAZA ROAD,
DHURWA,
RANCHI – 4

DEAR SIR,

IN CONSIDERATION OF YOUR AGREEING TO ACCEPT THE SECURITY DEPOSIT OF RS. ……'*amount'*…….. FURNISHABLE TO YOU BY M/S ……'*firms name'*……..... (HEREINAFTER REFERRED TO AS CONTRACTOR) IN TERMS OF THE CONTRACT NO. ……'*HEC's purchase order no'*…….FOR SUPPLY OF ……'*details of items'*……...(HEREINAFTER REFERRED TO AS THE 'CONTRACT') IN THE FORM OF A BANK GUARANTEE IN THE MANNER HEREINAFTER CONTAINED WE…..*'bank details'*…… BRANCH, HAVING REGISTERED OFFICE AT ……'*place'*…… DO HEREBY COVENANT AND AGREE WITH YOU AS FOLLOWS:

1. WE HEREBY UNDERTAKE TO INDEMNIFY YOU UP TO A SUM OF RS. ……'*amount'*…….(RUPEES ……'*amount in words'*.....) AGAINST ANY LOSS OR DAMAGE CAUSED TO OR SUFFERED BY YOU OR THAT MAY CAUSED TO OR SUFFERED BY YOU BY REASON OF ANY BREACH OR BREACHES ON THE PART OF THE CONTRACTOR OF ANY OF THE TERMS AND CONDITIONS CONTAINED IN THE SAID CONTRACT AND IN THE EVENT THE CONTRACTOR SHALL MAKE ANY DEFAULT OR DEFAULTS IN CARRYING OUT ANY OF THE WORKS UNDER THE SAID CONTRACT OR OTHERWISE IN THE OBSERVANCE AND PERFORMANCE OF ANY OF THE TERMS AND CONDITIONS RELATING THERETO IN ACCORDANCE WITH THE TRUE INTENT AND MEANING THEREOF, WE SHALL FORTHWITH ON DEMAND AND WITHOUT ANY PROTEST OR DEMUR PAY TO YOU SUCH SUM OR SUMS NOT EXCEEDING IN TOTAL THE SAID SUM OF RS. ……'*amount'*…….(RUPEES ……'*amount in words'*.....) AS MAY BE CLAIMED BY YOU AS YOUR LOSSES AND / OR DAMAGES, COSTS, CHARGES OR EXPENSES BY REASON OF SUCH DEFAULT OR DEFAUTS ON THE PART OF THE CONTRACTOR.

2. NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED IN THIS GUARANTEE YOUR DECISION AS TO WHETHER THE CONTRACTOR HAS MADE ANY SUCH DEFAULT OR DEFAULTS AND THE AMOUNT OR AMOUNTS TO WHICH YOU ARE ENTITLED BY REASONS THEREOF WILL BE BINDING ON US AND WE SHALL NOT BE ENTITLED TO ASK YOU TO ESTABLISH YOUR CLAIM OR CLAIMS OR DAMAGES OR LOSSES SUFFERED BY YOU BUT WILL PAY THE AMOUNT DEMANDED BY YOU UNDER THIS GUARANTEE FORTHWITH ON YOUR DEMAND WITHOUT ANY PROTEST OR DEMUR.

3. THIS GUARANTEE SHALL CONTINUE AND HOLD GOOD UNTILL IT IS RELEASED BY YOU ON THE APPLICATION BY THE CONTRACTOR AFTER EXPIRY OF THE RELATED WARRANTY PERIOD OF THE SAID CONTRACT AND AFTER THE CONTRTACTOR HAVE DISCHARGED ALL THEIR OBLIGATIONS UNDER THE SAID CONTRACT AND PRODUCED A CERTIFICATE OF DUE COMPLETION OF THE WORK UNDER THE SAID CONTRACT AND SUBMITTED A 'NO DEMAND CERTIFICATE' PROVIDED ALWAYS THAT THIS GUARANTEE SHALL IN NO EVENT REMAIN IN FORCE AFTER THE DATE OF …'*date'*…… WITHOUT PREJUDICE TO YOUR CLAIM OR CLAIMS ARISEN AND DEMANDED FROM OR OTHERWISE NOTIFIED TO US IN WRITING BEFORE THE EXPIRY OF SIX MONTHS FROM THE SAID DATE WHICH WILL BE ENFORCEABLE AGAINST US NOTWITHSTANDING THAT THE SAME IS OR ARE ENFORECED AFTER THE SAID DATE.

4. WE ……*'bank name'*……, FURTHER UNDERTAKE TO EXTEND THE VALIDITY OF THIS BEYOND THE PERIOD PRESCRIBED IN CLAUSE 3 OR AS EXTENDED FROM TIME TO TIME, FOR SUCH FURTHER PERIOD AS MAY BE REQUIRED IN WRITING BEFORE THE EXPIRY OF THIS AND UPON SUCH EXTENSION(S), ALL TERMS AND CONDITIONS OF THIS SHALL REMAIN IN FULL FORCE TILL THE EXPIRY OF THIS EXTENDED PERIOD(S).

5. YOU WILL HAVE THE FULLEST LIBERTY WITHOUT AFFECTING THIS GUARANTEE FROM TIME TO TIME TO VARY ANY OF THE TERMS AND CONDITIONS OF THE SAID CONTRACT OR EXTEND THE TIME OF PERFORMANCE OF THE CONTRACTOR OR TO POSTPONE FOR ANY TIME OR FROM TIME TO TIME ANY OF YOUR RIGHTS OR POWERS AGAINST THE CONTRACTOR AND EITHER TO ENFORCE OR FOREBEAR TO ENFORCE ANY OF THE TERMS AND CONDITIONS OF THE SAID CONTRACT AND WE SHALL NOT BE RELEASED FROM OUR LIABILITY UNDER THIS GUARANTEE BY THE EXERCISE OF YOUR LIBERTY WITH REFERENCE TO MATTERS AFORESAID OR BY REASON OF ANY TIME BEING GIVEN TO THE CONTRACTOR OR ANY OTHER FORBEARANCE , ACT OR OMISSION ON YOUR PART OR ANY INDULGENCE BY YOU TO THE CONTRACTOR OR BY ANY OTHER VARIATION OR MODIFICATION OF THE SAID CONTRACT OR ANY OTHER ACT, MATTER OR THINGS WHATSOEVER, WHICH, UNDER THE LAW RELATING TO SURETIES, WOULD BUT FOR THE PROVISIONS HEREOF, HAVE THE EFFECT OR SO RELEASING US FROM OUR LIABILITY HEREUNDER PROVIDED ALWAYS THAT NOTHING HEREIN CONTAINED WILL ENLARGE OUR LIABILITY HEREUNDER BEYOND THE LIMIT OF RS. ……*'amount'*……(RUPEES ……*'amount in words'.....*) AS AFORESAID OR EXTEND THE PERIOD OF THE GUARANTEE BEYOND THE SAID DATE OF …*'date'*…. UNLESS EXPRESSLY AGREED TO BY US IN WRITING IN TERMS OF CLAUSE 4 HEREOF.

6. THIS GUARANEE SHALL NOT IN ANY WAY BE AFFECTED BY YOUR TAKING OR VARYING OR GIVING UP ANY SECURITIES FROM THE CONTRACTOR OR ANY OTHER PERSON, FIRM OR COMPANY ON ITS BEHALF OR BY THE WINDING UP, DISSOLUTION, INSOLVENCY OR DEATH AS THE CASE MAY BE OF THE CONTRACTOR.

7. IN ORDER TO GIVE FULL EFFECT TO THE GUARANTEE HEREIN CONTAINED, YOU SHALL BE ENTITLED TO ACT AS IF WE ARE YOUR PRINCIPAL DEBTORS IN RESPECT OF ALL YOUR CLAIMS AGAINST THE CONTRACTOR HEREBY GUARANTEED BY US AS AFORESAID AND WE HEREBY EXPRESSLY WAIVE ALL OUR RIGHTS OF SURETYSHIP AND OTHER RIGHTS, IF ANY, WHICH ARE IN ANY WAY INCONSISTENT WITH ANY OF THE PROVISIONS OF THIS GUARANTEE.

8. SUBJECT TO THE MAXIMUM LIMIT OF OUR LIABILITY AS AFORESAID THIS GUARANTEE WILL COVER ALL YOUR CLAIM OR CLAIMS AGAINST THE CONTRACTOR FROM TIME TO TIME ARISING OUT OF OR IN RELATION TO THE SAID CONTRACT AND IN RESPECT OF WHICH YOUR CLAIM IN WRITING IS LODGED ON US BEFORE EXPIRY OF SIX MONTHS FROM THE DATE OF EXPIRY OF THIS GUARANTEE.

9. ANY NOTICE BY WAY OF DEMAND OR OTHERWISE HEREUNDER SHALL BE IN WRITING AND MAY BE SENT BY SPECIAL COURIER, SPEED POST OR TELEFAX TO US AT OUR LOCAL ADDRESS AS AFORESAID.

10. THIS GUARANTEE AND THE POWERS & PROVISIONS HEREIN CONTAINED ARE IN ADDITION TO AND NOT BY WAY OF LIMITATION OF OR SUBSTITUTUION FOR ANY OTHER GUARANTEE OR GUARANTEES HERETOFORE GIVEN TO YOU BY US WHETHER JOINTLY WITH OTHERS OR ALONE AND NOW EXISTING UNCANCELLED AND THAT THIS GUARANTEE IS NOT INTENDED TO AND SHALL NOT REVOKE OR LIMIT SUCH GUARANTEE OR GUARANTEES.

11. THIS GUARANTEE SHALL NOT BE AFFECTED BY ANY CHANGE IN THE CONSTITUTION OF THE CONTRACTOR OR US NOR SHALL IT BE AFFECTED BY ANY CHANGE IN YOUR

CONSTITUTION OR BY ANY AMALGAMATION OR ABSORPTION THEREOF OR THEREWITH BUT WILL ENSURE FOR THE BENEFIT OF AND BE AVAILABLE TO AND ENFORCEABLE BY THE ABSORBING OR AMALGAMATGED COMPANY OR CONCERN.

12. THIS GUARANTEE IS IRREVOCABLE DURING THE PERIOD OF ITS CURRENCY AND SHALL NOT BE REVOKED WITHOUT YOUR PREVISOUS CONSENT IN WRITING.

13. WE FURTHER AGREE AND UNDERTAKE TO PAY YOU THE AMOUNT DEMANDED BY YOU IN WRITING IRRESPECTIVE OF ANY DISPUTE OR CONTROVERSY BETWEEN YOU AND THE CONTRACTOR OR ANY REFERENCE TO ARBITRATION OF THE SAID DISPUTE / CONTROVERSY PENDING OR A CIVIL SUIT FILED BY THE CONTRACTOR IN RESPECT OF THE DISPUTE OR CONTROVERSY.

14. NOTWITHSTANDING ANYTHING CONTAINED HEREIN ABOVE OUR LIABILITY UNDER THIS GUARANTEE IS RESTRICTED TO RS. ……'*amount'*……(RUPEES ……'*amount in words'.....*) AND THIS GURANTEE SHALL REMAIN IN FORCE UNTILL ……'*date'*…. UNLESS A WRITTEN CLAIM IS LODGED ON US FOR PAYMENT UNDER THIS GUARANTEE WITHIN SIX MONTHS FROM THE DATE OF EXPIRY OF THIS GUARANTEE i.e. ON OR BEFORE …'*date' + '6 month'*…… ALL YOUR RIGHTS UNDER THIS GUARANTEE SHALL BE FORFEITED AND WE SHALL BE DEEMED TO HAVE REALEASED AND DISCHARGED FROM ALL LIABILITIES THEREUNDER. IRRESPECTIVE OF WHETHER OR NOT THE ORIGINAL GUARANTEE IS RETURNED TO US.

15. WE HAVE POWER TO ISSUE THIS GUARANTEE IN YOUR FAVOUR UNDER THE MEMORANDUM AND ARTICLES OF ASSOCIATION OF THE BANK AND THE UNDERSIGNED HAS FULL POWER TO EXECUTE THIS GUARANTEE UNDER THE POWER OF ATTORNEY GRANTED TO THEM BY THE BANK.

FOR AND ON BEHALF OF
'name of bank'

'*signature with seal'*

Annexure-F

FORMAT OF PERFORMANCE BANK GURANTEE

(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT & TO BE ISSUED BY ANY NATIONALISED /SCHEDULED BANK AUTHORISED BY RBI TO ISSUE A BANK GUARANTEE)

Name of Equipment: ---------- Guarantee NO----------
Purchase Order No.:---------- dated: ---------- Date: ----------
Validity ----------
Claim period----------

To:
M/s Heavy Engineering Corporation Ltd.
Heavy Machine Building Plant
Ranchi-834004 Jharkhand

In consideration of your having placed an order bearing Purchase Order No.----------dated:---------- with----------(hereinafter referred to as Supplier) for the supply of----------
---------- (hereinafter referred to as the----------
We ---------- do hereby agree with you irrevocably that, should the machinery and equipment fail to give the guarantee performance and achieve the efficiency as stipulated in the Purchase Order within the period of guarantee or should the material and/or workmanship of the machinery and equipment supplied or any part thereof be found defective and/or fully, as per the purchase order, we undertake to pay without any demur merely on demand a sum of Rs. ----------being 20% of the value of Rs. ----------for the supply of ----------
Your decision whether the supplier have made any such defaults and the amount to which you are entitled by reasons thereof shall be conclusive and bind on us, subject to maximum of Rs. ---------- as aforesaid.

We----------further guarantee that the machinery and equipment manufactured and supplied by the supplier shall be new, of good quality materials and of the first class workmanship as specified in the Purchase order and should the machinery and equipment supplied or any part thereof be found defective and that should the defect as pointed out in inspection note be not made good and/or in case of failure within guarantee period same shall be replaced on free of cost or repaired on free of cost to the entire satisfaction of Heavy Engineering Corporation Ltd.
We ----------agree that the guarantee herein contained shall remain in full force and effect till the machinery and equipment give the desired performance and it shall continue to be enforceable till your dues have been fully paid and claims satisfied or discharged subject to a period not later than---------. In the event of any extension granted for commissioning/dispatch suitable extension shall be given on your request.
We----------, further agree that any neglect, omission or forbearance or indulgence in enforcing any claim as per the terms and conditions of your purchase order or performance guarantee or any of them or any extension of the time granted for the performance or payment of penalty under the guarantee or any dispute between the supplier and yourselves as regard performance of machinery and equipment supplied or issued related to your Purchase order, shall not effect in any way our liability under this guarantee until the full payment, but in any case, shall not extend beyond----------.
This guarantee is in addition and not substitution for guarantee given to you by the seller or by their bankers on their behalf.
We---------- lastly undertake not to revoke this bank guarantee during its currency except with the previous consent of the corporation in writing.
Notwithstanding anything to contrary stated above, our liability under this guarantee will be restricted to Rs. ---------- and shall remain in force up to ----------, unless a demand or claim under this guarantee is made from the date i.e. on or before----------all your rights under the said guarantee shall be forfeited and we shall be released and discharged from all liabilities there under.
Dated at ---------- day of ----------

Seal of the Bank

Technical Specification Annexure- G

ELECTRICS FOR WAGON HANDLING PLANT

QTY. – 1 SET

MAT. CODE: - 5535810045

1.0 OPERATING CONDITION:-

Ambient Temp.	:	50°C.
Relative Humidity	:	100% (Max. temp. & max. humidity not occurring simultaneously).
Environment	:	Hot, salty, dusty & corrosive due to sea shore.
Vibration	:	Severe shocks & vibration as encountered by the pusher.
Altitude of VSP	:	10.5M above mean sea level.

2.0 POWER SUPPLY:-

Main supply	:	415VAC±10%, 50Hz ± 5%, 3Ph, 4 wire.
Control supply	:	110VAC±10%, 50Hz ± 5%, 1Ph.
Supply for space heater	:	230VAC±10%, 50Hz ± 5%, 1Ph.
Supply for solenoids	:	24V DC.
Fault level	:	50KA for 1 sec.
System Neutral	:	Solidly earthed.

3.0 STANDARDS :-

3.1.1 The design, manufacture, assembly and testing as well as performance (including safety, earthing and other essential provisions) of equipment and accessories covered under this specifications will, in general, comply with the latest issue of:

a) Latest applicable Standards and Codes of Practices published by Indian Standards Institution (BIS).

b) Latest IPSS (Interplant Standards for Steel Industry).

c) Latest Indian Electricity Rules & Statutory requirements of Central Govt. and State Govt.

d) Relevant standard as referred in the technological part of the Technical specifications, TS and GTS of M/s VSP.

3.1.2 IEC recommendations or other reputed national or international standards subject to the approval of the Employer.

3.2 In absence of standard for design, assembly and testing of any items / components in this specification including general specifications enclosed, the items / components shall conform to the relevant Indian Standards published by the Bureau of Indian Standards (BIS), wherever applicable. If any item / component is not covered by Indian Standards, Standards of International Organisation for Standardisation (ISO), International Electrotechnical Commission (IEC) and or some other reputed institutions or generally accepted codes of engineering practices shall be followed / adopted.

3.3 All components, equipment and systems shall comply with statutory requirements of the Government of India and the State Government of Andhra Pradesh. The successful tenderer shall be responsible for obtaining approval from the concerned Local, State or Central authorities.

3.4 The relevant equipment shall conform to the Indian Electricity Rules published in the year 1956 as regards safety, earthing and other essential provisions specified therein for installation and operation of electricals in the plant.

3.5 In case of any discrepancy between this Technical specifications and the stipulations and the standards mentioned in the GTS and TS of M/s VSP, this technical specifications shall prevail upon the standards.

4.0 SCOPE OF SUPPLY AND WORK:-

4.1 The scope of this section includes design, engineering, manufacture, assembly, training, testing and supply of Materials, Electrical equipments and Services for the equipment as specified in this Technical specifications FOR HMBP store at Ranchi/ VSP's Store at VSP. The materials, equipment and services to be provided by the tenderer will include but not limited to the following:

A. WAGON PUSHER

Sl. No.	Description	Qty. / Pusher	Total qty (for 2 Nos. of Pushers)	Remarks
1.	3KVA, UPS {(Input / Output - 415V (3Ph) / 230V (1Ph)} AC, 50Hz with 30 minutes battery backup with batteries and isolation transformer etc. with floor mounting arrangement. **Refer clause 16.4** along with **HEC Drg. No. SK-EDB- 1365.**	1 Set.	2 Sets.	In Panel cabin on WP.
2.	Lighting distribution board for pusher lighting, sheet steel enclosed, floor mounting type, CRCA sheet, sheet thickness -2mm, gland plate thickness -3.0mm and degree of protection - IP54 having MCCBs, MPCBs and MCBs etc. as per	1 No.	2 Nos.	In Resistance cabin on WP

	HEC Drg. Nos. - SK-EDB-1358.			
3.	PLC Panel with back-up processor in hot standby mode and with 1No. - Spare CPU with loaded software, sheet steel enclosed CRCA sheet floor mounting complete with EOI & communication cables, degree of protection shall be IP 42 for main PLC and IP 54 for RI/O panel and associated Interrogation regulated power supply, hardware etc. as per HEC Drg. Nos. - SK-EDB-1356.	1 No.	2 Nos.	In Panel Cabin on WP
4.	Magnetic Proximity switch degree of protection IP - 65 with installation materials, sensing range - 5mm – 120mm as per HEC Drg. Nos. - SK-EDB-1361.	4 Nos.	8 Nos.	On WP machine and ground.
5.	Ultrasonic sensor degree of protection IP - 65 with installation materials, sensing distance up to 7M (Maximum) as per HEC Drg. Nos. - SK-EDB-1361.	1 No.	2 Nos.	On dummy Wagon of Wagon Pusher.
6	Absolute encoder (multi-turn) with coupling as per HEC Drg. Nos. - SK-EDB-1361.	1 Set.	2 Sets.	Mounted on one no. drive gear box for WP position along rail track
7.	Siren, dual tone type, 230V AC, 1Ph, 50Hz, Range-1 Mile, industrial duty, surface mounting type, degree of protection IP – 65 as per HEC Drg. Nos. - SK-EDB-1362.	1 No.	2 Nos.	On WP machine.
8.	Complete set of 2 x 18 W, CFL light fitting with CFL lamps, 230V AC, 1Ph, 50Hz. as per HEC Drg. Nos. - SK-EDB-1380.	14 Nos.	28 Nos.	On WP machine.
9.	Complete set of 70 W, HPSV light fitting with 70W lamp, 230V AC, 1Ph, 50Hz as per HEC Drg. Nos. - SK-EDB-1380.	3 Nos.	6 Nos.	On WP machine.
10.	Complete set of 100W, Bulk head light fitting with bulb, 230V AC, 1Ph, 50Hz as per HEC Drg. Nos. - SK-EDB-1380.	4 Nos.	8 Nos.	On WP machine.
11.	Search light, 250W, 230V AC, 1Ph, 50Hz, industrial duty, degree of protection – IP-65, floor mounting type, Outdoor duty etc as per HEC Drg. Nos. - SK-EDB-1380.	2 Nos.	4 Nos.	On WP machine.
12.	Metal clad, Plug & Switch socket (2P + E) with	2 Nos.	4 Nos.	On WP

	integral switch 15A, 240V AC, 1Ph. degree of protection of Plug & Socket shall be IP65. The switch and socket shall be mounted on cubicle made of CRCA sheet, sheet thickness – 2mm, gland plate thickness – 3.0 mm, wall mounting type, degree of protection of cubicle shall be IP55 with canopy as per HEC Drg. Nos. - SK-EDB-1363.			machine.
13.	Metal clad, Plug & Switch socket (2P + E) with integral switch 5A, 24VAC, 1Ph. degree of protection of Plug & Socket shall be IP65. The switch and Socket shall be mounted on cubicle made of CRCA sheet, sheet thickness – 2mm, gland plate thickness – 3.0mm, wall mounting type degree of protection of cubicle shall be IP55 with canopy as per HEC Drg. Nos. - SK-EDB-1363.	3 Nos.	6 Nos.	On WP machine.
14.	Hand lamp, with compressed rubber handle and galvanized wire guard, having ES Bakelite lamp holder for 24V, 100W, GLS lamp, complete with 24V, 100W tungsten filament lamp and 10M of twin core, flexible, Cu. cable.	2 Nos.	4 Nos.	On WP machine.
15.	Cabin fan with metallic body, 240V AC 50Hz, 1Ph, 300mm sweep, ceiling / wall mounted, universal swiveling type, protected by wire mesh having motor with class F insulation and complete with ON / OFF switch, speed regulator, Fan shall be supplied with mounting arrangement. as per HEC Drg. Nos. - SK-EDB-1380.	2 No.	4 Nos.	On WP Machine in Resistance cabin.
16.	Industrial type Exhaust fan with gravity type louvers, sweep dia - 300mm, 1500 rpm, 230V AC, 1Ph, 50Hz with totally enclosed, heavy duty, class – F insulated motor. Performance shall conform to IS- 2312 – 1973. The fan shall be suitable for installation in resistance cabin and shall be supplied with mounting arrangement as per HEC Drg. Nos. - SK-EDB-1380.	2 Nos.	4 Nos.	On WP machine in Resistance cabin.
17	3.2 Kg, CO2 type, Portable, fire extinguisher with mounting arrangement.	8Nos.	16Nos.	On WP machine and in sub-stations.
18	1.1KV grade, HRPVC / EPR insulated, armoured / unarmoured cu. cable for Power and Control wiring on Wagon pushers and control copper cables on ground and communication cables for	1 Lot	2 Lot	On WP machine and at ground.

	wagon pushers as per HEC Drg. Nos. - SK-EDB-1367.			
19	125A, 3Pole + Neutral + Earth, Plug & Switch Socket, The plug & socket shall be metal clad, industrial type, degree of protection IP65, The switch shall be 125A, MCCB, TP with O/L, S/C and E/F protection. The switch and socket shall be mounted on CRCA sheet, sheet thickness – 2mm, gland plate thickness 3.0 mm, degree of protection of enclosure shall be IP55 with canopy. Enclosure shall be mounted type as per IEC 60309-2 along with accessories as per HEC Drg. Nos. - SK-EDB-1363.	1 No.	2 Nos.	On WP machine

Note : -

1) The maximum height of panels in pusher panel cabin and pusher resistance cabin shall be limited to 1800 mm including base channels.
2) All panels inside pusher cabin shall have front access only.

B. WAGON TIPPLER

Sl. No.	Description	Qty.	Remarks
1.	WTMCC, Intelligent Non draw out MCC, sheet steel enclosed, floor mounting type, CRCA sheet, sheet thickness - 2mm, gland plate thickness -3.0mm and degree of protection-IP54 having 1No.-1250A, microprocessor based EDO ACB, with O/L, S/C, E/F, shunt trip and under voltage release and motor feeders etc. As per HEC drg No.- SK-EDB-1354.	1 No.	In substation 1-14LC-9
2.	Absolute encoder with coupling. As per HEC drg No.- SK-EDB-1361.	1 Set.	On ground near Wagon tippler.machine
3.	PLC system and a back up processor in hot standby mode with 1 no spare CPU with loaded software, sheet steel enclosed CRCA sheet floor mounting complete with remote I/Os panel, Communication cables, degree of protection of main PLC shall be IP 42 and RI/O panel IP 54 main PLC shall have regulated power supply as per HEC, drg No.- SK-EDB-1355,	1Set.	Main PLC panel in ground floor of Control desk building and RI/O panel in Sub-station 1-14LC9
4.	CCVM system with 5 Nos. - Camera, 1No. - PC based LCD/TFT screen for video monitoring and 1 No. PC based video recording station with LCD/TFT screen, PDB, 2 Nos. - Cameras shall be provided in inhaul side and out haul side in tippler house, 3 Nos. - of Cameras shall be provided in	1 Set.	2Nos. in WT house and 3Nos in Outhaul area.

	outhaul area, Cables, associated approaching hardwares, Junction boxes, Camera post with Ladders etc. as per HEC, drg No.- 1507.97.075.		
5.	Control desk, sheet steel enclosed, CRCA sheet, sheet thickness – 2.5 mm, gland plate thickness – 3.0mm for 1No. - Wagon tippler, 2Nos. - Wagon Pushers, CCVM system, 1No. - HMI, minimum 22" TFT colour monitor industrial grade with latest configuration in the market, 3Nos. - Master controllers and following minimum items mounted: - 7Nos. - Selector switches, 42Nos. - Signal lamps, 65Nos. – Illuminated push buttons, 4Nos. - Push buttons, Keyboards and Mouse etc. as per HEC, drg No.- SK-EDB-1359.	1 Set.	In Control desk room building 1st floor.
6.	10KVA, UPS (Input / Output 415(3Ph) / 230(1Ph)V AC, 50Hz with 30 minutes battery backup, with floor mounting arrangement, isolation transformer and batteries etc. **Refer clause no.- 16.4** along with **HEC Drg. No. SK-EDB- 1366.**	1 Set.	In control desk building
7.	Laptop with programming software and all accessories for programming with mouse. (for Wagon tippler & wagon pushers PLC and for CCVM system)	1 Set.	For Wagon pushers an Tippler PLC and CCVM
8.	Laser jet colour printer, A3 size.	1 Set.	In control desk room
9.	Inductive Proximity switch, nominal sensing distance – 10mm, degree of protection IP– 65 with installation arrangement. as per HEC, drg No.- SK-EDB-1361.	16 Nos.	On wagon tippler machine
10.	Laser beam transmitter receiver set, sensing distance range 0.2 –15M, degree of protection IP-65 with installation arrangement. as per HEC, drg No.- SK-EDB-1361.	2 Sets.	In inhaul side and outhaul side
11.	3.2 Kg, CO2 type Portable fire extinguisher, with mounting arrangement.	4 Nos.	In control desk building
12	Railway signal lamp, twin aspects, wall / structure mounting, 240 VAC, 1Ph, 50Hz, Red & Green visor.	2 Nos.	In wagon tippler house
13	Switch socket (2P + E) with integral switch for hand lamp, 5A, 24VAC, 1Ph. The socket shall be metal clad and degree of protection IP65. The switch and socket shall be mounted on CRCA sheet, sheet thickness – 2mm. Enclosure shall have degree of protection IP55 with canopy. Enclosure shall be mounted type as per IEC 60309-2 along with accessories. as per HEC, drg No.- SK-EDB-1363.	4 Nos.	In wagon tippler house
14	Siren, dual tone type, 230 VAC, 1Ph, 50Hz, Industrial duty, range – ½ mile, surface mounting type, IP 65 protection	2Nos.	In wagon tippler house

	outdoor duty. as per HEC, drg No.- SK-EDB-1364.		
15	1.1 KV grade, HRPVC insulated armoured / un armoured, Copper cables for power wiring VFD motors for Wagon tippler. as per HEC, drg No.- SK-EDB-1368.	1Lot	For Wagon tippler and auxiliaries equipments
16	1.1 KV grade, HRPVC insulated, armoured / unarmoured Al. cable for other associated equipment motors on ground and auxiliaries equipment etc. for power wiring. as per HEC, drg No.- SK-EDB-1368.	1Lot	For Wagon tippler and auxiliaries equipments
17	1.1 KV grade, HRPVC insulated, armoured / un armoured copper cables for control wiring of Wagon Tippler and auxiliaries equipments etc. as per HEC, drg No.- SK-EDB-1368.	1Lot	For Wagon tippler and auxiliaries equipments
18	1.1 KV grade, EPR insulated, flexible PCP / CSP sheath, trailing copper cables for Vibrator motors, Limit switches and Proximity switches etc. this cables shall be used from ground to tippler. as per HEC, drg No.- SK-EDB-1368.	1Lot	For Wagon tippler
19	Communication, Screened and special cables as per HEC, drg No.- SK-EDB-1368.	1Lot	For Wagon handling system
20	Control room furniture including chairs, table for printer, CCVMs etc. as per HEC, drg No.- SK-EDB-1359.	1 Set.	For Wagon tippler and auxiliaries equipments
21	Pits for Electronic earthing.	1 Lot	For Wagon tippler and auxiliaries equipments
22	Loud speaker broadcasting system with minimum 13 nos. of speakers and 2 mics with required accessories as per clause no. – 16.12.	1 Lot	For Wagon handling system
23	Telephone distribution system with 8 Nos. of telephones with required accessories and details shall be as per clause no. – 16.13.	1 Lot	For Wagon handling system
24	Data communication system with required accessories shall be as per clause no. – 16.14.	1 Lot	For Wagon handling system
25	Lightening Protection System	6 Sets	For Wagon handling system
26	Portable type, Emergency light, 230V AC, 1Ph	3Nos. minimum	For Wagon handling

			system
27	PDB 100A for repair load, PDB CRCA sheet steel enclosed wall / floor mounting type, sheet thickness - 2mm, detachable gland plate thickness - 3mm, degree of protection IP55 with canopy as per HEC drg no. – SK – EDB – 1357.	1 No.	In Wagon Tippler house
28	MLDB with lighting transformer, CRCA sheet steel enclosed, Wall / floor mounting type, sheet thickness - 2mm, detachable gland plate thickness - 3mm, degree of protection IP55 with canopy, component shall be as per HEC drg no. – SK – EDB – 1357.	1 No.	In Wagon Tippler house
29	100A, Welding socket, 3Pole + Neutral + Earth, Plug & Switch Socket, The plug & socket shall be metal clad, industrial type, degree of protection IP65, The switch shall be 100A, MCCB, TP with O/L, S/C and E/F protection. The switch and socket shall be mounted on CRCA sheet, sheet thickness – 2mm, gland plate thickness 3.0 mm, degree of protection of enclosure shall be IP55 with canopy. Enclosure shall be mounted type as per IEC 60309-2 along with accessories. as per HEC drg no. – SK – EDB – 1363.	2 Nos.	In Wagon Tippler house
30	Hand lamp, with compressed rubber handle and galvanized wire guard, having ES Bakelite lamp holder for 24V, 100W, GLS lamp, complete with 24V, 100W tungsten filament lamp and 10M of twin core, flexible, Cu. cable.	2 Nos.	For Wagon Tippler
31	First aid boxes, Shock treatment charts, Danger boards, Danger signals etc. as per GTS – GS – 03.	1 Set	For Wagon handling system

C. WAGON HANDLING SYSTEM

Sl.No.	Description	Remarks
1	Supply of spares as per clause no. -11	
2	All tools, tackles, instruments, meters, testing kits, accessories, consumables etc. required for site testing, relay setting, commissioning, performance & guarantee tests as well as for equipment operation shall be supplied by the tenderer. List of minimum items are indicated at clause no. – 12.0. If additional items are required during the above activities the same will be supplied by the tenderer without any price implication. List to be furnished by tenderer along with the offer.	
3	The BOQ mentioned above is covering all major electrical components, However the supply has to be complete in all respects within the parameters of the specifications and no extra claim can be accepted. The demonstration of proper functioning of the electrical system during performance, guarantee test is in the scope of supply and work. Also,the design and engineering shall be complete in all respect and any equipment or facility not covered in the specification	

	but essential for proper installation and maintenance of electrics for Wagon handling complex, VSP, Visakhapatnam, shall be deemed to be included in the scope of work of the tenderer.	
4	Supply of all required control cables, communication cables, signal cables and hardware / interface card for system are included in the scope of the tenderer. Terminations and hardwares required at both the ends will be in the scope of the tenderer. Successful exchange of signals between VSP's plant PLC system and WTPLC system will be the responsibility of the tenderer.	
5	Training of Plant engineers of M/s VSP on PLC system, Drive system (For type of Yaskawa make VFD, refer cl. no.- 4.2 for free issued Wagon Pusher VFD and wagon Tippler VFD) and Telecommunication System for 8 Persons for Two weeks.	
6	Cable carrier system i.e. overhead Cable Bridge for cables laying between VSP's building to HEC's equipment will be in the scope of the tenderer	
7	Status of wagon tippler with Pusher car and its associated equipment will be made available in the CHP PLC by signal exchange on Ethernet. Additionally, for critical signals, hard wired interface will also be provided between Wagon Tippler PLC and VSP's plant (CHP) PLC	
8	The supply of electrics comprising of MCCs, CCVM system, PLC system, Telecommunication system with Telephone distribution system, Data communication system, Loud speaker broadcasting system, Lightening protection system, Limit switches, sensors, Cables, Cable laying, Cables trays, Junction boxes, Cable accessories, Earthing, Cable trenches installations materials, Earthing Pits, earthing materials, insulating rubber mats, cable tunnels and misc. electrics based on design data / basis covered in this technical specifications is on **turn – key basis**.	
9	Any items / equipment / material including contractual obligation which are not specifically mentioned in the TS but are required to make the job complete in all respects for trouble free maintenance, smooth and safe operation of the offered equipment/ system as well as smooth execution of contract to the complete satisfaction of M/s VSP will be provided by the tenderer without any price implication.	
10	M/s VSP / MECON / HEC reserves the right to change the quantity or delete any item from the scope of supply of this technical specifications. Tenderer to consider supply of all types of software required for successful operation of PLC system, HMI, EOI, Communication to higher level. At least one **(**1**)** licensed set of PLC and one **(**1**)** licensed set of visualization (HMI / EOI) software etc. and	

	other system shall be provided for customer use**.** Tenderer shall also provide the required software for successful data communication between PLC and VSD units in addition to the required hardware.	

	Description	**Qty. / Pusher**	**Total qty (for 2 Nos. of Pushers)**	**Remarks**
11	Installation materials, such as : Sheets, Plates, chequered plates, Pipes, Angles, Channels, G.I. Fasteners, G,I. strips / G.I. wires / copper wires, cable markers, Insulating rubber mats, anti vibration mount, Junction boxes with IP55 protection with canopy, Cable trays, Copper cable lugs, Double compression brass Cable glands and associated cable accessories etc for supply items indicated at cl no-4.1.A and free issue items indicated at cl no.-4.2.A.	1 Lot	2 Lot	For **Wagon Pushers**
12	Earthing arrangements such as:- GI strips, minimum size 50 x 6, GI wires, Copper strips, Boss, Copper cable, Lugs, Galvanized fasteners etc for supply items indicated at cl no-4.1.A and free issue items indicated at cl no.-4.2.A.	1 Lot	2 Lot.	For **Wagon Pushers**

	Description	**Qty.**	**Remarks**
13	Installation materials, such as, sheets, Plates, Pipes, Angles, chequred plates, Channels, GI Fasteners, GI strips / GI wires / copper wires, cable markers, Insulating rubber mats, Anti vibration mounts, Junction boxes with IP55 protection, Cable trays, Cable lugs, Double compression brass Cable glands etc for supply items indicated at cl no-4.1.B and free issue items indicated at cl no.- 4.2.B	1 Lot	For **Wagon tippler** and auxiliaries equipments
14	Earthing arrangements such as :- GI strips size 50 x 6, GI wires, Copper strips, Bosses, Copper cable, Lugs, Galvanized fasteners etc for supply items indicated at cl no-4.1.B and free issue items indicated at cl no.- 4.2.B	1 Lot	For **Wagon tippler** and auxiliaries equipments

4.2 Following items shall be **free issue items** to the tenderer and will be handed over to the successful tenderer from Purchaser's stores at VSP, Vishakhapatnam. Loading and transportation from Purchaser's store at the premises of M/s VSP to the site of Wagon Handling system, receipt, unloading, storage and re-conservation at site are in the scope of tenderer. Installation**,** Erection, testing and commissioning of these items are also included in the tenderer's scope as listed under in tabular format. **Licensed version of all required softwares, hardwares / accessories as required for communication, parameterization and programming of the drives are included in tenderer's scope (For details of drives refer HEC drg no SK-EDB-1376 and SK-EDB-1377)**

A. <u>WAGON PUSHER</u>

Sl. No.	Description	Qty. / Pusher	Total qty (for 2 Nos. of Pushers)	Remarks
1.	Incoming MCC on ground, sheet steel enclosed, floor mounting type, CRCA sheet, sheet thickness - 2 mm, gland plate thickness - 3.0 mm and degree of protection-IP54 having 1No. - 800A microprocessor based EDO ACB, with O/L, S/C, E/F and under voltage release, shunt trip etc.	2 Nos.	4 Nos.	On ground in 1-14LC10B & 1-14LC10D
2.	Incomer cum Auxiliary MCC Panel, Sheet steel enclosed, Floor mounting type, CRCA sheet, sheet thickness - 2mm, gland plate thickness - 3.0 mm and degree of protection IP54 having 1No. - MCCB, 800A, 4P with O/L, S/C, E/F and under voltage release and 1No. – Power contactor, T.P., 1000A etc.	1 No.	2 Nos.	In Panel Cabin on WP
3.	VFD Panel **(Make of VFD - Yaskawa)**, Sheet steel enclosed, Floor mounting type, CRCA sheet, Sheet thickness -2mm, Gland plate thickness -3.0mm and degree of protection - IP42 having IGBT based, sine coded PWM control and vector control drive, for 45 KW, 750rpm, 415V, 3Ph, 50Hz, S1 duty, Sq. cage motor	6 Nos.	12 Nos.	In Panel cabin on WP .
4.	Dynamic braking resistance unit (DBR) for 45 KW motor, S1 duty (continuous rating of DBR shall be minimum 18 KW Mech.), floor mounting type, Degree of protection IP-33.	6 Sets.	12 Sets.	In Resistance cabin on WP

5.	45 KW at 40°C, 750 rpm (syn), 415V, 3Ph, 50Hz, class – F insulation with temperature rise limited to class –B limit, TEFC, Inverter grade Crane duty, B3, S1 duty, Degree of protection IP 55 with canopy Sq. cage ind. motor. Cooling – 411.	6 Nos.	12 Nos.	On WP machine.
6	DCEM shunt brake, Brake dia- 300mm with manual release lever arrangement and degree of protection IP 55.	6 Nos.	12 Nos.	On WP machine.
7.	Brake rectifier panel housing 3 Nos. of rectifiers unit suitable for individual operation of brake, Brake dia – 300 mm, degree of protection of brake rectifier section - IP 54 and resistance section IP 33.	2 Sets.	4 Sets.	In Resistance cabin on WP
8.	Lighting transformer - 10KVA (9000VA + 1000VA), 415 / 240 / 24V AC, single phase, 50Hz, Sheet steel enclosed, Floor mounting type, CRCA sheet, Sheet thickness -2mm, Gland plate thickness -3.0mm and degree of protection IP42, class- F insulated with temperature rise limited to class – B limit, winding shall be double wound copper conductors .	1No.	2 Nos.	In Resistance cabin on WP
9.	Radio remote control with modem (100% Hot Redundant), transmitter & receiver set with antennae cables, hardware and degree of protection IP65 etc.	2 Sets.	4 Sets.	In Panel Cabin on WP
10.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type with installation arrangement on ground, degree of protection - IP65, consists of following minimum items mounted :- 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 2Nos. – LED, cluster type indicating signal lamps etc.	5 Nos.	10 Nos.	On ground along the rail track of WP

11.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP-65, consists of following minimum items mounted : - 1No-. Red mushroom head emergency stop switch with 2NO + 2NC contacts, 9Nos. - Illuminated push button with 2NO + 2NC contacts, 4Nos. - Push button with 2NO + 2NC contacts and 7Nos. - LED, cluster type, indicating signal lamps etc.	1 No.	2 Nos.	In Panel cabin on WP
12.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - 10A, 4P, ON / OFF, Lever operated emergency stop switch, 2Nos. - Illuminated push button with 2NO + 2NC contacts and 3Nos-. LED, cluster type indicating signal lamps etc.	3Nos.	6Nos.	On WP machine.
13.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 3Nos. - Illuminated push button with 2NO + 2NC contacts, 3Nos. - Push button with 2NO + 2NC contacts and 2Nos. – LED, cluster type indicating signal lamps etc.	1 No.	2Nos.	For Lubricatio n system on WP
14.	Roller lever operated track limit switch, heavy duty, 10A, 415VAC with 2NO + 2NC contacts, degree of protection IP65.	2 Nos.	4 Nos.	On WP Machine

B. <u>WAGON TIPPLER</u>

Sl. No.	Description	Qty.	Remarks

1.	VFD Panel **(Make of VFD - Yaskawa),** Sheet steel enclosed, Floor mounting type, CRCA sheet, Sheet thickness -2mm, Gland plate thickness -3.0mm and degree of protection - IP42 having IGBT based, sine coded PWM control and vector control drive, for 55 KW, 750rpm, 415V, 3Ph, 50Hz, S1 duty, Sq. cage motor.	2 Nos.	In substation 1-14LC-9
2.	Dynamic braking resistance unit (DBR) for 55 KW motor, S1 duty (continuous rating of DBR shall be minimum 30 KW Mechanical.), floor mounting type, Degree of protection IP-33.	2 Sets.	In substation 1-14LC-9
3.	55 KW at 40°C, 750 rpm (syn), 415V, 3Ph, 50Hz, class – F insulation with temperature rise limited to class –B limit, TEFC, Inverter grade Crane duty, B3, S1 duty, Degree of protection IP 55 with canopy Sq. cage induction motor. Cooling – 411.	2 Nos.	On ground near Wagon tippler.
4.	DCEM shunt brake, Brake dia -500 mm with manual release lever arrangement and degree of protection IP– 55.	2 Nos.	On ground near Wagon tippler.
5.	Brake rectifier panel for individual operation of brake, Brake dia – 500mm, degree of protection of brake rectifier section-IP 54 and resistance section IP 33.	2 Sets.	On ground near Wagon tippler machine
6.	Incremental encoder with coupling.	2 Sets.	On ground near Wagon tippler machine
7.	Radio remote control with modem (100% Hot Redundant), transmitter & receiver set with antennae, cables, hard wired and degree of protection IP65 etc.	2 Set	For Wagon Pushers in control desk room

8.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 4Nos. - Illuminated push button with 2NO + 2NC contacts, 2Nos. - Push button with 2NO + 2NC contacts and 7Nos. – LED, cluster type indicating signal lamps etc.	2 Nos.	For Wagon tippler in Tippler house
9.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 3Nos. - Illuminated push button with 2NO + 2NC contacts, 3Nos. - Push button with 2NO + 2NC contacts and 2Nos. – LED, cluster type indicating signal lamps etc.	1No.	For Lubricatio n system in Tippler house
10.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / Structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 4Nos. - Illuminated push button with 2NO + 2NC contacts, 5Nos. - Push button with 2NO + 2NC contacts, 6Nos. LED, cluster type indicating signal lamps and 1No. - 4P, 2way ON / OFF selector switch etc.	1No.	For Hydraulic system in Tippler house
11.	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 4Nos. - Illuminated push button with 2NO + 2NC contacts, 4Nos. - Push button with 2NO + 2NC contacts and 6Nos. – LED, cluster type indicating signal lamps etc.	1No.	For Vibrator motors in Tippler house
12	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 2Nos. - Illuminated push button with 2NO + 2NC contacts, 2Nos. - Push button with 2NO + 2NC contacts, 4Nos. – LED, cluster type indicating signal lamps and 1No. - 10A, 4P, 2 way with OFF selector switch etc.	1 No.	For Dust suppressi on system in tippler house

13	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 1No. - Red mushroom head emergency stop switch with 2NO + 2NC contacts, 2Nos. - Illuminated push button with 2NO + 2NC contacts, 1No. - Push button with 2NO + 2NC contacts and 3 Nos. – LED, cluster type indicating signal lamps etc.	2 Nos.	For Actuator drive in Tippler house
14	Local control station, Thermoplastic polycarbonate moulded enclosure, wall / structure mounting type, degree of protection IP65, consists of following minimum items mounted : - 2Nos. - Illuminated push button with 2NO + 2NC contacts and 2Nos. – LED, cluster type indicating signal lamps etc.	1No.	Attendent post at De-coupling point in WT house
15	Roller lever operated track Limit switch, Heavy duty, 10A, at 415V AC with 2NO + 2NC contacts, degree of protection IP65.	18 Nos.	Near Wagon tippler machine
16	Rotary geared limit switch, 5 circuits, gear ratio 1:30, Vertical mounting, type- KTLS-4658 of EPCC make or equivalent.	2 Nos.	Near wagon tippler machine

4.3 Inspection and Test as per clause no.8.0

4.4 Installation of electrical equipments as per clause no. 9.0

4.5 Guarantee and performance as per clause no. – 10.0

4.6 Supply of drawings and documents as per clause no. - 13.

4.7 Technical particulars and details of work as per clause no.16.0

5.0 <u>GUARANTEE</u>: 12 (twelve) months from the date of commissioning.

6.0 <u>GENERAL REQUIREMENT</u> :-

6.1 **<u>Quality and Workmanship</u> :-**

6.1.1 All materials shall be of tested quality suitable for the purpose intended and workmanship shall be of highest standards and practices for equipment of the class covered by the specification**.**

6.2 **<u>Safety:</u>-**

6.2.1 All electrical equipment shall be complete with adequate safety devices wherever a potential hazard to personnel exists and with provision for safe access of personnel to and around electrical equipment for operational and maintenance functions**.**

7.0 Battery limit:-

7.1 **WAGON TIPPLER:** One feeder of 415 V of current rating 1250A will be made available at outgoing terminal of VSPs MCC feeder at existing Electrical Premise 1-14LC-9 which is located near Wagon Tippler Building. Drawings of 1-14LC-9 is enclosed for reference. Power cables as per HEC drg no. SK – EDB – 1366 from VSP's MCC to WTMCC shall be supplied by M/s HEC at site. Erection, installation of cable trays, cables laying and termination of these cables are in the scope of tenderer.

Further distribution of power from WTMCC to electrics is in the scope of tenderer, power, control & communication cables from WTMCC as per SK- EDB – 1366, SK-EDB- 1355 & HEC drg. No. 1507.97.075 are in the scope of tenderer.

Supply, erection and installation of cable trays, pipes, cable pits, trenches, laying and termination of these cables shall be in the scope of tenderer.

7.2 WAGON PUSHER: Two feeders of 415V of required current rating will be made available at outgoing terminal of LT switchboard in substations 1-14LC-10B & 1-14LC-10D. Tenderer will locate the incoming MCC for pusher at these Electrical rooms. Drawings of these Electrical rooms is enclosed for reference. Supply, erection and installation of incoming MCC in substations 1-14LC10B & 1-14LC10D are in the tenderer's scope. All power, control & communication cables on wagon pusher machines and control & communication cables on ground as per HEC drg no. SK-EDB-1365 & SK-EDB-1355 shall be in the tenderer's scope.

Supply erection and installation of cable trays, pipes cable pits, cable trenches etc. and laying & termination of these cables shall be in the scope of tenderer.

7.3 In case of sensitive equipment which require more stringent quality of power supply with lesser variations to achieve the desired performance, the successful tenderer shall provide the necessary regulator/stabilizer before such equipment.

7.4 For any equipment which is designed for a voltage different from the above**,** the necessary transformers**,** conversion equipment etc**.,** will be provided by the tenderer**.**

7.5 **Standard Voltage levels:**

Standard voltage levels to be adopted in the plant are specified as below & same will be followed unless mentioned otherwise in the Technical specification (TS).

Sl. No	**Description**	**Data**
1	LT AC	415V±10%, 3Phase, 50Hz± 5%, 4 wire, Solidly earthed for motors up to 200 KW and other LT equipment.
2	AC control and signaling voltage for PCC, MCC, MCP, Soft starter, VFD etc.	110V AC ± 10% obtained using suitable control transformers with manual changeover facility.
3	Special socket outlets for portable lamps	24V AC Single Phase, 50Hz, obtained through suitable

		transformers
4	Solenoid valves	24V DC, unearthed
5	Machine tools lighting	240V, Single phase, 50Hz, lighting AC obtained through suitable transformers.
6	Sockets for Welding purposes	415V, 125A, 3Pin + Earth with Plug interlocked switch
7	Sockets for hand tools	240V AC 15A, 2Pin + Earth with Plug interlocked switch
8	Illumination system	240V AC, 1Ph, 50Hz.
9	Search Light	240V AC, 1Ph, 50Hz.
10	Automation system equipment like PLC, RIO, PC, Servers etc, and other electronic panels	240V AC, 50Hz, obtained through UPS
11	Special Electronic equipment / Package type control & monitoring system	24/12VDC through SMPS & UPS
12	PLC DI interrogation voltage	110 V AC through SMPS
13	PLC DO	Potential free relay contact, 5A rating suitable for 240V AC,24V DC
14	PLC DI Module	110 V AC
15	PLC DO Module	24 V DC

8.0 INSPECTION AND TESTS: -

8.1 All necessary tests shall be carried out by the successful tenderer to demonstrate whether the electrics and materials offered conform to the relevant standards and specifications. The tenderer shall submit a quality assurance plan (QAP) within 30 days after award of contract and they will carry out inspection as per approved QAP mutually agreed between M/s VSP/MECON/HEC or their authorized representative without any commercial implication.

8.2 The tenderer shall furnish in his offer, a complete list of tests of electrics to be carried out at their factory and at site during the commissioning of each equipment. These shall include carrying out the requisite tests at site and obtaining of statutory test certificates / clearable from the relevant Indian / State Government Authorities prior to commissioning. The M/s VSP/MECON/HEC may ask for special tests to be carried out for any equipment. The tests to be done and the procedures to be adopted will be finalized between M/s VSP/MECON/HEC and successful tenderer.

8.3 The test certificates for bought-out items including instruments etc., shall be supplied before inspection to M/s VSP/MECON/HEC or his authorized representative. These test certificates shall indicate actual test results in relevant unit obtained in such test.

8.4 Testing of all electrical equipment shall be carried out as per General Technical Specification GTS – GS - 03 & GTS – GS – 05.

9.0 INSTALLATION OF ELECTRICAL EQUIPMENTS:-

9.1 The successful tenderer is required to carry out the installation of all panels, electrics of wagon pushers & wagon tippler, CCVM system, Telephone distribution system, Data communication system, loud speaker broadcasting system and lightening arrestor at site and its associated electrics such as lubrication panel, local control station, Junction boxes etc. Danger boards, Danger signals and insulating rubber mats, first aid boxes, fire extinguishers, lightening arrester shall be installed by the tenderer. The successful tenderer shall therefore, be responsible for satisfactory erection, testing and commissioning of the equipment notwithstanding that he may have been assisted by the M/s VSP/MECON/HEC's authorised representative.

9.2 All installation works related to electrics and other associated electrics. Such as Laying of cables and Cable trays, earthing, Cable trenches, Cable pits, Cable pipes, GI strips, termination of cables with copper cable lugs and gland of cables with double compression brass cable glands and associated works at Wagon Handling Plant, COB # 5, VSP.

10.0 GUARANTEE AND PERFORMANCE :-

10.1 General:-

10.1.1 All electrics / equipment / component shall be guaranteed for design, materials, workmanship and satisfactory performance as required in this specification and in accordance with relevant clauses of the General conditions of this Technical specifications and integrated performance of all the electrics / equipments will be responsibility of the successful tenderer and this will be binding on them.

10.1.2 The successful tenderer shall be responsible for carrying out performance tests on all electrics / equipments in the presence of the supplier and the representatives of M/s VSP/MECON/HEC to demonstrate that the electrics is capable of achieving the performance guarantees as specified in this technical specification. Instruments as installed for normal operation of the plant, machinery and equipment shall be made use of during the performance tests as far as practicable. The successful tenderer shall also provide any additional instrument required. Manning required for the performance tests shall not be more than the manpower required for normal plant operation. The performance tests shall be carried out by the successful tenderer as per the terms and conditions given in this technical specifications.

10.1.3 M/s VSP/MECON shall schedule the availability of raw material rakes for carrying out the performance tests.

10.1.4 The performance tests shall be carried out for unloading of three (3) consecutive rakes after ascertaining that the plant is commissioned as a whole and is capable of conducting the performance guarantee test. The successful tenderer shall guarantee the performance tests parameters given in this technical specification.

10.1.5 All necessary tests shall be carried out by the successful tenderer to demonstrate whether the performance of electrics conform to the relevant standards and specifications and meet the operational requirements indicated in the technical specifications.

10.1.6 The performance and guarantee test at site shall be conducted after completion of erection. The tests shall establish the following:

a) Tippling rate of minimum 18 tips per hour with co-ordinated operation of electric wagon pusher and wagon tippler.

b) Proper functioning of controls of all the integrated electrics for dust suppression units to contain dust emission level as per statutory regulation.

c) Proper functioning of controls of vibrator motors, etc.

d) All control and other functions.

10.2 Performance Guarantees :-

PG parameters	**Acceptable Tolerance limit**
Unloading rate of 18 tips/hr.	16 tips/hr to18 tips/hr.

11.0 SPARES: -

11.1 The tenderer shall furnish a list with quantity of commissioning spares, based on his past experience for items indicated at clause. no. 4.1, a list of minimum commissioning spare is indicated below and in case of any shortfall in the quantity of such spares, additional quantity, as required, shall have to be supplied by the successful tenderer without any cost implication.

11.1.1 LIST OF MINIMUM COMMISSIONING SPARES FOR ELECTRIC WAGON PUSHERS AND WAGON TIPPLER

(To be supplied with the equipment)

	Electrical	
Sl. No.	**Description**	Quantity
1.0	Power contactor	2 Sets of each rating.
1.1	MCBs	2 Sets of each rating.
1.2	MPCB	2 Sets of each rating.
1.3	Aux. Relays	10 Nos. of each rating
2.0	Timers	6 Nos.
2.1	Push Buttons	20 Nos.

2.2	Illuminated push buttons	20Nos.
2.3	Signal lamps cluster LED type 240VAC	10 Nos.
2.4	Signal lamps cluster LED type 110VAC	10 Nos.
2.5	HRC fuses	6 Nos. of each rating
2.6	Semiconductor fuses	6 Nos. of each rating

11.1.2 A list of Commissioning spares for Loud speaker broadcasting system (LSBS), Telecommunication system and Data communication system shall also be furnished during detail engineering.

11.1.3 The Tenderer shall also furnish a separate item wise price list with quantity of commissioning spares and shall have to be supplied by the successful tenderer for free issue items mentioned at clause no.- 4.2.

11.2 2 years operation maintenance spare with itemised list and quantity, which are required for two years normal trouble-free operation of the equipment**.** The itemised list and quantity are indicated below**.** Tenderer should also furnish item wise price. However supply of these spares are not included in the scope of supply.

11.2.1 LIST OF RECOMMENDED SPARES FOR 2YEARS NORMAL OPERATION & MAINTENANCE FOR WAGON PUSHERS AND WAGON TIPPLER

Sl. No.	***Description***	*Unit*	*Qty.*
1.0	***Programmable controller & Peripheral devices***		
1.1	*CPU*	*Pc.*	*2*
1.2	*Power supply card*	*Pc*	*2*
1.3	*Memory card*	*Pc*	*2*
1.4	*Communication card*	*Pc*	*2*
1.5	*Radio modem communication card*	*Pc*	*2*
1.6	*110 V AC input card*	*Pc.*	*2*
1.7	*Output card (relay based)*	*Pc*	*2*
1.8	*Analog input card*	*Pc*	*2*
1.9	*Analog output card*	*Pc*	*2*
1.10	*PLC Processor Cards*	*Set*	*1*
1.11	*I/O Module of each type (Digital / Analog)*	*Set*	*2*
2.0	***Ultrasonic sensor***		
2.01	*Controller*	*Pc*	*1*
2.02	*Sensor*	*Pc*	*1*
3.0	***MCC / DB / Control panels***		
3.01	*MCCB each rating*	*Set*	*2*
3.02	*MPCB each rating*	*Set*	*2*
3.03	*MCB each rating*	*Set*	*2*
3.04	*Contactor each rating*	*Set*	*2*
3.05	*EOCR with display unit /Thermal overload*	*Set*	*2*

	relay each rating		
3.06	*ELR of each rating*	*Set*	*2*
3.07	*Auxiliary relay.*	*Pc*	*10*
3.08	*Timer*	*Pc*	*4*
4.0	***Safety Switches & Field Mounted Devices***		
4.1	*Magnetic proximity switch*	*Pc*	*1*
4.2	*Laser beam transmitter and receiver*	*Set*	*1*
4.3	*Inductive Proximity switch*	*Pc*	*2*
5.0	***Sensor***		
5.01	*Absolute encoder (multi turn) with coupling for Wagon pusher*	*Pc*	*1*
5.02	*Absolute encoder with coupling for Wagon tippler*	*Pc*	*1*
6.0	*Power contactor of each rating*	*Set*	*1*
7.0	***Motors***		
7.0.1	*DE & NDE end bearing of Wagon tippler motor*	*Set*	*1*
7.02	*DE & NDE end bearing of Wagon pusher motor*	*Set*	*1*
7.03	*Motor for wagon tippler*	*Pc*	*1*
7.04	*Motor for wagon pusher*	*Pc*	*1*
8.0	***Sensor***		
8.01	*Incremental encoder with coupling for WT*	*Pc*	*1*
8.02	*Extension shaft for incremental encoder*	*Pc*	*1*
8.03	*Incremental encoder with mounting gear for Wagon tippler*	*Pc*	*1*
9.0	*Heavy duty roller type limit switches*	*Pc*	*2*
10.0	*Radio modem*	*Pc*	*1*
11.0	*Key Board*	*Pc*	*1*
12.0	***VVVF / VECTOR drives***		
12.01	*Controller card each rating*	*Set*	*1*
12.02	*IGBT block each rating*	*Set*	*2*
12.03	*Diode / thyristor block each rating*	*Set*	*2*
12.04	*Semiconductor fuses each rating*	*Set*	*3*
12.05	*DBR transistor & control block each rating*	*Set*	*2*
12.06	*Basic resistor block each rating*	*Set*	*2*
12.07	*Coupling RC circuit each rating*	*Set*	*2*
12.08	*One full drive unit*	*Pc*	*1*

11.2.2 A List of recommended spares for 2 year normal operation and maintenance for loud speaker broadcasting system, Telephone distribution network, Data communication network and lightening protection system will be furnished **during detail engineering by the tenderer** with item wised price.

11.2.3 At least ten (10) years spare supports shall be ensured for PLC system, Components of VVVF drives, Radio remote control, Loud speaker broad casting

system, Telephone distribution network, Data communication network, Lightening protection system and associated equipment etc.

12.0 TOOLS AND TACKLES:-

12.1 The Tenderer shall include and furnish special tools and tackles for normal operation and maintenance of the electrics in the offer**.** The itemised list**,** shall be indicated in the offer : -

However a minimum list of Tools & tackles for electrical equipments are indicated below.

Sl. No.	Description	Qty.
1	Portable handheld CCTV monitors for CCTV system maintenance	2 Nos.
2	Digital handheld multimeters	2 Nos.
3	Laptop with necessary software loaded for CCTV maintenance	1 No.

13.0 DRAWINGS AND DOCUMENTS :-

13.1 INFORMATIONS TO BE FURNISHED ALONG WITH THE OFFER, OTHERWISE OFFERS MAY BE IGNORED :-

The Tenderer shall furnish the following information / drawings / documents along with the offer for electrics of electric wagon pushers, Wagon tippler, CCVM system, Telecommunication system, Data communication system, Loud speaker broadcasting system and Lightening protection system etc of Wagon Handling System, **COB # 5,** failing, which the offer may be ignored.

13.1.1 Stamped and signed copy of tender specifications as a token of acceptance of technical specifications.

13.1.2 Point wise confirmation of the enquiry specifications, clearly listing out deviations, if any.

13.1.3 General Arrangement drawing with dimensions, bill of materials, brief technical specification, make and type of components for the followings electrics: -

i) GA drgs. / Overall dimension of Lighting Distribution Board for Wagon pusher, Intelligent MCC for Wagon tippler etc.
ii) GA drgs. / Overall dimension of Control Desk (for Wagon pushers, Wagon tippler and CCVM etc.).
iii) GA drgs. / Overall dimension of Sensors along with data sheet, Catalogues etc.
iv) GA drgs. / Overall dimension of CCVM System.
v) GA drgs. / Overall dimension of PLC / RI/O panels etc.
vi) Block diagram for CCVM system.
vii) Block diagram for Loud speaker broadcasting system.
viii) Block diagram for Telecommunication system with Telephone distribution network.

ix) Block diagram of Data communication network.
x) GA & Block diagram of Lightening Protection system.
xi) Equipment Layout drgs. of Control desk and other equipments in the control room building for Wagon Tippler and Wagon Pushers.
xii) Any other item being offered.

13.1.4 Brief write-up on the controls of the WHP system with Telecommunication system and CCVM system being offered.

13.1.5 Write up on control logic**,** Automation system, Configuration diagram with CCVMs, PLC system, Loud Speaker broadcasting system, with Telephone distribution system, Data communication network etc.

13.1.6 Data sheets and BOM for, PLC system, , CCVM system, Limit switches, Sensors, Encoders, Telephone Distribution network, Loud Speaker broadcasting system, Data communication network, Lightening protection etc.tshall be furnished.

13.1.7 Catalogue / Leaflets of the components being offered.

13.1.8 All items / Electrics shall be as per preferred make list of M/s VSP, (GTS-GS-13) only.

13.1.9 Confirmation regarding completeness of the system i.e. any items required for completeness of the system, though specifically not mentioned shall be included in the tenderer's scope without any price implications.

13.1.10 Any other information asked, elsewhere in the technical specifications shall be in the tenderer's scope.

13.2 **Drawings and Document to be submitted after placement of the order:-**

13**.**2.1 The successful tenderer shall submit the following Electrical drawings / documents to M/s HEC / VSP / MECON for their approval **/** comments **/** information before supply of the Electrics, However, detailed list of drgs to be submitted for approval from Customer / Consultant shall be furnished to the successful tenderer after placement of order : **-**

1	GA, SLD, Schematic, BOM, terminal details of Lighting distribution board.
2	UPS GA, schematic, BOM & calculations for Wagon tippler & Wagon pushers**.**
3	GA, Technical details, wiring and looping diagram and BOM of PLC for Wagon tippler.
4	Operation and maintenance manual of PLC system for WHP
5	Logic diagram of PLC for Wagon tippler & Wagon pushers.
6	GA, technical details, wiring and looping diagram and BOM of PLC system for Wagon pushers.

7	Data sheet of sensors for WHP.
8	GA and data sheet of Siren for Wagon Pushers and wagon tippler.
9	GA & BOM of Lights, Lighting installation and cable layout on Wagon pushers.
10	GA, TB details & BOM of 415V Socket outlet & associated equipments for WHP.
11	Networking of Hand lamp, 24V, sockets in the Wagon Tippler house.
12	Cable schedule for Wagon pusher-1 & Wagon pusher-2 (power & control and communication cables)
13	Cable schedule for Wagon tippler.
14	Details of earth pit, earthing rod, GI earth strips for WHP.
15	Equipment, conduit, cable trays and Earthing layout on Wagon tippler
16	Equipment, Cable tray, Conduit, Pipe Layout and Earthing Layout in control desk building.
17	Details of cable Pits for Wagon Pushers and wagon tippler.
18	Installation, cable layout and Earthing layout of field equipments for WHP.
19	GA & BOM of Pits for electronic earthing.
20	Equipment, cables, conduit, cable trays and Earthing layout on wagon pushers machines.
21	Equipment, Cable tray, Conduit & Cable layout and Earthing layout on Wagon pushers.
22	GA, BOM with details of Electronic grounding system.
23	GA of cable tray for WHP**.**
24	Equipment, cables, conduit, cable tray and earthing layout in substations 1-14LC10B & 1-14LC10D for pusher.
25	Cable trays / Pipe / Conduit layout, Power and control wiring and Earthing layout from Load centre Sub-station 1-14LC9 to Wagon tippler house & WHP control desk building and from Wagon tippler house to WHP control desk building.
26	Equipment layout**,** Cable tray, Conduit layout, Power and control wiring and Earthing layout in Wagon Tippler House and on Wagon tippler machine.
27	Equipment, Cable tray, Conduit , Pipe Layout and Earthing Layout in Sub-station 1-14LC-9 building from Incoming supply feeder of M/s VSP (located in Sub-station 1-14LC-9).
28	GA and BOM with details of cable trenches for cable laying of WHP.
29	GA & BOM of Lightening protection system for WHP.
30	Data sheet of Cables for wagon handling system.

31	GA, SLD, schematic, BOM, Technical details, TB details, wiring diagram of MCC for Wagon tippler.
32	GA and data sheet of Limit switches for Wagon pushers.
33	GA drg & Data sheet of limit switches for Wagon tippler.
34	GA, wiring diagram, TB details & BOM of control desk for Wagon tippler & Wagon pushers.
35	Technical details of HMI and Laptop for Wagon pushers & Wagon Tippler and CCVM system.
36	System write-up and system feature for CCVM.
37	System configuration / Block schematic diagram of CCVM system.
38	Data sheets / Specification for equipment, accessories and cables of CCVM system.
39	Details of location and type of CCVM equipment along with environmental condition of location of camera.
40	Bill of material of CCVM system.
41	Operation and maintenance manual for CCVM system. Cable routing for CCVM system.
42	Cable schedule for CCVM system.
43	SLD & BOM of power supply arrangement of CCVM system.
44	System write-up and system features for LSBS.
45	System configuration / Block schematic diagram of LSBS.
46	Data sheet / Specification for equipment, accessories and cable of LSBS.
47	Details of location and type of LSBS equipment.
48	Bill of material of LSBS.
49	GA drawing of LSBS.
50	Cable routing for LSBS.
51	Cable schedule for LSBS.
52	System write-up and system features for telecom system.
53	System configuration / Block schematic diagram of Telephone distribution network.
54	Data sheet / Specification for equipment accessories and cable of Telephone distribution network
55	Details of location and type of Telephone distribution network
56	Bill of material of Telephone distribution network.
57	GA drawing of Telephone distribution network.
58	Cable routing for Telephone distribution network

59	Cable schedule for Telephone distribution network.
60	System write-up and system features for Data communication network.
61	System configuration / Block schematic diagram of Data communication network.
62	Data sheet / Specifications for equipment accessories and cable of Data communication network..
63	Details of location and type of Data communication network.
64	Bill of materials of Data communication network..
65	Cable routing for Data communication network.
66	GA drawing of Data communication network..
67	Cable schedule for Data communication network..
68	Location and mounting arrangement of Cameras with stairs and platform at Wagon Tippler Complex & Post tippling area.
69	GA, TB details & BOM of Junction boxes for Wagon tippler & Wagon pushers.
70	Operation manual for WHP, VSP.
71	**Software for PLC: -**
a	Assignment list for I / Os flags, Timers, Counters etc.
b	Application program.
c	Static and dynamic programmes for visualization system
d	Graphic display, Colour page print outs.
e	User and operator manual.
f	Licenced software of PLC and visualization system.

13.2.2 Drawings / data / documents of the supplied items shall be submitted by the tenderer in (12) copies to the Purchaser for approval / reference by M/s VSP / MECON.

13.2.3 All the submission of drgs. / documents by successful tenderer for approval from M/s MECON / VSP shall be routed through M/s HEC, But the approval of drgs / documents / calculations from M/s MECON / VSP shall be the responsibility of the tenderer. However approval of the drgs. by M/s MECON / VSP will not relieve the tenderer of his responsibilities for correctness & adequacy of design, drgs, BOM and completeness of the work on **Turn key basis**.

13.2.4 Any minor change required by M/s MECON / VSP during drawing approval stage shall have to be incorporated by the successful tenderer without any price implications.

13.2.5 Furnishing details of auxiliaries which though not a part of the tenderer's scope of work**,** but are essential for safe and efficient operation of equipment as well as the whole system shall be included in the tenderer's scope.

13.2.6 **With delivery of the electrics, the following shall be supplied :-**

13.2.6.1 Following drawing / documents shall be supplied along with the electrics: -

a) Instruction in English language including erection diagram, procedure for assembly and erection of all equipment.

b) Instruction in English language for operation and maintenance of each of the equipment and their control philosophy. This shall include complete list of components / individual items with their rating, capacity, services etc.

c) Spare parts list with specifications, make, type and technical catalogues.

d) Soft copy of the drawings in AutoCAD format in latest version.

13.2.6.2 **Certified 'As-made' drawings of the electrics shall be supplied after successful commissioning of equipment/electrics.**

13.2.7 Successful tenderer shall prepare and supply complete list of electrical / electronic components of each equipment with brief specification, make, type etc.

13.2.8 Furnishing power requirements and terminal battery points, where power supplies are required.

14.0 COMPLETION PERIOD:-

14.1 The tenderer will submit **BAR CHART** along with the offer: –

I) Design
II) Engineering
III) Manufacture
IV) Supply
V) Erection & commissioning
VI) Performance guarantee test after successful integrated commissioning.

14.2 In complying with the above, the tenderer have noted that the overall time schedule and integrated guarantee performance of all the equipment supplied by them will be the responsibility of the tenderer and this will be binding on them.

15.0 DESIGN DATA / BASIS :-

15.1 Raw Material Unloading System :-

15.1.1 For this purpose, three (3) additional pre-tippling lines in the pre-tippling yard for coal shall be provided, out of these, two (2) lines shall be for stabling and placement of loaded rakes and one (1) for engine escape provided between two adjacent lines as per existing concept. Electric and diesel locomotives of the Indian railways shall deliver the loaded rakes on the pre-tippling lines in the pre-tippling yard as at present.

15.1.2 After the railway locomotive places the loaded wagons on the pre-tippling lines and the engine escapes through the escape line, the electric wagon pusher along with two dummy wagons shall move at the rear of the loaded rake and shall be manually coupled with the loaded wagons. The pusher shall then push rake of wagons such that the first wagon is placed and indexed on the wagon tippler platform. The first loaded wagon shall then be manually uncoupled and the rake is pushed back to clear the tippler platform for start of tippling operation. Before the second loaded wagon is pushed to the tippler table by the pusher, the first loaded wagon shall be tippled by the wagon tippler. While placing the second loaded wagon to the tippler table, the empty wagon on it shall be pushed out by the loaded one. Thus, all the wagons shall be tippled. For pushing out the last wagon of the tippler table, the pusher car shall be fitted with two (2) flat type dummy wagons on which concrete blocks equal to the payload capacity of these wagons shall be placed to avoid derailment.

15.1.3 The system shall have facility to push out sick loaded wagon through the tippler without tippling the same.

15.1.4 In the pre-tippling yard, electric wagon pusher as well as electric locomotive shall move on the same track. Electric locomotive shall draw power from 25KV overhead conductor while the electric wagon pusher shall be designed on low voltage overhead conductors to be located on the sides as shown in enclosed drawings.

15.1.5 The coal trains to be pushed by the wagon pusher will consist of 52(fifty two) BOY type & 56 (fifty six) BOXN type eight-wheeler open wagons. The overall dimensions of the wagons proposed to be handled by the tippler and their particulars are as below:

Wagon type	Wagon dimension in mm Length x Width x Height[(2)]	Tare weight (T)	Max. Payload (T)	Gross Weight (T)	Other Particulars
BOY	11929 x 3134 x 2450	19.91	71.49	91.40	8-Wheeler
BOXN	10715 x 3136 x 3735	24.28	57.00	81.28	8- Wheeler
BOX NHA	10713 x 3200 x 3450	23.17	65.23	88.40	8- Wheeler
BOX C	14082 x 3136 x 3161	25.00	56.28	81.28	8- Wheeler
BOX NCR	10713 x 3200 x 3233	23.20	58.08	81.28	8- Wheeler
BOST	13729 x 3100 x 3080	25.50	55.78	81.28	8- Wheeler

Notes:-

(1) Wagons will be provided with centre buffer coupler.

(2) Tippler will be designed such that the same is able to tipple all types of tippable wagons having maximum width of 3500 mm with maximum and minimum heights of 3735 mm and 2250 mm respectively.

15.2 Electric Wagon Pusher :-

15.2.1 The brief particulars with quantity of electric wagon pusher are as given below:

1)	Quantity, (Nos.)	: Two (2)
2)	Gauge of wagons, (mm)	: 1676
3)	Travel speed (Fwd/Rev)	: 0.5 m/s suitable to meet the cycle time.
4)	Capacity of hauling, tons	: 5000 (max.)
5)	Length of travel (m)	: 1200 (approx.)
6)	Type of wagons	: All type of tippable wagons to be used by Indian Railways as indicated in this technical specifications.
7)	Lubrication	: Centralised grease lubrication system shall be provided with motorized pumps and automatic line changeover valves.

15.2.2 The system of unloading loaded wagons through tippler provided in coal yard for COB # 5 shall be suitable to unload at least 18 wagons per hour considering all human factors present in operation of the system.

15.2.3 The wagon pusher will be designed with variable speed drives to operate the wagon pusher for operation at two speeds (rated & creep). The successful tenderer will select the speed of wagon pusher such that it will be possible to obtain the rate of unloading of wagons stipulated in this specifications, when the wagon pusher operates in conjunction with wagon tippler. While returning, it will blow suitable horn at every 30 seconds interval.

Provision of two speeds (rated & creep) for the wagon pusher, VFD will be provided in the electric cabin of wagon pushers.

15.2.4 The power collection arrangement of wagon pusher shall be for the full length of travel of the wagons and will be designed such that it can collect power from overhead conductors. The approximate locations of the DSL conductors are shown in enclosed HEC drawings no. – SK – EDB – 1328.

15.2.5 The wagon pusher shall be driven by VSD with vector control drive, electric motors and reduction gear boxes, which will be axle mounted. Separate drive shall be provided for each axle. Each drive unit shall consist of an electric motor, coupling and gear box. Travel (Forward & Reverse) of wagon pusher shall be controlled from joystick master controller provided in control desk via Radio remote control & PLC. Other operations of wagon pusher shall be through HMI provided, in control desk via Radio remote control unit having radio communication interface module, antennae & PLC. While designing radio communication system for wagon pusher, interference due to induction voltages (25KV Line & 415V bus bars) will be considered. Radio communication system will be without repeater.

15.2.6 Parallely connected full capacity duplicate power collection system, 1000A, Gravity type current collectors has been considered on each wagon pusher. The duplicate power collection system shall be located at 5.830M away from 1st Set of power collection system (current collectors) on Wagon pusher to avoid complete failure of power on wagon pusher.

15.2.7 The wagon pusher shall be complete with DC electromagnetic brakes of BCH make. Front and rear end Search Lights and a Loud electric horn (siren) located suitably and audible from a distance of about 1 mile.

15.2.8 The wagon pusher shall be remote controlled from wagon tippler control desk cabin, so as to ensure co-ordinated operation with the wagon tippler.

15.2.9 The equipment shall be designed for continuous 3-shift operation for 365 days in a year and minimum availability of the equipment in operation shall be 95 per cent.

15.3 <u>Wagon Tippler</u> :-

15.3.1 The brief particulars with quantity of wagon tippler included in the scope of this specification is given below :

1) Quantity, No. : 1

2) Track gauge of wagon, mm : 1676

3) Type of wagon handled : All types of tippable wagon used / to be used by Indian Railways as indicated in Cl. No. 15.1.5.

4) Lubrication : Centralised grease lubrication system with motorized pumps and automatic line change over valves.

15.3.2 The wagon tippler shall be operated in sequence with wagon pusher from a common control desk for unloading of wagons.

15.3.3 The angle of tippling shall be between 175 and 180 degree with sufficient time provided to allow unloading of materials from wagon. However, total time from starting of rotation of loaded wagon to bringing back the empty wagon in normal position ready for pushing out will be suitable to achieve the rate of unloading indicated elsewhere in this technical specification. The tilting drive will comprise of two (2) electric motors controlled by VFD with one no. - Absolute encoder hooked up to the units for tracking the angle of tilting. Also an incremental pulse encoder for each motor will be provided for monitoring the speed of the wagon tippler motors.

15.3.4 For unloading sticky materials from wagons, the tippler shall be provided with electric motor operated vibrators (to be provided by vibrator supplier). The vibrators will operate automatically during tippling of each wagon, if it is selected for Remote operation from control desk at the beginning of unloading of a rake.

15.3.5 The wagon tippler shall be provided with effective dust suppression unit so that dust emission level does not exceed statutory regulation (to be provided by Dust suppression system supplier). The dust suppression will be done by plain water spray. Provision will be kept to cut-off the water spraying system from the circuit.

15.3.6 A suitable arrangement with Proximity switches will be provided by the tenderer for correct / automatic positioning of loaded wagons on the tippler platform.

15.3.7 The necessary protection shall be provided so that:

a) Wagon cannot be pushed inside the wagon tippler unless the tippler is in correct position to receive wagons, with provision of limiting forward and reverse turning of the rotor.

b) Wagon tippler will not start rotating, unless the rake is retracted from wagon tippler platform by wagon pusher.

c) Wagon tippler shall not start its operation unless the wagon placed on its deck for unloading is in correct position and is properly clamped to be ensured by inductive proximity switches, limit switches.

d) Wagon tippler shall not start its operation unless the loaded wagons are placed correctly on the deck and empty wagons are pushed out of the tippler platform & leading wagon of loaded rake is also out of the tippler platform and in safe position.

e) Wagon tippler will be provided with interlock system with wagon pusher. Placement of the wagon inside the wagon tippler can only be done with the help of wagon pusher and hydraulic clamps is in clamped positions and rail clamps is in unclamped positions.

15.3.8 All electrical protections with respect to above must have secondary back - up.

15.3.9 The tippler shall be driven through drive units consisting of squirrel cage induction motor having VSD with vector control drive, helical gear box, necessary coupling, driving pinion and DC electro-magnetic brake. Brake provided for the wagon tippler will be suitable to hold the loaded wagon at any position for long time in case of power failure.

15.3.10 The control system of wagon tippler shall be designed, such that the tippling operation of any sick wagon at the wagon tippler can be by-passed by pressing a switch at the control desk without upsetting the automatic interlocked unloading operation.

15.3.11 The design of the equipment and components shall be suitable to withstand the shock, dust and moisture hazard of the area. It will be designed for continuous 3-shift operation for 365 days in a year and minimum availability of the equipment in operation will be 95 per cent.

15.3.12 Wagon tippler operator will enter necessary data / information in operating station provided for wagon handling control desk for MIS.

15.3.13 The equipment offered should be suitable for smooth, efficient and trouble free service in the tropical humid climate prevailing at plant site and under the ambient temperature conditions indicated above for the different shops and areas.

16.0 TECHNICAL PARTICULARS AND DETAILS OF WORK :-

16.1 415V Motor control centre :-

16.1.1 The MCC for wagon tippler shall be intelligent type, Non- drawout type to be installed in the substation 1-14LC9. The intelligent MCC for wagon tippler shall have single incomer comprising of 1 No. - 1250A motorised, draw out ACB with closing coil & under voltage, coil, rated - 110V AC, shunt trip, 50Hz, capable of withstanding 50KA fault level for 1(one) second. The main power from VSP's ACB (located in substation 1-14LC9) will be taken to the 1250A, ACB of WTMCC. ACB shall be operated (ON/OFF) from control desk having remote closing and tripping features. All ACB / MCCB shall have microprocessor based, over current, short circuit, earth fault release etc. The outgoing feeders shall include necessary motors & power feeders comprising MCCB with short circuit protection, power contactor, thermal overload relay / EOCR / ELR comprehensive motor protection, as applicable for wagon handling plant.

16.1.2 The component rating of all outgoing feeder shall be selected in accordance with Type-2 co-ordination as per IS: 13947 (Part−4). Power and motor control feeders shall be provided with ON/OFF/TRIP indication lamps, LED cluster type. Rating of MCCB / MPCB / Contactors / Overloads shall be selected based on Type-2 coordination.

16.1.3 The 415V, WT Intelligent MCC shall be sheet steel enclosed, CRCA sheet, sheet thickness – 2 mm, gland plate thickness – 3.0 mm, self supporting, floor mounted, cubic type of multitier compartmentalized, Single front, non – draw out type, and with 1No. - 1250A, draw out type ACB. The Intelligent MCC shall conform to IS:8623 (Part-1), (Part-2) for factory built assemblies, IS:13947 (Part-1) for general requirement of switchgear and IS:5578 and IS:11353 for marking and arrangement of bus-bars and internal wiring etc. Degree of protection shall be IP-54. The Intelligent MCC shall conform to VSP's General Technical Specification, GTS – GS - 03.

16.1.4 The MCC shall have TPN bus-bars of aluminium alloy conforming to IS: 5082. The busbar size shall be selected such that the temperature of bus-bar does not exceed 90°C. Rating of the bus-bars shall not be less than the derated rating of the drawout ACB unit.

16.1.5 The control voltage, rated for 110V AC shall be fed from two (2) Nos. adequate capacity Single phase, double wound copper conductors, dry type, control transformers of voltage rating- 415/110V AC, generally conforming to IS:11171, with MPCB at the primary and DP MCB at the secondary side along with selector switch for working / stand−by selection. The control bus-bar shall be made of copper of adequate size as per VSP–GTS–GS– 03 (minimum size – 25x3 mm cu.).

16.1.6 The power contactors shall conform to requirements of IS: 13944 **(**Part-4**).** All reversing contactors shall be provided with both mechanical and electrical interlock**.** Minimum rating of power contactor for motor feeders shall be 32A (AC-3) duty and for reversible drive, rating of power contactor shall be AC4 duty.

16.1.7 Interlocking between power and control circuit shall be provided so that control circuit cannot be energized, when the main MCCB is OFF**.** However**,** this interlocking shall be defeated in test position**.** Motor control circuit shall have provision for testing through a 'Test' push-button**,** which shall be accessible only, when the motor feeder compartment door is open and the MCCB of the power circuit is switched off**.**

16.1.8 Identification labels shall be provided for MCC as well as for each devices by using engraved anodized aluminium plate**.**

16.1.9 A continuous Al**.** Earth Bus-bar shall be provided for the complete length of the MCC**.** Two separate earthing terminals shall be provided for external earth connection in conformity with IE Rules**.**

16.1.10 The other constructional and design features of the MCC / Intelligent MCC shall be in line with VSP General Technical Specification (GTS- GS – 03)**.**

16.1.11 The Intelligent MCC of wagon tippler shall have the provision of power source as per HEC Drg. No. - SK – EDB - 1354 for the Dust suppression system, Hyd. Power pack, Lubrication system, Vibrator motors, Actuator drives, 30M High Mast Tower Lights, Apron feeders, MLDB, PDB etc. The tenderer shall also consider all required electrics required for successful operation of Dust suppression system Hydraulic system, Lubrication system and Vibrator motors, 30M High Mast Tower Lights, Apron feeders, MLDB, PDB etc for new coal handling Wagon tippler (WT # 3), COB # 5.

16.1.12 Single ended, Intelligent, non draw-out type MCC having communication capability on Ethernet will be provided for Wagon Tippler.

16.2 Programmable Logic controllers (PLC) & associated equipment :-

16.2.1 Programmable Logic controllers and associated equipment will be considered for integrated operation of Wagon Tippler and Wagon Pushers. The PLC system shall conform to basic automation system as per VSP General Technical specification, GTS - GS - 03. PLC shall be hooked up with Plant PLC at bus level as well as I/O level. Wagon Tippler PLC will have facility to communicate with Dispatcher / Central control room PLC with Ethernet modbus TCP / IP. The processor shall have proper communication modules (for each CPU) for communicating with redundant processor, remote I/O modules and for communicating with other communication bus protocols like Ethernet bus / Profibus / Modbus / Controlnet / Field foundation bus etc. 30 nos. of potential free discrete I/Os shall be provided for signal exchange between wagon tippler and VSP's main PLC based control system. All the required hardware and software for these communications and Supervision of laying of cables and termination of interfacing cables (bus level & I/O level) are included in the tenderer's scope. However finalisation of communication system between WTPLC and VSP Plant PLC shall be decided during detail engineering by our Customer or their Consultant. Any change required by them

shall be provided by the successful tenderer without any price implication.

Pusher PLC drg. shall be as per the HEC drg No. - SK-EDB–1356 & Tippler PLC drg. Shall be as per the HEC drg No. - SK-EDB–1355.

PLC processor in hot back-up with following I/Os shall be provided :-

A) Wagon pusher-1

	No. of Input /output
DI	– 208 (16 / 32 channels)
DO	– 128 (16 / 32 channels
AI	– 16 (8 / 4 channels)
AO	-- 8 (8 / 4 channels)
AI (RTD)	-- 24 (8 / 4 channels)

B) Wagon pusher-2

	No. of Input /output
DI	– 208 (16 /32 channels)
DO	– 128 (16/32 channels)
AI	– 16 (8 /4 channels)
AO	- 8 (8/4 channels)
AI (RTD)	- 24 (8/4 channels)

C) Wagon Tippler PLC: -

C.1) Wagon Tippler Main PLC (in Control desk building)

	No. of Input /output
DI	– 304 (16 / 32 channels)
DO	– 176 (16 / 32 channels)

C.2) RI/O Panel for WT PLC (RI/O located in 1-14LC9 building)

	No. of Input /output
DI	– 272 (16 /32 channels)
DO	– 128 (16 / 32 channels)
AI	– 16 (8 /4 channels)
AO	-- 8 (8 /4 channels)
AI (RTD)	-- 8(8 / 4 channels)

PLC System shall be capable of handling above mentioned Discrete I/O s and Aanalog I/Os. Also memory of CPU shall have at least 50% spare capacity over the requirements.

PLC will perform the following task :-

i) Logic interlock functions, Control & supervision of drives & solenoid valves.
ii) Automatic sequential operation of various drives.
iii) Status indication & signalling.
iv) Fault monitoring & annunciation.
v) Diagnostic features to recognize and display faults.
vi) Communicate with Coal Handling Plant's Central control room PLC.
vii) Provision for update / change of program in future will be provided.
viii) Up – loading and down – loading features.
ix) Off – line and on – line modification in the programming logic.
x) Accessibility for viewing and modifying the program in any block.

Remaining features will conform to VSP's General Technical Specification (GTS-GS-03).

16.2.2 The programmable controller **(**PLC**)** shall be microprocessor based with processor, power supply cards, network switches, communication cards with Hot stand-by configuration both for Wagon tippler & for each Wagon pusher units and shall be used for carrying out automatic control**,** interlocking**,** sequencing and monitoring**.** PLC shall be of rugged modular construction suitable for reliable fail**-**safe operation under arduous industrial conditions**.** The constituent units of PC shall comprise Central processing unit**,** memory unit**,** input and output units**,** interface and communication units**,** power supply assembly, SMPS for interrogation power supply etc. as required to make it a standalone system**.**

16.2.3 The system shall be so chosen that at least 20% spare Input **/** Output channels are available in each rack**.** At each rack spare slot shall be kept to add Inputs / Output cards at later**.** The system shall have the provision to add at least 20% more inputs and outputs in the future**.** Accordingly 30% spare capacity shall be kept in memory for future use of the Customer after complete programming of the system is over**.**

16.2.4 <u>Basic operational requirements</u>:-

The following two **(**2**)** modes of control shall be provided for the plant**:**

<u>Sl. No</u>.	**<u>Mode of control</u>**	**<u>Application</u>**
i)	Centralized manual interlocked control of the equipment from HMI and control desk located in the wagon tippler control room	For operation of equipment individually in sequence
ii)	Local manual de**-**interlocked control of individual equipment from Local control station located near the drive	For maintenance of equipment only

16.2.5 The general functional requirement to be performed by the programmable controller system shall include, but not be limited to the following :-

16.2.5.1 **Centralised manual sequential control:-**

In manual sequential interlocked mode of control programme / path shall be selected and individual drives in a selected path will be operated sequentially through Push buttons, switches & Joysticks as applicable. Once the first drive is started and delay is over, there shall be indication on HMI / Control desk that the first drive is started and next drive will be chosen subsequently and to be operated through Push buttons, Switches & Joysticks as applicable. An 'Emergency stop' Push button shall also be provided in Wagon tippler control desk to stop all the related drives and two separate trip Push buttons to switch off Wagon pusher overhead power conductors.

16.2.5.2 Local de-interlocked control :-

16.2.5.2.1 In this mode, individually drive will be started from its Local control station. However, Selection will be made from PLC system over digital output. When a particular equipment is selected in 'Local mode', indication will be available in HMI through colour animation and blinking.

16.2.5.2.2 In case of emergency, Emergency stop push-button in Local control station will be pressed by the operator and the equipment will stop. Emergency stop signal can also be activated from other safety switches as applicable. In case of activation of emergency stop signal equipment will stop, irrespective of its mode of operation i.e. Local / Remote.

16.2.5.3 Central processing unit (CPU):-

16.2.5.3.1 The configuration of the programmable control system will be done with a main and a back up processor in hot standby mode. The main and back up processor will be arranged in such a way that in case of failure of one processor, the standby processor automatically takes over (bumpless change over) without interrupting the system. One no. - Spare CPU with loaded software shall be provided. Location of spare CPU shall be decided during detail engineering.

16.2.5.3.2 The CPUs and its associated memories shall be selected in such a way that it can execute the required Inputs / Outputs listed with an addition of 20 per cent, Input / Outputs in future. The CPU shall have the capability to control the inputs and outputs in free mix.

16.2.5.3.3 The programme memory shall store the application programme for the process being controlled. The programme shall be developed by using a programming unit and loaded in the programmable controller by using direct memory access facility. Suitable programming languages viz. control system flow chart, ladder symbology, language or statement list etc shall be adopted in accordance with IEC: 1131-3 (1993). The CPU & the memory for a particular application will be so chosen that the total scan time taken by the CPU to scan the programme shall not exceed 100 milli-seconds (typical). It will be possible to edit the application programme `ON line' without disturbing the process. Protection against unauthorized memory alterations shall be provided. Battery backup shall be provided to retain the programme memory in case of power failure.

16.2.5.3.4 All the Processors of Wagon tippler system & each Wagon pusher unit shall be of

identical type from standardization point of view.

16.2.5.4 Input / Output module:-

16.2.5.4.1 All external digital and analog signals shall be connected to the terminals of Input / Output modules. Input / Output modules shall be provided with LEDs on the front face to signal the status of each channel of the module.

16.2.5.4.2 The digital input channels shall be suitable for receiving digital signals directly. Optical / galvanic isolation and input delay features shall be provided for input channels to eliminate electrical noise. The input channels shall be protected against polarity reversal of field supply. The digital input modules shall be suitable for 110V AC and shall also be provided with protection against voltage transients. PLC DI interrogation supply shall be 110V AC through UPS. All digital inputs shall be connected to indicating fused terminal block.

16.2.5.4.3 Each digital output module shall be adequately rated to operate auxiliary relays, Solenoids, indication lamps etc. as required and shall be capable of withstanding the switching surge of the coil of the relays. Each digital output module shall have protective fuse inside or electronic protection against short-circuit. Also suitable circuit elements shall be provided to suppress transient voltage surges, when driving inductive loads. The indication for fuse blown or short-circuit in signal lead for output channels shall be provided for each module. All output modules shall be 24V DC. All digital output channels shall be potential free or floating type with control relay having galvanic isolation between channels, so that it can be used in the control supply voltage of other circuits. The rating of the potential free contact of the output relay shall not be less than 5 Amps at 240V AC, 24VDC. Fused terminals with LED indications for all Input & Output signals shall be considered.

16.2.5.4.4 An opto-electronic galvanic isolation shall be provided on each analog Input / Output module between the A/D converter and low level bus. All analog Input / Output modules shall be suitable for 4−20 mA. Fused T.B. with blowing fuse shall be provided for Analog inputs. All the cards shall be compatible of receiving analog signals from field sensors and switches directly, if not suitable converters shall be provided. Tenderer to consider required amount of counter and RTD modules as per requirements .

16.2.5.4.5 WT PLC system shall be provided with 30 Nos. of potential free discrete I/Os for hardwired interfacing with VSP's Plant PLC for signal exchange between WT control system and VSP's main PLC based control system. All signals shall be wired up to a common terminal block inside PLC panel of Wagon Tippler. Detail list of I/O's as per requirement will be finalized during detail engineering. Route length from RI/O panel (in substation 1-14LC9) to Main PLC panel (in control desk building) shall be more than 100M. Route length from Main PLC Panel to equipment in wagon tippler house shall be also more than 100M.

16.2.5.4.6 In addition to individual control, all other interlocks amongst Wagon tippler, Wagon pushers, railway route interlock and downstream / upstream equipment shall be carried out through programmable logic controller.

16.2.5.5 Programming and debugging tools:-

16.2.5.5.1 The programming unit shall essentially be one (1) No. personal laptop computer with mouse. The hardware of the programming unit shall comprise of latest version available in the market. Proper interfacing card / module with related communication protocol shall be installed in the programming unit so that it can communicate with the network (i.e. PLC processor, server, HMI, printers.) smoothly. Programming unit shall be suitable for developing programs. Programming unit shall have facility for loading the program from CD and DVD.

16.2.5.5.2 For storing of finalised application software, CDs shall be used. The programming unit shall have facility for loading the application programme in the CD and transferring the programmes from the diskette or the programming unit directly to the memory of the programmable controller and vice versa. Programming unit shall have facility for `off' line development of the application programme and shall also have in-built software for elaborate documentation of the programme. The programming unit shall have facility for being connected to a printer for taking printout of the developed programme. The programming software shall be based on manufacturer standard using models and standard function blocks and group of function blocks as sub-routine. The programming language shall have features to satisfy the following criteria:

- Simple and easy to check programming.

- Capability to use standard programme modules.

- Simple programme organisation.

- Easy to change programme.

- Simple testing and commissioning.

16.2.5.5.3 Off line programming and troubleshooting shall be possible for Wagon pusher PLC system from Control desk room of wagon tippler through radio link..

16.2.5.6 <u>Visualisation system (HMI) & EOI</u> :-

16.2.5.6.1 1No. - HMI, minimum 22" TFT colour monitor, industrial grade with latest configuration and HMI software along with proper interfacing card to be provided, so that it can communicate with the network (i.e. PLC processor, sensor, HMI, printers) smoothly and other features as per VSP, GTS–GS–03.

16.2.5.6.2 The HMI / EOI (latest version)system shall have facilities for performing the following functions:

i) Acquisition, storage and display of data.

ii) Development of mimic images for plant and equipment from a standard library provided in the system software.

iii) Display of the operating status of different equipment by suitable colours.

iv) Display of dynamic conditions of various process parameters like temperature, level, current, speed, etc. based on the actual process data / based on operator data entry in the form of alphanumeric form.

v) Generation and display of alarms with date and time of occurrence.

vi) Generation of current and historical trend curves for various process and generated data & the data entered by the operator of WT.

vii) Generation of management information and report and display of the same on request.

viii) Interfacing with programmable controllers and other intelligent systems for receipt of data and downloading of commands.

16.2.6. <u>Constructional and hardware requirement</u> :-

The programmable controller and Input / Output racks shall be housed in totally enclosed, dust and vermin-proof, floor mounting type cubicles having standardised dimensions with various sections arranged logically within the panel. The cubicle shall be fabricated out of 2 mm thickness CRCA sheet steel, gland plate thickness - 3.0 mm having protection class of IP- 42. Cubicle shall have hinged doors at front and back to provide easy access for maintenance personnel. The front door shall be provided with a wide toughened glass window for viewing LED indicators. The components shall be so arranged that the various sections are easily accessible from the front or back of the panel for inspection and maintenance after opening front or back door for Wagon Tippler PLC Panel. The various modules namely CPU, Memory, Inputs, Outputs, Power supply etc. shall be of plug-in type. The plug-in modules shall have locking pins to prevent wrong insertion of modules in slots. The modules shall be housed in metal racks conforming to dimensions given in IEC-297. The cubicle shall be provided with single phase power supply socket outlets for connecting instruments, hand lamps etc. during maintenance and testing. Cubicles shall be provided with internal illumination. Suitable electromagnetic shielding shall be provided, wherever required to make the modules free from stray noise pick-up and the shielding screen shall be electrically connected to an isolated screen-bar, which shall be connected to an electronic earth bus distinctly separate from the protective earth bus. In Wagon Pusher PLC panel only front access of components shall be provided due to space constraints on Wagon Pusher machine. Height of PLC panels for wagon pusher shall be maximum 1800mm including base channel ISMC – 75. All panels / posts on wagon pushers shall have bracing angle on both sides.

16.2.7 Status of wagon tippler and its associated equipment and wagon pushers will be hooked up to VSP, Plant control PLC system at Bus level and I/O level over potential free contacts. Necessary co-ordination shall be done by the successful tenderer for establishing connectivity with VSP Plant main automation system.

16.2.8 One (1) No. – A3 size, Laser Jet, colour printer with provision for bus connectivity shall also be provided

16.3 <u>Wagon handling control desk :-</u>

16.3.1 An integrated control desk of floor mounting, CRCA sheet steel, sheet thickness 2.5 mm and gland plate thickness 3.0 mm, dust tight construction, degree of protection - IP-54, suitable for installation in control desk room (1st floor of control room building) shall be provided for one no. - Wagon tippler and two nos. - Wagon pushers. The control desk shall be complete with one no. - HMI, three nos. - Joy stick Master Controllers, Selector switches, Push-buttons, Indicating lamps, CCVM system, A3 printer, Buzzers etc.

16.3.2 The control desk shall be arm chair type having five (5) section of semicircular types with movable arm chair in between or fixed type to be decided during detail engineering. The arm chair shall have facility for forward and backward adjustments, tilting sideways and backwards as well as adjustment of height according to the convenience of the operator. In addition to that, one no. minimum 22" TFT colour monitor PC based colour graphics (operating station as HMI) with keyboard and mouse shall be provided for operation and control with HMI run time, fault annunciation, equipment status indication as well as data storage. This unit shall be placed on control desk suitably, so that operator can have direct view of the same, The control desk shall be mounted on anti-vibration pads. One (1) Mushroom head emergency stop push button shall be considered on control desk for wagon Tippler and two (2) Mushroom head emergency stop push button shall be considered on control desk for wagon Pushers.

16.4 UPS system:-

16.4.1 The parallel redundant uninterrupted power supply (UPS) system inline with **VSP GTS–GS-03** shall be provided for wagon tippler and used for providing clear and regulated power supply to WT-PLC, visualisation system, engineering console, CCVM system, Radio modems, Telephone distribution network, Data communication network, Loud speaker broadcasting system located in Wagon tippler control desk room building.

Separate parallel redundant uninterrupted power supply (UPS) system inline with **VSP GTS–GS-03** shall be provided with distribution boards for Wagon pusher for WP-PLC system, Radio modem, EOI etc.

16.4.2 The minimum capacity of UPS system shall be decided by the tenderer as per the system requirement. Tenderer shall carefully check adequacy of rating considering 25% spare capacity to be utilised by the purchaser for different purpose and shall finalize the capacity and shall supply the UPS of that rating.

16.4.3 The UPS system shall be suitable for 3-Phase 415V, 50Hz, 4-wire system designed with duplicate power supply. The UPS system shall be designed with static by−pass switch through anti-parallel thyristor having heat sinks. The battery shall be designed for 30 minutes back-up with SMF sealed lead−acid battery of approved make with proper protection circuit.

16.4.4 The UPS shall be provided with input and output side isolation transformers and one full capacity Scott-connected transformer with Servo control voltage stabiliser (SCVS) in the bypass line. The static by−pass line should have selector switch for manual by−pass of the UPS system, in case of maintenance of UPS system. The output of UPS shall be suitable for 230VAC, 50Hz with voltage and frequency variation limited

to ± 1% and ± 0.5% respectively.

16.4.5 The UPS shall have the built-in UPS distribution board for supply to various consumer points. The incoming MCCB / MCB shall be rated for the total capacity of the UPS and adequate output feeders shall be provided for feeding all the consumers as well as spare output feeders. Spare feeders shall be considered for future use. All the outgoing power terminals shall be wired-up upto the power terminals within the panel for external wiring.

16.5 Lighting distribution board (LDB) : -

The LDB shall be sheet steel (CRCA) enclosure floor mounting type, sheet thickness - 2mm, detachable gland plate thickness 3.15 mm, degree of protection - IP54 with canopy. LDB shall be hot dip galvanized. Two nos. - Earthing studs shall be provided. All electrics shall be wired up to power terminal stud with minimum 4mm², HRPVC insulated, copper cable.

16.6 Power Distribution board (PDB) : -

16.6.1 The PDB shall be sheet steel (CRCA) enclosure, sheet thickness – 2.0 mm, detachable gland plate thickness 3.0 mm, wall / structure / floor mounting type, degree of protection- IP55 with canopy. PDB shall be hot deep galvanised and 2Nos. - Earthing studs shall be provided. Painting shall be as per VSP's painting procedure (GTS – GS – 09) and paint shade shall be as per clause no. – 16.33.3.

All electrics shall be wired up to power terminal studs with minimum 4mm², HRPVC insulated, copper cable.

16.7 Main Lighting distribution board (MLDB) : -

16.7.1 The MLDB shall be sheet steel (CRCA) enclosure Wall / Structure / floor mounting type, sheet thickness - 2mm, detachable gland plate thickness 3.0 mm, degree of protection - IP55 with canopy. MLDB shall be hot dip galvanized. Two nos. - Earthing studs shall be provided. Painting shall be as per VSP's painting procedure (GTS – GS – 09) and paint shade shall be as per clause no.- 16.33.3. All electrics shall be wired up to power terminal stud with minimum 4mm², HRPVC insulated, copper cable.

16.8 Closed circuit video monitoring (CCVM):-

16.8.1 Closed Circuit Video Monitoring (CCVM) system along with associated Cable Network hardwares etc. shall be provided for viewing and monitoring of outhaul area of Wagon tippler house from Wagon tippler control room and three more cameras shall be provided for monitoring of Centre Buffer coupling (CBC) misalignment at the post tippling area. Tenderer shall also consider access ladder to all cameras for cleaning purpose and mounting poles for cameras located at post tippling area.

16.8.2 The CCVM system shall essentially comprise of the following :-

a) Five (5) Nos. of colour low light sensitive IP based television cameras of MPEG4 standard with CCD sensor, lens, shutter, IR filter (as required), LAN port, Flash / SDRAM memory, motorized pan and tilt head, motorized zoom lens with remote control

arrangement.

b) One (1) No. of PC based video monitoring and control station with 21" color LCD/TFT screen of latest configuration.

c) One (1) No. of PC based Server cum video recording station of latest configuration and features with 21" color LCD/TFT screen of latest configuration. The hard disc will have adequate storage capacity so that picture of all cameras can be stored for minimum 72 hours for retrieval at 4 CIF resolutions.

d) All the cameras with housing will be provided with mounting frames suitable for mounting the same on wall / column / pedestal as per site condition. Approach facilities like platform / ladders will be provided for maintenance of cameras.

e) Selection of cameras and control of motorised pan & tilt head and motorised zoom lens will be software driven through keyboard / mouse control station and the same shall be housed suitably on Wagon Tippler Control Desk.

f) CCVM network will comprise of cat 5e/6 or Optical fibre cable and L2/L3 manageable switch etc. The network switches will have required nos. of fibre optic ports for direct termination of optical fibre cable, in addition to the required UTP ports used for distribution within the Wagon Tippler area and connected to the Central server. The network switches, Optical fiber cable will be used to maintain the signal strength as and where required and also in case connectivity length is 100 metre or more. All network equipment will be so selected as to ensure minimum 1GB bandwidth for CCVM network. Frame transmission speed of each element of CCVM system will be 25 FPS minimum.

g) The CCVM Server and Clients shall be provided with required software viz. operating software, Video management software, application software, database management software, network management software, anti-virus software and any other software of licenced version as required for proper functioning of both CCVM server and clients. All software will work on an open platform to ensure interoperability of this CCVM system in a multi-vendor scenario. All software will be of original licensed version only.

h) Power distribution box (PDB) with required transformer (if required), incoming & outgoing MCBs will be provided for powering all CCVM system equipment. The PDB will have minimum 20% spare outgoing feeders. Power on Ethernet may be used as per system requirement.

i) All CCVM cameras will be provided with vandal proof, weather proof enclosure of minimum IP-66 grade of protection.

j) Earthing of CCVM equipment.

k) All CCVM equipment will be of CE / UL certified / listed.

l) All cameras shall have approachable ladder and with structural platform

16.9 Electrically operated sirens :-

16.9.1 Sirens shall be provided at strategic locations for warning the operating and maintenance

personnel before starting the system. The siren shall be horizontal foot / structure mounting type, 230V, single phase, 50Hz. The sirens shall be industrial type, heavy duty with an audible range of one (1) mile for Wagon pushers and half (1/2) mile for wagon tippler, the sirens shall be capable of providing trouble-free service in dusty atmosphere. degree of protection of siren shall be IP – 65 as per HEC drg no.- SK-EDB-1362 & SK-EDB-1364.

16.10 LIGHTING :-

16.10.1 Two (2) Nos. - search lights - one (1) at the front and the other at the rear shall be provided on the each wagon pusher and those lights will glow automatically, Illumination systems and Local selection of wagon pusher will be controlled through wagon handling control desk over compatible radio remote control units and PLC system.

16.10.2 Internal lighting on Wagon pusher preferably with CFL lamps shall be provided to facilitate maintenance men's working inside the wagon pusher cabin. All other light fittings mounted on wagon pusher shall be bulkhead type and HPSV light. All lighting fittings shall be mounted on anti - vibration pads. Switch boxes with MCB shall also be provided by the tenderer. Switch boxes , Light fitting's shall be as per the HEC drg No. - SK-EDB–1380.

16.10.3 **COMPACT FLUORESCENT LIGHT FITTINGS WITH 2X18W LAMP**

16.10.3.1 Compact fluorescent light fittings with 2x18W lamp, 230VAC, complete with decorative, surface mounted, mirror optics provided with serrated aiuminium cross louvres and white engineering plastic end caps.

Type – TLE218EB of Crompton Greaves make or equivalent.

16.10.4 **HPSV LIGHT FITTINGS WITH 70W LAMP** :-

16.10.4.1 70W, 240V AC, HPSV light fittings with 70W lamp, the luminaire shall be non integral industrial type, dust proof, well glass luminaire with pressure die cast aluminium housing in hammertone grey finish fitted with clear glass cover and wire guard.

Type – SWV1207ES of Crompton Greaves make or equivalent.

16.10.5 **BULK HEAD LIGHT FITTINGS WITH 100W BULB** :-

16.10.5.1 100W, 230VAC, GLS Bulkhead luminaire with 100W bulb, Industrial type cast aluminium body, heat resistant glass cover and powder coated wire guard.

Type – IBH1110ES / BC of Crompton Greaves make or equivalent.

16.10.6 **SEARCH LIGHT** :-

16.10.6.1 Search light, 250W, 230V AC, 1Ph, 50 Hz, industrial duty, floor mounting type, outdoor duty degree of protection IP: 65.

16.11 Illumination system and Fire fighting :-

16.11.1 Portable type Emergency lights shall be provided as per VSP's GTS-GS-03.

16.11.2 Required numbers of fire extinguishers at pusher cabins, Sub-stations (1-14LC-10B, 1-14LC-10D & 1-14LC9) Wagon tippler control desk building and Wagon tippler house will be provided .

16.11.3 24VAC. 1Ph, 50Hz Hand lamp sockets including 2 Sets of Hand lamps in the Wagon Pushers will be provided.

16.11.4 Network of 24VAC. 1Ph, 50Hz Hand lamp sockets including 2 Sets of Hand lamps in the Wagon Tippler house will be provided.

16.12 LOUD SPEAKER BROADCASTING SYSTEM (LSBC):-

16.12.1 DESIGN FEATURE **: -**

16.12.1.1 The system shall be central amplifier type. The amplifiers shall be located in the Control room premises and the announcement points and shall also be installed in Plant control room. One No. - Loud Speaker Broadcasting System (LSBC) shall have 13Nos. - Speakers and 2 Nos - Mics.

16.12.1.2 The amplifier shall have the capacity of suitable output power inclusive of 50% standby capacity.

16.12.1.3 The announcement / paging shall normally be made from the main plant control rooms with provision of a second announcement point in the shop in- charge's office at suitable locations.

16.12.1.4 The loudspeakers shall be operated group wise or all at a time depending upon the requirement.

16.12.2 **LIST OF LOCATION FOR LOUDSPEAKERS FOR SYSTEM : -**

.16.12.2.1 Tentative locations of 13 nos. Loud speakers with 02 nos. of mikes are indicated below, However exact locations shall be finalized during detail engineering.:-

i) O+ elevation – 02 nos. Loud speakers.
ii) -6m elevation – 02 nos. Loud speakers.
iii) -15m elevation – 02 nos. Loud speakers.
iv) -18m elevation – 01 no. Loud speaker.
v) Inhaul area – 02 nos. Loud speakers.
vi) Outhaul area – 02 nos. Loud speakers.
vii) Control room (WT-1 & 2) -01 no. Loud speaker and 01 no. mike.
viii) Control room (WT-3 & 4) -01 no. Loud speaker and 01 no. mike.

16.12.2.2 Space for mounting of equipments shall be provided by M/s VSP / MECON.

16.12.3 SYSTEM FEATURE **: -**

16.12.3.1 The general announcement system shall ensure quality performance using the latest technology in design and manufacture of audio equipment.

16.12.3.2 The system shall facilitate near total reproduction of original speech or music and shall guarantee trouble free operation.

16.12.3.3 The system shall adopt modular construction. The amplifier rack shall be provided with input and output terminals, plated and tinned for good contacts.

16.12.3.4 The system shall be switched on through press – to - talk switch.

16.12.3.5 Suitable protection of the system against accidental wrong connection, over loading, short circuit etc. shall be provided.

16.12.3.6 The equipment shall be of rugged construction to withstand shock and vibration.

16.12.3.7 The system shall be capable of withstanding extreme conditions of temperature and humidity.

16.12.3.8 The equipment shall be suitable for operation from 240V +/- 10%, 50Hz +/- 5% Single phase, AC mains power supply. The power supply equipment shall be provided with protections against short circuit, over voltage, under voltage & transients.

16.12.3.9 The communication equipment shall be designed to work effectively to provide clear speech communication in the plant under the following ambient condition :

i) Temperature - 0 deg.C to 55 deg.C
ii) Relative humidity - Upto 90% at 35 deg. C
iii) Surrounding - Dusty and Corrosive
iv) Vibrations - 25 Hz (+/-) 2 Hz
v) Ambient noise - 90 to 110 d

16.12.4 EQUIPMENT DETAILS **: -**

16.12.4.1 Each of the system shall broadly consist of but not limited to the following:

i) Amplifier rack housing preamplifier, power amplifier including working and stand-by capacity with changeover facility, monitoring facilities etc.

ii) Microphone assembly.

iii) Loudspeakers (re entrant horn type / indoor box type) complete with mounting accessories such as poles, mounting brackets

iv) Cable network comprising cables, wires, junction boxes, cable termination devices, GI pipes / conduits, and all other cable laying accessories.

16.12.4.1.1 POWER AMPLIFIER **: -**

i) The amplifier shall be fully solid state electronics.

ii) The amplifier dynamic characteristics shall accommodate the entire dynamic range of the sound signal and shall provide optimum fidelity ensuring faithful reproduction of speech and music.

iii) The stability of gain shall be fairly high. Reliable and quality components shall be used in its construction to prevent drift in their characteristics.

iv) The amplifier shall be provided with easy to operate filter type volume and tone Controls and potentiometer adjustment facility to regulate its input sensitivity.

v) The amplifier shall be provided with variable high frequency boost for increased clarity of speech and music.

16.12.4.1.2 MICROPHONE : -

i) The microphone shall be of gooseneck desk mounted type offering high sensitivity and reliability and shall facilitate optimum reproduction of speech and music.

ii) It shall be of noise canceling type having unidirectional pick-up pattern and shall prevent acoustic feedback due to reverberation from within the announcement / paging room.

iii) The microphone shall be provided with in-built screen to prevent explosive wind and breathing sound.

iv) It shall be capable of withstanding vibrations and shocks. Adequate protection against penetration of dust and foreign particles into the microphone shall be provided.

16.12.4.1.3 **LOUDSPEAKER** : **-**

i) The loudspeaker shall have uniform sensitivity and low frequency cut off having suitable directional response pattern for efficient and high quality speech reproduction.

ii) It shall be of sturdy construction capable of withstanding extreme conditions of temperature and humidity.

iii) The loudspeaker assembly shall be capable of being swiveled in any desired direction, thus allowing flexible beaming of sound.

iv) The driver unit shall incorporate built-in line matching transformer.

v) The loud speaker shall be either industrial re-entrant horn type (conforming to IP- 55) for use on shop floors or box type (conforming to IP 52) for use in control

rooms and other such rooms.

vi) The indoor box type loudspeaker shall be housed in sheet steel enclosure suitable for wall mounting and shall have built in volume control facility.

vii) The industrial horn type loudspeaker shall be weather proof version of die cast Aluminium body with sturdy mounting bracket suitable for mounting on wall/column. The driver unit shall be concealed in the horn to prevent damage due to environmental condition and pilferage.

viii) Peak output power : 6 watts for indoor box loudspeakers, 15 watts for outdoor industrial re-entrant horn type loudspeaker.

16.12.4.1.4 POWER SUPPLY **: -**

i) The equipment will be suitable for operation from a centralised uninterrupted power supply source.

ii) The power supply equipment shall be provided with protections against short circuit, over voltage, under voltage and transients.

16.12.5 CABLES : -

a) The loudspeaker cable shall be 2 core, 24/0.2 mm twisted annealed tinned high conductivity copper conductor, PVC insulated and overall PVC sheathed, generally as per IS-694. The cable shall be GI wire armoured or unarmoured as per the requirement.

b) All PVC armoured and un armoured telephone cables shall be Fire retardant low smoke type (FRLS Type) having protective system of inner and outer sheath specially designed with thermoplastic or thermosetting materials having superior resistance to ignition and flame propagation with smoke emission and toxicity or corrosive characteristics. The cable will conform to the following standards –

i) IEC - 332 (Part 1)
ii) IEC - 332 (Part 3
iii) IEEE - 383 * BS – 4066

16.12.6 TECHNICAL PARAMETERS : -

16.12.6.1 **AMPLIFIER** :

i) Input sensitivity - 100 mv
ii) Bandwidth - 100 Hz to 10 KHz
iii) Signal to noise ratio - Better than 60 dbS
iv) Hum and noise level - Better than 65dbbelow rated output power
v) Distortion - Less than 3% at 1 KHz and at full output power
vi) Floating outputs - 100v/70V
vii) Protection - Against open and short circuits and spurious oscillation
viii) Safety requirement - As per IEC-65/268

16.12.6.2 **MICROPHONE :**

i) Type - Unidirectional,dynamic (moving coil)
ii) Frequency response - 100 Hz to 10 KHz
iii) Impedence - 230 - 270 Ohms

16.12.6.3 **LOUDSPEAKER :**

i) Type - Horn/Box enclosure
ii) Bandwidth - 100 Hz to 10 KHz
iii) Input voltage - 100V/70V
iv) Voice coil impedence - 8 Ohms, 16 Ohms
v) Sensitivity at 1KHz SPL - 111 dB+/- 3db per watt at a distance of 1 meter.

16.12.7 LSBC system will be provided for reliable, instantaneous announcements from control room to various locations in the field for locating people, giving operational instructions and for passing important messages to operation & maintenance personnel of the Plant complex in high noise level conditions (in the range of 90 to 110 db).

16.12.8 The system shall include two announcement consoles, an amplifier rack and indoor & outdoor loud speakers. The amplifier rack consists of sub rack having amplifier with chime module and required Nos. of power amplifiers (with one standby). All the amplifiers are of minimum 300 Watts (RMS).

16.12.9 Earthing of LSBC system shall be done as per manufacturer standard.

16.13 **TELEPHONE DISTRIBUTION NETWORK :-**

16.13.1 Provision of Telephone Distribution Network within the Technological Battery Limit of the Plant under consideration for communication inside the plant as well as with outside. The connectivity shall be from the nearest Plant DP of the existing Building.

16.13.2 Supply, laying, termination, testing and commissioning of cables, distribution Boxes along with installation materials, GI conduits etc. including the Telephone Instruments required for facilitating plant telephone Network within the Battery Limit in the Wagon Tippler & Wagon Pusher Area.

This will also include the Incoming Telephone Cable from the nearest TJB of the already existing Telephone Cable Network.

16.13.3 Incoming telephone cables shall be drawn from telephone exchange located at Rail Bhawan (RRI control building around 1.3KM from Tippler house). Telephone connections shall be provided at following locations :-

i) New Tippler control room (WT- 3 & 4) - 03 Nos.
ii) MCC room (1-14LC 9 room) – 01 No.
iii) Apron feeder level (-6m) – 02 Nos.

iv) - 15m elevation – 01 No.
v) - 18m elevation – 01 No.

16.13.4 For providing telephone connection at required location inside battery limit, the following will be provided and taken care :

16.13.4.1 One (1) no. Krone make Distribution cabinet (DC) / Main Cable termination (CT) box with required pair termination capacity will be installed inside battery limit of Wagon Tippler Area. All Incoming telephone cables from Plant telephone cable network and distribution telephone cables inside the battery limit will be terminated in the above DC/CT box and cross jumpered as per site requirement.

16.13.4.2 One (1) No. of Krone make 10 Pairs, Krone type CT Box for distribution Telephone cable network within the battery limit.

16.13.4.3 Required quantities of armoured jelly filled /unarmoured dry core multi-pair Telephone Cables. All multi-pair cables shall have minimum 20% spare pair capacity. For each telephone connection, two (2) pair, unarmoured, telephone cable will be provided from end CT box to subscriber telephone set.

16.13.4.4 Rossette Blocks (RJ11 type) suitable for termination of two (2) pair cable at each telephone set with mounting arrangement.

16.13.4.5 All cabling accessories.

16.13.4.6 Telephone connections shall be provided at the Control desk room and the Shop floor area etc. At each subscriber location, arrangement will be made for two elephone connections (i.e., with two rosette blocks and necessary cabling arrangement), one for Plant communication and another for Shop communication.

16.13.4.7 Incoming telephone cables to the above DC / main CT box from Plant telephone system shall be included in the scope of tenderer.

16.13.4.8 Tenderer will also co-ordinate with the Plant Telecommunication (Exchange) Wing for the availability of required spare ports in the existing DP and also make necessary configuration of the Telephone Lines to be provided for the New Wagon tippler and Wagon Pushers Facility.

16.13.4.9 Telephone Instruments of Analog type as per the following description is envisaged:

i) The Telephones/ subscriber equipment located in areas with high ambient noise and dust shall be with min. IP 65 class of protection and provided with audio and visual signalling to indicate incoming calls to the persons nearby.

ii) The audio-visual signalling equipment will consist of a loud ringer and a blinking lamp, both working on 240V, 50Hz, Single phase AC supply or from the telephone line supply itself.

iii) General purpose Analog Phones: :-

These telephone instruments shall be desktop, digital push-button type, rugged construction suitable for industrial application. These will be complete with all necessary devices, circuits, push buttons in standard configuration, ringing bell, flexible coiled cord, plug connector, etc.,

The telephone instruments should be rugged, elegant & electronic DP / DTMF phones and provide features for general use.

The features of telephones will be as below:-

a) Tone / Pulse switchable.
b) Ringer Volume control.
c) Flash, Mute, Pause, and Re- dial facility.

16.14 **DATA COMMUNICATION NETWORK :-**

16.14.1 As part of extension of existing Business LAN system, One No. of Edge Switch will be provided in Control desk Room of CT- 3 & 4.

16.14.2 Scope of work of tenderer of data communication will include supply, installation, testing and commissioning of required UTP cables, PVC conduits for cable laying copper patch panel, copper patch cord, I/O nodes, RJ45 connector etc. for Wagon Tippler & Wagon Pushers area.

16.14.3 For achieving the above, the following will be provided and taken care :-

i) Approximately 200M of SMF FO, armoured cable to be considered to link the tow Control Rooms (CT – 3 & 4).

ii) One No. Ethernet Switch of minimum 24 Ports

iii) All office rooms, Control rooms, etc as required at site will be provided with the above each room will be provided with minimum 2Nos of I/Os and as per site requirement.

iv) Provision of Minimum 2 Nos. LAN points in the Battery Limit and as per site requirement.

16.15 Lightening protection : -

16.15.1 Lightening protection system will be provided by the tenderer for control desk Building of Wagon Tippler and Substations 1-14LC10B & 1-14LC10D and as per site requirements.

16.15.2 All buildings (control desk building, substation 1-14LC10B & 1-14LC10D) and plant structures vulnerable to lightning strokes owing to their height or exposed situation shall be protected against atmospheric flash-overs and lightning strokes in such a manner as to eliminate any danger to the personnel employed therein. Stipulations

of IS : 2309 - 1969 shall be followed.

16.15.3 A 'Faraday Cage' made of hot galvanised strip steel connected to all buried pipes and steel structures crossing this cage ring shall be laid around each main building or plant unit as earthing device. This shall be separate from the electrical equipment earthing ring main.

16.15.4 All lightning arrestor earth leads of the buildings and plant units shall be connected to this cage ring.

16.15.5 Air termination network should cover all salient points of the structure. All metallic ducts and the like above the roof of the structure shall be bonded to and form part of the air termination network. .

16.15.6 Down conductors shall follow the most direct path possible between air termination and earth termination avoiding sharp bends. Down conductor shall have a testing point adjacent to the earth electrode. Each conductor shall have an independent earth termination. All earth terminations shall be interconnected.

16.15.7 Earthing electrodes and grid for lightning protection shall be distinct separate from the earthing system for earthing of electrical equipment and at no place shall be connected to the earthing system.

16.15.8 Earthing connection to equipment subject to movement, vibration and shocks,shall be through flexible stranded conductors.

16.15.9 The termination of strips to the equipment shall be done by bolting and the wires shall be terminated by compression lugs. Jointing of strips shall be done by welding for proper continuity. All contact surfaces shall be thoroughly cleaned of dust and oil and after jointing, the joints shall be given bitumen paint.

16.16 **Control junction box :-**

16.16.1 The power junction boxes shall be made of sheet steel (CRCA) enclosure, sheet, thickness 2.0mm, detachable gland plate thickness 3.0mm, wall mounting / column mounting / floor mounting type, hot dip galvanized having degree of protection IP55 with canopy. The power junction boxes shall be designed to provide adequate space for terminating cables. The power junction boxes with higher current rating, aluminium Bus bar for tapping of outgoing cables shall be provided.

Supporting on pin type insulator shall be provided within PJB with hole on bus bar tapping of outgoing cables. Detachable gland plate shall be provided from two sides. Two nos. - Earthing studs shall be provided. Painting shall be as per VSP's Painting procedure (GTS – GS – 09) and paint shade shall be as per clause no. – 16.33.3

16.17 **Power Junction box :**

16.17.1 The control junction boxes shall be made of sheet steel enclosed (CRCA sheet), Hot dip galvanized, sheet thickness 2mm, detachable gland plate thickness 3mm, wall mounting / floor mounting type, degree of protection - IP55 with canopy for

outdoor. Gland plate shall be provided from two sides. Terminals shall be Elmex make, type – Cat - M4 or equivalent. Two nos. - Earthing studs shall be provided. Painting shall be as per VSP's Painting procedure (GTS – GS – 09) and paint shade shall be as per clause no. – 16.33.3. The Junction boxes with following nos. of terminals block shall be provided : -

Type-I − with 60 Nos. terminals
Type-II − with 20 Nos. terminals
Type-III − with 10 Nos. terminals

16.18 **Power, control, communication, screen and special cables :-**

16.18.1 1.1 kV grade, HRPVC insulated, armoured, aluminium power cable, flexibility class–2 for equipment on ground.

16.18.2 1.1KV grade, HRPVC insulated, armoured, copper cables for VFD motors and other associated motors on machine and VFD motors on ground, flexibility class – 2.

16.18.3 1.1 kV grade, EPR insulated, PCP / CSP sheathed, flexible, trailing copper cable, flexibility class – 5 for Power & control wirings on wagon pushers & Wagon Tippler.

16.18.4 1.1kV grade, HRPVC insulated, armoured/unarmoured, copper for control wiring on machine and ground.

16.18.5 1.1kV grade, HRPVC insulated, armoured/ unarmoured, individual screen, twisted pairs copper cables for analog signals.

16.18.6 Triad, HRPVC insulated, armoured / unarmoured, copper cables for RTDs / BTDs.

16.18.7 1.1KV grade, HRPVC insulated, armoured/ unarmoured, copper cables, size- 2.5 mm² for lighting.

16.18.8 Special / Communication cables as per requirements.

16.18.9 All power, Control, communication, screened and special / instrument cables, cable accessories, cable laying & terminations etc for Wagon Pushers and Wagon Tippler shall be as per HEC drg No. – SK – EDB – 1367 & SK – EDB – 1368.

16.18.10 Incoming power cables from Intelligent WTMCC to Apron feeders panels (located in 1-14LC9 room) shall be provided.

16.18.11 During running in steady state condition, total voltage drop at motor terminals from Incoming MCC of wagon pushers & Intelligent MCC of wagon tippler shall be limited to 6%.

16.18.12 Permissible voltage dip at the LT switch gear bus during starting of LT motors shall be -15%.

16.19 Limit switches/Sensors/Encoders:-

16.19.1 Heavy-duty, roller lever operated, track limit switches shall be used for normal stoppage during pusher travel at both ends of pusher track. The limit switches shall be provided with 2NO+ 2NC auxiliary contact of 10A,rating at 500VAC. The degree of protection for enclosure shall be IP65.

16.19.2 Heavy-duty, roller lever operated, track Limit switches shall be provided for normal stoppage during over travel of wagon tippler. The limit switches shall be provided with 2NO+ 2NC auxiliary contact of 10A rating at 500VAC. The degree of protection for enclosure shall be IP65.

16.19.3 Heavy-duty, roller lever operated, track Limit switches shall be used for stopping of Hydraulic clamping / unclamping. The same shall be provided with 2NO+ 2NC auxiliary contact of 10A rating at 500VAC. The degree of protection for enclosure shall be IP65.

16.19.4 Heavy-duty, magnetic proximity switches with sensing distance to suit the application shall be provided for over travel positioning of the Wagon pusher at both extreme end of pusher track. The proximity switches shall be 3/2-wire type with leakage current below 10mA suitable for signal exchange with PLC system.

16.19.5 Absolute encoder shall be considered in addition to Rotary geared, cam operated limit switches for stoppage at extreme ends (0° and 170° position) of tippler rotation and interlocking at different angles of rotation of wagon tippler with other associated system.

16.19.6 Each wagon pusher shall be provided with one no. - Absolute encoder with coupling gear to be mounted in one of the drive gear box for tracking of position of wagon pusher along the rail track.

16.19.7 Each motor of wagon tippler shall be provided with one no. - Incremental encoder with coupling at N.D.E. for speed feedback.

16.19.8 One no. - Absolute encoder with coupling gear to be mounted on output shaft of drive gear box for tracking of angular position of wagon tippler during rotation.

16.19.9 Multi-turn absolute encoder shall be provided for positioning of the wagon pusher along the rail track of pusher.

16.19.10 Laser beam transmitter and receiver unit shall be considered at the Inhaul side and Outhaul side of wagon tippler platform to confirm that loaded wagon in inhaul side and empty wagon in outhaul side has cleared the tippler platform and ready for next pushing.

16.19.11 Ultrasonic sensor shall be used to stop the wagon pusher, while approaching to loaded wagons to avoid collision / jerking.

16.19.12 Heavy duty Magnetic proximity switches shall be provided to identify the wagon pusher for reaching at parking zone.

16.19.13 Heavy duty, inductive proximity switches shall be provided for hydraulic clamping / unclamping of wagon tippler.

16.19.14 Heavy duty, inductive proximity shall be provided to identify the correct position of wheels of loaded wagon (BOXN & BOY) on the tippler platform.

16.19.15 Any other special sensors required by customer / consultant during drg. approval stage, the same shall be provided by the tenderer without any cost implications**.**

16.20 The maximum operating height of panels on wagon pushers shall be limited to 1800mm including base channel ISMC75. All panels / posts on wagon pushers shall have bracing angle on both sides.

16.21 All the electronics cards of PLC, UPS. etc. will be coated with insulation coat, i.e. plastic coat to protect it from coal and coke dust conducting.

16.22 Supply of materials for any civil works required during erection of equipment and complete Civil work for cable trenches / Pipe laying / Cable pits are included in the scope of tenderer.

16.23 **Cables : -**

16.23.1 1.1 KV grade, HRPVC insulated, LT Power cable : -

Sl. No.	Parameter	Description
1	Voltage Grade	1.1 kV grade
2	Duty type	Heavy duty
3	No. of cores	- 3.5 / 4 core cables shall be used for motor feeders. - For other consumers or for power supply to other panel, 4 core (up to conductor size of 50 sq.mm) or 3.5 core (for conductor size beyond 50 sq.mm) cables shall be used.
4	Reference standard	IS: 8130 – 1984 IS: 5831 – 1984 IS: 3975 – 1988 IS: 1554, (part - I),- 1988 IS: 3961 (Part-II) - 1967. IEC - 60502
5	Conductor type	- Plain aluminium stranded conductor for aluminium / Annealed high conductivity stranded conductor for copper. - All power cables of size 10 sq.mm and above shall have standard sector shaped (sm) or compact circular stranded (rm/V) or circular stranded (rm) aluminum conductors as

		applicable. - The conductors shall be H2 or H4 grade. - The solid conductor shall be class - 1 and the stranded conductor shall be class - 2. - The conductors shall be solid / stranded for conductor of nominal area up to and including 4 sq. mm. and stranded beyond 4 sq. mm. Conductors of nominal area less than 25 sq. mm shall be circular or shaped. Cables with reduced neutral conductor shall have sizes as per Table - 1 of IS: 1554 (Part-I) -1988.
6	Insulation type	- HRPVC insulation
7	Inner sheath	- For armoured / unarmoured cables a tough inner sheath of heat resisting PVC compound (wrapped / extruded as per size), Type ST2 as per IS: 5831. - Black in colour.
8	Armour	- Galvanised steel wire armour shall be used for 3Cx10 sq. mm / 4Cx 6 sq. mm cable. - Galvanised flat steel wires (strips) armour shall be used for bigger size cables. - Single core, armoured, cables are provided with non-magnetic, armour consisting of hard drawn flat or round aluminium wires.
9	Outer sheath	- For armoured / unarmoured cables a tough outer sheath of heat resisting, PVC compound (Type - ST2 as per IS 5831. - Black in colour.
10	Miscellaneous	- Minimum cross - sectional area of the power cables shall be 6 sq. mm in case of aluminium conductor and 4 sq. mm in case of copper conductor. - Power cables shall be selected from core sizes of 4, 6, 10, 16, 25, 50, 70, 120, 150, 240 sq. mm (Aluminium conductor).
11	Temp. rise	Shall be limited to 85° C.
12	Core identification	- Cable identification shall be provided by embossing on the outer sheath the following: - Manufacturer's name & trade mark - Voltage grade

		- Year of manufacture - Type of insulation - R, Y, B for phases. - Black for neutral (fourth core)

16.23.2 <u>1.1KV grade, HRPVC insulated, control copper cable</u> : -

Sl. No.	Parameter	Description
1	Voltage Grade	1.1kV grade
2	Duty type	Heavy duty
3	No. of cores	As per requirement
4	Reference standard	IS: 8130 – 1984 IS: 5831 – 1984 IS: 3975 -1988 IS: 1554, (Part- I) - 1988 IS: 3961 (Part- II) - 1967 IEC - 60502
5	Cross sectional area	Shall be 1.5 / 2.5 sq. mm.
6	Conductor type	Solid annealed circular stranded copper conductor.
7	Insulation type	HRPVC, Type - C insulated
8	Inner and outer sheath	- Type ST-2 PVC shall be used for inner sheath. - Type ST-2 PVC shall be used for outer sheath. - Both inner and outer sheath shall be extruded type up to 7 core and after 7 core inner sheath shall be wrapped.
9	Armour	- Galvanised steel wire armour / galvanised steel strip
10	Spare Cores	- 20% spare cores shall be provided.
11	Miscellaneous	- The Tenderer shall furnish necessary calculations to show that the selected cable satisfy the criteria including for voltage drop. - Cables for temperature detectors shall be screened type of required technical parameters with core size not less 1.5 sq. mm.
12	Core identification	- Cable identification shall be provided by embossing on the outer sheath the following: - Manufacturer's name & trade mark - Voltage grade - Year of manufacture

		- Type of insulation - Cores of the cables upto 5 cores shall be identified by colouring of insulation. - For cables having more than 5 cores, core identification shall be done by numbering on insulation of core sequentially. - All the numbers shall be of same colour, which shall contrast with the colour of insulation. - Numbers shall be written in figures and words both - The numerals shall be legible and indelible. - The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. - When number is a single numeral a dash shall be blacked underneath. - If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. - The spacing between consecutive numbers shall not exceed 100 mm.

16.23.3 <u>1.1KV grade, Screened copper / Special cable</u> : -

Sl. No.	Parameter	Description
1	Voltage Grade	1.1KV grade
2	Duty type	Heavy duty
3	No. of cores	As per requirement
4	Cross sectional area of conductor & armouring	- Shall be 1.5 sq.mm & Armoured.
5	Conductor type	- Solid annealed circular stranded copper conductor. - For twisted pair cables, the conductors shall be of stranded tinned copper having proper flexibility to provide limpness and extended flex-life as required for these small diameter cables.
6	Insulation type	- PVC insulated, Type - A - Type ST-1 PVC shall be used for inner sheath. - Both inner and outer sheath shall be extruded type. - Outer sheath made of PCP (Chloroprene rubber), abrasion resistant, oil resistant and flame retardant conforming to IS: 434 –1964 (Part - I), as amended up to date.
7	Screened	- Tinned annealed copper mesh over metallised tape in a close woven braid.

8	Shielding	- Special aluminium foil to provide 100% shield coverage for optimum protection against radiated interference and ingress of audio and radio frequencies. - It shall have shorting fold for metal to metal contact and isolation fold to prevent adjacent shields from shorting to one another, so as to improve the voltage breakdown characteristics. The drain wire shall be of stranded tinned copper wire of 0.518 sq. mm. (20 AWG) cross - section.
9	Spare Cores	- 20% spare cores but not less than 2 spares shall be provided in all the multi core cables.
10	Reference standard	As per relevant IS with latest amendments
11	Miscellaneous	- The Tenderer shall furnish necessary calculations to show that the selected cable satisfy the criteria including for voltage drop. - Cables for temperature detectors shall be screened type of required technical parameters with core size not less 1.5 sq. mm. - The special twisted paired cables shall be of the type to provide balanced signal transmission and shall have good noise immunity.
12	Core identification	- Cable identification shall be provided by embossing on the outer sheath the following: - Manufacturer's name & trade mark - Voltage grade - Year of manufacture - Type of insulation - Cores of the cables upto 5 cores shall be identified by colouring of insulation. - For cables having more than 5 cores, core identification shall be done by numbering insulation of core sequentially. - All the numbers shall be of same colour, which shall contrast with the colour of insulation. - Numbers shall be written in figures and words both - The numerals shall be legible and indelible. - The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. - When number is a single numeral a dash shall be blacked underneath. - If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. - The spacing between consecutive numbers shall not

		exceed 100 mm.

16.23.4 **1.1KV grade, trailing Copper cables : -**

Sl. No.	Parameter	Description
1	Voltage Grade	1.1 KV grade confirming to IS: 9968 (Part-II) - 1988
2	Reference standard	IS: 9968 IS: 8130 IS: 6380 IS: 9968 (part – II) - 1988
3	Duty type	Heavy duty
4	No. of cores	Single or multicore as per requirement
5	Cross Sectional area.	As per requirement.
6	Conductor type	Highly flexible stranded tinned annealed high conductivity copper conductor
7	Insulation type	EPR (Ethylene Propylene Rubber), for higher temperature zone , Silicone rubber
8	Shielding	Each individual core protected and covered and overall
9	Sheath	Poly - chloroprene rubber or chloro-sulphorated polyethylene cable conform to IS: 9968 (Pt-I) - 1988. Flame retarded (for higher temperature area), Oil resistant
10	Miscellaneous	Shall have one additional core for earthing
11	Armouring	GI wir, armoured as per requirement and size (as specified in respective Technical Specifications)

16.24. **Cabling accessories, termination and jointing material :-**

16.24.1 **Cabling accessories :-**

16.24.1.1 Galvanised mild steel ladder type cable trays / racks and supports for laying of power and control cables shall be considered. The cable trays / racks with supporting steel work shall be provided with anti-corrosive treatment and painting work for the welded part of tray support with embedded insert / other structural support with other details as per VSP, GTS-GS-03. However, data highway cables shall be taken through adequate size, GI conduits with pull boxes at appropriate locations and @ 30M interval on straight run.

16.24.2 **Cable termination and jointing materials :-**

16.24.2.1 Termination of 1.1 kV grade, 4 core, 3 core, 2 core, 1 core, aluminium / copper conductor, HRPVC, armoured / unarmoured power cables shall include supply of double compression brass cable glands with armour clamps, adhesive PVC tapes, crimping type copper lugs, cable tag, earthing bolts, nuts and other consumable including supply of services of jointer and labour, testing to make each termination complete in all respects. Double compression brass cable glands and copper cable lugs will be procured in consultation with site engineers on the basis of the outer diameter of the available cables.

16.24.2.2 Termination of 1.1 kV grade, multi-core, 1.5 / 2.5 sq.mm copper conductor, HRPVC insulated, armoured, control cables and other special cables shall include supply of double compression brass cable glands, copper cable lugs with armour clamp, adhesive PVC tapes, ferrules, earthing, bolts, nuts and other consumable including supply of service of jointer and labour and testing to make each termination complete in all respects. The copper sockets / plugs shall be supplied and installed for termination of copper conductor cables by the tenderer.

16.24.2.3 Jointing of 1.1 kV grade, 4 core, 3 core, 2 core, 1 core aluminium / copper conductor, HRPVC insulated, armoured / unarmoured power cables shall include supply of epoxy compound, mould, ferrules suitable for crimping, armour clamp, earthing and consumables including services of the jointer, labour and testing as required to make the installation complete in all respects as per recommendation of the cable manufacturer and to the satisfaction of the M/s VSP / MECON / HEC.

16.24.2.4 Termination / jointing shall include service of the jointer, labour and testing as required to make the installation complete in all respects as per recommendation of the cable manufacturer and to the satisfaction of the M/s VSP / MECON / HEC.

16.25 **GI Pipes and flexible conduits :-**

16.25.1 All GI pipes shall be heavy duty, hot dip galvanised and electric resistance welded screwed type design, manufactured and tested in accordance with IS:1239 (Part-I) - and pipe fittings shall be in accordance with IS:1239 (Part-II). Flexible conduits shall be of heavy duty, interlocked type with PVC sleeving conforming to IS: 3480.

16.25.2 The Tenderer will render all such assistance as may be required by M/s VSP to obtain approval from Government Electrical Inspector and other Statutory Authorities for the installation and carry out changes called for at no extra cost to M/s HEC. Tenderer will be responsible for obtaining licensed frequency, if applicable for radio remote control system and Telecommunication system etc.

16.25.3 Any modification of the equipment and control circuitry, if necessary at site, shall be rectified at free of cost by the successful tenderer.

16.25.4 All erection and related work for WHP, COB # 5 will be carried out by the successful tenderer. According to equipment suppliers, drawings and instruction of work shall be completed in all respect by the successful tenderer.

16.26 **Cable Installation : -**

16.26.1 Interplant cabling shall be done in overhead cable bridge or cable tunnel or Buried under ground as specified in TS.

16.26.2 Concrete cable channels can be considered in case of lesser number of cables as specified in TS. Cables of small in numbers and cables for drives / field switches inside shop units shall be laid along the structures and column of the shop / buildings. Cables may run partly in walkable cable tunnels of underground trenches and or surface ducts in the shops and partly along the structures and columns of the buildings considering site conditions.

16.26.3 In case of space constraints / restrictions, Cable shall be laid in walkable cable tunnels, where the number of cables to be laid calls for walkable tunnels and cable shafts, same shall be provided. Underground walkable cable tunnels shall have hydro sealing to prevent water seepage.

16.26.4 For multi layer installation, overhead cable bridge / walkable cable tunnels shall be used as specified in TS depending upon the number of cables to be laid.

16.26.5 Laying of cables directly in underground or in trenches shall be avoided. However, it may allowed in special case with permission from site in charge. In such case, cable shall be laid in one layer only, more than one layer is not permissible.

16.26.6 Cables in trenches shall be laid on 8 cm of riddled sand and covered with 8 cm of riddled sand. RCC slabs shall be provided for covering these trenches. The maximum trench depth shall normally be 1.5M and thickness of top cover of 75mm. If the trench is to cross railway tracks / roads or any load bearing area the cables shall be taken through suitable GI conduits / Pipes / Ducts.

16.26.7 For crossing the road / rail track, cables shall be laid in concrete cable ducts, heavy duty, GI pipes / RCC Hume pipes encased in concrete blocks. 25% spare conduits / pipes / duct openings shall be provided. The top of pipe blocks shall be minimum 1500 mm from rail sleeper / road or as per approved drawing.

16.26.8 Installation of cables directly buried in ground shall generally conform to the requirements given in IS: 1255 – 1983.

16.27 **Laying in Tunnels / surface ducts / on structure : -**

16.27.1 Cable rack for cable trays shall be fixed at a maximum interval of 1.5M.

16.27.2 Cable leaving the ground / floor shall be protected up to 2M height by conduits / metallic guards.

16.27.3 Ladder type cable racks and trays shall be provided to lay cables in tunnels / shafts / cable basements. Cables shall be laid in separate racks according to the voltage / application classification. Fireproof partitions such as asbestos sheets shall be provided between trays carrying LT & HT power cables, control and screened cables, communication cables, instrumentation cables & telecommunication cables. The cables shall be laid from Bottom to Top in order or HT on bottom rack followed by LT cables and other cables on upper racks, Signal / Instrumentation cables shall be laid on top racks.

16.27.4 All necessary frame works and fixings for the support of cables and accessories shall be supplied.

16.27.5 Cables shall be suitable protected against heat, and mechanical damages.

16.27.6 Cables at fire partition wall crossings shall be painted with heat resistant paint 2M on either side of wall.

16.28 Structure for cable laying : -

16.28.1 Power cables shall be laid on ladder type cable trays & control / signal cables shall be laid on perforated trays. Communication cables, FO cables shall be laid inside separate GI Conduits.

16.28.2 Ladder type cable trays shall be selected from sizes 300 mm, 450 mm & 600 mm.

16.28.3 The cable trays shall be pre-fabricated Galvanised mild steel.

16.28.4 MS trays shall be fabricated from 50x50x6 mm MS angles for longitudinal members and 25x5 mm flats for cross members placed at an interval of 250mm along the length of cable tray.

16.28.5 GI ladder type cable trays shall be pre-fabricated from 50x50x6 MS angle with Hot dip galvanizing. GI perforated type cable trays shall be pre-fabricated from sheet steel of min. 3.0 mm thick with Hot dip galvanizing.

16.28.6 For GI trays, method of hot dip galvanizing shall conform to IS 2629:1985. Mass & thickness of zinc coating shall conform to IS: 4759:1996. However, minimum thickness of GI coating shall be 100micron.

16.28.7 Supporting vertical racks and horizontal hooks shall be of 50x50x6 mm MS angles. Cable racks and hooks shall be of welded construction.

16.28.8 To avoid damage during cable laying, cable structures shall have no scales, abrasive or rough surfaces or cutting edges.

16.28.9 The over head cable bridge structure shall be designed considering future cable laying and shall have 30% spare space for installation of future cable trays.

16.28.10 Walkway of minimum 800 mm wide shall be provided for laying of cables.

16.28.11 Wherever, cable trays are installed in parallel formations, they shall have minimum distance (or gap) of 250 mm or higher as per requirement.

16.28.12 Cable shall be fixed to racks or trays or cleats as required for proper support, accessibility and neatness of installation. Hanging of cables racks over panels shall not be permitted rather no cable shall be laid / pass over any electrical equipment e.g. transformer, switchboards etc. Cable tags shall be provided at a regular interval of 30M. For cable run shorter than 30M, one cable tag shall be provided in the middle. These tags shall be in addition to end cable tags. The cable tags shall be marked with cable number, size and voltage grade. Middle tag shall be indicated with destination. The end tag shall be with second terminal point.

16.28.13 Cables shall be clamped rigidly at an interval of not more than 1000 mm in horizontal, and 500 mm in vertical & inclined run and at bends.

16.28.14 In the cable basement / cable galleries, cable structures shall be properly arranged giving sufficient clearance for movement of personnel from one part of the basement / gallery to the other. It shall also be possible to escape easily in case of fire.

16.28.15 Cable passing through water/scale pit/acid fume etc. shall be laid in PVC pipe with PVC junction boxes and Pull boxes etc, where cable racks or trays cannot be erected or the number of cables on the route does not justify their use, cables shall be cleated direct to walls or structural steel work.

16.28.16 Perforated type cable trays shall only be used, where necessary for the support of a number of small cables. Each tray shall be firmly supported at suitable intervals and shall carry the weight of its cables without sagging. Trays shall be painted and where the surfaces or edges are cut or otherwise impaired during erection, they shall be made good by coating with aluminium paint.

16.28.17 Small cables may be bunched together under one saddle provided that in any bunch all cables have sheaths of the same material. The number of cables shall not exceed four wide and two deep.

16.28.18 Not more than one cable shall be drawn into one conduit, unless otherwise agreed. After the cable has been drawn in, the conduit shall be sealed by an approved means.

16.28.19 After complete installation of racks and trays etc. it shall be painted with a primer of red oxide(zinc chromate)and a top coat of finishing paint as approved.

16.28.20 Fire protection barrier as approved by purchaser shall be provided between HT cables racks and LT cables racks.

16.28.21 All cables shall be tested for proper insulation before start of laying work. Cables shall be laid in conduits, racks / trays, cable tunnels / trenches, along with structures or buildings, as per cable routing drawing and cable list.

16.28.22 Suitable adjustment shall be made in cable routes, if required at site, with a view to avoid any interference with any part of building, structures, equipment, utilities and services with the approval of the purchaser.

16.28.23 While laying cables, care shall be taken that kinks, twists or mechanical damage do not occur to the cable.

16.28.24 All bends in cables shall be made with due consideration to the minimum permissible bending radius of the cables.

16.28.25 Loops shall not be allowed to be formed during the laying of the cables. When being pulled, the cable shall not be allowed to drag drawing along the ground or over a second cable already laid. Special care shall be taken, while pulling through an opening, where other cables have already been laid. Only approved cable pulling devices shall be used.

16.28.26 No joints shall normally be made at any intermediate point in through run of cables unless the length of the run is more than the standard drum length. In such cases, where jointing is unavoidable, the same shall be made inside proper bases having plastic moulds and shall have moulded epoxy resin construction. Provision shall be made for earthing continuity at the joint. Cable splicing and jointing shall be

done in accordance with the relevant IS, code of practice and manufacturer's instructions. Insulation resistance of cables shall be checked before cable jointing.

16.28.27 Adequate length of cables shall be pulled inside the switch boards, control panels, control desks, etc. so as to permit neat termination.

16.28.28 All cables shall be neatly dressed without interlocking or cross overs. While laying the cable vertically, these shall be clamped at suitable intervals. Horizontal runs shall be rigidly secured to trays on racks / hangers in all the places, where the direction of the route changes as well as at cable terminations or joints. The clamps shall not be done up so tight that the insulation is damaged or deformed.

16.28.29 Cable markers shall be provided on either side of road crossing at each turning and at 30 m intervals at straight runs for underground cables.

16.28.30 Where cables are required to cross roads, surface drains and water, oil, gas or other pipe lines, they shall be taken through reinforced spun concrete or steel pipes.

16.28.31 Entry of cables from underground to the buildings or trenches shall be through pipe sleeves. After laying of cables, the sleeves shall be sealed with bitumen or epoxy compound with sand matting and cement plaster to make them fully water tight. Special consideration shall be given for protection of cables against chemical and mechanical damage.

16.28.32 All cable entry openings in the equipment shall be sealed and made vermin proof. All cable openings in walls and floors shall be sealed after laying of cables by a weak mixture of asbestos and cement mortar.

16.28.33 All cables shall be provided with identification tags indicating the cable number in accordance with cable lists. Tags shall be fixed at both ends of the cable and at 15 m spacing for straight runs as well as on both sides, wherever cables are crossing walls / floors. The tags shall be of aluminium / PVC with numbers punched / painted on them and securely attached to the cables by non-corrosive wires. The shape of tags shall be round, triangular and rectangular for control, medium voltage and high voltage cables respectively.

16.28.34 Glanding shall be done for direct entry of both power and control cables into the panels by the tenderer. Double Compression type brass cable glands shall be used.

16.28.35 The cables shall be terminated in accordance with relevant connection diagram. Termination and clamping shall be carried out in such a manner as to avoid strain on the terminals.

16.28.36 All power cable terminations shall be by means of crimping type copper cable lugs. For flexible conductors, solder less crimping type termination shall be adopted. In case of aluminium power cables termination on copper bus bars, suitable aluminium copper bimetallic washers shall be used. Corrosion inhibiting grease shall be used for aluminium cable terminations. All 0.5 sq.mm control cable termination shall be made by crimping using pin type insulated copper lugs. The 0.5 sq.mm copper lugs shall be supplied by the tenderer.

16.28.37 Suitable numbered and coloured letter interlocking type, ferrules shall be provided for end termination of power and control cables.

16.28.38 Control cable entering switch boards, control panels, control desks etc. shall be neatly bunched and strapped with PVC perforated straps and suitably supported to keep it in position at the terminal blocks. All spare cores of each cable shall be segregated, marked spare, neatly dressed and suitably tapped at both ends.

16.28.39 When the cores of two or more multicore cables take a common route in side equipment, cores of each cable shall be separately bound and the separate bundles neatly bound together.

16.28.40 Individual cores of control cables shall have plastic interlocked type coloured ferrules with engraved numbers at both ends of the circuit for identification.

16.28.41 The tenderer shall be responsible for correct phasing of motor power connections and shall interchange connections at the motor terminals box, if necessary, during each motor is in test run.

16.28.42 The trays shall be earthed and rendered electrically continuous by welding the trays to the grounding strip at not less than two places from both sides of the tray.

16.29 **Cable joint / termination accessories : -**

16.29.1 The cable accessories shall include end termination kits, straight through joints and also any special tool and tackles and accessories required for making the joints / terminations.

16.29.2 The straight through joint / termination arrangement shall be complete with all fittings and consumables. The joint shall have electrical and mechanical withstand capability, same as that of the associated cable. For all cables, a minimum extra length of 2 metres shall be left before jointing.

16.29.3 The termination kit shall be of heat shrinkable type.

16.29.4 The termination kits/straight through joints shall have the following features :-

i) Electrical stress control to be provided at the cable insulation shield terminus.

ii) An external leakage insulation to be provided between the cable conductors and ground.

iii) Adequate protection to be provided at the end of the cables against the entrance of the moisture and, provision to maintain the constant pressure in the cable.

16.30 **Exposed & concealed conduits** : -

16.30.1 Exposed conduits shall be laid along walls, floors, ceilings, on steel supports etc. as per working drawings / site requirements in consultation with the supervisory personnel. The conduits shall be neatly run and evenly spaced.

16.30.2 Fixing of conduits to the supports on wall, column, structure shall not be done by welding. Exposed conduits shall be adequately supported by racks, clamps, straps etc.

16.30.3 Jointing of conduits shall be done only in straight portion and not in bend portion.

16.30.4 The tenderer shall have arrangements at site for bending facilities for conduits as well as dies for threading conduits of diameters and threads corresponding to the standards. The threaded ends of conduits shall be painted with anticorrosive paint. The outer ends shall be smoothened free of burrs and sharp edges. Bushings shall be fitted at both ends of conduits.

16.30.5 Flexible metallic conduits shall be used for termination of connections to motors and other electrical equipment like pressure switches etc. which need to be disconnected at periodic intervals.

16.30.6 All conduits shall be effectively connected to the earth terminal of the equipment where it terminates.

16.30.7 Both ends of conduits shall be suitably earthed. Earthing continuity to be maintained by means of flexible wire, wherever, two conduits are joined with sockets.

16.30.8 Approved conduit bending machines to be arranged by the tenderer shall be used for bending conduits at site. The radius of any conduit bend shall be as per standards for cabling. Bends shall be free from cracks, crimps or other damage to the pipe or its coating.

16.30.9 Annular space of used & un-used conduits should be sealed at both ends.

16.31 **Installation materials:-**

16.31.1 Installation materials & erection accessories such as:- Angles, Channels, Sheets, Plates, Pipes, Chequered plates, GI conduits, Conduit fittings. Cable trays, Cable accessories, Insulating rubber mats, GI Fasteners etc. as required at site.

16.31.2 Chequered plates shall be used for covering the left over openings after installation of equipment, fabricated frames required for installation of all Panels / Posts / Junction boxes and all other electrical equipment and instruments on machine and on ground.

16.31.3 Fabrication and installation of GI cable trays, mounting brackets, supports etc.

16.31.4 GI flexible conduits including Conduits couplers, Clamping arrangement, Sockets, Adaptors, and Locknuts etc.

16.31.5 Pull boxes / flexible bends / Junction boxes etc. will be considered for cable pulling inside GI conduits.

16.31.6 Fire retardant paint and M-seal putty.

16.31.7 All cabling accessories including jointing kits, copper cable lugs, Double compression brass cable glands for laying and termination of cables at site.

16.31.8 Nomenclature / tags / designation number of Cable trays, LT switchgear, MCC, Control panels, Control posts etc..

16.31.9 First aid boxes, Shock treatment charts, Danger boards, Danger signals etc, shall be provided as per site requirement and also as per instruction of M/s VSP / MECON / HEC's engineer at site.

16.31.10 Vulcanized reinforced, patterned, Insulating rubber mat of required voltage classes as per latest IS:15652 shall be provided in front of switchgear, MCCs, Control panels, PLC panels, VFD panels, LDBs, Lighting transformers, Control desk etc.

16.31.11 Canopy shall be provided for Motors, Local control stations, MLDB, PDB, Junction boxes and other electrical equipment installed in the outdoor location.

16.31.12 Cable laying materials, Cable accessories including cable trays with supporting brackets, Pull boxes, Heavy duty G.I. pipes & G.I. fittings and other supporting structures made of Steel Angles, Steel channels, Cable tray covers, Protection covers for cables, Copper cable lugs, Double compression brass cable glands, Cable markers, Ferrules (interlocking type), Cable tags, Clamps etc. as required at site for cable wiring and termination shall be provided.

16.31.13 Wagon pusher control cabinets such as PLC panel, VFD panels, Incomer cum Auxiliary panel Local control station, Radio modems etc. will be installed on the respective wagon pusher in air conditioned panel cabin on anti-vibration pads. Lighting distribution board, Lighting transformer, Brake rectifier panels, Dynamic Braking Resistance boxes, Lubrication Panel shall be installed in the Resistance cabin on anti-vibration pads on the respective wagon pusher.

However, a common Control desk for Wagon tippler & Wagon pushers, PLC cabinet of wagon tippler, UPS, Battery bank, Radio modems, CCVM equipment, Telecommunication system equipment etc. will be installed in the control room building (1st floor and Ground floor). However, exact location of these equipments shall be finalized during detail engineering by Customer or their consultant.

16.31.14 All electrics on Wagon pusher machines and Wagon tippler machines shall be mounted on Anti - vibration mount.

16.32 **Earthing :-**

Earthing System as well as equipment earthing complete with earth electrodes, earthing conductors and accessories as required shall be as follows : -

16.32.1 Entire system shall be earthed in accordance with the provisions of the relevant IEC recommendations/ IS code of practice IS 3043-1987 and Indian Electricity Rules, so that the values of the step and contact potentials in case of faults are kept within safe permissible limits.

16.32.2 Parts of all electrical equipment and machinery not intended to be alive shall have two separate and distinct earth connections each to conform to the stipulation of the Indian Electricity Rules and apparatus rated 240 V and below may have single earth

connections.

16.32.3 All shops and buildings as well as the electrical sub-stations and electrical rooms shall be provided with a ring main earthing system each. Individual ring main earthing systems shall again be interconnected as a network. The earthing system shall be provided to have overall network earthing resistance shall be less than one ohm.

16.32.4 The ring earthing system around each building shall be laid at a distance of approximately 1.5 m from the building and at a depth of approximately 0.8m. The ring shall be bonded at intervals to the building steel structures, reinforcement of building columns and also to pipes, wherever they are crossing. The earth ring shall further be connected at intervals to deep earthing electrodes to achieve a combined earth resistance of less than one ohm.

16.32.5 For the purpose of dimensioning the earthing lines/conductors, the duration of the earth fault current shall be taken as 0.3 seconds.

16.32.6 For different floors in a building, localized ground mats shall be formed and connected to the ground earthing ring through vertical risers. The earthing mat shall be common to both power and lighting installations.

16.32.7 For protective earthing separate conductor shall be used for flow of earth fault current as elaborated below.

16.32.8 The LV side neutrals of the Power distribution transformers shall each be connected to two separate earthing electrodes. They shall also be connected with the neutral bus of the corresponding switchgear and the switchgear neutral bus shall be connected to the earthing ring at two different and distinct points. The fourth core or armour of cables and all conduits for cables shall also be connected to the earthing mains. A continuous earth strip shall be run in each side of cable tunnel and in cable ducts and trenches.

16.32.9 The power supply cables (LT) from the sub-station and the distribution cables to individual motors shall have 4/3.5 cores.

16.32.10 LT power supply cables shall have four cores and the fourth core shall have cross-sectional area of 50% of the other cores generally. The fourth core of the main supply lines shall be connected to the solidly earthed neutral bar in the substation switchgear as well as at the earth bars in MCC / distribution boards.Separate electronic earthing system shall be provided for all electronic equipment like PLC"s, weighing panel, computer etc.

16.32.11 **Conductor sizes for ground connections** :-

For equipment ground connections, the minimum conductor sizes used should be as follows :-

16.32.11.1 **LT system where the voltage does not exceed 650V normally** : -

16.32.11.1.1 **6 Sq.mm stranded GI wire : -**

i) Motors and starters upto and including 2.2KW, Light fitting, JBs, etc.
ii) Instruments and miscellaneous small items protected by fuses of ratings not exceeding 15A.

16.32.11.1.2 **16Sq.mm stranded wire : -**

i) Motors and starters above 3.7KW and upto and including 15KW.

16.32.11.1.3 **25 x 3 mm GI flat : -**

i) Motors and starters above 15KW, and upto and including 45KW.
ii) Control desks, cabinets, Local Control Stations, Welding socket outlet, Isolators. LDBs.

16.32.11.1.4 **50 x 6 mm GI flat : -**

i) Motors and starters over 45KW and HT motors.
ii) MCC, PDB, MLDB.
iii) Main earthing ring for MCC room, in shop units / plant buildings.
iv) Bond to crane gantries.
v) Cable trays all around.
vi) Aux. LT switchboards and other equipment protected by circuit breakers.

16.32.3 **Electronic earthing :-**

16.32.3.1 Electronic earthing shall be carried out for the electronic panels **(**viz**.** PLC cabinet, VVVF drive**,** Telecommunication system, electronic unit **/** instruments etc. **)** to be located in the control building room and for this purpose adequate length of copper flat of size 25 mm x 4 mm to be installed at strategic location in each substation for looping of electronic earthing system through 1-C, 16 sq**.** mm stranded copper cable **(** armoured **)** of colour green or yellow - green**.** The bus-bars shall be supported on pin type insulator**.** The connection between copper flat to individual signal grounding bus of each panel will be connected over 1/C, 16 sq**.** mm **(** Cu.**)** cable**.** Three **(**3**)** separate earth electrodes connected in delta formation will be provided at each location for signal grounding system**.** Tenderer will consider supply of the 1/C, 16 sq**.** mm **(** Cu.**)** cable for the above job within their scope**.**

16.32.4 **Earthing electrodes : -**

16.32.4.1 The earthing electrodes shall be of GI pipe, 50 mm dia and about 4 mm thickness in one piece provided with water holes and other filling devices. Earthing system for computers and microprocessor based equipment/ PCs shall be distinct and separate from the power and lighting equipment earthing system.

16.32.4.1.1 **Earthing of electrical equipment on Wagon Pushers and Wagon Tippler machine** :-

16.32.4.1.1.1 All electrical equipment installed on Wagon Pushers and on Wagon Tippler

machine shall be effectively earthed. All equipment shall be earthed by two (2) separate and distinct earth electrodes.

16.32.4.1.1.2 The Earthing ring of MS strip of size 50x6 mm on Wagon Pushers shall be connected to the earth conductor of trolley lines through the power current collector system. All electrical equipment on Wagon Tippler machine shall be earthed at two distinct points by grounding arrangement of Copper wire / GI wires / GI strips of adequate size etc. and for earthing from ground to wagon tippler machine shall be through flexible, trailing, EPR insulated copper cable.

16.32.4.1.1.3 For earthing of individual equipment on the machine, an earthing ring main shall be established and individual earth connections at two points of equipment shall be taken from the ring main.

16.32.4.1.1.4 The conductor for the ring main and individual earth connection shall be galvanized MS strip / copper strips and with stranded GI / copper wires. The selection of earthing conductor and its installation shall be as per the General Technical Specification of VSP (GTS - GS – 03).

16.32.5 **Guidelines for installation of Earthing conductor : -**

16.32.5.1 Earthing conductor laid directly in ground for Lightening protection will be coated with one coat of bituminised paints, be wrapped with one layer of bitumaetic tape laid on half lapped and will have a final coat of bituminised paint to prevent corrosion.

16.32.5.2 Earthing conductors run on wall / floor / cable and equipment structure etc. will be supported at suitable intervals and painted with black oxide paint.

16.32.5.3 All joints in all kind of Earthing conductors except at earthing electrode will be welded and painted black with bitumen paint.

16.32.5.4 At road / rail crossing earthing strips shall be laid through conduits / concrete ducts.

16.32.5.5 Special earthing will be provided for all electronic equipment as per manufacturer's recommendations / practice.

16.33 **Painting :-**

16.33.1 For all electrical equipment necessary steps shall be taken in treating all enclosures, plates, frames, fixtures etc. to prevent any rusting, corrosion, sulphation, or any other physical damage to the equipment or components thereof, whether or not the equipment are kept energised.

16.33.2 Painting of all electrics shall be done as per VSP, General Technical specification (GTS –GS- 09).

16.33.3 Paint shade of equipments / electrics shall be as follows :-

SI.	DESCRIPTION OF EQUIPMENT	COLOUR	PAINT

No.			SHADE (RAL CODE)
1	HT isolator	Traffic Grey A	7042
2	Transformer	Squirrel grey	7000
3	Bus-duct	Light grey	7035
4	Power Control Centers (PCC)	Light grey	7035
5	11 KV / 3.3 KV motors	Traffic Grey A	7042
6	415V LT AC motors	Silver Grey	7001
7	Inverter duty Motors	Dark Grey	7030
8	Equipment installed on or along with motors viz. Tacho generators, brake etc.	Same as that of motor	
9	Equipment installed on mechanism but separate from motor viz. Limit switches, pull chord switches, belt sway switches, speed switches, load cells, photo electric relays etc.	Traffic Grey A	7042
10	VFD panels, UPS panels, Automation system panels, Relay panels, Weighing controller panel, TR controller panel, MCC, PDB, MLDB, MCP, Soft starter, LDB etc. including crane control panels	Light grey	7035
11	Lighting distribution and power distribution board	Light grey	7035
12	Fire fighting panel	Carmine Red	3002
13	Local control box, Junction box	Traffic Grey A	7042
14	Control desk	Light grey	7035
15	Pulpit equipment	Light grey	7035
16	Telecommunication panel	Blue grey	7031
17	Junction boxes	Traffic Grey A	7042
18	Conduit / pipe, pull boxes	Traffic Grey A	7042
19	Light fittings	Traffic Grey A	7042
20	415 V Welding sockets	Grass green	6010
21	230 V Power sockets	Yellow orange	2000
22	24 V transformer sockets, lamp sets etc.	Sulfur yellow	1016
23	Earthing strip	Black	

16.34 The scope of work of the tenderer shall be on **Turn-key basis** which includes design**,** engineering**,** manufacture **/** fabrication, inspection, shop testing, Painting of electrics at manufacturers shop as well as at site after erection of electrics, installation and commissioning of all necessary electrics and automation system including all items mentioned at clause no.- 4.1.

16.35 The erection , installation, testing and commissioning of all necessary electrics and automation system including all items mentioned at clause no.- 4.0 are included in the

scope of work of the tenderer.

16.36 The tenderer will be responsible to obtain approval from Government Electrical Inspector and other Statutory Authorities for the installation and carry out changes called for at no extra cost to M/s VSP / MECON / HEC.

16.37 Tenderer shall also be responsible for obtaining licensed frequency, if applicable for radio remote control system and Telecommunication system etc.

16.38 Any modification of the equipment and control circuitry, if necessary at site, shall be rectified at free of cost by the successful tenderer.

16.39 All Erection, Installation / Pipe laying for cablings / Cable pits / earth pits and related civil works will be carried out by the tenderer as per equipment supplier's drawings and instructions for completion of the work in all respect.

16.40 Electric power will be made available by M/s VSP / MECON / HEC at the outgoing terminals of 415V, Load centre Sub-stations 1-14LC-10B, 1-14LC-10D for wagon pushers and 1-14LC9 for wagon tippler. The scope of work of the tenderer will commence from outgoing terminals of above 415V, Load centre sub-station switchboards. Wagon pusher control panels / cabinets will be installed on the respective wagon pusher units within an air conditioned switchgear room on anti-vibration pads and wagon tippler Intelligent MCC, VFD, RI/O panel, BRP's & DBR will be located at existing substation 1-14LC9. However, common control desk of Wagon tippler & wagon pushers, PLC panels of wagon tippler, CCVM system, Radio modems and UPS with battery bank will be installed at New Wagon tippler control room building. Tenderer should visit the VSP's site to have clear understanding of plant & scope of work for wagon handling system, COB#5.

16.41 Packing, forwarding, transport, insurance to FOR HMBP store at Ranchi, loading and unloading and transportation from Purchaser's store at the premises of M/s VSP to the site (Coal unloading yard of Rashtriya Ispat Nigam Ltd., VSP), receipt, unloading, storage and re-conservation at site, Erection, testing & commissioning of wagon pushers, wagon tippler, CCVM system, PLC system, Radio remote control, Telecommunication system with Telephone distribution system, Data communication system, Loud speaker broadcasting system, Lightening protection system, VFD drives, Limit switches, Sensors, UPS etc and testing and commissioning of Motors brakes limit switches & sensors etc. PG test of complete system of electrics for WHP. Precaution against damage during transit, storage at site during erection, testing & commissioning is included in the scope of the tenderer.

16.42 Any civil works required during erection of equipment and complete Civil work for cable trenches / Pipe laying / Cable pits are included in the scope of tenderer.

16.43 Location of PLC panel, HMI, UPS, UPS Battery, Radio modems and CCVMs will be in the existing air conditioned room of control room building (1st floor & ground floor) for Wagon Tippler and Intelligent MCC. VVVF drives, BRPs, DBRs, RI/O Panel for wagon tippler shall be located in the Sub-station 1-14LC9. However exact location shall be decided during detail engineering.

16.44 **MOTORS AND CONTROLS:-**

16.44.1 415V AC motors (inverter grade, crane duty).

16.44.2 Wagon pusher Incoming MCC at ground in substations 1-14LC-10B & 1-14LC-10D.

16.44.3 Wagon tippler MCC in Sub-station 1-14LC9.

16.44.4 DC electromagnetic brakes with Brake rectifier panel etc.

16.44.5 Wagon pusher Incomer cum auxiliaries panel in pusher panel cabin.

16.44.6 VSD with vector control drive for wagon tippler and wagon pushers.

16.44.7 Power Junction boxes, Control Junction boxes and Local control stations,

16.44.8 Field and safety switches / Sensors i.e., Magnetic proximity switches / Inductive proximity switches, Heavy duty, roller lever operated limit switches, Absolute encoders, incremental pulse encoder, Cam operated rotary geared limit switches, Laser beam transmitter and receiver set, Ultrasonic sensor and all field mounted instruments as applicable on ground and on wagon pusher machine and Wagon Tippler machine.

16.44.9 Programmable logic controller (PLC), Visualisation system, Programming terminal, printer etc., New PLC system will be hooked up to plant VSP PLC at bus level in addition to that signal exchange potential free contact shall also be considered.

16.44.10 Wagon handling control desk.

16.44.11 Closed Circuit PC based video monitoring (CCVM) with camera, 21" colour LCD/TFT Screen with latest configuration and PC based server cum video recording station of latest configuration and features with 21" colour LCD/TFT Screen of latest configuration with motorized zoom lens cameras with remote control arrangement.

16.44.12 Wagon pusher Incomer cum auxiliaries panel, VSD with vector control drive, DC shunt electromagnetic brakes, Brake rectifier panels, Dynamic braking resistors, Safety switches, Lighting distribution boards, Illumination lamps, Local control stations etc.

16.44.13 Sirens on Wagon pusher machine and Sirens for Wagon Tippler house (Single phase, 230V AC feeders to be considered in respective MCC / Control panel).

16.44.14 Radio remote control units (Receiver & transmitter) with communication ports & antenna as applicable for operation of Wagon pushers.

16.45 **Auxiliary power wiring and earthing :-**

16.45.1 415V, Power socket outlets for welding.

16.45.2 Junction boxes for power and control wirings.

16.45.3 Complete earthing system with G.I. flats / Copper strips / G.I. wires, Sockets, Nuts,

washers, test link etc.

16.45.4 Separate electronic earthing grid for PLC, I/O cabinet, VVVF drive, CCVM equipments, Telecommunication system, Loud speaker broad casting system (LSBC), Telephone distribution network, Data communication network Electronic instruments etc. as applicable. Tenderer to note that separate electronic earthing is not possible in wagon pusher machine. So the hardware shall be selected accordingly.

16.46 **VSD with vector control drive :-**

16.46.1 VSD converters will be provided for 415 V motor drives. The Drives shall be suitable to meet the speed control and technological requirement. All drives will have communication capability on Ethernet with Level-1 automation system.

16.46.2 The **VSD** will be of pulse width Modulation (PWM), vector controlled type with closed loop control to keep the ratio of voltage to frequency (V/F) constant throughout the speed range to maintain constant motor torque with initial current injection to overcome starting inertia of the system.

16.46.3 The **VSD** will comprise incoming Moulded case circuit breaker, dry type line reactor on the incoming side, three-phase diode bridge rectifier & three-phase IGBT Based PWM inverter and outgoing current limiting choke and outside AC23 duty isolator.

16.46.4 The inverter will have fully digital microprocessor based regulation and control system with suitable interfaces for instruments and signals. The microprocessor will carry out all the functions required from the unit including triggering protection, self-diagnostics and operator interface. Suitable programming and debugging unit will be provided. Display of faults, alarms, as well as diagnostic messages will be available in plain text on the operator's panel of the cubicle.

16.46.5 Suitable dynamic braking resistor along with solid state controller will be provided for the purpose of braking of motor as applicable.

16.46.6 The control electronics unit will be accommodated in sub-rack away from power handling devices.

16.46.7 The VSD converter will be designed considering the following input conditions and specific requirements as listed below:

i. **Input power supply:** 415V, 3Phase, 4 Wire, 50Hz, 50KA for 1 sec. Neutral solidly earthed near transformer.

ii. **Voltage and frequency variation:** The converter will be capable of operating normally under AC system voltage and frequency variation of ±10% and ±5% respectively on a continuous basis. It will be designed to withstand momentary dips in supply voltage without damage to electronic components and blowing of fuses.

iii. **Ambient temperature:** 50ºC (Derating shall be done for 50ºC ambient).

iv. **Type of inverter IGBT based PWM inverter:** DC link**,** 6–pulse**.**

v. **Output ripple content:** Below 2 per cent**.**

vi. **Incoming side unit:** Over current**,** short circuit & earth fault**.**

vii. **Outgoing side unit:** Over current**,** short circuit & earth fault**.** output current limit**,** over & under voltage protection**.**

viii. **Overload capacity of VSD unit:**

a) 150 per cent for 60 seconds**,** following 100% load in a duty cycle of 5 minutes,

b) 200% for 3 seconds.

ix. VSD for wagon pusher shall be able to take care of momentary loss of power for a short duration of around 500 milliseconds. VSD should operate satisfactorily using the "power ride through" feature

16.46.8 VSD panel will have necessary indication lamps **(**LED**)** for status and fault diagnostic purpose**.** The Enclosure shall be made of CRCA sheet, sheet thickness – 2.0 mm and undrilled gland plate thickness 3.0 mm, floor mounting type, degree of protection IP-42.

16.46.9 Base channel shall be ISMC -75. Bracing angles on both sides of VSD panels shall be provided. Maximum height of Wagon pusher VSDs shall be 1800mm including base channel ISMC – 75.

16.46.10 The Tippler will be operated on close loop condition with VSD panel with incremental encoder in Remote / Local mode selection from HMI / Selector switch provided in control desk. Provision will also be made for Emergency stop, push button in VSD panel / Local control station**.**

16.46.11 Local control station shall be provided with ON **/** OFF push buttons**,** Forward / Reverse push buttons (Slow / High), Local selection signal lamps and Emergency stop push buttons / Mushroom head Emergency stop push buttons.

16.46.12 The VSD unit shall be designed keeping provision for signal exchange with WP / WT PLC system over compatible data bus. The VSD panel should have selector switches for selection of Panel / Local / Remote mode selection, as applicable.

16.46.13 The VSD unit shall be suitable for thermistors input.

16.46.14 In addition to the data bus communication, all VSD units shall be designed with provision of signal exchange with PLC system over potential free contacts and 4-20 mA signals. Minimum signals are indicated below.

Digital / Analog output **Digital / Analog input**

a) Control supply ON

b) Emergency stop operated

c) VVVF drive fault

d) Remote selected

e) Drive ON feedback.

a) Start command

b) Feed rate set value (4-20 mA)

16.47 **Local control stations (LCS) :-**

16.47.1 Local Control Station (LCS) shall be provided as per requirements.

16.47.2 All Local Control Stations (LCS) shall be supplied as per the following specifications**:-**

16.47.3 Enclosure of LCSs shall be Thermoplastic polycarbonate moulded and shall be suitable to install on walls **/** structures **/** columns etc**.** LCSs shall be dust & vermin proof and protected against rain, degree of protection of LCSs shall be IP–65.

16.47.4 LCSs shall have one **(**1**)** 'Local Selected Lamp'**,** one **(**1**)** Start push-button**,** one **(**1**)** Stop push button **(** in case of reversing feeder, Forward and Reverse start push buttons **)** and control terminal blocks shall be Cat-M4 type terminals of Elmex make or equivalent suitable for termination of cable size - 2.5 sq. mm. All components shall be wired upto the terminal blocks**.** The Stop push-button shall be "Red Mushroom head lockable type" **(** press to lock and turn to release type **).**

16.47.5 Thermoplastic polycarbonate moulded enclosures of LCS shall be finalised during detail engineering by our customer or their consultant.

16.47.6 All LCS shall have provision for pedestal / wall mounting / structure mounting. Supply and installation of pedestal etc. at site shall be supplied by the successful tenderer.

16.48 **Dust suppression system :-**

The water spraying for dust suppression will start automatically, when wagon tippler is rotating in forward and will stop, when the tippler is returned to initial position. This will be achieved by establishing suitable interlocking between controls of wagon tippler and de-dusting system. Dust suppression system control is integral part of Intelligent WTMCC.

16.49.0 **Transformers** :-

16.49.1 **Control transformer : -**

Control transformer shall be double wound copper conductor. Dry type, Winding shall

be class – F insulated with temperature rise limited to class – B limit. Tapping in secondary sides with ± 2.5% & ± 5% shall be provided, Centre taps to be earthed in secondary side.

16.49.2 **Lighting Transformer : -**

Lighting transformer, 10KVA, Single phase, 50Hz, tappings in secondary sides with ± 2.5% & ± 5% shall be provided, sheet steel enclosed, floor mounting type, CRCA sheet, sheet thickness - 2.0 mm, gland plate thickness - 3.0 mm and degree of protection IP42, Winding insulation shall be class- F insulated with temperature rise limited to class – B limit, winding shall be double wound copper conductors. Two nos. earthing studs shall be provided.

Primary winding : 415V, 50Hz, 10KVA

Secondary winding - I : 240V, 50Hz, 9KVA, 1Ph, with center tap brought out for Earthing.

Secondary winding - II : 24V, 50Hz, 1KVA, 1Ph

16.50. **Electro-magnetic brake (DCEM Brake) :-**

16.50.1. The brakes shall be of heavy duty, DC electromagnetic type suitable for floor mounting type. These shall be of two shoes, self-aligning, quick acting type with self - lubricating, robust bearings complete with brake mechanism, shoe, coil and brake wheel to be mounted on the motor shaft or its extension shaft. The brake mechanism shall be provided with suitable means for adjustment of braking torque and magnetic air gap. The mechanism shall be 'spring reset type'. Necessary rectifier unit shall be provided suitably for operating from 415V AC, 1Ph, 50Hz, supply. The operating control voltage 110V AC will be provided.

16.51 **Site tests: -**

16.51.1 On completion of the installation but before energisation of the system, all installation will be physically checked and properly tested. These checks and tests will be conducted successfully by the tenderer under the supervision / witness of employer / his consultant. The Tenderer will furnish the final status and test results. Any defect observed during such check and tests will be rectified by the tenderer free of cost within contract completion period.

16.52 **Approval of Statutory Authorities: -**

16.52.1 The tenderer will obtain as per requirements necessary approval of statutory authority as per rules of State Government and Central Electricity Authority for the work under his scope, before energizing / charging the equipment. However, employer will extend all assistance in this regard, like submission of application, relevant documents and payment of statutory fees etc. The tenderer will carry out changes called for at no extra cost to Employer as pointed out by the approving authorities. Tenderer will be responsible for obtaining licensed frequency, if applicable for Radio remote control system and Telecommunication system etc.

16.53 **Fire retardant paint :-**

16.53.1 All HT and LT power as well as control cables will be painted with fire retardant paint at a regular interval of 30 M on straight run and cable entering and exiting of cable vault and basement at a stretch of 1.5 M. M-SEAL putty will be provided for all control cables entering into the panel base plate.

16.54 **Control function :-**

The wagon pusher shall operate in conjunction with the wagon tippler. The pushing cycle will be as given below:

16.54.1 After the loco has left leaving a rake of 52/56 loaded wagons, the wagon pusher will push the rake load of wagons onto the tippler platform. The 1st leading wagon of the rake will be manually decoupled and the pusher will pull back the rake to clear the tippler platform for permission of tippling operation with the loaded wagon.

16.54.2 Once the tippling operation is complete and the tippler platform is in horizontal position, the pusher will again push the rake into the tippler platform to push off the empty wagon and subsequent placement of the 2nd wagon on the Tippler platform.

16.54.3 The process will continue till the last wagon in the rake is tippled. The two (2) flat type dummy wagons will be attached with the wagon pusher, which will ensure to clear the last empty wagon from the tippler platform. Out of the above operations, the initial pushing of the leading loaded wagon and placing on Tippler platform will be done manually. However, in Auto mode selection, operation of Wagon tippler and Wagon pushers shall done through HMI provided in control desk except rotation of Wagon tippler and travel of Wagon pushers as per unloading cycle. Rotation of wagon tippler and travel of wagon pushers will be operated from control desk with joy stick Master controllers. While designing the control scheme, the tenderer shall take care of the following interlocking requirement :

i) The wagon pusher cannot be operated in the forward direction, when wagon tippler is operating.

ii) End limit switches shall be provided to restrict the travel at forward and reverse limit of the wagon pushers.

iii) Heavy duty, magnetic proximity switches with appropriate sensing distance will be considered for positioning at extreme forward limit and extreme reverse limit of wagon pusher movement as a back up by of forward and reverse limit switches.

iv) . Interlock of wagon tippler platform position with Railway route interlock system of railways etc. shall be considered for integral operation of wagon handling system.

v) Wagon tippler shall have to be interlocked to ensure that empty wagon is cleared from wagon tippler platform through Laser beam transmitter – receiver units in outhaul side and loaded wagon is cleared from the wagon tippler platform in inhaul side after de-coupling through Laser beam transmitter – receiver unit.

vi) Interlock shall be provided to ensure proper clamping of various sizes of wagons through Inductive proximity switches and Roller lever operated limit switches prior to rotation of wagon tippler.

vii) Interlock shall be provided to ensure unclamping of rails through 2 nos. of actuator drive units.

16.54.4 Wagon tippler and wagon pusher drives shall be driven through VVVF vector drive.

16.54.5 The degree of enclosure protection of motors for the wagon pushers & wagon tippler shall be IP-55 however suitable protection cover shall be provided for protection against weather, rain, conforming to IS**:** 4691**.**

16.55 **Power collector system (Not in the scope of supply of tenderer) :-**

16.55.1 The power from four (4) Nos. - Trolley line conductors to the wagon pusher shall be fed through overhead, Gravity type, 1000A power current collector system. Overhead conductors for power and earth will be provided by the side of the railway track, where the wagon pusher will be moving. The tentative arrangement has been shown in the HEC drawing No. - SK-EDB-1328.

16.55.2 Due to the proximity of the 25KV, Single Phase**,** 50Hz traction line located near the low voltage power conductors for the wagon pusher**,** there will be electrostatic as well as electromagnetic induction effects on the overhead power conductors**.** To neutralise the electrostatic effects**,** the overhead power conductors shall have to be earthed through earthing power contactor provided in the Incoming MCC. Which earths the outgoing side of 800A, Air circuit breaker**.** Also**,** to keep the voltage induced due to the electromagnetic induction effect to the minimum permissible limit of 25 Volts**,** the overhead conductors will be sectionalised by putting insulated barriers after every 150 meters**.** While designing the electrics for the wagon pusher, the aspect of electromagnetic induction should be considered by the tenderer (control vendor)**.**

16.55.3 Each pusher car shall be provided with two (2) numbers full capacity Gravity type, 1000A, Current collector system, physically mounted on the wagon pusher (5.85M apart) and are electrically connected in parallel (supply of current collectors is not in the scope of tenderer).

16.55.4 Power collector system includes four (4) Nos. - Trolley line conductors for each wagon pusher track.

16.55.5 Forward / reverse movement, switching ON - OFF of lights and Local - Remote selection shall be done through radio remote control unit. Tenderer shall select the suitable radio modems and antennae considering variation of distance between wagon pusher and Wagon tippler control desk room (Max. around 1300M) close vicinity of 25KV overhead line. The radio modem shall be selected considering hot stand-by feature with single point at each wagon pusher and multi point unit at control room. Effort should be made to use non licensed frequency domain without sacrificing the reliability of the system. In case of selection of licensed domain, tenderer will take up with Govt. of India for issue of licence as per Govt. directives. The successful tenderer shall provide the required application fees. The radio

modems at control desk room will be connected to wagon tippler PLC system and the modems at wagon pusher will be connected to PLC Panel mounted on wagon pusher over compatible data bus using redundant configuration for interfacing and control of wagon pusher units from Wagon tippler control desk room. The successful tenderer will also bear the expenses for licence fees for one (1) year.

17.0 Eligibility criteria:-

17.1 The firm should have executed the projects for Steel Plant with Drive system (Yaskawa make VFD) & PLC system.

18.0 Trainings :-

Training of Plant engineers of M/s VSP on PLC system, Drive system and Telecommunication System for 8 Persons for Two weeks.

DRAWINGS FOR REFERENCE

SL. NO.	DRAWING NO.	DESCRIPTION
1.	SK-EDB- 1366	SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR COB # 5, PKG. – 006, VSP
2.	SK-EDB- 1365	SINGLE LINE DIAGRAM FOR WAGON PUSHER FOR COB # 5, PKG. – 006, VSP
3.	SK-EDB- 1328	GA DRG. OF WAGON PUSHER WRT. VERTICAL DSL COLUMNS AND LOCATION OF 1000A, GRAVITY TYPE, CURRENT COLLECTORS FOR COB # 5, PKG. – 006, VSP
4.	SK-EDB- 1329	LOCATION OF ELECTRICAL ITEMS IN WAGON TIPPLER MACHINE FOR COB # 5, PKG. 006, VSP.
5.	SK-EDB- 1330	LOCATION OF SUBSTATIONS, CONTROL DESK BUILDING, TIPPLER HOUSE AND DSL POSTS ALONG THE RAIL TRACKS OF WAGON PUSHERS (TYPICAL) FOR COB # 5, PKG. – 006, VSP
6.	SK-EDB- 1354	GA, SLD, Schematic, BOM, Technical details, TB details, wiring diagram of MCC for Wagon Tippler

7.	SK-EDB- 1355	GA, technical details, wiring and looping diagram and BOM of PLC for wagon tippler
8.	SK-EDB- 1356	GA, technical details, wiring and looping diagram and BOM of PLC for wagon pushers
9.	SK-EDB- 1357	GA, SLD, Schematic, BOM, TB details, wiring diagram of PDB & MLDB for Wagon Tippler
10.	SK-EDB- 1358	GA, SLD, Schematic, BOM, Terminal details of Lighting Distribution Board for Wagon pushers
11.	SK-EDB- 1359	GA, wiring diagram, TB details & BOM of control desk for Wagon Tippler & Wagon Pushers
12.	SK-EDB- 1361	List of Data Sheet of Sensors for WHP
13.	SK-EDB- 1362	GA and data sheet of Siren for wagon pushers
14.	SK-EDB- 1363	GA, TB details & BOM for socket & associated equipments for WHP
15.	SK-EDB- 1364	GA and data sheet of Siren for wagon tippler
16.	SK-EDB- 1367	Cable schedule for Wagon Pushers
17.	SK-EDB- 1368	Cable schedule for wagon tippler
18.	SK-EDB- 1380	Schematic diagram & BOM of Lighting Installation for Wagon Pusher.
19.	**SK-EDB-1376**	GA, SLD, Schematic, BOM, TB details, wiring diagram of VFD panels for Wagon Pusher
20.	**SK-EDB-1377**	GA, SLD, Schematic, BOM, TB details, wiring diagram of VFD panels for Wagon Tippler
21.	**SK-EDB-1381**	Cable selection chart for Wagon Tippler and Wagon Pushers
22.	1507.97.075	CCVM system for wagon handling system VSP
23.	25945-01-01-ELE-0121	EQUIPMENT LAYOUT PLAN ON EXISTING FLOOR AT -40 LEVEL AND FLOOR CUTOUT DETAIL ON EXISTING FLOOR OF EXISTING 1-14LC9 BUILDING.
24.	25945-01-01-ELE-0145	LOAD CENTER SUBSTATION NO 1-14LC10B EQUIPMENT LAYOUT – PLAN AND SECTION.
25.	25945-01-01-ELE-0146	LOAD CENTER SUBSTATION NO 1-14LC10D EQUIPMENT LAYOUT – PLAN AND SECTION.

RASHTRIYA ISPAT NIGAM LIMITED
VISAKHAPATNAM STEEL PLANT
VISAKHAPATNAM (VIZAG)

GENERAL SPECIFICATION
FOR
PREFFERED MAKES
(GS – 13)

CHAPTER-13

MECON LIMITED
RANCHI - 834002

No. MEC/GS/123K/11/38/01 **JULY, 2012**

CONTENTS

01 **PREAMBLE**

This document "PREFERRED MAKES OF EQUIPMENT AND SUPPLIES" is a part of the tender specification for various packages of VISAKHAPATNAM STEEL PLANT.

The makes of various equipment and supplies in respect of imported/indigenous equipment/components/materials are listed out in this document. It is essential that the equipment/component/materials to be supplied from imported/indigenous sources by the Tenderer will be of any one of the makes listed against that particular equipment/ component/material in these documents. In case of any contradiction in respect of 'Preferred Makes' indicated in this document with the preferred makes indicated in any other tender document, the one indicated in this document shall prevail.

In case the Tenderer/ Contractor intends to substitute any particular make of equipment / components/ materials by a make other than that listed in this document, the Tenderer shall clearly bring out the same in his tender along with justification and indicate the alternative makes offered by him. It will be prerogative of the Purchaser to accept or reject the alternative makes so offered. Refer clause 04.02.01 of GS-01 also.

02 FLUID SYSTEM

02.01 Water Supply Facilities

Item Description		Manufacturers
Horizontal Centrifugal Pumps	:	Kirloskar Brothers, KSB, Beacon Weir, Khimline, Voltas, Mather & Platt, Jyoti, Flowmore Pumps, BE Pumps, Microfinish Pumps, Sintech, Ghaziabad.
Vertical Turbine Pumps	:	Kirloskar Brothers, Voltas, WPIL, Jyoti, Mather & Platt, Flowmore Pumps.
Vertical Wet Pit Type Pumps	:	SU Motors, Kishore Pumps, Kirloskar Brothers, KSB, Flowmore Pumps
Submersible Pumps	:	KSB, SU Motors, Kirloskar Brothers, Kishore Pumps, Darling, Beacon, Weir, Flowmore Pumps
Slurry Pump	:	Akay, Sam Engg., MBE, Hyderabad Industries, KBL, Flowmore Pumps, KSB Pumps, WARMAN.
Dosing Pump	:	Shapo Tools, Asia LMI (Madras), VK Pumps, Toshniwal, Milton Roy India.
Cooling Towers	:	Paharpur, Shri Ram Tower Tech, Gammon, Himgiri, Southern Cooling Tower, BDT, GEA
Pressure Filters	:	Thermax, Ion-Exchange, Resin India, Driplex, Doshion, VA Tech, Wabag, VEM, Aquatech
Sluice Gates	:	Jash, IVPL, GM Dalui, H-Sarkar, Associates Toolings.
Travelling Water Screen	:	Macmet, Triveni, Otokiln, Mecgale (Nagpur), General Mechanical
Sludge Scrapper	:	Triveni, Neo – Parisrutan, Mata India, Geomiller
Fire Hydrants	:	New Age Industries, Steelage Industires, ASCO, Strumech, Vijay Fire, Zenith

Basket Strainers	:	Filteration Engrs, J.N Marshall, Masturlal Fabrication , ARF Engg, Purolator Filters, ABB, Filters Mfd India
Duplex Strainers	:	Filteration Engrs., Otokiln, Superflo
Rubber Dismantling Joints	:	BDX, CORI Engineers, D.Wren, Sur Industries, Forbes Marshal.
Basalt Liners	:	DEMECH, Vidyut Green Bank, Enviro Abrasian, Garden Reach Ship Builders & Engg.
Oil Skimmer	:	JVM Engg., Potential Engg., Premier, Rema Engrs, Mumbar
Plate Heat Exchangers	:	Alfalaval, GEA Ecoflex, IDMC, Dover, Prag Ind., Iml Morhtor, Hindustan Radiaton
Item Description		Manufacturers
Surge Tanks	:	Anup Engg., Govinda Ent., Perfect Engg., Sakthi Hitech, Engineering Fabricators & Enterprise.
C.I. Valves (gate, globe, NRV)	:	Kirloskar Brothers, Kalpana Valves, Steam & Mining, H.Sarker, IVPL, AV Valves, Shiv Durga, NECO Valves, K.L.Parui & Sons, BDK, Fouress.
CS Valves (gate, NRV)	:	Audco, Fouress, BHEL, Sakhi, KSB, Steam & Mining, Associated Tooling, BDK, Kirloskar, Leader, Virgo, AV Valves
Plug Valves	:	Audco, Vass Ind., Xomox, Virgo, BDK, L&T, Tuflin, Chemtrol Samit
Ball Valves	:	Audco, Vass Ind., KSB, Microfinish, Nitton, AL Saunders, Xomox, Virgo, BDK, Hi-Tech, Butterfly Valves, Virgo, Haborim-Vaas.
GM Valves	:	Bombay Metals, Leader, Bankim, NECO, Upadhyay Valves, Kalpana Valves
Butterfly Valves (Manually & electrically operated)	:	L&T, Fouress, Kirloskar Brothers, IVPL, VIRGO, AL Saunders, Keystone, BDK, L&T, SPITMAN, Intervalves, BHEL, XOMOX.

Diaphragm Valves	:	AL Saunders, Fluid System, BDK
Float Valve	:	Leader, IVPL, IM Engineers, H.Sarkar.
Control Valve	:	BHEL, L&T, Fouress, IL, MIL Controls, NECO Scharbet, Sabim Valves, Sam Sons, DCV Dandy, Darling
Solenoid Valve	:	Rotex, Sicmag, Scharder, NECO INDFOS, Eastern Pneumatic, Bluestar, AVCON, ASCO.
Air Release Valve	:	Shiva Durga, IVPL, H.Sarkar, IM Engineers, Steam & Mining, Schroder Duncum, Fluid Line Valves
Pressure Reducing Valve	:	JNM, Fouress, Bestobell, IL, Mazda, Nirmal Ind., Forbes Marshal, R.K.Control
Strainer/Filter	:	Otokiln, Superflo, Triveni Plenty, Filter Mfg. Ind., Purolator, Filteration Engineers
Electric Actuators	:	Beacon Rotork, Auma, Marsh Engineers, Keystone, Limitorque, Antrieb, IL, Palghat
Rotory Pneumatic Actuators	:	AL Saunders, Xomox, EL-O-Matic, Virgo, L&T, Flocon, Precision Processing Equipt. Co.
Valves for O_2 Services	:	BHEL, BOC India Ltd., Fouress Engg, The Indian Valve Co., BDK Engg.
Diesel Engine	:	Cummins/Ashok Layland/Ruston
Softening & DM Plant	:	Doshi/Resin India / Thermax / Thermax Cullinyan / Urminus/VA Tech/Ion Exchange /Triveni
Hoses	:	Aeroflox/Markwel/Senior Flexonics
Pipes a) MS/GI	:	SAIL/TATA/Jindal/Zenith/Man/SAW/Surindra/Welspun/Prakesh
b) DI	:	Electro Steel Casting
MS/GI Pipe Fittings	:	Tube bends / Stewards & Lloyds / Shivananda / ITC / BST/Jindal/ Ajanta/ Prakash Tubes/ Zenith.

02.02 Valves For Fuel Gas, Steam, Nitrogen, LPG & Compressed Air Facilities

Item Description		Manufacturers
C.I. Valves for Fuel Gas & Compressed Air (gate, globe, NRV)	:	Kirloskar Brothers, GM Dalui, Steam & Mining, H.Sarker, IVPL, AV Valves, Leader, Associated tooling, BDK, Kalpana Valves
CS, FS, SS Valves for Steam, Feed Water, & LPG (Gate, Globe, NRV)	:	L&T (Audco Div), Fouress, BHEL, KSB, GM Dalui, Leader, BDK, NECO, Associated Tooling, Hawa Egr., Vass Ind, Advance Valves, Kalpana Valves
CI, CS, SS & FS Plug	:	Vass Ind., Xomox, Virgo, BDK, Leader,

Valves		Steam and Mining, GM Dalui, H.Sarkar, Audco
Ball Valves	:	Audco, Vass Ind, KSB, BDK, Microfinish, Niton,AL Saunders, Xomox, Virgo, United Engineers, Steam & Mining, Hi-Tech B.Valves
GM Valves	:	Bombay Metals, GM Dalui, Leader, NECO, Kalpana Valves
Butterfly Valves	:	Audco, Fouress, Kirloskar Brothers, IVPL, Inter Valve, Virgo, AL Saunders, Keystone, BDK, Leader, AVC Engg., Crowley & Ray, Xomox, Tyco, Hi-Tech.
Diaphragm Valves	:	AL Saunders, Fluid System, Leader, BDK, Xomox, Steam & Mining
Pressure Control Valve/Pressure Reducing Valve	:	JNM, Fouress, Bestobell, IL, Mazda, Nirmal Ind., Vanaz, Kosan Metal, Vass Ind., RK Control, Fluid Line, Forbes Marshal, Leader.
Large Diameter Goggle Valve	:	Audco, Fouress, Cimmco, L&T
Fabricated Gate Valves	:	Fouress, Cimmco, BECO, Beekay, L&T, Kalpana Valves
Safety Relief Valve (Pressure relief Valves)	:	BHEL, Keystone, Bliss Anand, L&T (Audco Div.), Sempell, Fainger, Leser Valves (P) Ltd., IL, Anderson, Kosan.

02.03 Miscellaneous Gas Facility & Compressed Air Equipment

Item Description		**Manufacturers**
Oxygen Acetylene & LPG Manifolds	:	Kamrup Industrial Gases, INOX, Titan Engg., BOC, Ramba Hydrogen, Asiatic Oxygen

SS Bellows Expansion Joints	:	Flexican, Flexatherm, SURR Ind., Pressel (Cuttack), BD Engr., Eludyne Engr., SPB, SEPL, PEBI, Lonestar, GBM Mfg., TI Flexible Tube.
Centrifugal Gas Booster	:	Andrew Yule, TLT, James Howden (U.K), Donkin (U.K), Hibhen
Twin Lobe Type Booster	:	Skoda, CKD Kompressors, MD Pneumatics, Demag Delavl, Bryan Donkin Sulzer, Oil & Gas Plant Engg., (Tuthill), Kay International
Gas/Air Compressors	:	Ingersoll Rand, Atlas Copco, KG Khosla, Kirloskar Pneumatic, Chicago Pneumatic, Mannesman Demag, Eliat, Cooper, Sulzor, Corken (USA)
Hoses	:	Flexican, Gaytri Industrial Corpn., Inalsa, Teksons, Sudeep Industries, Markwell

Valves for Oxygen Services:

Item Description		**Manufacturers**
1. **Non-Ferrous**:		
For Isolation	:	Bestobell (UK), ETH IRELAND (France), RT Orseal (UK), Truflo (Belgium), Worcestor Controls (UK)
Quick Sheet-off Valve	:	Bestobell (UK), ETH IRELAND (France), RT Orseal (UK), Truflo (Belgium), Worcestor Controls (UK), Moorco, SEBIM
Pressure Control Valve (PCV) & Flow Control Valve (FCV)	:	SEVERN (UK), NELES SECK GLOKON (UK), IL (Palghat)
Solenoid Valve	:	AVCON, SEITZ, ROTEX, ASCO
Safety Relief Valve (SRV)	:	KUNKLE (USA), KEYSTONE (USA), BROADY (UK), MOORCO, SEBIM, IL (Palghat)

	Pressure Regulators (Self regulating with pressure gauge)for Oxygen	:	ESAB, BOC, Speciality Gases, Kamrup Industrial Gases, Venaz Engineers, Nirmal Ind.
2.	**Stainless Steel (SS) (manual)**	:	Precision Engg., BDK, Niton, Akay, Leader, Audco, Sakhi & Co., KSB

POWER & ENERGY

Item Description		**Manufacturers**
Air Drying Uuit	:	Chemech, Cleanair, Delair, Indcon, Mellcon, Mirch Mirex, Gasoenergy System Pune.
Condensate Pumps	:	KSB, BHEL, Kirloskar Brothers, Mather & Platt, Khimline, Sigma
Ejector	:	BHEL, Weigand, Newfield, Mazda
Trap & Strainer for Compressed Air & Steam	:	Uniklinger, ESCO, JNM, Dryton Greaves, Forbes Marshall, Hawa Engrs., Mazda
Actuators		
Electrical	:	AUMA India, Beacon Rotork Controls, Continental Profiles, Emtork Actuators, Limitorque
Pneumatic	:	Marsh Engg., Keystone, IL, Massoneilan, EL-O-MATIC, Virgo, AL Saunder, L&T, Flocan
Heat Exchanger (Shell & Tube Type)	:	BHPV, Kaveri, Texmaco, Thermax, Babcock & Wicox, Parkair Engg., Rhine, Universal Heat Exchanger, Godrej, L&T, GEI Godavari, Patel Air Temp., Hindustan Radiaton
Control Valves	:	Blue Star, Fouress Engg., IL, JNM, Mazda, Forbes Marshall
Pressure Vessel & Tanks	:	Beekay Engg., BHPV, ISGEC, Kaveri Engg., TSL, Lloyds Steel, Mukand, Parkair Engg., Grasim Industries, Anup Thermal System, Texmaco, SV Tank, Grasim Industries, Hyderfuel Industries.

Thermal Insulation	:	Hyderapad Industries, Lloyds Insulation, Rockwool, Thermax Heat Tracers, U.P. Twiga Fibreglass.
Suction Filters	:	FMI, KAAF, L&T, Flakt, Autokiln Filter, GEC Alsthom, Filtration Engr., ARF Engg., ABB, Dyna Filter, Purolator Filters, GM Dalui

02.04 Pipes & Fittings for Water Supply, Gas Facilities, Steam and Compressed Air Facilities.

Item Description		Manufacturers
SW/SAW, ERW/EFW MS Pipes	:	SAIL, BHEL, TISCO, Jindal, Ajanta, Zenith, Saw Pipes, Welspun, Man Industries, Surindra Engg., Maharastra Seamless, Indian Seamless, BST, Advance Steel, Good Luck, Indus Tubes, Mukat, Lloyds, Poonam Enterprises, Soor Neogi Koumar.
SS Pipes / SS Fittings	:	Heavy Metal Tubes, Nobel Tubes, Rajendra Mech. Ind., Sterling Supply Agency, Vitrag, SAIL, Poonam Enterprises, N.L.Hazra, M.S.Fittings
Seamless, Stainless Steel Pipes/Tubes	:	Amardeep Steel, Choksy Tubes, MJ Patel, Nagardas Kanji, Poonam Enterprises, Sandulk Asia, MEC Tubes, Nagardas & Kusai, Noble Tubes, Allied Steel, Kamlesh Tube, Menilal & Bro, Uday Tubes, SAIL, Maharastra Seamless (P) Ltd, Imperial Steel, Soor Neogi Koumar.
Fittings for the above Pipes/Tubes	:	EBY Ind., High-Tech, Hydro technic, Hydro-Air Engg., Project Toolings, Shivananda, M.J.Patel, Nagardas & Kusai, MEC Tubes, Nobles Tubes, Amardeep Steel, Allied Steel, Kamlesh Tube, Menilal & Bros, Poonam Enterprises, N.L.Hazra, M.S.Fittings
RCC Pipes & Fittings	:	SUR Industrial Pipes, Hind Ceramics, Indian Hume Pipes, Daya Cuncrching.
HDPE Pipes & Fittings	:	EMCO, KWH Heliplastic Polyolefins, Oriplast
PVC Pipes & Fittings	:	Oriplast, Finolex, Bharat Pipe & Fittings, Supreme Industries.

03. VENTILATION, AIR CONDITIONING & AIR POLLUTION CONTROL EQUIPMENT

Item Description		Manufacturers
Centrifugal fans for Ventilation	:	Thermax, C.Doctor, EFE, HUL, AEROVENT, Flow Link, Andrew Yule, RIECO, ISEL, BATLIBOI, Flaktwood, REITZ, ACCEL, Suburban Engg., Dustven, ALMONARD, INDFAN, AREVAT&D
Centrigugal fans for Dedusting	:	BHEL, TLT, Thermax, C.Doctor, HUL, Andrew Yule, RIECO, Batliboi, F.Harley, Flaktwood, REITZ, DUSTUEN, ISEL, INDFAN
Tube axial fans / Propeller Fans	:	C.Doctor, EFE, Flow Link, Flaktwood, REITZ, Dustven, ALMONARD, ACCEL, KHAITAN, AEROVENT, ISEL, INDFAN
Panel filter for air	:	FMI, Clean Filter Industries, EFE, ACCEL, FILTRONIC, FLOWLINK, CADILLAC, C. DOCTOR
Air washer	:	C.Doctor, EFE, FLOW LINK, FHARLEY, ALSTOM, Dustven, BATLIBOI, FMI
Man coolers	:	C.Doctor, Ventura, LM ENGINEERS, KHAITAN, ALMONARD, DUSTVEN, FLOWLINK
Roof exhauster	:	C.Doctor, EFE, ACCEL, ALMONARD, FLOWLINK, INDFAN, AEROVENT
Window air conditioners	:	Fedders Lloyd, VOLTAS, Blue Star, ARCTIC, Carrier Aircon, LG, Samsung, HITACHI
Packaged air conditioners	:	VOLTAS, Blue Star, KIRLOSKAR, ACCEL, BATLIBOI, EMERSON, FEDDERS LLOYDS, ROOS TEMPKOOL, ROOTS COOLING

Item Description		Manufacturers
Packaged chillers	:	VOLTAS, Blue Star, ALSTOM, Batliboi, ACCEL, FEDDERS LLOYD, KIRLOSKAR, PNEUMATIC, EMERSON
Air handling units	:	VOLTAS, BLUE STAR, ALSTOM, BATLIBOI, PATELS AIR TEMP, ROOTS COOLING
Cooling towers	:	PAHARPUR, MIHIR, ADVANCE, GAMMON INDIA, Southern Cooling Towers Ltd., SHRIRAM TOWER TECH.
Refrigerant compressors	:	VOLTAS, SHRIRAM, ACCEL, BLUE STAR, , Atlas Copco, Kirloskar, HITACHI
Cyclones	:	THERMAX, RIECO, ALSTOM, C.DOCTOR, F.HARLEY, Dustven, EFE
Multicyclones	:	THERMAX, ALSTOM, C. DOCTOR, BATLIBOI, RIECO, F.HARLEY, EFE
Bag filters (Cap – 10,000 m^3/h to 80, 000 m^3/h)	:	THERMAX, ALSTOM, ANDREW YULE, RIECO, C.DOCTOR. F.HARLEY, Dustven, BATLIBOI, FMI
Bag filters (Cap –Above 80,000 m^3/h)	:	ALSTOM, RIECO, ACC, THERMAX, VAI, Dustven, BATLIBOI
Wet scrubbers	:	ALSTOM, THERMAX, BATLIBOI, RIECO, C.DOCTOR, F.HARLEY, EFE, SOIL & ENVIRO SYSTEM
Venturi scrubbers	:	BATLIBOI, THERMAX, RIECO, ALSTOM, Dustven
Electrostatic precipitators	:	ANDREW YULE, ACC, THERMAX, BHEL, VOLTAS, ABB, VAI
Insulation		TWIGA, LLOYDS, BAKELITE HYLAM, MALANPUR ENTECH
Valves for air conditioning	:	DANFOSS, HONEYWELL, BLUE STAR
Vibration isolators	:	DUNLOP, EMERALD, ARF
Centrifugal horizontal	:	KSB, BEACON WEIR, VOLTAS, MATHER

pumps		& PLATT
Horizontal split casing pumps	:	VOLTAS, BEACON WEIR, KSB

04. HANDLING & HOISTING EQUIPMENT & COMPONENTS

04.01 Equipment

Item Description		Manufacturers
EOT Crane (Up to 10T capacity)	:	Armsel, Avon, FAFECO, Mukand, WMI, Anupam, Shivpra, Tubrofurguson
EOT Crane (Up to 50 T capacity)	:	HEC, Jessop, Mukand, Hyderabad Ind. Ltd., WMI, FAFECO, Unique
EOT Crane (Above 50 T capacity)	:	Jessops, HEC, Mukand, FAFECO, Unique, WMI
Underslung Cranes (Upto 5t only)	:	Armsel, Brady & Morris, FAFECO, Shivpra
Electric Hoists	:	Armsel, Shivpra,WH Brady, Brady & Morris, Grip Engrs., Hi-tech, Century Crane,
Transfer Cars	:	HEC, L&T, Hyderabad Ind., METCO, Mukand, Eqipt Engrs, ELECON, TRF
Chain Pulley Blocks & hand operated travelling cranes.	:	Armsel, Century Cranes, Brady & Morris, Light Lift Ind., Hi-tech, MR Engg. Lifting Equipment
Shunting Winch	:	Beekay, HEC, Armsel, Century Cranes, Nirmal Equipments, Mining & MH Equipment, Cyclo transmission
Jib Crane	:	Brady & Morris, Century Cranes, Hi-tech, Grip Engrs., Elite, Light Lifting, Armsel
Crawler Mounted Mobile Crane	:	TIL, Hyderabad Industries, TATA-P&H
Excavator/ Shovel	:	TIL, HEC, Hyderabad Industries, BEML
Elevator/Lift	:	OTIS, OMEGA, Kone, ECE

04.02 **Mechanical Components/ Equipment**

Item Description		Manufacturers
Hooks	:	Herman Mohta, Free Trading Corporation, Steel Forgings & Engg..
Flexible / Geared coupling	:	Hicliff, Concord, Wellman, GBM, Alliance, New Allenbery Works
Wire rope	:	Bharat Wire Rope, Orion Ropes, Usha Martin
Bearings for Cranes	:	SKF, FAG
Bearings for other equipment	:	SKF, FAG, Tata Timken, Asian Bearings
Oil Seals	:	Vaco Oil Seals, Rubber Equipment & Engg. Sealjet India (Pune), Sealpack, Champion Seals
Lubrication Fittings	:	Lubcon, AFMC, Prakash, Lincoln.
Lubricating Systems	:	AFMC, Prakash, Grindwell Norton, Lincoln Helios.
Gear box	:	New Allenburry, Greaves Cotton, ELECON, Shanti Gears, Flender
Hydraulic Systems	:	Vickers Sperry, Yuken, Manesmann, Rexroth, Hugglands Denison-Parker
Hydraulic Coupling	:	Fluidomat, Ghatge Patil, VOITH
Centrifugal blowers	:	REITZ, Flaht Wood, James Howden (UK)
Burners	:	Stein Heurtey, Techint, LOI, Weswan North American, Ecllpse, Hotwork
Recuperators	:	Eastern Equipment, GEFFI (Germany) SAFMAT (France), North American Minnt. Co. Thermal Transfer Corporation (USA)

Item Description		Manufacturers
Hydraulic Power/Cylinders	:	Rexroth, Vickers, Wipro, Usha Telehoist, Veljan, Yuken, Oscar.
High Pressure Vane/Piston Pump	:	Vickers, Yuker, Rexroth, Hugglands, Denison
Crusher	:	Sayaji, HEC, McNally Bharat, TRF, ELECON
DCEM Brake	:	Electromag, BCH, Industries Syndicate, Storm Kraft
Track type Limit Switch	:	Electromag, BCH, Speed-o-Control, Jayshree, EP&C, Bengal Technocrats
Thruster Brake	:	Electromag, BCH, Speed-o-Control, Elite
Belt changing Device	:	Nilos, Shawalmex
Conveyor Belting	:	Northland Rubber, Phoenix-Yule, Oriental Rubber
Vibrating Screen	:	IC, TRF, ELECON, McNally Bharat
Vibratory Feeder	:	Electromag, IC, TRF, Orien Engineers, ELECON, McNally Bharat
Magnetic Separators	:	Electromag, WMI, Magnet Corporation, Electro magnetic Ind., Ericz, Sartorius, Hans Bockels, Krupp Forder, Technick
Pneumatic Actuators	:	Prepec, Technomech, Nucon Industries, OSCAR Equipt, Veljan Hydair.
Electro Mechanical Actuators	:	PREPEC, Technomech, Pebco

Item Description		Manufacturers
Rubber liner	:	TEGA, Kaveri
Polymer liner	:	TEGA, Kaveri
Polyethelene liner	:	Kaveri, Tega
Polyurethane liner	:	Kaveri, Tega
Cast Basalt liner	:	DECCAN, Enviro Abrasion
Belt Scraper/ Belt Cleaner	:	Hosch Equipment, Vinar IDC, Kaveri Macmet, Hindustan Udyog Ltd., Karam Chand Thapper, Cobit Engg, Elecon, TRF, Promac, BMH Concare
Flexible Coupling	:	Already covered 04.02 2nd item
Belt Switches	:	Jayshree, PROTO CONTROL, EPC
Bin Vibrator	:	Electromag, Electromagnetic Industries, IC
Samplers	:	Prisector (UK), Ramsay Engg (USA), Eastmn Crusher, Advanced system sampling (P) Ltd.
Belt Vulcanisers	:	Shaw Almex, Nilos India, SV Dattar
Sector Gates, Diverter Gates, Rack and Pinion Gates etc.	:	Vinar, IDC, Macmet, TRF, Precision Processing, Moktali, Holtzman, Mining & Material, Chennai Radha
Flexowel Conveyors	:	METSO, Flexowel
Drag Chain Conveyors	:	Moktali Engrs., TRF, Equipt Engrs, Redler India, Enviro Abrasion, Karam Chand Thapar

Item Description		Manufacturers
Bucket Elevator	:	Moktali, Golden Electrical, Hindustan Udyog, Vinar, Cobit, Shree Conveyor, IDC, Orien, Macmet, Elecon, TRF
Belt Feeder	:	Vinar, IDC, HEC, Orien, Macmet, Elecon, TRF, Cobit
Reclaimer	:	Metso, L&T, Elecon, TRF, HEC
Stacker	:	Metso, L&T, Elecon, TRF, HEC
Stacker – Cum-Reclaimer	:	Metso, L&T, Elecon, TRF, HEC
Wagon Tippler	:	L&T, HEC, Elecon, TRF, Metso
Wagon Loader	:	L&T, HEC, Elecon, TRF, Metso
Belt Weigh Feeders & Weigh Hopper	:	Kistler – Morse, Sartorius Mechatronics, Transweigh, Avery, Jenson Nicholson
Belt Weigh Scale	:	Kistler-Morse, Transweigh, Avery, Sartorius Mechatronics, Jenson Nicholson
Conveyor belt pulleys	:	Elecon, TRF, McNally Bharat, Macmet, HEC
Conveyor Idlers	:	Elecon, TRF, McNally Bharat, Kali, Hindustan Udyog Ltd., Macmet
Pneumatic Handling Equipment	:	TTG, Scorpio
Front – end – loader	:	TIL, Hyderabad Industries Ltd.
Fork-lift-truck	:	Godrej, Voltas, TIL

05. REPAIR & MAINTENANCE FACILITIES

Item Description		Manufacturers
Centre Lathe	:	HMT, Mysore Kirloskar, HEC
Universal Milling m/c	:	HMT, BFW, Batliboi
Shaper	:	PAL, P&B, Loyal
Radial Drilling m/c	:	HMT, Batliboi, Kerry Jost, HEC
Horizontal Boring m/c	:	HMT, HEC, PAL
Submerged Arc Welding Set	:	Advani, ESAB, ADOR, Mogora, COSMIC
Welding Rectifier	:	Advani, ESAB, ADOR, Mogora, COSMIC
Welding Transformer	:	Advani, ESAB, MEMCO
Universal Tool and Cutter Grinding m/c	:	HMT, Praga, Batliboi
Hydraulic Press	:	BEMCO, P&B, Centerprise
Cast Iron Plate	:	Jash, Madras Gauge, P&B
Power Hacksaw	:	ITL, P&B, EIFCO
Column Drilling m/c	:	HMT, Thakoor, Kerry Jost, EIFCO, Batliboi
Bench Drilling m/c	:	Accuax, EIFCO, P&B, Thakoor
Double-ended Pedestal Grinder	:	Grind Tools, GECO, AMC, P&B
Cylindrical Grinder	:	HMT, Mysore Kirloskar, ELP
Tools & Tackles	:	P&B, Mekaster, Centerprise, Ally
Measuring Tools and Gauges	:	P&B, Bombay Tools
Garage Equipment	:	ELGI, USHA, WAP, P&B
Oiling & Greasing	:	ELGI, P&B

06. ELECTRICAL

Sl. No.	Item	List of Vendors
A.	**EXTRA HIGH TENSION (EHT) SUBSTATION EQUIPMENT (OUTDOOR)**	
1	**220 kV SF6 Circuit Breakers (SPRING-SPRING)**	**ABB / AREVA / BHEL/ CGL / SIEMENS** (All work in their own works)
2	**220 kV Disconnecting Switch/ Isolators**	**ELPRO / HIVELM/ ALLIANCE**
3	**220 kV Lightning Arrestors**	**ELPRO / CGL / ABB / ALSTHOM**
4	**220 kV CTs**	**BHEL / ABB / TELK / CGL / ALSTHOM**
5	**220 kV Electromagnetic PTs**	**BHEL / ABB / TELK / CGL / ALSTHOM**
6	**220 kV Class Power Transformers**	**BHEL / TELK / CGL / ABB / SIEMENS**
7	**220 kV Insulators (Disc & solid core)**	**Jayashri Insulator / WSI / Modern Insulator / BHEL**
8	**220 kV Indoor GIS and accessories**	**ABB (SWITZERLAND) / ALSTOM AREVA (SWITZERLAND / FRANCE) / HITACHI (JAPAN) / SIEMENS (BERLIN) / GERNOBLE (FRANCE) / TOSHIBA (JAPAN) / GANZ (CGL) /**
B.	**HIGH TENSION (HT) SUBSTATION EQUIPMENT (INDOOR)**	
23	**33KV GIS and Accessories (switch device VCB)**	**SIEMENS / ABB / SCHNEIDER (AREVA)**
1	**11/6.6 kV Vacuum Circuit Breaker Distributuion Board (including circuit breakers)**	**BHEL / SIEMENS / SCHNEIDER (AREVA) / ABB** [All work in their own works]
2	**33/11/6.6 kV PTs (Panel mounted type)**	**AEP / PRAGATI / SCHNEIDER (AREVA) /Prayog Electricals/SILKANS**
3	**33/11/6.6 kV CTs (Panel mounted type)**	**AEP/PRAGATI / SCHNEIDER (AREVA) / Prayog Electricals / SILKANS**
4	**HT Busduct (Phase-Segregated)**	**C&S/ STAR DRIVE/ ENPRO**
5	**HT Reactor Air Cored Dry Type**	**HIND RECTIFIER / PS Electricals / Quality Power**
6	**HT Capacitors**	**BHEL / ABB / UNISTAR**
7	**11/6.6 kV Vacuum Contactors**	**AREVA / BHEL / SIEMENS / ABB**
8	**11/6.6 kV Lightning Arrestors & ZnO type surge suppressors**	**ELPRO / RAYCHEM / SCHNEIDER (AREVA) / SIEMENS AG**
	RC Surge Suppressor (dry type)	**TYCO / Madhab**
9	**HT HRC Fuses**	**SCHNEIDER (AREVA) / DP / S&S/ COOPER BUSSMAN**

10	Neutral Grounding Resistor	NARKHADE / PEFCO / RESITECH / NATIONAL
11	Indoor HT Isolators	DP / A BOND STRAND / ESWARI
	33kV Power Transformers	BHEL / TELK / CGL / ABB / SIEMENS / ALSTHOM / BB
12	11 kV and 6.6 kV HVLC Power Transformers	BHEL / BB / CGL / SCHNEIDER (AREVA) / VOLTAMP / EMCO/ TELK /
	(Oil-filled) & Earthing Transformers	KIRLOSKAR(KEC)/ ABB/ SIEMENS
13	11kV & 6.6kV LCSS power transformers (Oil-filled)	BB / CGL / SCHNEIDER (AREVA) / VOLTAMP / EMCO / KEC /
		TRANSFORMERS & RECTIFIERS/PAN - ELECTROTECNIC ENTERPRISES (PETE)
14	11kV & 6.6kV Cast Resin type power transformers	ABB / VOLTAMP / BHEL
		KIRLOSKAR (KEC) / Sudhir Intra Vidyut/ SIEMENS/ SCHNEIDER (AREVA)
15	11 kV & 6.6 kV Dry type power transformers (VPI)	KIRLOSKAR(KEC)/ABB/BHEL/VOLTAMP/BB/CGL/
		AIMES IMPLEX / Sudhir Intra Vidyut
16	Winding and Oil Temperature Indicator	SKII / PRECI MEASURE / PRECISION INSTRUMENT / PERFECT CONTROL / OSMADIAL
17	Control and Relay Panel	SCHNEIDER (AREVA) / ABB / SIEMENS (All work in own works)/ ENPRO (for 33kV & below)
18	Magnetic Oil Level Indicator	SUKRUT
19	Buchholz Relay	PRAYOG / ATVUS
20	Battery (Lead Acid)	CHLORIDE (EXIDE) /AMCO / STANDARD /HBL-NIFE (SABNIFE)/ AMAR RAJA
21	Battery Charger	HBL-NIFE(SABNIFE)/ CHHABI ELECTRICALS/ DEBIKAY/ CALDYNE / AMAR RAJA/ HI-RECT/ UNIVERSAL/ AE
22	HT Power Socket outlets	A BOND STRAND/DP

C. MEDIUM VOLTAGE SWITCHGEAR AND CONTROL GEAR

1	**L.T. Air Circuit Breaker Distribution Board, fully drawout, single front (including circuit breaker), for main substation (process)**	**GE-POWER / L&T / SIEMENS / ABB / BCH / SCHNEIDER / COSMIC POWER SYSTEM/ C&S (All work in their own works with 415V ACBs of SIEMENS / GE-POWER / L&T / ABB / SCHNEIDER)**
2	**L.T. Busduct**	**STARDRIVE (KGS Engineering Ltd.) / ECC/C&S/PCE/HCE/ BRIGHT ENGINEERS/ UNITED ELECTRIC/ Cosmic Power System / MK Engineers / Power Media**
3	**415 V Air Circuit Breaker**	**SIEMENS / GE-POWER / L&T / ABB / SCHNEIDER / BCH**
4	**Moulded Case Circuir Breaker (MCCB)**	**SIEMENS / GE-POWER / L&T / ABB / SCHNEIDER / BCH/ ANDERW YULE / HAVELLS / MDS (LEGRAND)**
5	**LT Switch board (semi drawout) for auxiliaries & Non process units**	**SIEMENS / BCH / L&T / GE-POWER / SCHNEIDER / ABB /COSMIC POWER SYSTEM / MEDITRON/ SEN&SINGH / ECC/ HCE/ Vijoy Switchgear Controls/ MK Engineers/ ELECMECH / Industrial / Switchgear Ltd, Mumbai/ Control & Switchgear (C&S) / UNILEC**
6	**415V Motor Control Centre for process units**	**SIEMENS / GE-POWER / L&T / ABB / SCHNEIDER (All work in own works) / Cosmic power systems**
7	**415V Motor Control Centre for non-process units**	**SIEMENS / BCH / GE-POWER / L&T / C&S / ECC/ MEDITRON / ABB SEN & SINGH / MK Engineers/**

		POWER & PROTECTION / Cosmic Power System/ Switchgear / SCHNEIDER / INDPOWER, Vizag
8	415V INTELLIGENT Motor Contro Centre	SIEMENS/ SCHNEIDER/ ABB/ ROCKWELL AUTOMATION
9	Power Distribution Boards (single front), Outdoor distribution boards and Lighting Distribution Boards	SIEMENS / BCH / GE-POWER / L&T / CGL / C&S / SEN & SINGH / ECC / IND POWER / MK Engineers / TECHNOCRATS / POWER & PROTECTION / MEDITRON / ABB Cosmic Power System/Power Media/ Vijay Switchgear Controls, Visakhapatnam/ SCHNEIDER/ SONTOSH ENGG WORKS, VIZAG / PEC ELECTRICALS / R. K. ELECTRIC AUTOMATION / POWER CONTROL / UNILEC / Innovative systems, Visakhapatnam
10	MPCB	SIEMENS/GE-POWER/L&T/ABB/SCHNEIDER/INDO ASIAN
11	ENCLOSURE	BCH / RITTAL
D.	MOTORS	
1	HT AC Motor (1000 kW and above)	KEC /BHEL / CGL / MARATHON (AREVA) / ABB/ SIEMENS
2	HT AC Motor (200 kW - 1000 kW)	SIEMENS / CGL / KEC / BHEL / MARATHON (AREVA) / ABB
3	Synchronous & Sq. Cage Motors above 3000 kW	BHEL / SIEMENS / ABB
4	LT AC Sq-cage induction Motor (General purpose)	SIEMENS / CGL / ABB / MARATHON (AREVA) /BB / ELGI / WEG / KIRLOSKAR / Westing House / HINDUSTAN ELECTRIC MOTORS / Lakshmi Hydraulics (up to - 75kW)

5	LT AC Motor (Flame proof)	KIRLOKAR (KEC) / CGL / SIEMENS / BBL / MARATHON (AREVA)
6	L.T. Geared Motor	KIRLOSKAR (KEC)/POWER BUILD/IC (Imported-Assebled at india)/BHARAT BIJLEE / SEW / NORD/ DEMAG, ROSI , KEB (GERMANY)
7	DC Mill Motor (Main Drive)	KRILOSKAR (KEC) / BHEL
8	DC Mill Motor (Auxiliary Drive) (AISE Type)	KIRLOSKAR (KEC) / BHEL
9	DC Motors (Industrial type)	CGL / AREVA / KIRLOSKAR (KEC) / BHEL
10	Roller Table Motors (AC)	BHARAT BIJLEE/ KIRLOSKAR(KEC)/ CGL/ MARATHON IC (Imported-Assebled at india)/ ABB/ SIEMENS / NORD
11	VVVF Motors(AC) for process units	ABB / SIEMENS / CGL/KEC/BBL / MARATHON
E.	DRIVES AND CONTROL EQUIPMENT	
1	Converter duty cast resin transformer	BHEL / AREVA / ABB / HOLEC / KEC / VOLTAMP / BB/ INDCOIL / JYOTI / CGL
2	Thyristor Converter Unit	BHEL / SIEMENS / ROCKWELL/ AREVA/ ABB/SCHNEIDER
3	VVVF drive, AC drive for process units & mills	BHEL / SIEMENS / ABB / ROCKWELL / AREVA / L&T / SCHNEIDER
4	AC Drives, VVVF drive for non process units & auxiliary motors	SIEMENS/ ABB / L&T(Yasakawa)/ SCHNEIDER/ Rockwell/ VACON
5	DC Drives	SIEMENS / ABB / L&T / ANSALDO SCHNEIDER / ROCKWELL AUTOMATION
6	VOID	
7	UPS	HITACHI-HI-REL / EMERSON(DB) / LIVELINE/ GE

8	Isolator	SIEMENS / L&T / C&S / ABB / BCH
9	HRC Fuses	SIEMENS / STANDARD (INDO ASIAN) / ABB / GE POWER / ESWARAN
10	AC Power Contactor	SIEMENS / L&T / BCH / ABB / SCHNEIDER / GE-POWER / C&S
11	DC Power Contactor	BCH / BHEL / SIEMENS / L&T / ABB
12	Bimetallic Relay	SIEMENS / L&T / BCH / GE / SCHNEIDER (TELEMECHANIQUE) / ABB/ C&S
	Electronic Overload Relays	BCH / SIEMENS / L&T / ABB/ SCHNEIDER-SAMWHA/ LG
13	Single Phase Preventer	L&T/ MINILEC / SIEMENS / GE
14	Resistor boxes	BCH/RSI/ Resistors India/ Electromag RESITECH /NARKHADE / KAKKU / Industries Syndicate / Ohmark Controls, Bangalore
15	L.T. Capacitor	UNISTAR / CGL / AREVA / DANDAPANI
16	Semiconductor Fuse	ALSTOM / SIEMENS / FERRAZ / COOPER BUSSMAN /ABB
17	Thyristor	SIEMENS/ BHEL/ HIND RECTIFIER / ABB
18	LT Vacuum Contactor	GE / SCHNEIDER / L&T / SIEMENS / ABB
19	Soft-starter (LT)	ABB/ ROCKWELL/ SIEMENS/ SCHNEIDER/ BCH
F.	CONTROL DESKS AND CONTROL DEVICES	
1	Control Desk/ Control Panel/ Control Station	SIEMENS / L&T / BCH / BHEL/ C&S / TECHNOCRAT / B&C / MEDITRON / ELECTRO FABRIC / HCE /SEN & SINGH TECHNO COMMERCE / PYROTECH SWITCHING CIRCUIT / ECC / POWER & PROTECTION / VijaySwitchgear / Cosmic Power System
2	Control Switch	SIEMENS / KAYCEE / AREVA / L&T / VAISHNO / C&S
3	Push Button	SIEMENS / BCH / L&T / VAISHNO / C&S / SCHNEIDER /TECHNIC/ ESSEN/ SALZER/ GEPOWER
4	Limit Switch	AG SYSTEMS/JAY BALAJI/TECHNOCRATS/JAYSHREE ELECTROMAG/ JSI/ TECHNIC (SIEMENS / BCH may be considered only for light duty)
5	Change Over Switch/Selector Switch	C&S / STANDARD / HHE /KAYCEE / SIEMENS/ BCH/L&T/ABB / GE POWER/ BCH/ INDOASIAN

6	Discrepancy Control Switch	ABB / AG SYSTEMS
7	Timer/Time Delay Relay	BCH / L&T / SIEMENS / ABB / CGL/ GE POWER
8	Emergency Switch/Belt Sway Switch/Pull Cord Switch/ Belt Slip Switch	JSI / AG SYSTEMS / PB / JAI BALAJI / JAYSHREE / EPCC(KAKKU) / TELEMECHANIQUE/ STROMKRAFT
9	Semaphore Indicator	ALSTOM / SIEMENS
10	Auxiliary Relay/ Control Contactor	SIEMENS / L&T / BCH / C&S (TM) / ABB / GE POWER / SCHNEIDER / ROCKWELL / Jyothi
11	Master Controller	SIEMENS / STROMKRAFT / ELECTROMAG AG Magnetics / Perfect Electrics/ KAKKU (EPCC) / SCHNEIDER (TELEMECHANIQUE) / SPEED O CONTROL
12	Control Transformer	SIEMENS / AEP / INDUSREE / KAPPA / ANU ELECTRICALS
13	Voltage/Power/Current/Frequency/Energy Transducers	ABB / AEP / SIEMENS / AREVA / ELSTER/ ADEPT
14	Indicating Lamp (Cluster LED type)	SIEMENS / VAISHNO / TECHNIK / BINAY/ J-AUER/ BCH / ESSEN/ L&T
15	Temperature Scanner	JYOTI /APLAB / SYSTECH / MASIBUS
16	Photo-cell transducer	SYSTECH / TSC
17	Hooter/Buzzer/Bell	KHERAJ / VAISHNO/ BEMCO/ EPCC (KAKKU)
18	Solid State Annunciator	APLAB / L&T / PROCON / CONTROL AND DYNAMICS / MINILEC / ELECMECH
19	Proximity Limit Switches (Non-contact type)	JSI / AG SYSTEMS / ROCKWELL / TELEMECHANIQUE

20	Zero Speed Switches	JAYSHREE / TELEMECHANIQUE / AG MECHANICAL / KAKKU / TECHNOCRATS/ SCHNEIDER- SAMWHA /SEIMENS / ROCKWELL AUTOMATION
21	Current Transformer	AEP / KAPPA / INDCOIL /ABB / JAYSHREE/ PRECISE / INTRA VIDYUT
22	Voltage Transformer	AEP / KAPPA / INDCOIL
23	Tachos/Encoders	HUBNER / IFM / LEINE LINDE / ROCKWELL AUTOMATION (ALLEN BRADLEY)
24	Hot Metal Detector (HMD)	DELTA / DANIELI
25	Loop Scanner	DELTA / DANIELI
G.	PROTECTION RELAYS	
1	Electronic Motor Protection Relays	GE POWER / SCHNEIDER / L&T / SIEMENS / ABB / C&S / Specher & Schuh (Rockwell)
	Microprocessor based Motor Protection Relays for LT Motors	SIEMENS / L&T / AREVA / Specher & Schuh (Rockwell)
	Microprocessor based Protection Relays for HT Motors	L&T- / ABB / Areva / SIEMENS
2	Auxiliary Relays	AREVA / EASUN / ABB / L&T / SCHNEIDER / SIEMENS / BCH / ROCKWELL / GE
3	Numerical Protection Relays (for HT system)	ABB / SIEMENS / AREVA / GE(Multilin) / L&T

4	Numerical Protection Relays (for LT system)	ABB/SIEMENS/AREVA/GE/SCHNEIDER/L&T / ASHIDA
H.	ELECTRICAL MEASURING AND TESTING EQUIPMENT	
(i)	ELECTRICAL MEASURING INSTRUMENTS	
1	Ammeter/Voltmeter	AEP / IMP / MECO
2	Watt-hour meter	ALSTOM / BHEL / IMP / MECO / HPL
3	PF meter	AEP / IMP / MECO
4	Frequency meter	AEP / IMP
5	Multimeter	MECO / MOTWANE / RUTTONSHAW
6	Low resistance ohm-meter and kelvin double bridge	MOTWANE / AGRONIC / TOSHNIWAL
7.	Electronic energy meter	CONZERV (ENERCON) / SEMS / SATEC / PML / L&T / HOTLINE / IMP / MOTWANE / HPL
(ii)	SPECIAL INSTRUMENTS	
1	Microprocessor based digital power meter	AEP/MECO/ALACRITY/DIGI
2	Maximum demand meter	AEP / MECO
3	True RMS' digital panel ammeter/voltmeter	AEP/MECO/ALACRITY
4	Intelligent P.F. regulator	AEP/MECO/ALACRITY

5	Transducer operated metering system	AEP / MECO
I.	LIGHTING AND POWER WIRING EQUIPMENT AND ACCESSORIES	
1	Lighting Fitting (SV/MV/MH/FLUROESCENT/CFL)	PHILIPS / GE / BAJAJ / CGL/ WIPRO/ HAVELLS
	LED Fittings/ lamps	Philips/ AVNI/ Bajaj/ Wipro/ Binay
2	Flameproof Lighting Fittings and Accessories	BAJAJ / BALIGA / CGL / SUDHIR / FCG / CEAG/ PROMT/ GOVAN
3	a) 240 V Switch Socket Outlet (10A & 20A)	HANSEL / HAVELL'S / BCH / ABB / LEGRAND/ SUDHIR/ INDO ASIAN
	b) 415 V Switch Socket Outlet (30A, 63A & 100A)	BCH / ABB / HANSEL /LEGRAND/INDO ASIAN
4	Flame-proof Equipment	BALIGA / SUDHIR/ FCG/PROMPT/GOVAN/CEAG
5	MCB	STANDARD / CGL / SIEMENS / GE / HPL / HAVELL'S / MERLIN GERIN / GUTS / INDO ASIAN / ABB / LEGRAND
6	ELCB	SIEMENS / GE / MARLINGERIN / HAVELL'S / HPL/ HAGER / GUTS/ INDOASIAN / LEGRAND / ABB
7	MCB DB	HAVELL'S / MERLIN GERIN / SIEMENS / GE / HPL/ GUTS / INDOASIAN / ABB / LEGRAND/HANSEL
8	Single-core flexible copper wire	RAJNIGANDHA / HAVELL'S / FINOLEX / THERMO PAD/

		NICCO / RPG / FINECAB / RADIANT / POLYCAB / LAPP/ DELTON / UNIFLEX / KDK
9	High Mast Towers	BAJAJ / BP Projects / PHILIPS / CGL / VENTURA / Aster/ GE Lighting
10	Street Light Poles	
	Octagonal Type	BAJAJ / BP Projects / PHILIPS / CGL /BMW / Aster
	Tubular Type	Electro Steel / Quality Steel / Calcutta Poles &Tubes / Steel Pole Corporation / BMW / JINDAL
11	DRY TYPE TRANSFORMERS (Lighting)	AE / SAI TECH (Vizag) / ANU ELECTRICALS / Sudhir IntraVidyut/ VOLTAMPP/ P&P/ KEC
12	FRP / SMC Junction boxes, switch socket outlets ,P. B. stations)	RITTAL / HENSEL / DEVI POLY MERS / SHRENICK / SYNTEX
J.	CABLES AND CABLING ACCESSORIES	
1	33kV/ 11kV/ 6.6 kV XLPE Cable (Triple extrusion dry cured method)	RPG / UNIVERSAL / CCI/NICCO / TORRENT CABLES / INDUSTRIAL/INCAB / CRYSTAL/ UNIFLEX / POLYCAB / KEI /
2	a) 1.1 kV PVC/XLPE/HRPVC Cable (Power)	RPG / UNIVERSAL /CCI /NICCO/TORRENT/ INDUSTRIAL/ POLYCAB / FINECAB / RADIANT / CRYSTAL /GOVIND KEI / SPECIAL CABLES / RAVIN / HAVELLS / KEI
	b) 1.1 kV PVC/XLPE/HRPVC Cables (Control)	RPG / UNIVERSAL / NICCO / TORRENT / INDUSTRIAL / POLYCAB / DELTON /CCI / CORDS / SPECIALCABLES / CAPCAB/ FINECAB/ RADIANT/ GOVIND/ CRYSTAL/

		LAPP/Thermopads / KEI / RAVIN / HAVELLS
3	Silicon Rubber insulated copper Cable	RPG / UNIFLEX / UNIVERSAL / NICCO / INCAB / CCI / INDUSTRIAL / POLYCAB / LAPP / TORRENT /
4	Flexible trailing copper cable	RPG/ UNIVERSAL/ NICCO/ INCAB/ CCI/LAPP/ Thermopads/ INDUSTRIAL / POLYCAB / TORRENT/ KEI
5	33KV/11KV/6.6KV Cable Termination Kit/straight through jointing kits	RAYCHEM RPG / 3-M /YAMUNA GASES(DENSION)/
6	1.1KV Cable Termination Kit/straight through jointing kits	RAYCHEM RPG / 3-M / YAMUNA GASES(DENSION)//CCI
7	Cable Reeling Drum (Stacker Reclaimer)	ELECTRO ZAVOD / ELECTROMAG / TECHNOCRATS/ STEMMANN TECHNIC/ IS
8	Cable Reeling Drum (Cranes, Hoists, Transfer Trolleys)	ELECTRO ZAVOD / ELECTROMAG / IS / TECHNOCRATS/ STEMMANN TECHNIC
9	Cable Lugs	DOWELLS / FORWARD / COMMET / 3D / KALTER
10	Cable Gland	ELECTROMAG / CC I/ COMMET / PHOENIX / DOWELLS/ KALTER/ LAPP/ HENSEL
	Cable Gland (Dusty tight)	ROXTEC
11	Terminal Block	ELMEX / ESSEN / CONNECTWELL / C&S/WAGO/PHOINEX/ HENSEL
12	220 kV XLPE cable	BRUGGS CABLE (UK) / PHELPS DODGE (THAILAND) / NEXANS (SWITZERLAND) / HITACHI CABLES (JAPAN) / CCI (INDIA) / UNIVERSAL CABLES (INDIA)

13	220 kV cable termination kit / Straight through termination kit	NEXANS (SWITZERLAND) / SEEFAG (SWITZERLAND) / ABB KABELDON (SWEDEN) / TYCO (SWITZERLAND)
K.	MISCELLANEOUS	
1	Diode	HIND/USHA RECTIFIER/BHEL/RUTTON SHAW
2	Battery (SMF)/ NiCd Battery	EXIDE / HBL-NIFE / AMAR RAJA / AMCO
3	Braking Resistance Panel	RESISTEC / BCH / KAKKU/ KINH ELECTRIC
4	DC EM Brake	BCH/STROM KRAFT/ELECTROMAG/ELECTROMECH CORPN./ EPC/IS
5	Thrustor brake	IS / STROMKRAFT / ELECTROMAG / ELECTROMECH / EPCC / TECHNOCRAT
6	Lifting Magnet (circular)	ELECTROMAG / SUPERLIFT / EPCC / Electro Zavod
7	Power Pack for Magnet	ELECTROMAG / SUPERLIFT
8	Earthing Resistor	BHEL / BCH / IS /EEF / RESITECH / NARKHADE
9	Sandwitch Bus ducts	
	- Power	Siemens/Schneider/ ABB/ Legrand
	- Lighting	Siemens/Schneider/ ABB/ Legrand
L	CRANE ELECTRICS	
1	Motors	KIRLOSKAR (KEC)/MARATHON/BBL/ Siemens/ ABB/CGL (CGL motor shall not be used for extra heavy duty/heavy duty crane)
2	Inverter Duty Motors	KIRLOSKAR (KEC)/MARATHON/BBL/ Siemens/ ABB

3	Limit Switch	EPCC (KAKKU)/ EMM/ IS/ Dynatrol/ Stromkraft/ SEIMENS / ESSEN/ GE POWER/ JAYSHREE
4	Contactor	Siemens/ BCH/ L&T/ ABB
5	Electronic Overload Relay	Siemens/ GE/ L&T/ ABB/ Schneider
6	Push Button	Siemens/ L&T/ BCH/VAISHNO / SCHNEIDER /TECHNIC
7	Master Controler	Siemens/ EPCC (KAKKU)/ Stromkraft/ EMM
8	Joystic Controller	Spohn+Burkhardt
9	Isolating Switch	GE/ Siemens/ L&T
10	Resistance	KAKKU/ BCH/ Resitech / EMM/ Stromkraft/Rasi/ Ohmark/ ELECTROMAG/ SEIMENS
11	Terminal(Screw type hex head)	Essen/ ODN/ ELMEX
12	Safety Switch	Siemens/ L&T/ Kaycee/ KAKKU
13	Timer	BCH/ Siemens / L&T
14	Socket Outlets	Crompton/ Reyrolle/ BCH/ Siemens/ INDO ASIAN/ MDS LEGRAND
15	Control Panel	SIEMENS/ BCH/ ABB/ SCHNEIDER/ Rittal/ HINDUSTAN CONTROL/ MEDITRON/ CGL
16	Crane Power Conductor Assessories (DSL)	Armatic/IMSS/ Engg. Spares/Stromag/ Vahle (imported)
16	Trailing Cable Arrangement/ E-Chain Syatems	Igus

17	Ergonamic control station with Cabin	Briedacabins (imported)/ EMCO
18	Brake	
	DCEM Shoe -	BCH/ KAKKU /EMM/ IS (BCH make shall only be used for all motions of extra heavy duty) (BCH make shall only be used for all Hoist motions of all duty cranes)
	DCEM Disc	Pathe / EMCO
19	Cable	Universal / Asian / NICCO / /KEI /CRYSTAL / HAVELLS
20	Air Circuit Breaker	ABB/L&T/Siemens/Schneider/GE-Power
21	M C C B	L&T/ GE/ Siemens/ABB/BCH/SCHNEIDER/ MDS LEGRAND
22	MCB	Siemens/ MDS/ Havell's/ GE/ Standards/ HPL/ ABB
23	Thyristor	ABB/Siemens
24	Radio Frequency Remote Control	Control Chief / EMM / ACROPOLIS / Stromag /SPEED-O-CONTROL/LOTUS (NBB make)
25	VVVF drive	Siemens/ABB/ROCKWELL/ L&T/VACON/ SCHNEIDER
26	Air Conditioner	Lintern/ Sulzer/ Daiken/ IPW/SUNBEAM
27	Control Transformer	Kappa / AE/ ANU ELECTRICALS/ Sudheer Intra Vidyut
28	LED Indicating Lamp	Siemens/ Binay/ Vaishno/ Technik/ J-AUER/AVNI/ ESSEN/ BCH
29	Electro magnet (Circular) - cold duty	EPC/ EMM/ Superlift

30	Electro magnet (Rectangular) - HOT duty	Truninger/ SGM / SHINKO/OH10
31	Auxiliary Relays	SIEMENS/ BCH
32	Double Pole Switches	SIEMENS/ KAY
33	Cable Gland (Dusty tight)	ROXTEC
M.	GENERAL	
1		
2	F.D.A SYSTEM SUPPLIERS	As per FDA List
3	TROLLEY LINESS YSTEM FOR MACHINES	INDIA MILLS STORES , KOLKATA / INTERNATIONAL ENGG. PLANT(IEP), KOLKATA

Notes

1) Any equipment not covered above shall be with approval from VSP.

2) Any change /addition/deletion in the above makes list shall be done with the approval of VSP

1.

S.N.	ITEM DESCRIPTION	PREFERRED MAKES
G. TELECOM EQUIPMENTS & FDA SYSTEM		
1	FDA SYSTEM (UL /FM/LPCB/VDS approved)	EDWARDS / SIEMENS / HONEYWELL
2	IP-PBX	1. AVAYA 2. ALCATEL. 3. SIEMENS
3	IP-PBX SYSTEM SUPPLIER	1. AGCL 2. WIPRO 3. ABS 4. ITI 5. HCL 6. EQUANT TECHNOLOGY SERVICES
4	CCTV	1. BOSCH 2. PELCO
5	C.C.T.V SYSTEM SUPPLIERS	1. NELCO LIMITED. 2. POWER SYSTEMS LTD, KOLKATA 3. TOSHNIWAL INDUSTRIES
6	LOUD SPEAKER BROADCASTING SYSTEM (LSBC)	1. BOSCH. 2.INDUSTRONICS 3.NEUMANN
7	LSBC SYSTEMS SUPPLIERS	1. HARITASA,BANGALORE 1. POWER SYSTEMS, KOLKATA
8	TELEPHONE CABLE SUPPLIERS	1. DELTON CABLES. 2. TELE-LINK NICCO. 3. FINOLEX.
9	VHF SETS	MOTOROLA SIMOCO

NOTE

For those equipments whose makes are not indicated above, prior approval of Purchaser / Consultant shall be obtained.

07. INSTRUMENTATION

INSTRUMENTATION

Sl. No	Item Description	Approved Makes
A.	Field Instruments:	
1.	Pressure Gauge	, Fiebig, Waaree, Walchandnagar, GE Gauges, Ashcroft, Manometer India, WIKA, Forbes Marshall, A.N. Instruments, Hirlekar
2.	Draft Gauge / Differential Pressure Gauge	Switzer, General Instruments, A.N. Instruments, GE Gauges, Waaree, WIKA, Ashcroft, Hirlekar
3.	Pressure / Differential Pressure Switches	WIKA, Switzer, Waaree, Schneider, Ashcroft, Orion, General Instruments
4.	Pressure & Differential Pressure Type Transmitters (including DP-Type Flow & Level Transmitters)	Emerson (Rosemount), Fuji, Honeywell, Yokogawa, ABB, Invensys (Foxboro), Siemens, Endress & Hauser
5.	Flow Switch	Ifm, Krohne-Marshall, Magnetrol, D.K. Instruments, Switzer
6.	Temperature Gauges	General Instruments, Fiebig, Waaree, Walchandnagar, GE Gauges, Ashcroft, Manometer India, WIKA, Forbes Marshall, A.N. Instruments, Hirlekar
7.	Thermocouple & RTD with Thermowell	General Instruments, Toshniwal Industries, Tempsens, Pyroelectric Instruments, Industrial Instrumentation, Waaree, Altop
8.	Temperature Transmitter	Emerson (Rosemount), Fuji, Honeywell, Yokogawa, ABB, Invensys (Foxboro), Siemens, Endress & Hauser
9.	Temperature Switch	ifm, Ashcroft, WIKA, Goa Instruments, General Instruments, Switzer, Verma Trafag
10.	Level Gauge	General Instruments, DK Instruments, Pune Techtrol, Flowtech, Waaree, Chemtrols, Asian Industrial Valves & Instruments
11.	Level Switch (Conductivity Type)	Endress & Hauser, Vega (WIKA), SBEM Pvt. Ltd., Pune Techtrol, Nivo Controls, Sapcon, Siemens
12.	Level Switch (Capacitance / RF Type)	Endress & Hauser, WIKA (Vega), SBEM Pvt. Ltd., Pune Techtrol, Nivo Controls
13.	Level Switch (Tuning Fork / Rod Type)	Vega (WIKA), Endress & Hauser, SBEM Pvt. Ltd., K-TEK, Nivo Controls, Sapcon, Emerson, Siemens
14.	Level Switch (Float / Displacer Type)	D K Instruments, Chemtrols, Forbes Marshall, Emerson, Pune Techtrols, SBEM Pvt. Ltd., Scientific Devices, Bliss Anand,
15.	Level Switch (Electro-Mechanical Type)	Endress & Hauser, SBEM Pvt. Ltd., Nivo Controls, D.K.Instruments,
16.	Level Transmitter / Switch (Nucleonic Type)	Concord (Dr. Berthold), Emerson (Kay Ray), E+H, ECIL, OHMART-Vega
17.	Level Transmitter / Switch (Ultrasonic Type)	Vega, Endress & Hauser, Siemens (Miltronics), Krohne Marshall, ABB, Emerson (Saab), Chemtrols, K-TEK
18.	Level Transmitter / Switch	Vega, Endress & Hauser , Emerson, Siemens, Krohne- Marshall, K-TEK

Sl. No	Item Description	Approved Makes
	(Radar Type)	
19.	Rotameters	Krohne-Marshall, Instrumentation Engineers, Placka, Rota Instruments, Eureka instruments, Emerson (Brookes), Chemtrols, Scientific Devices, Flowtech, JRU Control
20.	Orifice Plate & Flanges Assembly; Venturi Tube; Flow Nozzle	Engineering Specialities, Mechanical engineers, Micro-precision, Hydro-pneumatics, Chemtrols-Samil, General Instruments, Unicontrols, Flowtech
21.	Electromagnetic Flowmeter / Ultrasonic Flowmeter	Endress & Hauser, Krohne-Marshall, ABB, Invensys (Foxboro), Yokogawa, Emerson, Siemens, Chemtrols, Nivo,
22.	Positive Displacement Flowmeter / Turbine Flowmeters	Toshniwal Hyderabad (Bopp & Reuther), Rockwin, ABB, Daniel (Emerson), Smith, Liquid Controls, Barton
23.	Vortex Flowmeter	Endress & Hauser, Yokogawa, Krohne –Marshall, Emerson, ABB, Honeywell, GE India,
24.	Mass (Coriolis) Flowmeter	Emerson, Yokogawa, Endress & Hauser, ABB, Krohne–Marshall, Honeywell, Chemtrol, Rockwin, GE India, Siemens
25.	Globe / Ball Type Valve (Regulating Duty Or Shutoff Duty)	Fisher-Xomox, Instrumentation Ltd, Samson Controls, Arca (Forbes Marshall), MIL Controls, Fouress, Dembla, RK Controls, Flowserve (Valtek), Tyco, HiTech
26.	Butterfly Valve (Regulating Duty Or Shutoff Duty)	Fisher-Xomox, Instrumentation Ltd, Fouress, Dembla, Tyco valves, Flowserve (Valtek) Engineering Specialities
27.	Self-Regulating Pressure Control Valve	Fisher-Xomox. Forbes Marshall, Samson Controls, Flowserve (Valtek), Instrumentation Ltd., Nirmal Industries
28.	Electrical Actuator	Limitorque, Rotork, Instrumentation Ltd. (Bernard), Auma Marsh, Keystone
29.	Electro-pneumatic Converters	Emerson, Yokogawa, ABB, Moore (Forbes Marshall), Fisher–Xomox, Shreyas-Barton, Bellofram Instruments, MIL Controls, Watson Smith
30.	Pneumatic Actuator & Positioner	Fisher-Xomox, Instrumentation Ltd., MIL Controls, Flowserve (Valtek), Samson Controls, Arca (Forbes Marshall), Keystone, SMC Pneumatics, Fouress, Dembla
31.	Electro-Hydraulic Actuator	Reineke, Rexa
32.	Electro-Pneumatic Positioner	Fisher-Xomox, Instrumentation Ltd., Siemens, Samson Controls, Arca (Forbes Marshall), MIL Controls, Fouress, Dembla
33.	Solenoid Valve	Avcon, Rotex, Asco, Herion, Burkert, Precision
34.	Air Filter Regulator	Placka, Shavo-Norgren, Bellofram Instruments, JRU Control
35.	Heatless drier	Nucon, Trident
36.	Instrument Fittings	Swagelok, Parker, Excel-Hydro-pneumatics, Hylok, Flowtech, Waaree
37.	Stainless Steel Tube	Choksi Tubes, Sandvik, Mahalakhsmi, Flowtech,
38.	Ball Valve	Audco, KSB, Virgo, BDK, Dembla
39.	Transmitter Cabinet / Junction Box	Hensel, Baliga, Sumip
40.	Terminal Block	Wago, Phoenix, Elmex, Connectwell, Essen
B.	Instrument Cables & Accessories:	

Sl. No	Item Description	Approved Makes
1.	Instrumentation Cable (Screened, Paired, Triad Etc.)	Delton, Special Cables, Elkay Telelinks, Rajnigandha Cables, Cords Cable, Friends Cable, Ravin Cables, Servel Udyog, Thermo Cables, Colt Cables, TC Communication, Advance Cable, Insucon Cables, Universal Cables, Brooks Cable, KEI industries, Govind Cable, Paramount Cables, TCL Special Cables, Udey Pyrocables, Netco Cable
2.	Thermocouple Compensating Cable	General Instruments Consortium, Delton, Cords Cable, Friends Cable, Thermo Cables, TC Communication, Temcon Instruments, Brooks Cable, Paramount Cables, Udey Pyrocables
3.	Fibre Optic Cables / UTP Cable	RPG, AT & T, Molex, Lucent, HFCL, D-Link, Belden, Lapp
C.	Control Room Instrumentation:	
1.	Distributed Control System (DCS)	Yokogawa (CS 3000), Honeywell (Experion +C 300), Emerson (Delta-V), Invensys (Foxboro), ABB (AC 800 XA), Siemens (PCS 7+ S7400H), Toshiba (nv or V series), Rockwell (PAx system)
2.	Programmable Logic Controllers	Rockwell Automation, Siemens, Honeywell, ABB, Schneider, GE
3.	Single-Loop Controller	Yokogawa, Honeywell, ABB, Siemens, Invensys (Foxboro), Toshiba, Fuji
4.	Recorders (Chartless)	Eurotherm, Yokogawa, Chino, Invensys (Foxboro), Honeywell, Siemens, ABB, Fuji, Brainchild
5.	Digital Indicator	Masibus, Eurotherm, Yokogawa, Honeywell, Pyrotech, Lectrotek, Chino, Micro Systems, Toshniwal Industries, Invensys
6.	Bargraph Indicator	Masibus, Eurotherm, Yokogawa, Honeywell Chino, Pyrotech, Lectrotek
7.	Annunciation System	IIC, Minilec, Piri, Aplab, Digicont, Semuda, Lektrotek, Pyrotech, Micro Systems, Alan Electronic
8.	Signal Isolator / Multiplier	MTL, Yokogawa, Masibus, P&F, Stahl, Protech, Phoenix
9.	Instrument Panel / Cabinet / Desk	Rittal, Pyrotech, Radhakrishna Controls, Instrumentation Limited, Simcon, Vero, Hoffmann / DCS & PLC vendors
10.	DC Power Supply Unit	Aplab, Phoenix, Elnova, Siemens, Schneider, P&F, MTL, Cosel, Lamda
11.	Intrinsic Safety Barrier	P&F, MTL, Stahl, Turck
12.	Digital Scanner	Lectrotek, Micro Systems, Masibus, Procon, Pyroelectric, Toshniwal
13.	Large Screen Display (63”)	Barco, LG, Samsung, Sony
D.	Analytical / Special Instruments	
1.	Gas Analyser	ABB, Emerson, Yokogawa, Siemens, Sick-Maihak (Chemtrols), Forbes Marshall, Fuji, Servomex, Ametek, Thermo Electron, Panametrics,
2.	Calorific Value Analyser	Reineke, Union, Yokogawa, Chemtrols
3.	Heat-Traced Lines	Thermon, Tyco
4.	Peristaltic Pump	ASF Thomas (Germany), Bühler (Germany), Charles Austin (UK),
5.	Diaphragm pump	Bühler (Germany), Charles Austin (UK), K&F (Germany)
6.	Condensate monitor	Buhler (Germany), ABB, Siemens
7.	Needle valve	Baldota, Hydair
8.	Solenoid valves (for analyser systems)	Rotex, Baldota, Herion
9.	Fittings (for analyser systems)	Swagelok, Parker

Sl. No	Item Description	Approved Makes
10.	Sample Cooler	Analyser manufacturer's approved vendor
11.	Flow Indicator	Eureka, Placka, IEPL
12.	Water Analyser	Forbes Marshall, ABB, Yokogawa, E & H, Emerson
13.	ORP / pH / Conductivity Transmitter	Emerson (Analytical), Forbes Marshall, Invensys (Foxboro), Toshbro Controls, Yokogawa, ABB, Honeywell, Hach
14.	Radiation Pyrometer	Land, Chino, Raytek, Ircon, Keller HCW, Williamson
15.	Moisture Analysers (Nucleonic)	Dr. Berthold (Concord International), ECIL, Emerson
16.	Moisture Analysers	Invensys (Foxboro), Bartec, GE-Panametrics, Moist Tech, EMC Electronics (NDC)
17.	Vibration Sensors & Monitors	Bentley Nevada, Shinkawa, Bruel & Khaer, SPM Instruments, Mechanalysis India, Rockwell, Schenk-Avery
18.	Fire Detection & Alarm System (UL/FM/LPCB/VDS approval)	Edwards, Siemens, Honeywell
19.	Suspended Particulate Matter Analyser (Tribo-electric Type)	Durag, Sintrol, Sick-Maihak (Chemtrols)
20.	SO_2 & NO_X Analyser	Forbes Marshall, Emerson, Yokogawa, ABB, Honeywell, Sick-Maihak (Chemtrols), Opsis
21.	Gas Detector	Beiler & Lang (CO-Monitor), Draeger, MSA, Oldham, Honeywell, Detronics, General Monitors, Crowcon
E.	Testing & Calibration Instruments	
1.	Portable Digital Multimeter (4 ½ Digit)	Fluke, Yokogawa, Philips
2.	Millivolt/ MilliAmpere Feed & Measure	Beamex, Druck, Scandura, Yokogawa, Fluke, Emerson,
3.	Portable Temperature Calibrator	Druck, Scandura, Beamex, Fluke, Yokogawa
4.	Portable Pressure Calibrator with Pumps	Druck, Scandura, Beamex, Fluke, Yokogawa
5.	Universal HART Configurator	Emerson / Transmitter manufacturer
6.	Insulation Tester	Motwane / Reputed Make
7.	Cathode Ray Oscilloscope	Phillips, Hewlett Packard, Yokogawa, Tektronix
8.	Soldering & Desoldering Station	Q Max, Weller
9.	Vacuum Cleaner	Eureka Forbes, BPL, Philips
10.	Inclined Tube Manometer	Reputed Make
11.	'U'-Tube Manometer	Reputed Make
12.	Meggar	Motwani, Fluke
13.	Auto-Range Digital Clamp-Meter	Fluke / Reputed Make
14.	Portable Process Clamp Meter	Fluke, Yokogawa
15.	Tubular-Type Ferruling Machine	Reputed Make

08. FIRE PROTECTION SYSTEM

1.	Steel pipes	-	SAIL, ITC, JINDAL, Ajanta, Maharastra Seamless, Prakash Tubes Gujarat Steel tubes,
2.	Steel pipes fittings	-	Tube Bends, Jindal, Ajanta Shivananda, EBY Industries.
3.	Spray nozzles/Projectors	-	Laxmi sprinklers, Reliable, Avon, Mather and Platt, HD Fire.
4.	Deluge valves	-	Mather & Platt, ACE turnkey, Vijay Fire Protection System Ltd, HD Fire.
5.	Outside coating& Wrapping for pipes	-	Llyods/STP
6.	Quartzoid bulb detector	-	H.D. Fire Protect Co., Mather & Platt, Any other TAC approved make
7.	Diesel Engine	:	Kirloskar-Cummins, Crompton-Greaves, Ashok Leyland
8.	Fire extinguishers	:	New Fire, VIPL, Zenith, ASCO Strumech
9.	Fixed fire protection system	-	New Age, Agnice, Vijay Industries& Project , Lloyds Insulation, Techno Fire Controls

List of preferred make for Technological Equipment of By-product Plants.

Sl. No.	Equipment/ Item	Acceptable Make
1.	Primary Gas Coolers	(i) Mechanical BHPV, L&T, HEC, GRSE (ii) Bakelite varnish Shalimar, Multi coal Projects (iii) Gaskets Universal Moulders & Engineers, I.P.G. Engineering Ltd. Chennai.
2.	E.T.P.	Bengal Tools, Ador Powerton, Hind Rectifier
3.	Decanter	(i) Mechanical Equipment MICCO, Beekay, Dorr Oliver, Bhilai Techneeds, Simplex, Bhilai Engineering Corp., T.T.G. (ii) Gear boxes New Allenburry, Elecon, FMG, Radicon (iii) Coupling New Allenburry, Elecon, Fenner (iv) Bearing SKF, FAG, Tata Timkin
4.	Centrifugal Pump	KSB, Sulzer (khimline), B.D.K. (Microfinish), Akay, Jhonson Pump.
5.	Heat Exchanger	BHPV, L&T, Universal Heat Exchangers. Reliance, Thermax, Gansons, Godrej, Texmaco
6.	Gas Valves	L&T, FOURESS
7.	Technological Valves	(i) Cast Iron Gate Valve Kirloskar, Shiva Durga, G.M. Dalui, Steam & Mining, AV Valves. (ii) Cast Steel Gate Valve KSB, L&T, Fouress, AV Valves

		(iii) Cast Steel Plug Valve L&T Audco Valves (iv) Cast Steel Globe Valve KSB, L&T, Fouress, AV Valves (v) Cast Steel Non-Return Valve As cast steel globe valve (vi) Cast Iron/Cast Steel DN 800 Gate Valve Kirloskar, Shiva Durga, G.M. Dalui, KSB, L&T, Fouress, Steam & Mining, AV Valves. (vii) Cast Steel Globe Valve for Steam/ Condensate. As per (iv) above. (viii) Steam Trap Uniklinger, J.N. Marshall.
8.	Pipes & Fittings	(i) Pipes Tata, Jindal, Ajanta, SAIL, RSP. (ii) Fittings Tubes bends, S&L, Shivananda MS Fittings, BHEL, NL Hazra, Allied Steel & Tubes.
9.	Thermal Insulation	Lloyds, Rockwool, Finlay
10.	Reciprocating Pump	V.K. Pumps, Shapatools, Swelore
11.	Steam Ejector	Mazda
12.	Ammonia Column	ISGEC, HEC
13.	Centrifuge	KMPT AG, Ferrum Pusher Centrifuge Technology, Flottweg
14.	Lead Lining & Brick Lining of Equipment	Coromandal Prodorite
15.	Agitator	REMI Process Plant & Machinery, Shrachi Engg. & Industries, Thermotech Engineering.
16.	Static Mixer	Omega Technology, Sulzer
17.	Exhauster	Man Turbo, Dalturbo, Howden Donkin
18.	Final Gas Cooler & Naphthalene Scrubber	Ganson, HEC, Reliance, BHPV

SK-EDB-1324

SINGLE LINE DIAGRAM FOR WAGON TIPPLER, VSP

SUPPLY SYSTEM DETAILS :-

AMBIENT TEMP.	:	50°C
POWER SUPPLY	:	415V +/-10%, 50Hz +/- 5%, 3Ph, 4 WIRE.
CONTROL SUPPLY	:	110V+/-10%, 50Hz+/-5%, 1Ph.
BRAKE SUPPLY	:	220V DC OBTAINED THROUGH INDIVIDUAL BRAKE RECTIFIER PANEL.
FAULT LEVEL	:	50 KA FOR 1 SEC.
SYSTEM EARTHING AT 415V	:	SOLIDLY EARTHED

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP, PKG NO. - 006

SK-EDB-1324

SHEET 1 OF 10

प्र॰ इं॰ नि॰

BUREAU-CHIEF	B. N. JHA		SCALE-NTS
GROUP LEADER	M. D. VERMA		WEIGHT IN KG.- -
CHEKD BY	K. C. MAHATO		
DESIGNER	A. K. SAINI		
DRAWN BY	ANJU KUMARI		

REF.DRG.NO.

H.M.B.

HEC LTD.,RANCHI

SEPT'16

Rev-0

SK-EDB-1324

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

TO SHEET 3

1MPCB2
4A-6.3A

R, Y, B

E

415/110V
100VA
PT2

1MCB2
2A TP

MCCB1
25A TP

ASS1
0-800-2400A

A1

CT1-3
1250/5A
15VA
CL-1

CTR1
3 KVA
415/110V

ACB1

1250A,TP,EDO,
MICROPROCESSOR BASED ACB
WITH O/L, S/C & E/F RELEASE
U/V RELEASE, SHUNT TRIP

M

I>

1MCB3
20A DP

110VAC CONTROL
SUPPLY TO ACB

1MPCB1
4A-6.3A

415/110V
100VA
PT1

1MCB1
2A TP

VSS1
0-500VAC

V1

415V, 3PH, 50Hz, 4WIRE
INCOMING SUPPLY
FROM 1-14LC9

MCCB2
25A,TP

MCCB3
25A,TP

13MCCB
400A,TP

CTR2
5 KVA
415/110V

CTR3
5 KVA
415/110V

MCB2A
63A,DP

MCB3A
63A,DP

1CCS1
CHANGE OVER
SWITCH 63A

I

II

MCB2B
63A,DP

MCB3B
63A,DP

110VAC CONTROL SUPPLY BUS

TO VFD PANEL
TO SHEET NO.-4

NOTE:-

1. CONTROL TRANSFORMER SHALL BE CAST RESIN DRY TYPE.
2. ACB SHALL BE WITH U/V, OVER CURRENT, SHORT CIRCUIT & E/F RELEASE.
3. ALL AMMETERS SHALL BE DIGITAL TYPE.

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

WTMCC

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	2
NEXT SHEET	3

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1324

FROM SHEET 2

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

TO SHEET-5

IN WTMCC

MCCB5
40A TP

UPS-1 DISTRIBUTION BOARD

1MCCB1
40A TP

230V, 10KVA UPS

1MCCB1A
63A,TP

TO SHEET NO. 10

1MCB12	1MCB2	1MCB3	1MCB4	1MCB5	1MCB6	1MCB7	1MCB8	1MCB9	1MCB10	1MCB11
16A DP	10A DP	10A DP	10A DP	10A DP	10A DP	10A DP	10A DP	10A DP	10A DP	10A DP
	230V AC SUPPLY TO PLCWT	230V AC SUPPLY TO CONTROL DESK	230V AC SUPPLY TO CCVM	230V AC SUPPLY TO RADIO REMOTE	230V AC SUPPLY TO SENSORS	230V AC SUPPLY TO RIO WT	230V AC SUPPLY SPARE	230V AC SUPPLY SPARE	230V AC SUPPLY TO HMI	SPARE FEEDER

INSIDE PLC PANEL

1MCB61
10A DP

TRF1
230/110V
1KVA

1MCB62
16A DP

110VAC FOR PLC
I/O INTERROGATION

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	3
NEXT SHEET	4

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1324

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

1MCCB2
400A,TP

1MPCB1
10A,TP

CTR4
1 KVA
415/240V

0-500VAC
V1
VSS1

1MCB10
2A TP

PT3
415/110V
100VA

1MPCB2A
4A-6.3A

1MCB11
10A DP

1MCB12
10A DP

SHC
45A,TP

1MCB11A
6A DP

1MCB11B
6A DP

TO SPACE HEATER-1SH FOR MOTOR 1M

TO SPACE HEATER-2SH FOR MOTOR 2M

R,Y,B,N
INCOMER SUPPLY
FROM WTMCC PANEL

FROM SHEET-2

1MPCB2
10A,TP

CTR5
1 KVA
415/110V

1MCB15
10A DP

240VAC SUPPLY
FOR UTILITY

110VAC CONTROL
SUPPLY TO VFD
DRIVE & BRP

1MPCB
10A,TP

1BC
32A

1BRP
(BRAKE RECTIFIER PANEL)

220VDC

1BM

DC EM. BRAKE
DIA-500MM.

110VAC SUPPLY
FROM CTR5

CTR4

1MCB13
6A TP

1MCCB
160A,TP

SEMICON FUSE
1FS1-3
315A

I/P CHOKE

1VFD

1PE
INCREMENTAL ENCODER

INVERTOR

D/P CHOKE

1MPCB2
90-150A

SEMICON FUSE
315A

DBR
1DBR

1IS
160A

1M

1SH

1RTD1-3
TO PLC

1AE
ABSOLUTE ENCODER
(SINGLE TURN)
TO PLC

2MCCB
160A,TP

2MPCB2
90-150A

SEMICON FUSE
315A

DBR
2DBR

2PE
INCREMENTAL ENCODER

2VFD

2IS
160A

2SH

2RTD1-3
TO PLC

2M

2MPCB
10A

2BC
32A

2BRP
(BRAKE RECTIFIER PANEL)

220VDC

2BM

DC EM. BRAKE
DIA-500MM.

2 X 55 KW, 750 RPM
415V, 3PH, 50HZ
S1 DUTY,
SQ. CAGE IND. MOTOR
FOR WAGON TIPPLER

See note- 1 at sheet no- 6

VFD PANEL

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	4
NEXT SHEET	5

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1324

FROM SHEET 3

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

TO SHEET 6

	3MCCB 63A	4MCCB 63A	7MCCB 100A	8MCCB 100A	9MPCB 10A	10MPCB 10A
CT	3CT1-3 50/5A 5VA	4CT1-3 50/5A 5VA	7CT1-3 100/5A 5VA	8CT1-3 100/5A 5VA		
Ammeter	3ASS 0-50-300A (3A)	4ASS 0-50-300A (4A)	7ASS 0-100-600A (7A)	8ASS 0-100-600A (8A)		
Contactor	3C 63A	4C 63A	7C 100A	8C 100A	9C 25A	10C 25A
Relay	3ELR — 3CBCT	4ELR — 4CBCT	7ELR — 7CBCT	8ELR — 8CBCT		
Overload relay	3EOCR 0.5-60A I> WITH DISPLAY UNIT	4EOCR 0.5-60A I> WITH DISPLAY UNIT	7EOCR 0.5-60A, 7CT4-6 100/5A 5VA WITH DISPLAY UNIT	8EOCR 0.5-60A, 8CT4-6 100/5A 5VA WITH DISPLAY UNIT	9THR 4-6.3A	10THR 2-3.2A
Motor	3M	4M (STANDBY)	7M	8M (STANDBY)	9M	10M
Load	2 X 15 KW, 1500 RPM 415V, 3PH, 50HZ SQ. CAGE IND. MOTOR FOR DUST SUPPRESSION SYSTEM		30KW, 1500RPM 415V, 3PH, 50HZ SQ. CAGE MOTOR PUMP MOTOR-1	30KW, 1500RPM 415V, 3PH, 50HZ SQ. CAGE MOTOR PUMP MOTOR-2	2.2KW, 1500RPM 415V, 3PH, 50HZ SQ. CAGE MOTOR COOLING MOTOR	1.1KW, 1500RPM 415V, 3PH, 50HZ SQ. CAGE MOTOR AIR COOLING FAN

See note no-2 at sheet no-6

HYDRAULIC POWER PACK

See note no-3 at sheet no-6

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	5
NEXT SHEET	6

REV.-C

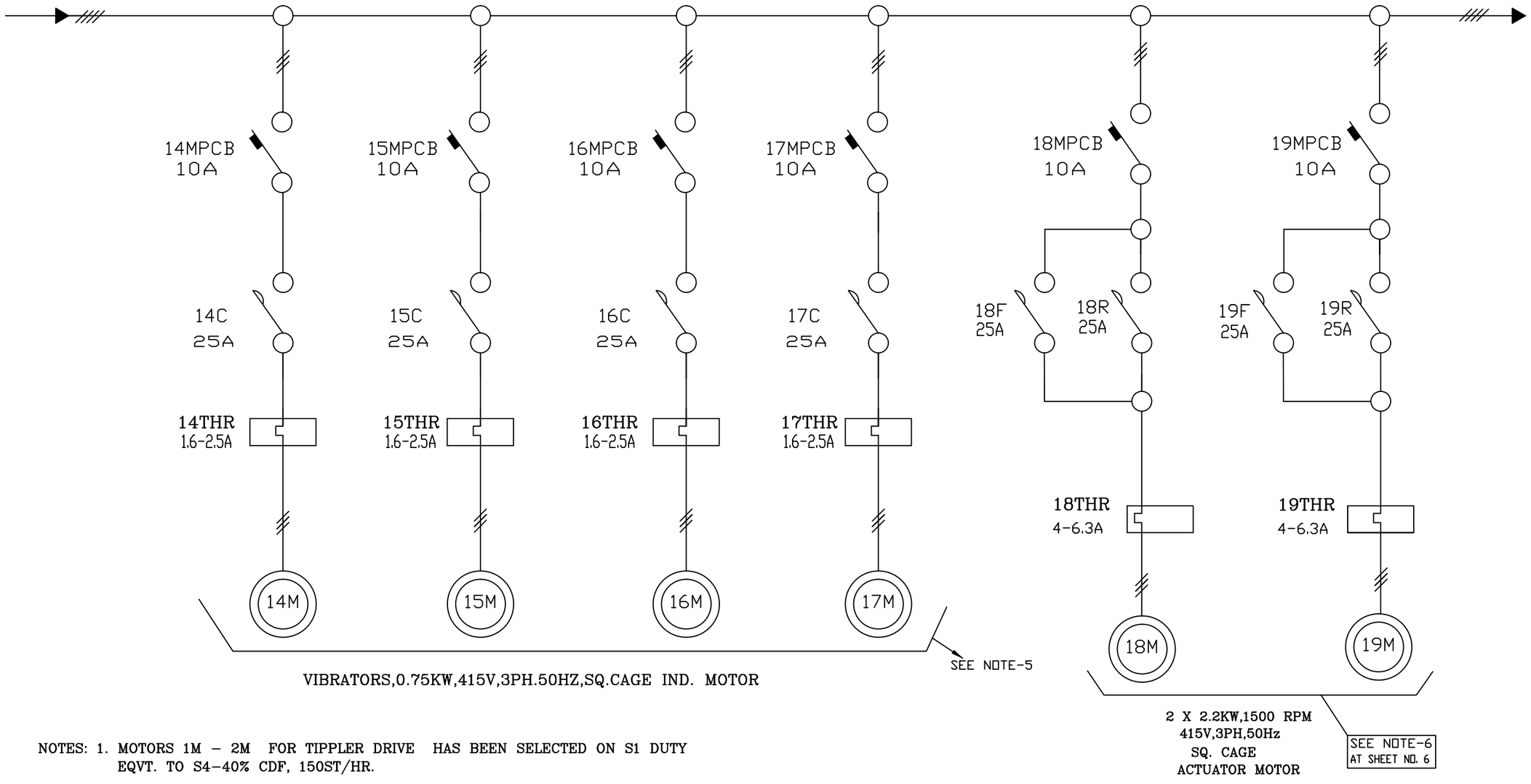
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1324

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

FROM SHEET 5

TO SHEET 7



VIBRATORS,0.75KW,415V,3PH.50HZ,SQ.CAGE IND. MOTOR

NOTES: 1. MOTORS 1M – 2M FOR TIPPLER DRIVE HAS BEEN SELECTED ON S1 DUTY EQVT. TO S4–40% CDF, 150ST/HR.

2. MOTORS FROM 3M–4M ARE INCLUDED IN DUST SUPPRESSION SYSTEM AND SHALL BE SUPPLIED WITH DSS, KWS MOTORS ARE TENTATIVE.

3. MOTORS FROM 7M –10M ARE INCLUDED IN HYDRULIC POWER PACK SYSTEM. AND SHALL BE SUPPLIED WITH HYD. SYSTEM. KWS OF MOTORS ARE TENTATIVE.

4. LUBRICATION MOTORS AND ITS CONTROL PANEL SHALL BE SUPPLIED WITH LUBRICATION SYSTEM.

5. VIBRATORS MOTORS 14M–17M SHALL BE SUPPLIED WITH VIBRATOR SYSTEM.

6. ACTUATOR MOTORS 18M–19M SHALL BE SUPPLIED WITH ACTUATOR SYSTEM.

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

HEC

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	6
NEXT SHEET	7

REV.-C

SK-EDB-1324

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

FROM SHEET 6

TO SHEET 8

28MPCB
10A TP

28C
25A

28THR
4-6.3A

2.2KW SPARE FEEDER

31MPCB
10A

31C
25A

31THR
1.6-2.5A

0.75KW SPARE FEEDER

22MCCB
100A

22CT1-3
100/5A
5VA

22ASS
0-100-600A
22A

22C
100A

22EOCR
0.5-60A

22CT4-6
100/5A
5VA

WITH
DISPLAY
UNIT

30KW SPARE FEEDER

23MCCB
160A

55KW SPARE FEEDER

24MCCB
25A

25A SPARE FEEDER

33MCCB
125A

33MCCB1
100A

PDB

33MCCB2
32A

33MCCB3
32A

33MCCB4
32A

41MCCB
125A,TP

100A
POWER FEEDER
(SPARE)

25MCCB
63A

25CT1-3
50/5A
5VA

25ASS
0-50-300A
25A

25C
63A

25EOCR
0.5-60A
I>

WITH
DISPLAY
UNIT

15KW SPARE FEEDER

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

HEC

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	7
NEXT SHEET	8

REV.-C

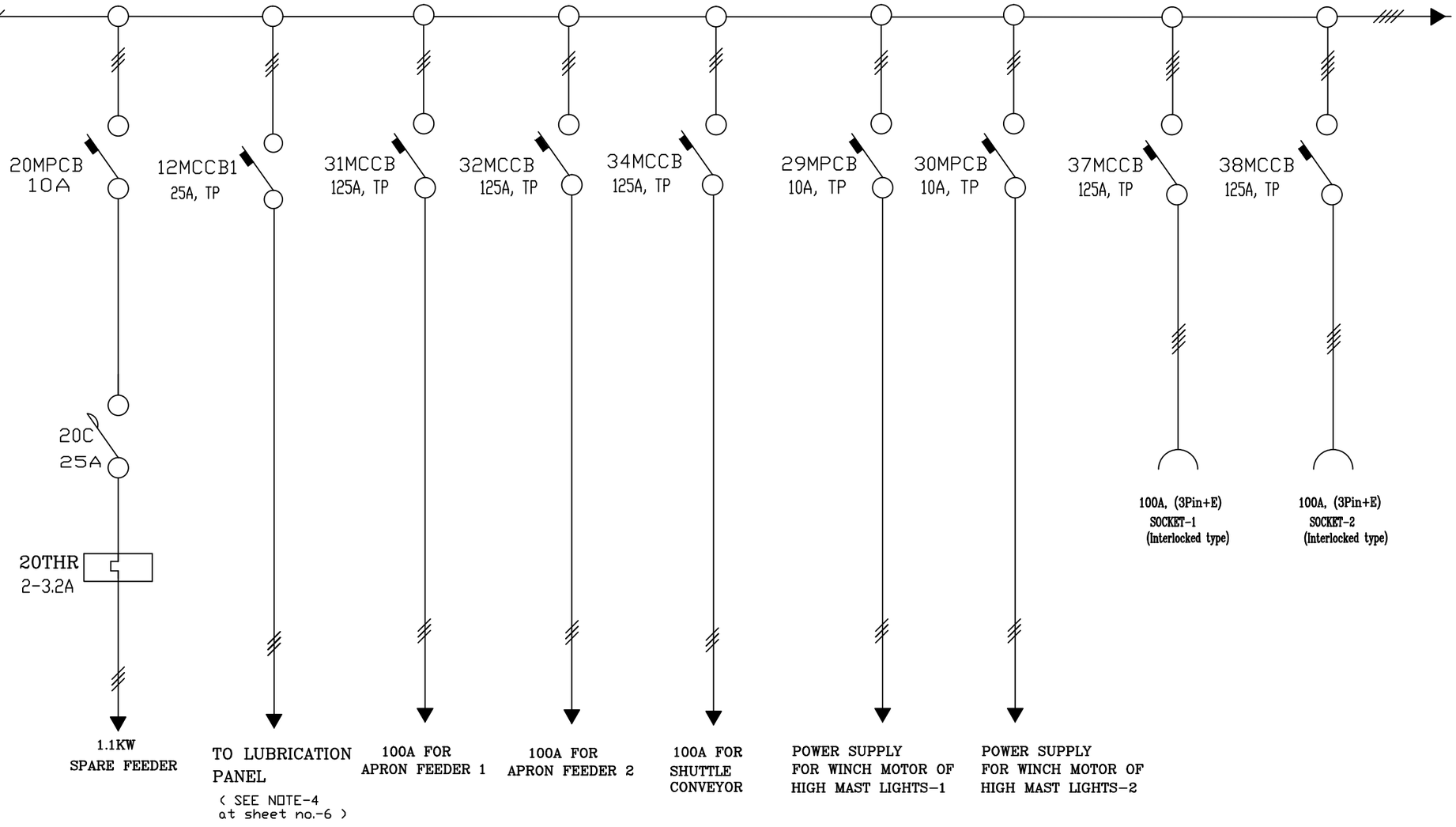
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1324

FROM SHEET 7

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

TO SHEET 9 & 10



NOTES: 1. WAGON TIPPLER MCC SHALL BE SINGLE ENDED INTELLIGENT, NON-DRAWOUT TYPE AND SHALL HAVE COMMUNICATION CAPABILITY ON ETHERNET AS PER CL. NO. - 07.11.2 OF TS OF VSP.

2. EOCR WITH CB-CT FOR MOTOR FEEDER ABOVE 5KW HAS BEEN CONSIDERED.

3. ALL AMMETERS SHALL BE DIGITAL TYPE.

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	8
NEXT SHEET	9

REV.-C

SK-EDB-1324

240V AC, 1PH, 50Hz, POWER SUPPLY

35MCB
63A, DP

35TR
7.5 KVA
415/240V

35MCCB
40A TP

FROM SHEET 8
415V AC, 3 PH, 4WIRE BUS, 50HZ

36MCB,
10A, DP

36C
25A

36THR
0.6-1A

HR

INHAUL SIDE
SIREN-1, 0.37KW,
240VAC, 1PH,50HZ

37MCB,
10A, DP

37C
25A

37THR
0.6-1A

HR

OUTHAUL SIDE
SIREN-2, 0.37KW,
240VAC, 1PH,50HZ

42MCB,
10A DP

10A SPARE
FEEDER

38MCB,
6A, DP

RSL1

RAILWAY SIGNAL LAMP
DUAL ASPECT
RED & GREEN
240VAC, 1-PH, 50-HZ

39MCB,
6A DP

RSL2

RAILWAY SIGNAL LAMP
DUAL ASPECT
RED & GREEN
240VAC, 1-PH, 50-HZ

40MCB1
25A, DP

TR
500VA
240/26.5VAC

40MCB2
32A

SW1,24VAC SW2,24VAC SW3,24VAC SW4,24VAC

SW1-4:-SWITCH SOCKETs
FOR 24VAC HAND LAMP
IN WT COMPLEX

HL1 HL2

HL1-2:- 24VAC HAND LAMPS
WITH 15M FLEXIBLE Cu. CABLE

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	9
NEXT SHEET	10

REV.-C

SK-EDB-1324

FROM SHEET 8

415V, 3PH, 50Hz 4 WIRE, 1250A, BUSBARS IN TIPPLER MCC

36MCCB
125A, TP

UPS-1
DISTRIBUTION
BOARD

FROM SHEET 3

26MCB1
16A DP

26MCB2
16A DP

26MCB3
16A DP

26MCB4
16A DP

1MCB11
10A DP

LOUD SPEAKER
BROADCASTING SYSTEM

TELEPHONE
SYSTEM

SPARE
FEEDER

SPARE
FEEDER

230V AC SUPPLY
TO DATA
COMMUNICATION
SYSTEM (LAN SYSTEM)

36MCCB1
40A TP

36MCCB2
40A TP

2TRF1
415/240V
15KVA

2TRF2
415/240V
15KVA

36MCB1
63A DP

36MCB2
63A DP

TO HIGH MAST
LIGHTS-1

TO HIGH MAST
LIGHTS-2

MLDB

36MCCB3
100A TP

3TRF
415/240V
5KVA

37MCB1
10A DP

37MCB2
10A DP

37MCB3
10A DP

37MCB4
10A DP

37MCB8
20A DP

37MCB7
20A DP

37MCB6
20A DP

37MCB5
10A DP

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM FOR WAGON TIPPLER FOR VSP

SK-EDB-1324	
SHEET NO.	10
NEXT SHEET	—

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1325

SINGLE LINE DIAGRAM FOR WAGON PUSHER, VSP

SUPPLY SYSTEM DETAILS :-

AMBIENT TEMP.	:	50°C
POWER SUPPLY	:	415V +/-10%, 50Hz +/- 5%, 3Ph, 4 WIRE.
CONTROL SUPPLY	:	110V, 50Hz, 1Ph.
BRAKE SUPPLY	:	220V DC OBTAINED THROUGH INDIVIDUAL BRAKE RECTIFIER PANEL.
FAULT LEVEL	:	50 KA FOR 1 SEC.
SYSTEM EARTHING AT 415V	:	SOLIDLY EARTHED

HEC	SINGLE LINE DIAGRAM FOR WAGON PUSHER FOR VSP, PKG NO. -006			SK-EDB-1325	
				SHEET 1 OF 10	
एच॰ई॰सी॰	BUREAU-CHIEF	R. N. JHA		SCALE-NTS	WEIGHT IN KG.- -
	GROUP LEADER	M. B. VERMA		H.M.B. HEC LTD.,RANCHI	AUG'16
	CHEKD BY	K. C. MAHATO			
	DESIGNER	A. K. SAINI			Rev-0
REF.DRG.NO.	DRAWN BY	ANJU KUMARI			

SK-EDB-1325

415V, 3Ph, 50Hz, 4 WIRE
INCOMING SUPPLY-I
INCOMER MCC 1/A
(FROM 1-14LC10B)

INCOMING MCC ON GROUND
IN 1-14LC10B

FROM O/G TO
EARTH CONTACTOR

1MPCB2
4-6.3A,TP

415/110V
100VA
1PT2

VSS1

0-500VAC
V1

1MCB2
2A,TP

1MCCB11
25A TP

1MPCB3
63A TP

ACB1

800A,4P,EDO,
MICROPROCESSOR BASED ACB
WITH O/L, S/C & E/F RELEASE
U/V RELEASE, SHUNT TRIP

I>

1TR1
CONTROL
TRANSFORMER
415V/110V
2KVA

C1
63A TP

ASS1

0-800

1CT1-3
800/5A
15VA

A1

1MCB11
16A DP

1MPCB1
4-6.3A,TP

415/110V
100VA
1PT1

1MCB1
2A, TP

R, Y, B

E

110V AC CONTROL
SUPPLY TO ACB

EARTH

4X3CX300SQ.MM AL +
1X3.5CX300SQ.MM AL
HRPVC INS. ARMOURED AL. CABLE

415V, 3Ph, 50Hz, 4 WIRE
TO DSL

TO SHEET NO 4

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM
FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	2
NEXT SHEET	3

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1325

415V, 3Ph, 50Hz, 4 WIRE
INCOMING SUPPLY-II
INCOMER MCC 1/B
(FROM 1-14LC10D)

INCOMING MCC ON GROUND
IN 1-14LC10D

FROM O/G TO
EARTH CONTACTOR

2MPCB2
4-6.3A,TP

415/110V
100VA
2PT2

VSS2

0-500VAC

V2

2MCB2
2A,TP

2MCCB11
25A TP

2MPCB3
63A TP

ACB2

800A,4P,EDO,
MICROPROCESSOR BASED ACB
WITH O/L, S/C & E/F RELEASE
U/V RELEASE, SHUNT TRIP

I>

2TR1
CONTROL
TRANSFORMER
415V/110V
2KVA

C2
63A TP

ASS2

0-800A

A2

2CT1-3
800/5A
5VA

2MCB11
16A DP

2MPCB1
4-6.3A,TP

415/110V
100VA
2PT1

2MCB1
2A TP

R, Y, B

E

EARTH

110V AC CONTROL
SUPPLY TO ACB

4X3CX300SQ.MM AL +
1X3.5CX300SQ.MM AL
HRPVC INS. ARMOURED AL. CABLE

415V, 3Ph, 50Hz, 4 WIRE
TO DSL

TO SHEET NO 4

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM
FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	3
NEXT SHEET	4

REV.-C

SK-EDB-1325

3PH + EARTH TROLLEY LINES, 415V, 3PH, 50HZ

FROM SHEET-2

800A ACB1

CC1 TO CC8
1000A, GRAVITY TYPE, CURRENT COLLECTORS

800A ACB2

FROM SHEET-3

INCOMING CUM AUX. MCC
ON PUSHER

1MPCB5
4-6.3A,TP

415/110V
100VA
PT5

1MCB5
2A TP

VSS3

0-500VAC

V3

15MCCB
40A TP

I>

TO SHEET 8

TO LIGHTING
TRANSFORMER

35MPCB
25A TP

35TR
CONTROL
TRANSFORMER
415V/110V
3KVA

35MCB
20A TP

110AC SUPPLY
FOR I/C & UTILITY

MCCB1
800A TP

I>

ASS3

0-800A

A3

1CT7-9
800/5A
15VA

1MPCB6
4-6.3A,TP

415/110V
100VA
PT6

1MCB6
2A,TP

R, Y, B

E

C3
800A

TO SHEET 5

13MCCB1
25A TP

13TR
CONTROL
TRANSFORMER
415V/110V
3KVA

13MCB
40A TP

14MCCB1
25A TP

14TR
CONTROL
TRANSFORMER
415V/110V
3KVA

14MCB
40A TP

1CCS3
63A
CHANGE OVER
SWITCH

I

II

13MCCB2
63A TP

TO 110VAC CONTROL SUPPLY
BUS FOR VFDs, BRPs &
INCOMER CONTROLS

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM

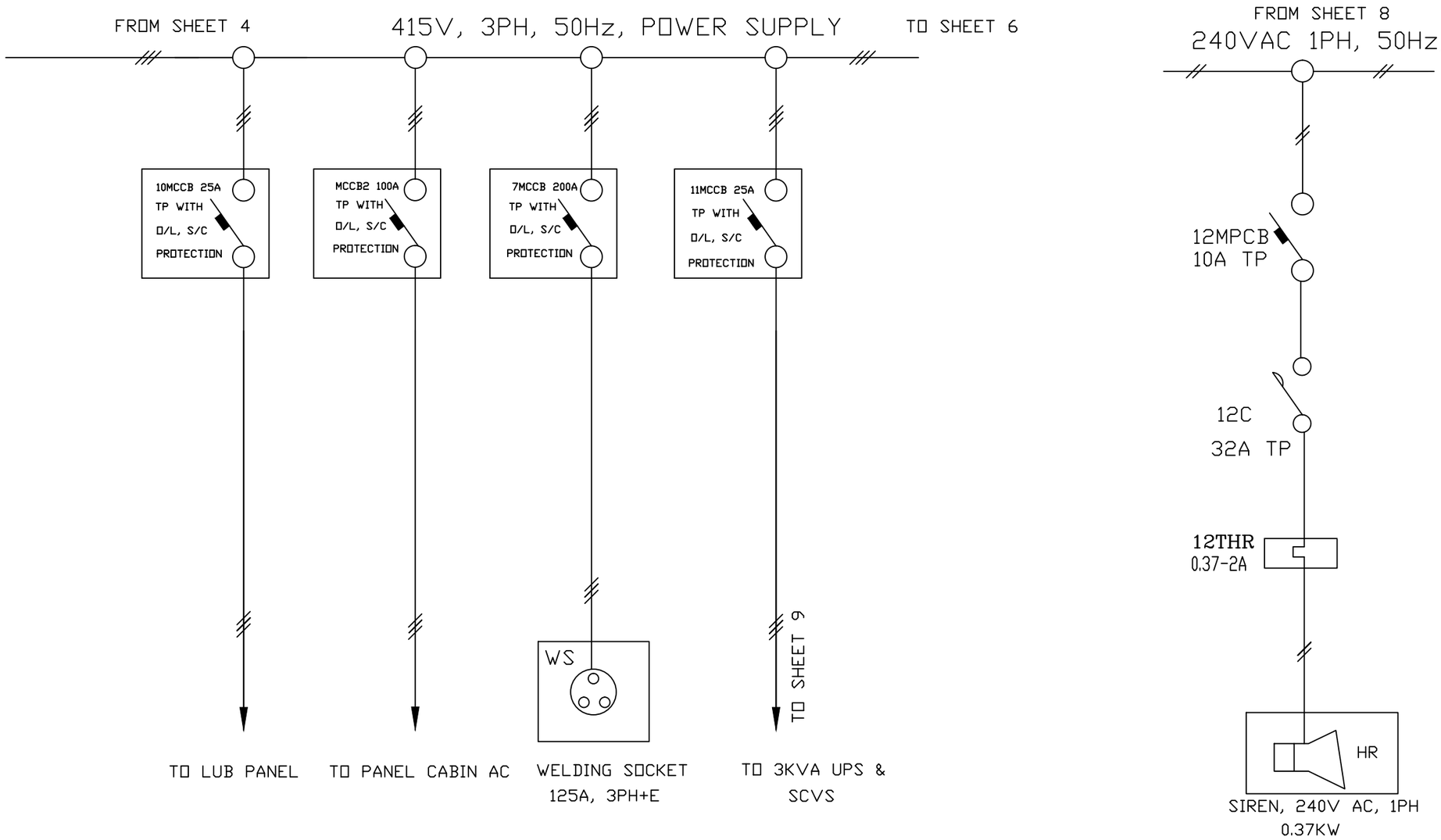
FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	4
NEXT SHEET	5

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1325



INCOMING CUM AUX. MCC ON PUSHER

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

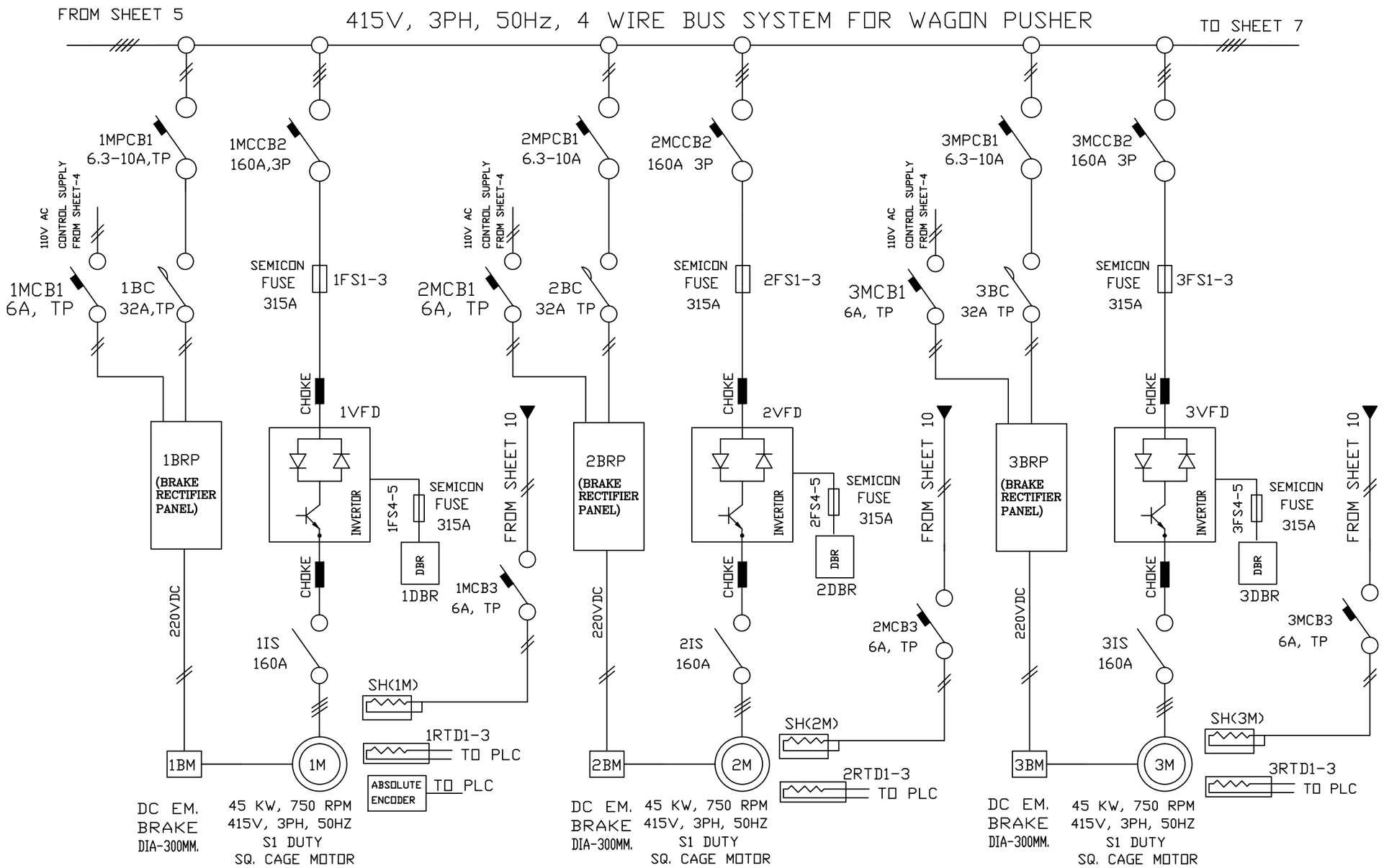
SINGLE LINE DIAGRAM

FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	5
NEXT SHEET	6

REV.-C

SK-EDB-1325



VFD PANEL ON PUSHER

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

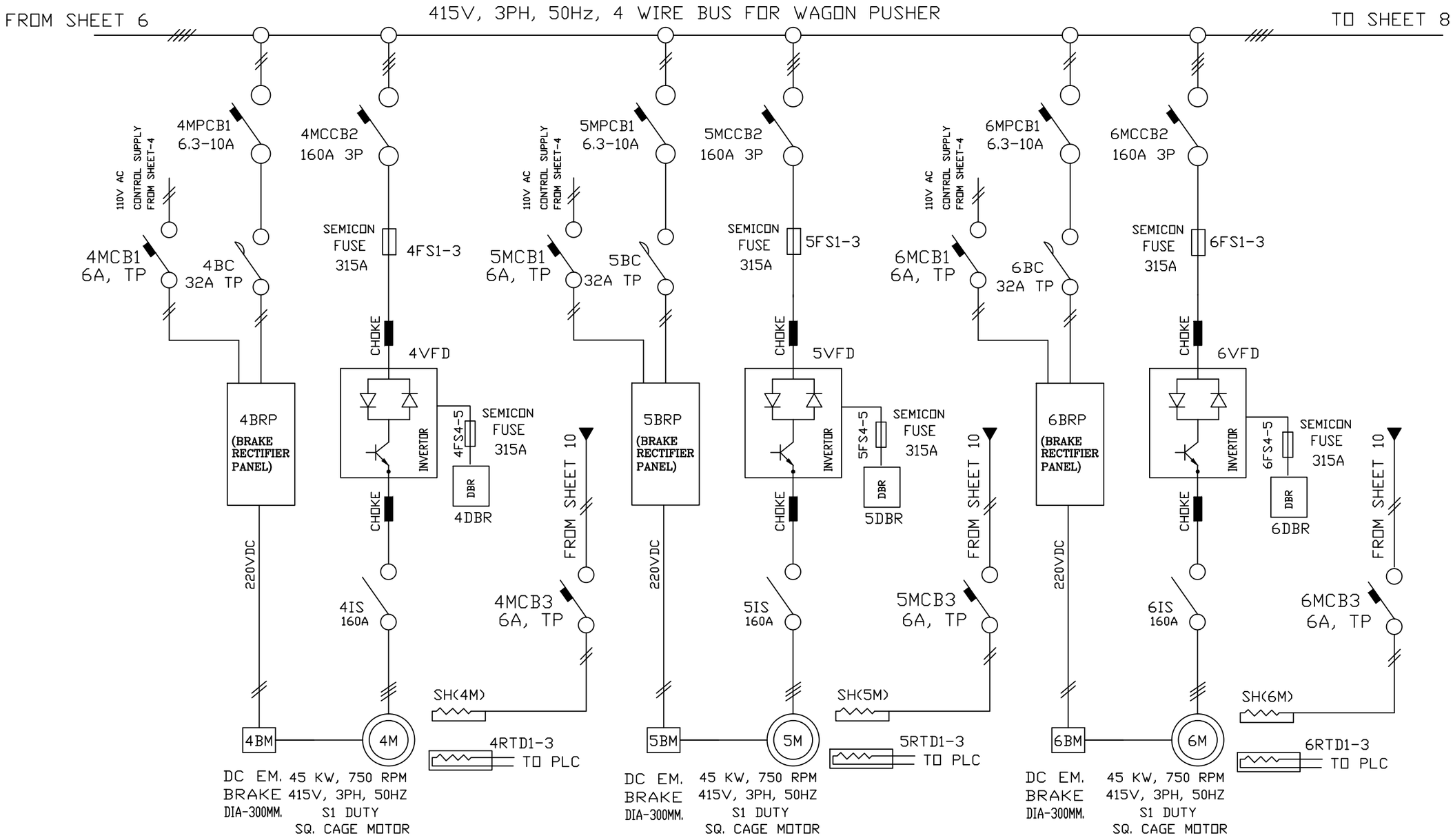
SINGLE LINE DIAGRAM

FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	6
NEXT SHEET	7

REV.-C

SK-EDB-1325



VFD PANEL ON PUSHER

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM

FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	7
NEXT SHEET	8

REV.-C

SK-EDB-1325

NOTE:- ALL MCB SHALL HAVE 1 NO. AUX. NO CONTACT

LIGHTING TRANSFORMER
PANEL ON PUSHER

INDEX	NO.	REVISION	SIGNATURE	DATE

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BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM
FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	8
NEXT SHEET	9

REV.-C

SK-EDB-1325

415V, 3PH, 50Hz, POWER SUPPLY

FROM SHEET 5

UPS DISTRIBUTION BOARD

1MCCB51
25A TP

230V
3 KVA UPS

1MCB52
25A DP

1MCB54
16A DP

1MCB55
10A DP

1MCB53
10A DP

1MCB56
10A DP

1MCB57
10A DP

1MCB58
10A DP

1MCB59
10A DP

1MCB60
10A DP

INSIDE PLC PANEL

1MCB61
10A DP

TRF1
230/110V
1KVA

1MCB62
16A DP

110VAC FOR PLC
I/O INTERROGATION

230V AC SUPPLY
SPARE

230V AC SUPPLY
TO PLCWP MAIN
PLC

230V AC
SUPPLY TO
RADIO REMOTE

230V AC
SUPPLY TO
SENSORS

230V AC SUPPLY
SPARE

230V AC SUPPLY
SPARE

230V AC SUPPLY
SPARE

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

HEC

SINGLE LINE DIAGRAM

FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	9
NEXT SHEET	10

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1325

INCOMING CUM AUX. MCC ON PUSHER

FROM WPLDB PANEL

FROM SHEET 8

230VAC. 1PH, 50HZ

1MCCB
16A

3BC
45A

1MCB55
6A DP

TO SHEET 6

TO SPACE HEATER FOR MOTOR-1M

1MCB55
6A DP

TO SHEET 6

TO SPACE HEATER FOR MOTOR-2M

1MCB56
6A DP

TO SHEET 6

TO SPACE HEATER FOR MOTOR-3M

1MCB57
6A DP

TO SHEET 7

TO SPACE HEATER FOR MOTOR-4M

1MCB58
6A DP

TO SHEET 7

TO SPACE HEATER FOR MOTOR-5M

1MCB59
6A DP

TO SHEET 7

TO SPACE HEATER FOR MOTOR-6M

WPLDB

FROM SHEET 8

24VAC. 1PH, 50HZ

32MCB
16A TP

24VAC. 1PH, 50HZ

33MCB
16A DP

34MCB
16A DP

SPARE

5A, 24V, HS1
WITH SWITCH

5A, 24V, HS2
WITH SWITCH

5A, 24V, HS3
WITH SWITCH

HANDLAMP SOCKET

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNER	A. K. SAINI
DRAWN BY	ANJU KUMARI

SINGLE LINE DIAGRAM

FOR WAGON PUSHER FOR VSP, PKG. NO.-006

SK-EDB-1325	
SHEET NO.	10
NEXT SHEET	—

REV.-C

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1326

RADIO COMMUNICATION, PLC & VFD CONTROL SYSTEM FOR COB ≠ 5, PKG. – 006, VSP.

SUPPLY SYSTEM DETAILS :–

POWER SUPPLY	:	415V ±10%, 50Hz ±5%, 3Ph
CONTROL SUPPLY	:	110V ±10%, 50Hz ±5%, 1Ph
UPS SUPPLY	:	230VAC
LIGHTING SUPPLY	:	240V, 50Hz, 1Ph
FAULT LEVEL	:	50 KA FOR 1 SEC.

INDEX	NO.	REVISION	SIGNATURE	DATE

HEC	RADIO COMMUNICATION, PLC & VFD CONTROL SYSTEM FOR COB ≠ 5, PKG.–006, VSP				SK-EDB-1326
					SHEET 1 OF 2
प्र॰ई॰ली॰	BUREAU-CHIEF	R. N. JHA		SCALE–NTS	WEIGHT IN KG.– –
	GROUP LEADER	M. B. VERMA		H.M.B. HEC LTD.,RANCHI	SEP' 16
	CHKD BY	K. C. MAHATO			REV. – 0
	DESIGNED BY	A. K. SAINI			
	DRAWN BY	ANJU KUMRI			

SK-EDB-1326

TIPPLER CONTROL ROOM

TOTAL I/Os	
DI	304
DO	176
AI	-
AO	-

LAPTOP BASED ENGG. STATION

22" LCD MONITOR (HMI STATION)

A3,LASER PRINTER

RADIO MODEM 1

BACK UP PROCESSOR IN HOT STAND BY MODE WITH 1 NO. SPARE CPU WITH LOADED SOFTWARE.

PLC

ETHERNET SWITCH

ETHERNET SWITCH

ETHERNET SWITCH

RADIO MODEM 2

EXISTING VSP MAIN PLC FOR COAL HANDLING SYSTEM

LAPTOP BASED ENGG. STATION

MONITOR (HMI STATION

A3,LASER PRINTER

PLC

(NOT IN HEC'S SCOPE)

WAGON PUSHER - 1

AC DRIVES FOR WAGON PUSHER MOTORS

RADIO MODEM 1/1

RADIO MODEM 1/2

1VFD1 1DBR1 1VFD2 1DBR2 1VFD3 1DBR3 1VFD4 1DBR4 1VFD5 1DBR5 1VFD6 1DBR6

TOTAL I/Os	
DI	208
DO	128
AI	16
AO	8
AI (RTD)	48

ETHERNET SWITCH

EOI

BACK UP PROCESSOR IN HOT STAND BY MODE WITH 1 NO. SPARE CPU WITH LOADED SOFTWARE.

PLC

ABSOLUTE ENCODER

1AE1

WAGON TIPPLER MCC/DRIVES ROOM

AC DRIVES FOR WAGON TIPPLER MOTORS

ABSOLUTE ENCODER

AE

VFD1 DBR1 VFD2 DBR2

MOTOR-1M INCREMENTAL ENCODER

MOTOR-2M INCREMENTAL ENCODER

PE1

PE2

TOTAL I/Os	
DI	272
DO	128
AI	16
AO	8
AI (RTD)	16

RI/O UNIT

WAGON PUSHER - 2

AC DRIVES FOR WAGON PUSHER MOTORS

RADIO MODEM 2/1

RADIO MODEM 2/2

2VFD1 2DBR1 2VFD2 2DBR2 2VFD3 2DBR3 2VFD4 2DBR4 2VFD5 2DBR5 2VFD6 2DBR6

TOTAL I/Os	
DI	208
DO	128
AI	16
AO	8
AI (RTD)	48

ETHERNET SWITCH

EOI

BACK UP PROCESSOR IN HOT STAND BY MODE WITH 1 NO. SPARE CPU WITH LOADED SOFTWARE.

PLC

ABSOLUTE ENCODER

1AE2

NOTE:-

1:- NO. OF I/Os INDICATED ARE TENTATIVE AND SHALL BE FINALISED DURING DETAIL ENGINEERING AS PER PLACEMENT OF ORDER ON VENDORS.

2:- TYPE OF COMMUNICATION PROTOCOL/INTERFACE BETWEEN PLC AND VFD FOR EXCHANGE OF SIGNALS SHALL BE FURNISHED BY VENDOR AFTER PLACEMENT OF ORDER.

INDEX	NO.	REVISION	SIGNATURE	DATE

BUREAU-CHIEF	R. N JHA
GROUP LEADER	M. B. VERMA
CHECKED BY	K. C. MAHATO
DESIGNED BY	A. K. SAINI
DRAWN BY	ANJU KUMARI

HEC

RADIO COMMUNICATION, PLC & VFD CONTROL SYSTEM FOR COB ≠ 5, PKG.-006, VSP

SK-EDB-1326	
SHEET NO.	2 OF 2
NEXT SHEET	-

REV.- 0

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

SK-EDB-1327

CCVM SYSTEM FOR WAGON HANDLING COMPLEX

FOR COB ≠ 5, PKG. – 006, VSP

SUPPLY SYSTEM DETAILS :–

POWER SUPPLY	:	415V ±10%, 50Hz ±5%, 3Ph
CONTROL SUPPLY	:	110V ±10%, 50Hz ±5%, 1Ph
UPS SUPPLY	:	230VAC
LIGHTING SUPPLY	:	240V, 50Hz, 1Ph
FAULT LEVEL	:	50 KA FOR 1 SEC.

INDEX NO.	REVISION	SIGNATURE	DATE

एच॰ई॰सी॰	CCVM SYSTEM FOR WAGON HANDLING COMPLEX FOR COB ≠ 5, PKG.–006, VSP			SK-EDB-1327	
				SHEET 1 OF 2	
	BUREAU-CHIEF	B. N. JHA		SCALE- NTS	WEIGHT IN KG.- -
	GROUP LEADER	M. B. VERMA		H.M.B. HEC LTD.,RANCHI	SEP'16
	CHEKD BY	K. C. MAHATO			Rev-0
	DESIGNED BY	A. K. SAINI			
REF.DRG.NO.	DRAWN BY	ANJU KUMARI			

SK-EDB-1327

FO CABLE (FROM ETHERNET SWITCH TO EACH CAMERA, JB)

FO CABLE
FO CABLE
FO CABLE
FO CABLE
FO CABLE

L I U

LOCATED IN CONTROL DESK ROOM

ETHERNET SWITCH (ESI)

SWITCH SOCKET 1

21" LCD/TFT

MONITOR

SWITCH SOCKET 2

21" LCD/TFT

MONITOR

SWITCH SOCKET 3

A

JB1 JB2 JB3 JB4 JB5

CAMERA JB

UTP CABLE

UTP CABLE

UTP CABLE

UTP CABLE

UTP CABLE

CAMERA 1

CAMERA 2

CAMERA 3

CAMERA 4

CAMERA 5

COPPER PATCH CORD

230 V supply from UPS

PC

Monitoring PC

PC

Server cum Recorder PC

JOYSTICK CONTORL

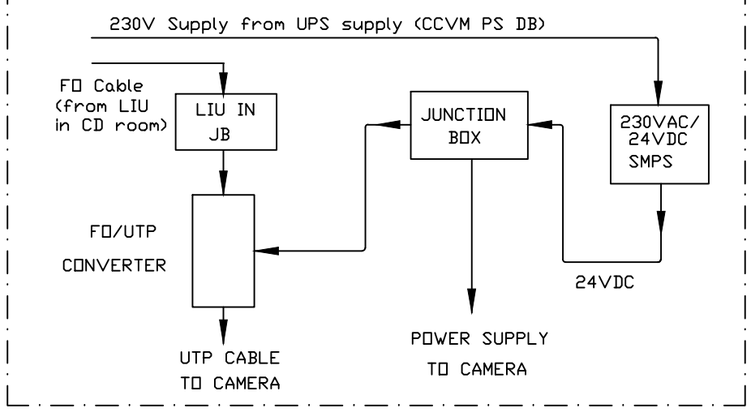
CAT 5e/6 CABLE or *FO CABLE

CAT 5e/6 CABLE or *FO CABLE

CAMERA NO. 1 ON INHAUL SIDE & CAMERA NO. 2 ON OUTHAUL SIDE OF WAGON TIPPLER HOUSE

CAMERA NO. 3, 4 & 5 AT POST TIPPLING AREA

DETAILS OF A



* FO CABLE SHALL BE USED WHEN DISTANCE EXCEEDS 100mtr

WAGON TIPPLER CONTROL ROOM

Note:- 1- All Camera shall be IP- based.

2- All Camera shall be provided with vandal proof / weather proof enclosure & with mounting frames.

3- All Cameras shall be pole mounted / structure mounted with platform and Ladder approach to cameras shall be provided.

INDEX	NO.	REVISION	SIGNATURE	DATE

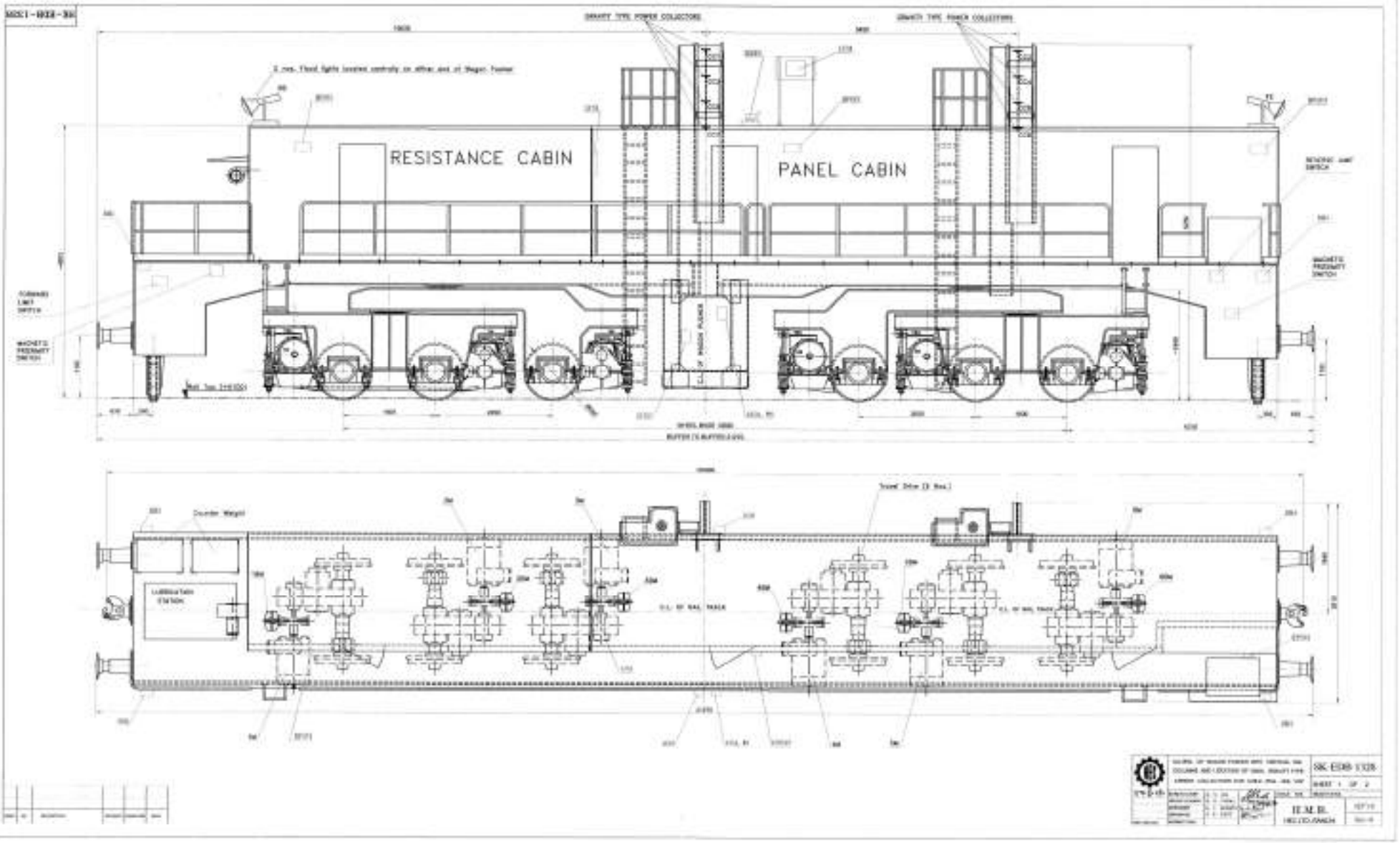
BUREAU-CHIEF	R. N. JHA
GROUP LEADER	M. B. VERMA
CHEKD BY	K. C. MAHATO
DESIGNED BY	A. K. SAINI
DRAWN BY	ANJU KUMARI

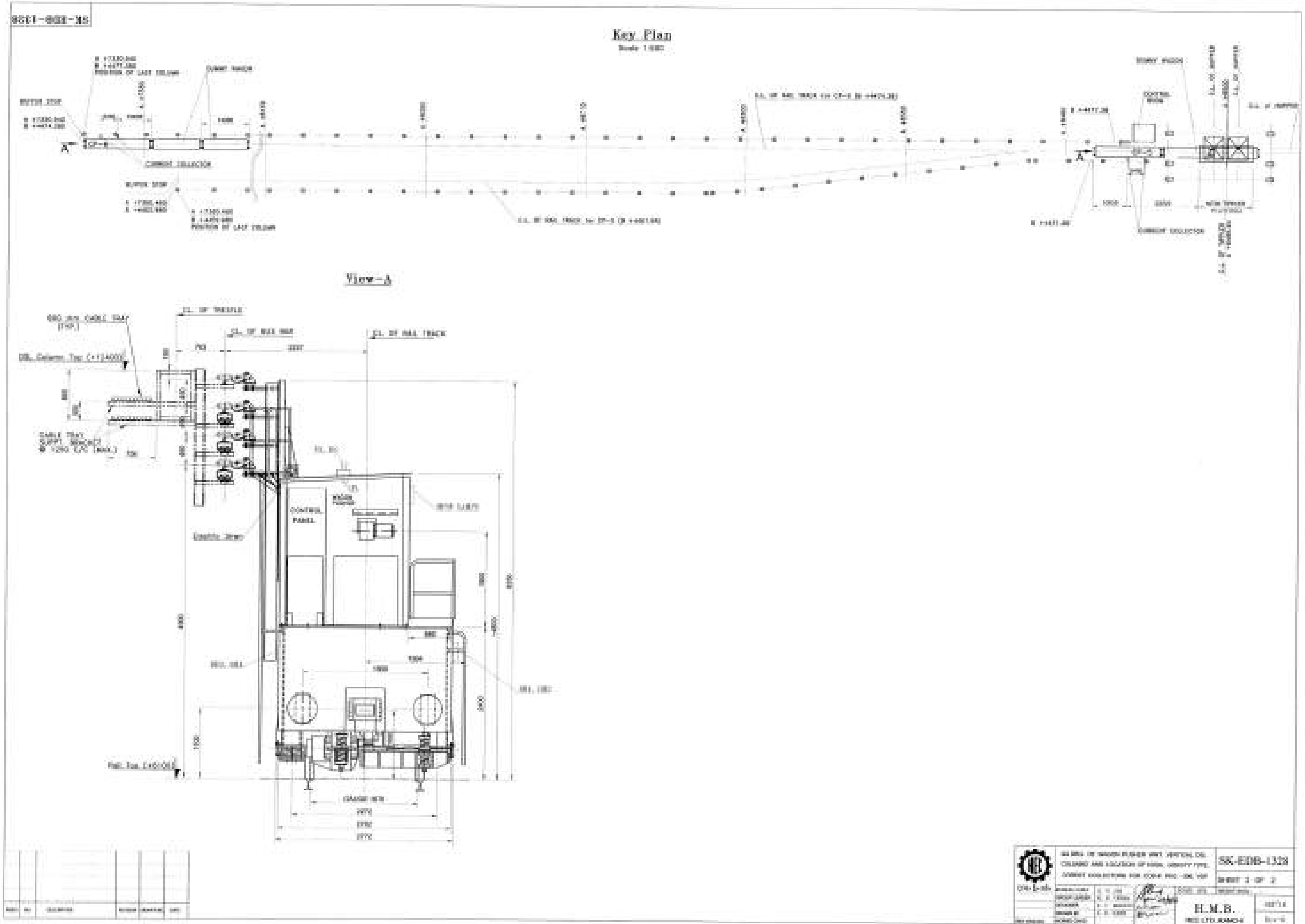
HEC

CCVM SYSTEM FOR WAGON HANDLING COMPLEX FOR COB # 5, PKG.-006, VSP

SK-EDB-1327	
SHEET NO.	2 OF 2
NEXT SHEET	-

Rev.-0


RESISTANCE CABIN
PANEL CABIN



Key Plan
View-A
CURRENT COLLECTOR
CONTROL PANEL
SK-EDB-1328
H.M.B.
HEC LTD.,RANCHI

SK-EDB-1329

MARK	NO.	DESCRIPTION	REVISION	SIGNATURE	DATE

LOCATION OF ELECTRICAL ITEMS IN WAGON TIPPLER MACHINE FOR COB#5, PKG-006, VSP

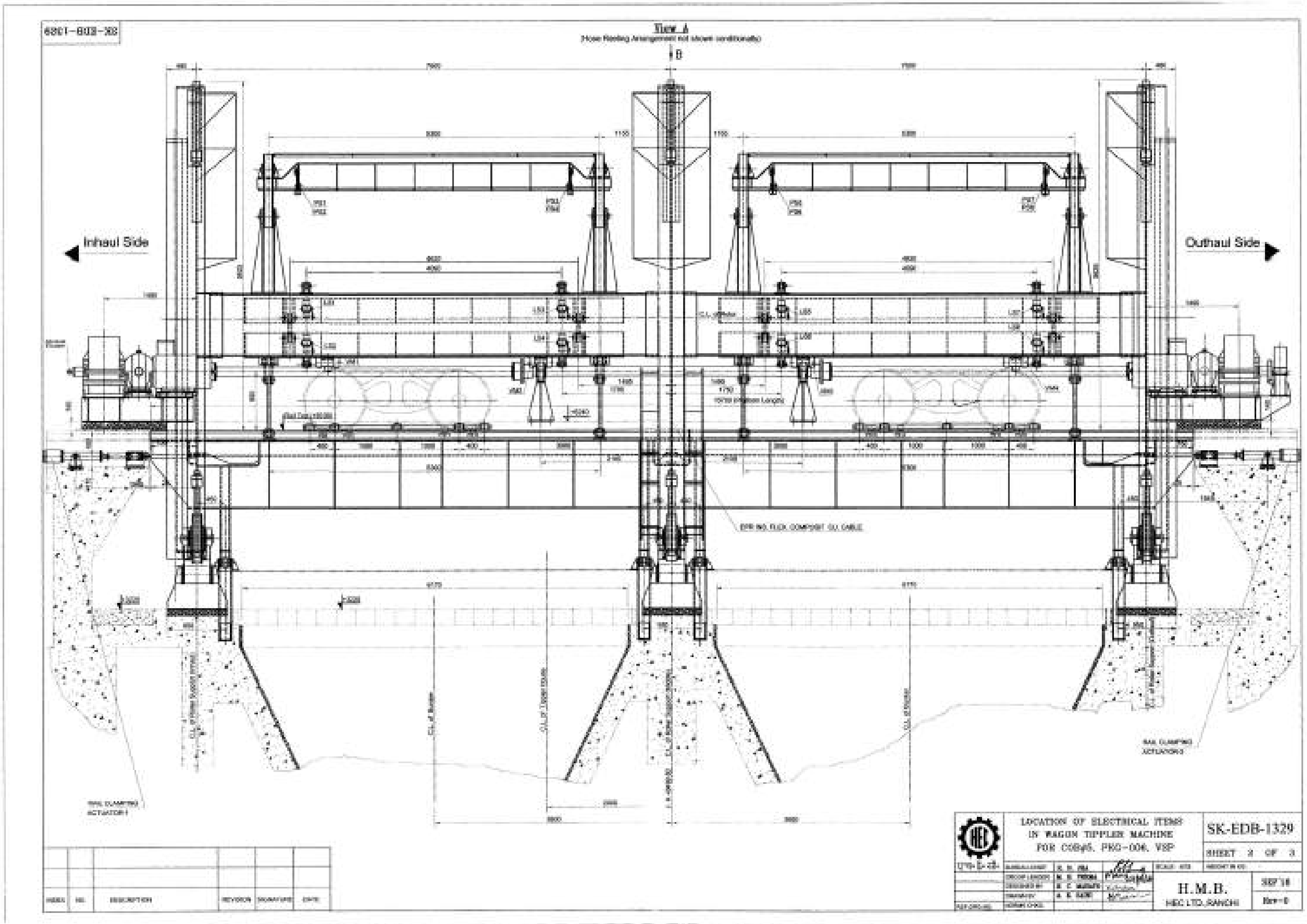
SK-EDB-1329

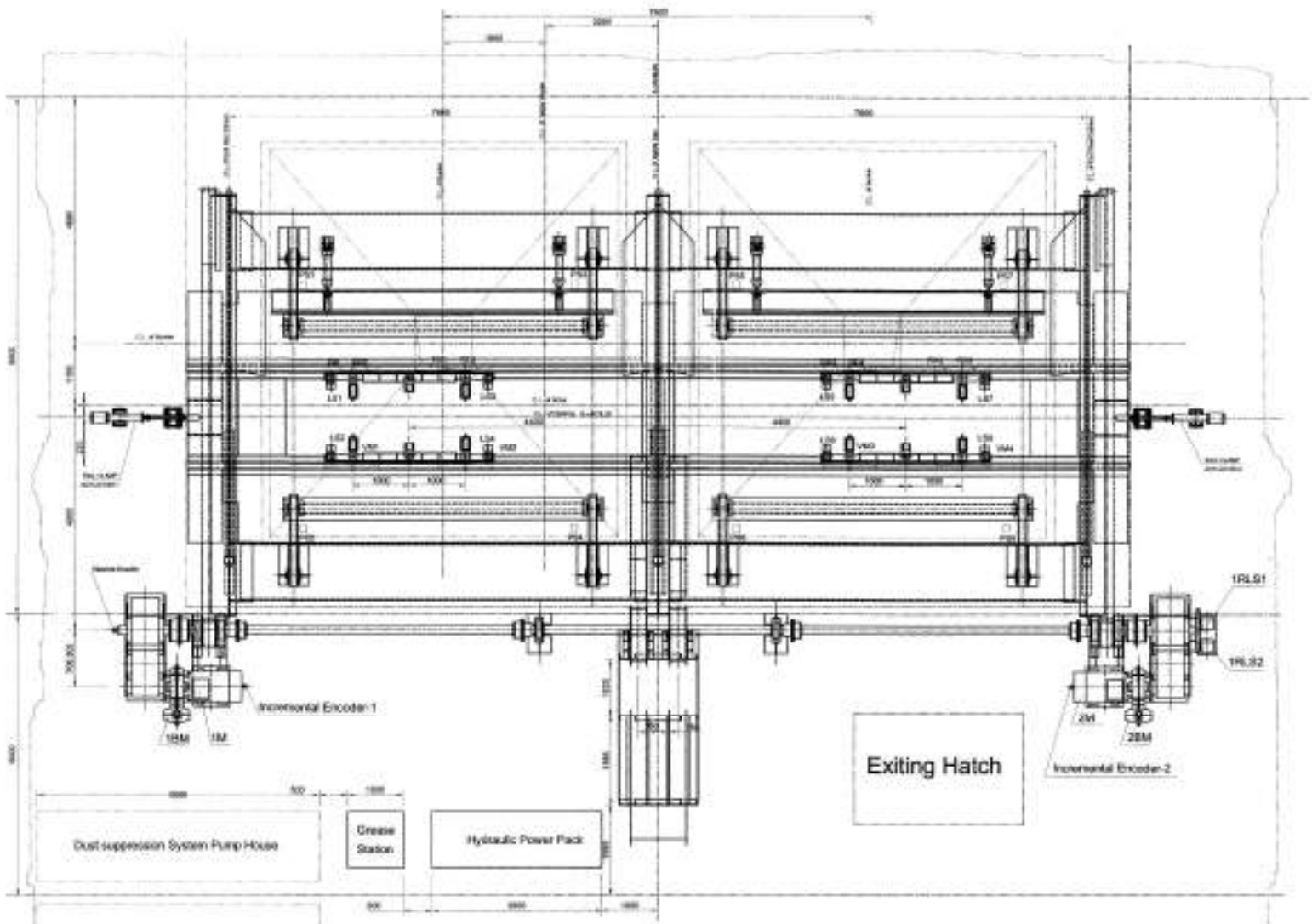
SHEET 1 OF 3

H.M.B.
HEC LTD JHANCHI

SEP'16

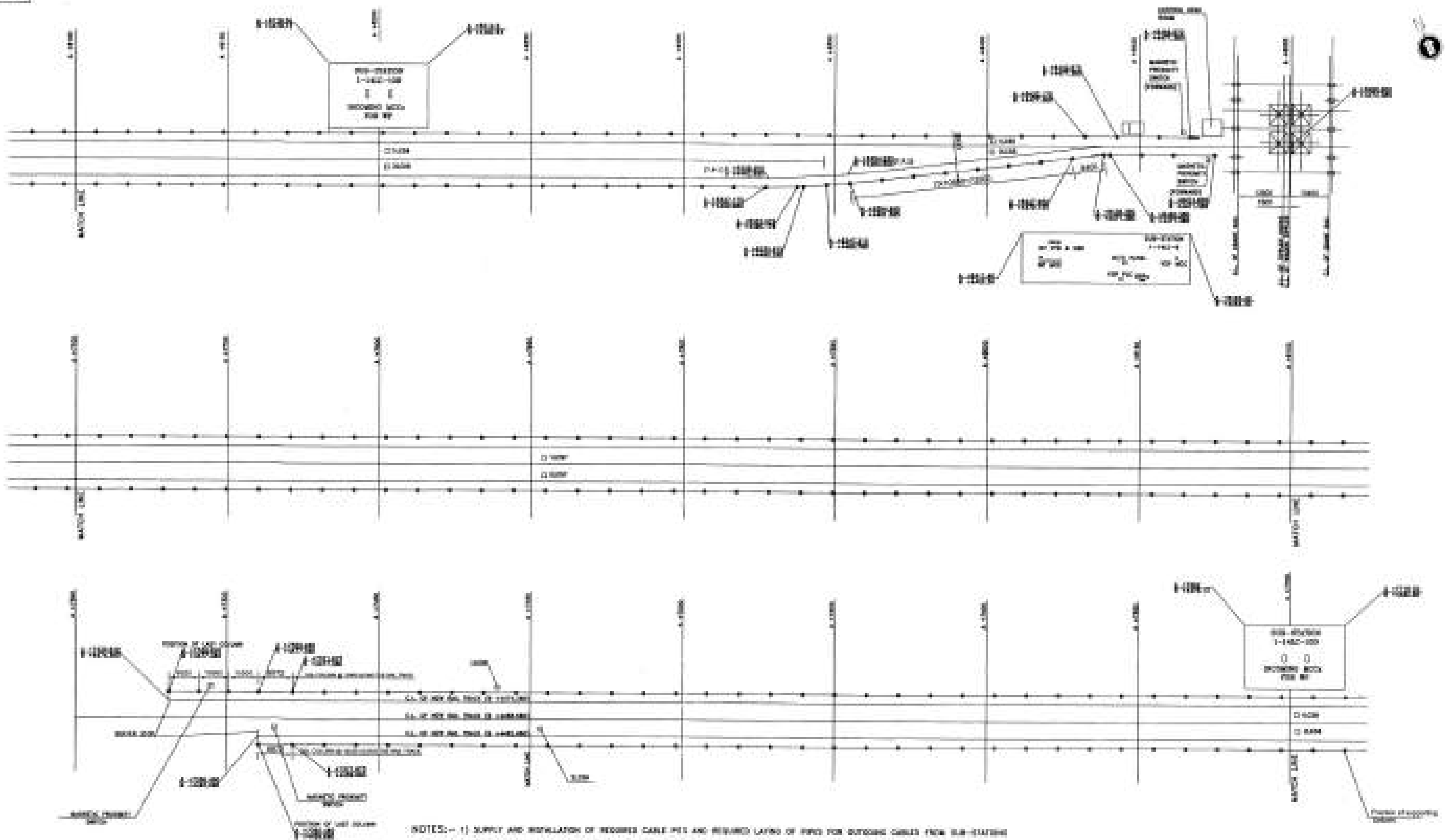
Rev-0


6801-803-XX
View A
B
Inhaul Side
Outhaul Side
EPR INS. FLEX. COMPOSIT CU. CABLE
RAIL CLAMPING ACTUATOR-1
RAIL CLAMPING ACTUATOR-2
LOCATION OF ELECTRICAL ITEMS
IN WAGON TIPPLER MACHINE
FOR COB#5, PKG-006, VSP
SK-EDB-1329
SHEET 2 OF 3
H.M.B.
HEC LTD.,RANCHI
Rev-0
DESCRIPTION
REVISION
SIGNATURE
DATE



MARK	NO.	DESCRIPTION	REVISION	ENGINEER	CHECKED	DATE

	LOCATION OF ELECTRICAL ITEMS IN WAGON TIPPLER MACHINE FOR CO&MS, PKG-006, VSP			SK-EDB-1329
				SHEET 3 OF 3
	DESIGN CHKD	S. S. JHA		
	GROUP LEADER	M. S. VERMA		
	DRAWN BY	S. C. MAITY		H.M.B. HEC LTD. RANCHI
	CHECKED BY	A. K. VERMA		SEP'16
	REF. DRG. NO.	NORMS CHKD		Rev-0



NOTES:-

1) SUPPLY AND INSTALLATION OF REQUIRED CABLE PITS AND REQUIRED LAYING OF PIPES FOR OUTGOING CABLES FROM SUB-STATIONS (1-14LC-108 & 1-14LC-105) TO ELECTRICS (LOCATED AT DIFFERENT LOCATIONS) IS IN THE SCOPE OF TENDERER.
2) SUPPLY AND INSTALLATION OF REQUIRED CABLE PITS AND LAYING OF PIPES FOR OUTGOING CABLES FROM SUB-STATIONS (1-14LC9) TO CONTROL DESK BUILDING AND TIPPLER HOUSE ELECTRICS IS IN THE SCOPE OF TENDERER.
3) SUPPLY AND INSTALLATION OF REQUIRED CABLE PITS AND LAYING OF PIPES FOR OUTGOING CABLES FROM CONTROL DESK BUILDING TO TIPPLER HOUSE ELECTRICS IS IN THE SCOPE OF TENDERER.
4) REQUIRED PIPES SHALL BE LAID NEAR THE SUB-STATIONS (1-14LC-108, 1-14LC-105) FOR CROSSING OF OUTGOING CONTROL CABLES IN THE GROUND UNDER THE RAIL TRACK.
5) REQUIRED CABLE TRENCHES SHALL BE PROVIDED BY THE TENDERER FOR OUTGOING POWER & CONTROL CABLES LAYING FROM SUB-STATIONS (1-14LC-108, 1-14LC-105 & 1-14LC9) TO VARIOUS ELECTRICAL EQUIPMENTS (IN THE TENDERER'S SCOPE).
6) SUPPLY AND INSTALLATION OF ELECTRONIC EARTH PITS.
7) SUPPLY AND INSTALLATION OF LIGHTENING ARRESTERS IN SUB-STATIONS AND IN CONTROL DESK BUILDINGS.

SK-EDB-1330

SHEET 1 OF 1

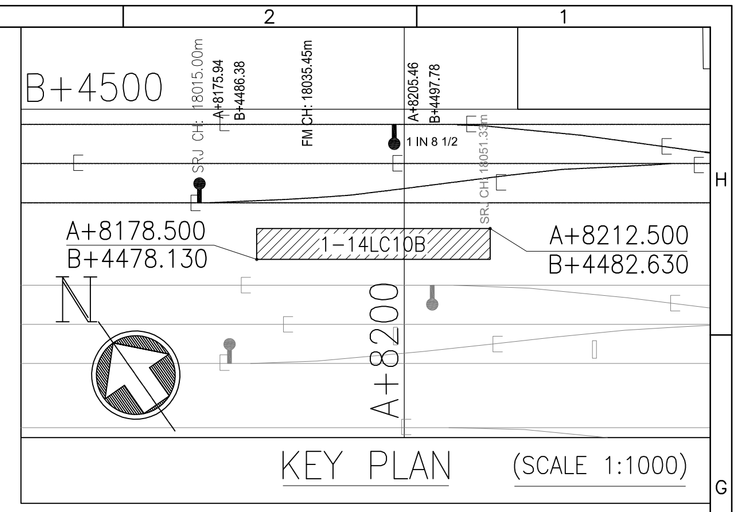
H.M.B.

Rev-0

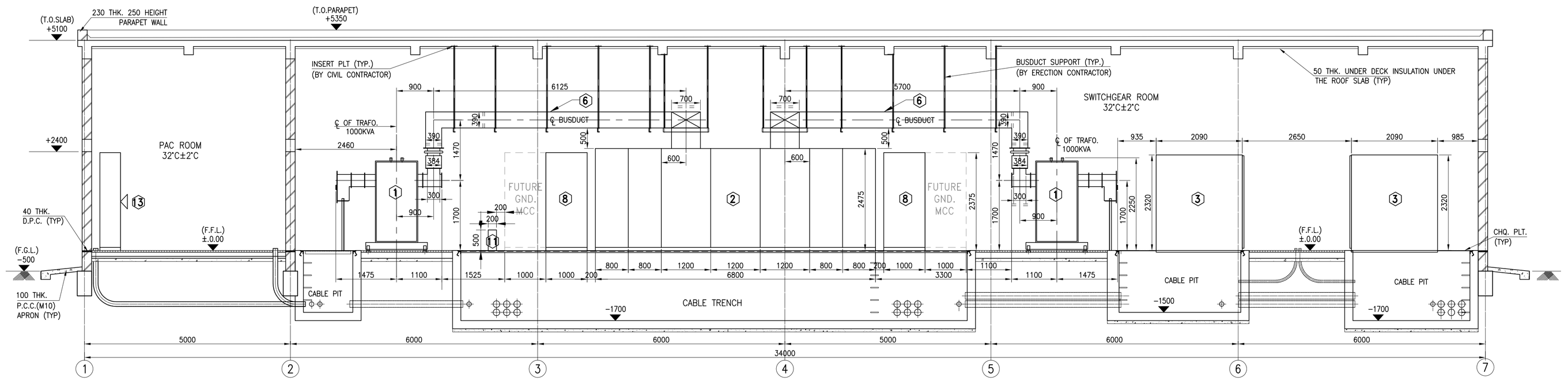
DRG. No. 25945-01-01-ELE-0145 REV. 0

LEGEND:

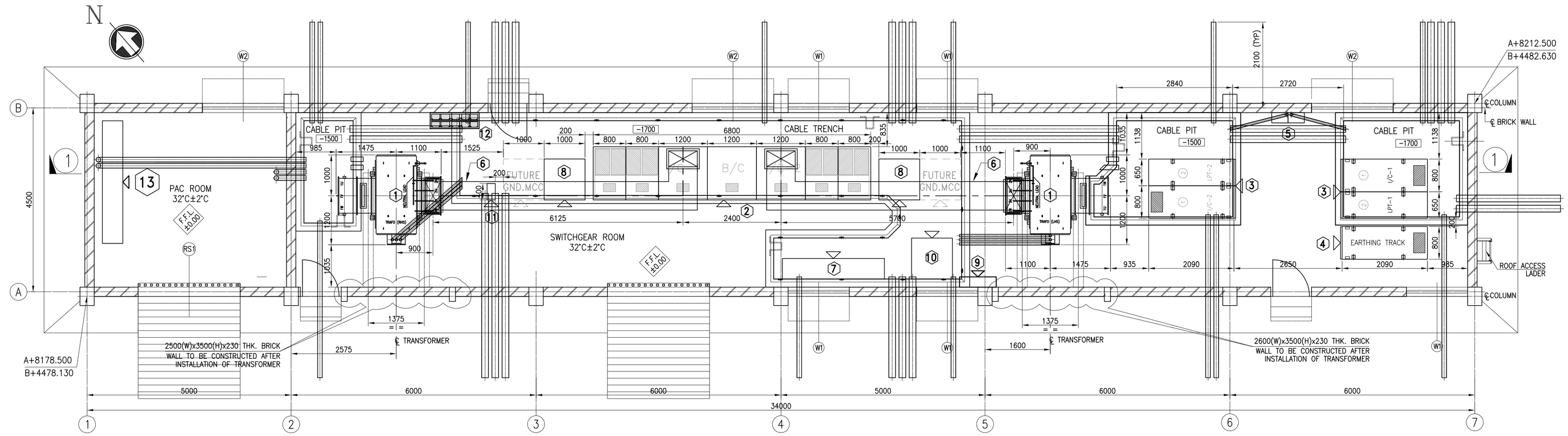
SL. NO.	PANEL DESIGNATION	EQUIPMENT NAME	EQUIPMENT SIZE	SUPPLY & ERECTION SCOPE	VSP SPECIFICATION NO.
1	1	1000KVA, 11/0.433KV, ONAN TRANSFORMER (RHS & LHS)	2575(L)x2200(D)x2250(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
2	2	415V SWITCH BOARD (LCSS 1-14LC10B)	6800(L)x1300(D)x2475(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
3	3	11KV UNIT VCB PANEL	2[800/650(L)x2090(D)x2300(H)]	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
4	4	CABLE EARTHING TRUCK FOR UNIT VCB PANEL	800(L)x890(D)x1320(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
5	5	WALL MOUNTED CONTROL PANEL FOR 11KV UNIT VCB	500(L)x400(D)x500(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
6	6	1600A, 415V BUSDUCT	2[---(L)x---(D)x---(H)]	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
7	7	415V AUXILIARY PDB (AUGOPLC10B)	2200(L)x500(D)x2375(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
8	8	GROUND MCC PANEL	2[1000(L)x1000(D)x2375(H)]	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
9	9	WAL MOUNTED SLDB (TYPE-III)	900(L)x250(D)x600(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
10	10	25KVA AN LIGHTING TRANSFORMER	1150(L)x1100(D)x1050(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
11	11	5KVA STATIC POWER SUPPLY UNIT (SEP)	400(L)x200(D)x500(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
12	12	BATTERY CABINET FOR SEP	1200(L)x390(D)x350(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
13	13	MCC FOR PAC	---(L)x---(D)x---(H)	COSMIC POWER SYSTEM (P) LTD.	VSP-IOS-AUG-01-ELE-001



KEY PLAN (SCALE 1:1000)



SECTION–(1)(1)



PLAN AT ±0.00 LEVEL (GND FLOOR)

No.	DATE	ZONE	REMARKS	BY	APP.	DRG. No.	DETAILS
						25945-01-01-CVL-0390	TRANSFORMER FOUNDATION DETAIL
						25945-01-01-CVL-0387	LAYOUT, G.A. & R.C. DETAILS OF CABLE TRENCH
						25945-01-01-CVL-0381	G.A. PLANS, ELEVTIONS & SECTIONS

REVISION — REFERENCE DRAWINGS

NOTES

1. ALL DIMENSIONS & LEVELS ARE IN MILIMETRES UNLESS OTHERWISE STATED.
2. ALL UNUSED OPENING OF CABLE TRENCH TO BE COVERED WITH REMOVABLE CHEQ. PLATE.
3. FOR 1000KVA TRANSFORMER G.A. REF. DWG NO. A1-ELE1-05-E-0541.
4. FOR 415V SWITCH BOARD (LCSS 1-14LC10B) G.A. REF DWG NO. A1-ELE1-06-E-0732.
6. FOR 11KV UNIT VCB PANEL G.A. REF DWG NO. A1-ELE1-04-E-0263.
7. FOR 415 PDB (AUGOPLC10B) G.A. REF DWG NO. A1-ELE1-09-E-0952.
8. FOR 415V, 1600A BUSDUCT G.A. REF DWG NO. A1-ELE1-07-E-0642.
9. FOR 11KV CABLE EARTHING TRUCK PANEL G.A. REF DWG NO. A1-ELE1-04-E-0283.
10. FOR 11KV UNIT VCB CONTROL PANEL G.A. REF DWG NO. A1-ELE1-04-E-0272.
11. FOR 25KVA LIGHTING TRAFO. G.A. REF DWG NO. 01-ELE2-01-E-3049
12. FOR WALL MOUNTED SLDB (TYPE-III) G.A. REF DWG NO. 01-ELE2-01-E-3013.
13. FOR SEP & SEP BATTERY G.A. REF. DWG. NO. 01-ELE2-01-E-3057.
14. DIMENSIONS OF MCC FOR PAC ARE GIVEN BASED ON PREVIOUS PROJECT DATA.

APPROVAL

APPROVED FOR CONSTRUCTION
SIGNATURE: Sd/-
DATE: 22/10/2013
M.N.DASTUR AND COMPANY (P) LTD. KOLKATA

DEPT	BY	DATE

RASHTRIYA ISPAT NIGAM LTD.
VISAKHAPATNAM STEEL PLANT
VSP-IRON ORE STORAGE - CAPACITY AUGMENTATION

VSP DRG. NO.

PRINCIPAL CONSULTANT **M. N. DASTUR & COMPANY (P) LTD.**
CONSULTING ENGINEERS, KOLKATA

SCALE	1:100	DATE	
DSGND. BY			05.06.2013
DRAWN BY	SSI		05.06.2013
CHKD. BY			22.10.13
APPVD. BY	Sd/-		22.10.13

ZONE	RAW MATERIAL HANDLING PLANT
UNIT	ORE HANDLING SYSTEM
TITLE	LOAD CENTRE SUBSTATION NO 1-14LC10B EQUIPMENT LAYOUT-PLAN AND SECTION

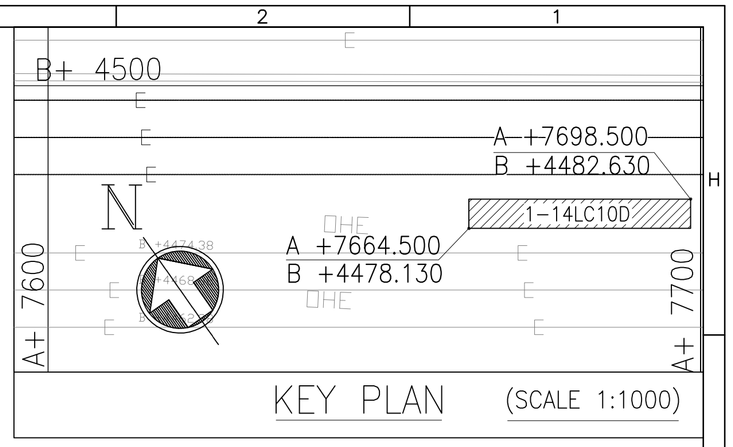
JOB No. 25945 | DRG. No. 25945-01-01-ELE-0145 | REV. 0

DRG. No. 25945-01-01-ELE-0146 REV. 0

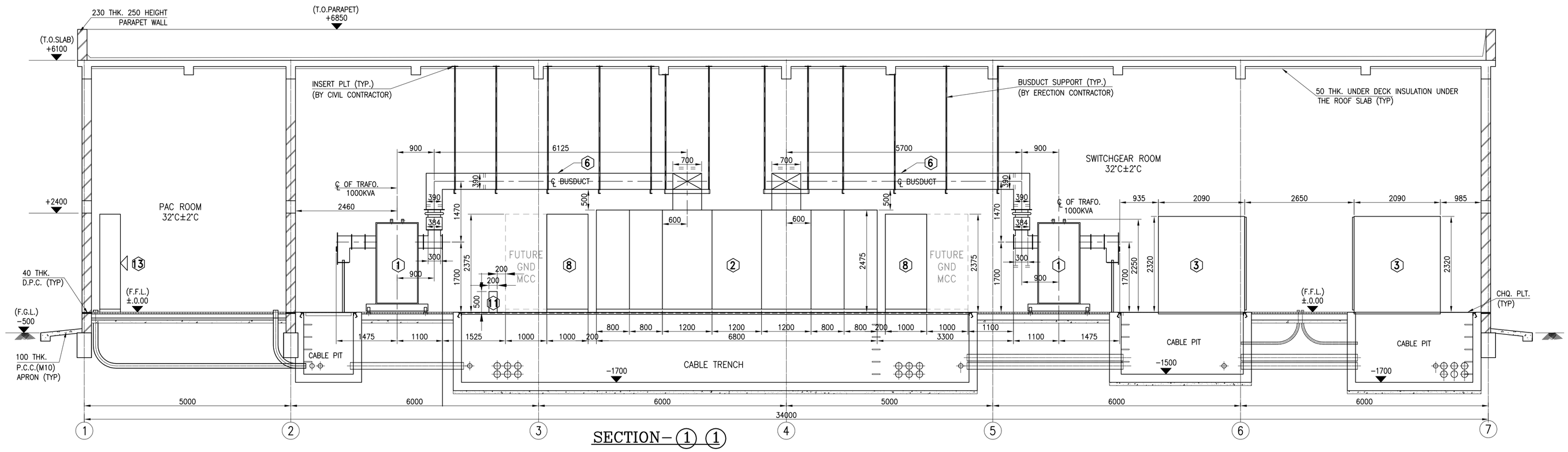
LEGEND:

SL. NO.	PANEL DESIGNATION	EQUIPMENT NAME	EQUIPMENT SIZE	SUPPLY & ERECTION SCOPE	VSP SPECIFICATION NO.
1	1	1000KVA, 11/0.433KV, ONAN TRANSFORMER (RHS & LHS)	2575(L)x2200(D)x2250(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
2	2	415V SWITCH BOARD (LCSS 1-14LC10D)	6800(L)x1300(D)x2475(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
3	3	11KV UNIT VCB PANEL	2[800/650(L)x2090(D)x2300(H)]	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
4	4	CABLE EARTHING TRUCK FOR UNIT VCB PANEL	800(L)x890(D)x1320(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
5	5	WALL MOUNTED CONTROL PANEL FOR 11KV UNIT VCB	500(L)x400(D)x500(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
6	6	1600A, 415V BUSDUCT	2[---(L)x---(D)x---(H)]	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
7	7	415V AUXILIARY PDB (AUGOPLC10D)	2200(L)x500(D)x2375(H)	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001

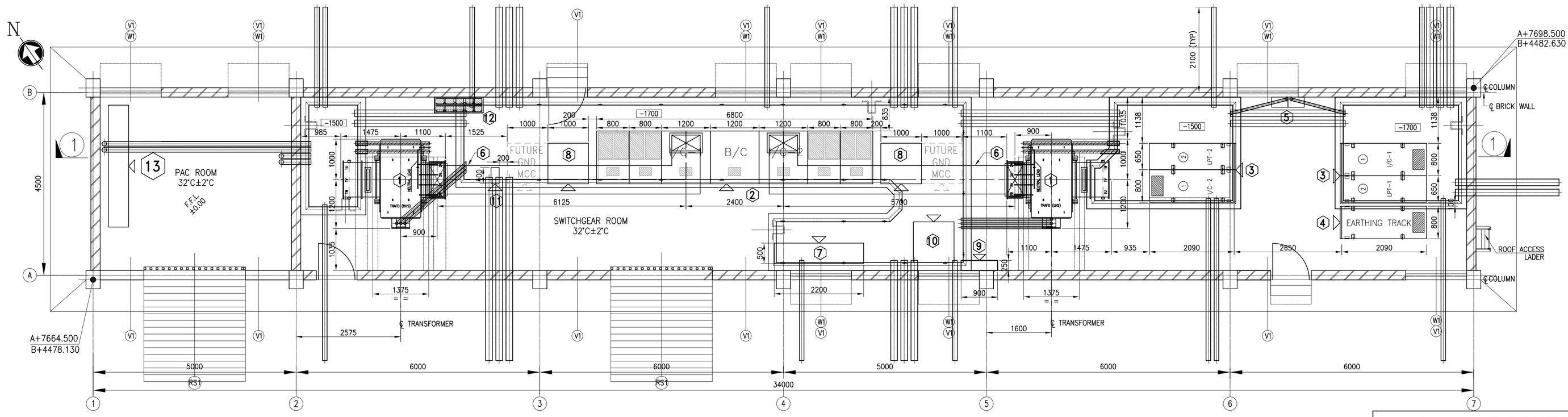
SL. NO.	PANEL DESIGNATION	EQUIPMENT NAME	EQUIPMENT SIZE	SUPPLY & ERECTION SCOPE	VSP SPECIFICATION NO.
8	8	GROUND MCC PANEL	2[1000(L)x1000(D)x2375(H)]	COSMIC POWER INDUSTRIES (P) LTD.	VSP-IOS-AUG-01-ELE-001
9	9	WAL MOUNTED SLDB (TYPE-III)	900(L)x250(D)x600(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
10	10	25KVA AN LIGHTING TRANSFORMER	1150(L)x1100(D)x1050(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
11	11	5KVA STATIC POWER SUPPLY UNIT (SEP)	400(L)x200(D)x500(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
12	12	BATTERY CABINET FOR SEP	1200(L)x390(D)x350(H)	GANESH ENTERPRISES	VSP-IOS-AUG-01-ELE-002
13	13	MCC FOR PAC	---(L)x---(D)x---(H)	COSMIC POWER SYSTEM (P) LTD.	VSP-IOS-AUG-01-ELE-001



KEY PLAN (SCALE 1:1000)



SECTION–(1)(1)



PLAN AT ±0.00 LEVEL (GND FLOOR)

No.	DATE	ZONE	REMARKS	BY	APP.	DRG. No.	DETAILS
						25945-01-01-CVL-0405	TRANSFORMER FOUNDATION DETAIL
						25945-01-01-CVL-0402	LAYOUT, G.A. & R.C. DETAILS OF CABLE TRENCH
						25945-01-01-CVL-0382	G.A. PLANS, ELEVTIONS & SECTIONS

REVISION — REFERENCE DRAWINGS

NOTES

1. ALL DIMENSIONS & LEVELS ARE IN MILIMETRES UNLESS OTHERWISE STATED.
2. ALL UNUSED OPENING OF CABLE TRENCH TO BE COVERED WITH REMOVABLE CHEQ. PLATE.
3. FOR 1000KVA TRANSFORMER G.A. REF. DWG NO. A1-ELE1-05-E-0541.
5. FOR 415V SWITCH BOARD (LCSS 1-14LC10D) G.A. REF DWG NO. A1-ELE1-06-E-0742.
6. FOR 11KV UNIT VCB PANEL G.A. REF DWG NO. A1-ELE1-04-E-0263.
7. FOR 415 PDB (AUGOPLC10D) G.A. REF DWG NO. A1-ELE1-09-E-0962.
8. FOR 415V, 1600A BUSDUCT G.A. REF DWG NO. A1-ELE1-07-E-0642.
9. FOR 11KV CABLE EARTHING TRUCK PANEL G.A. REF DWG NO. A1-ELE1-04-E-0283.
10. FOR 11KV UNIT VCB CONTROL PANEL G.A. REF DWG NO. A1-ELE1-04-E-0272.
11. FOR 25KVA LIGHTING TRAFO. G.A. REF DWG NO. 01-ELE2-01-E-3049
12. FOR WALL MOUNTED SLDB (TYPE-III) G.A. REF DWG NO. 01-ELE2-01-E-3013.
13. FOR SEP & SEP BATTERY G.A. REF. DWG. NO. 01-ELE2-01-E-3057.
14. DIMENSIONS OF MCC FOR PAC ARE GIVEN BASED ON PREVIOUS PROJECT DATA.

APPROVAL

APPROVED FOR CONSTRUCTION	DEPT	BY	DATE
SIGNATURE:			
DATE: 22/10/2013			
M.N.DASTUR AND COMPANY (P) LTD. KOLKATA			

RASHTRIYA ISPAT NIGAM LTD.
VISAKHAPATNAM STEEL PLANT
VSP-IRON ORE STORAGE - CAPACITY AUGMENTATION

VSP DRG. NO.

PRINCIPAL CONSULTANT **M. N. DASTUR & COMPANY (P) LTD.**
CONSULTING ENGINEERS, KOLKATA

SCALE	1:100	DATE	
DSGND. BY			05.06.2013
DRAWN BY	SSI		05.06.2013
CHKD. BY			22.10.13
APPVD. BY			22.10.13

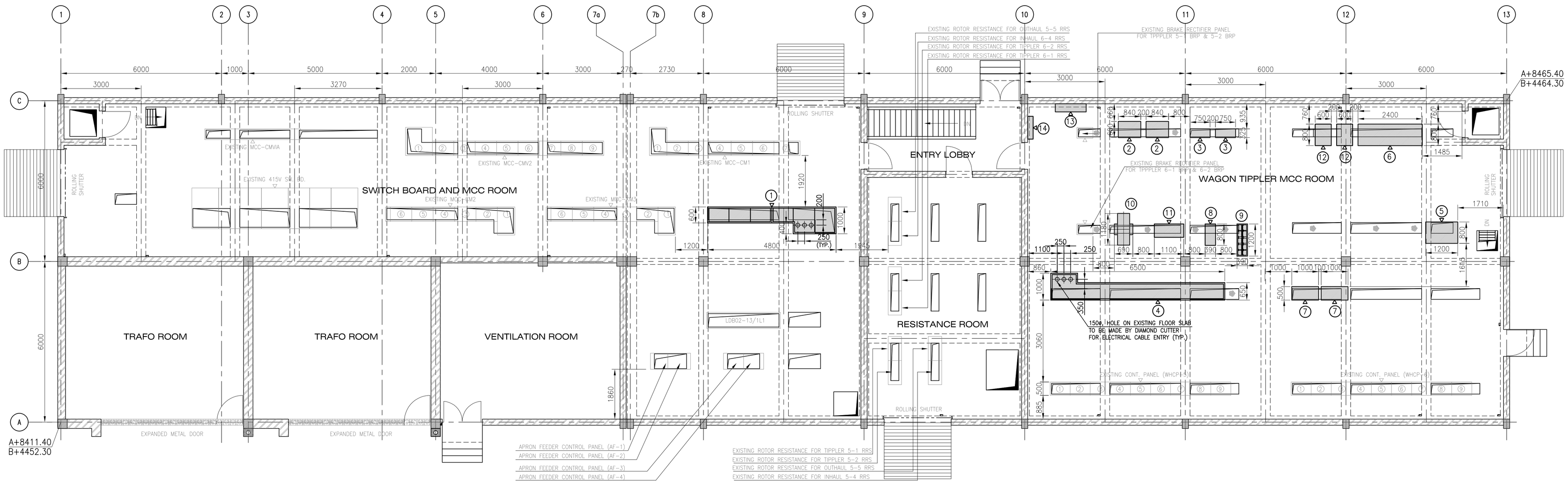
ZONE	RAW MATERIAL HANDLING PLANT
UNIT	ORE HANDLING SYSTEM
TITLE	LOAD CENTRE SUBSTATION NO 1-14LC10D EQUIPMENT LAYOUT-PLAN AND SECTION

JOB No. 25945 | DRG. No. 25945-01-01-ELE-0146 | REV. 0

DRG. No. 25945-01-01-ELE-0121 | REV. 0

LEGEND:

SL. NO.	PNL. DESIGNATION	EQUIPMENT NAME	EQUIPMENT DIMENSIONS	QUANTITY	REMARKS
1	1	MCC AUGOM3	4800(L)x1000/600(D)x2375(H)	1 NO.	
2	2	APPRON FEEDER	840(L)x600(D)x2080(H)	2 NOS.	BEFORE INSTALLATION OF NEW PANELS, EXISTING BRAKE RECTIFIER PANEL FOR INHAUL 5-4 BRP & BRAKE RECTIFIER PANEL FOR OUTHAUL 5-5 BRP TO BE DISMANTLED.
3	3	BREAKE PANEL FOR WT	750(L)x325(D)x900(H)	2 NOS.	
4	4	WT MCC	6500(L)x1000/650(D)x2800(H)	1 NO.	
5	5	RI/O-A5	1200(L)x800(D)x2115(H)	1 NO.	
6	6	RI/O-HEC	2400(L)x800(D)x2115(H)	1 NO.	
7	7	WT VFD	1000(L)x500(D)x2397(H)	2 NOS.	
8	8	5KVA STATIC EMERGENCY POWER SUPPLY (SEP)	800(L)x390(D)x530(H)	1 NO.	BEFORE INSTALLATION OF NEW PANELS, EXISTING BRAKE RECTIFIER PANEL FOR INHAUL 6-4 BRP & BRAKE RECTIFIER PANEL FOR OUTHAUL 6-5 BRP TO BE DISMANTLED.
9	9	BATTERY BANK FOR SEP	1200(L)x390(D)x440(H)	1 NO.	
10	10	415V,50KVA ANAN LIGHTING TRANSFORMER	1080(L)x690(D)x1135(H)	1 NO.	
11	11	FLOOR MOUNTED LIGHTING DISTRIBUTION BOARD	1100(L)x500(D)x975(H)	1 NO.	
12	12	FLOOR MOUNTED DBR	800(L)x600(D)x500(H)	2 NOS.	
13	13	WALL MOUNTED SLDB	800(L)x600(D)x500(H)	21NOS.	
14	14	WALL MOUNTED MCBDB	800(L)x600(D)x500(H)	2 NOS.	



FLOOR PLAN AT -40 LEVEL

No.	DATE	ZONE	REMARKS	BY	APP.	DRG. No.	DETAILS

REVISION | REFERENCE DRAWINGS

NOTES

APPROVAL

	DEPT	BY	DATE

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RASHTRIYA ISPAT NIGAM LTD.
VISAKHAPATNAM STEEL PLANT
VSP-IRON ORE STORAGE - CAPACITY AUGMENTATION

VSP DRG. NO.

PRINCIPAL CONSULTANT **M. N. DASTUR & COMPANY (P) LTD.**
CONSULTING ENGINEERS, KOLKATA

SCALE	1:100	DATE	ZONE	RAW MATERIAL HANDLING PLANT
DSGND. BY	BIP	25.04.2011	UNIT	ORE HANDLING SYSTEM
DRAWN BY	SSI	25.04.2011	TITLE	EQUIPMENT LAYOUT PLAN ON EXISTING FLOOR AT -40 LEVEL AND FLOOR CUTOUT DETAIL ON EXISTING FLOOR OF EXISTING 1-14LC9 BUILDING
CHKD. BY	BIP	25.04.2011		
APPVD. BY	MS	25.04.2011		

JOB No. 25945 | DRG. No. 25945-01-01-ELE-0121 | REV. 0