



Government eProcurement System

eProcurement System Government of India

Tender Details

Date : 28-Mar-2023 07:14 PM

Print

Basic Details

Organisation Chain	National Aluminium Company Limited,NALCO NALCO-Corporate Office-Bhubaneswar Materials,CO,Bhubhaneswar,NALCO		
Tender Reference Number	NBC/MM/510/3-8937/TIPPLER/2023		
Tender ID	2023_NALCO_747258_1		
Tender Type	Global Tenders	Form of contract	Tender cum Auction
Tender Category	Works	No. of Covers	2
General Technical Evaluation Allowed	No	ItemWise Technical Evaluation Allowed	No
Payment Mode	Offline	Is Multi Currency Allowed For BOQ	No
Is Multi Currency Allowed For Fee	No	Allow Two Stage Bidding	No

Payment Instruments

Offline	S.No	Instrument Type
	1	Direct Credit
	2	Bank Guarantee
	3	Demand Draft
	4	R-T-G-S
	5	ECS
	6	NEFT

Cover Details, No. Of Covers - 2

Cover No	Cover	Document Type	Description
1	Fee/PreQual/Technical	.pdf	Wagon Tippler and CHP Upgradation
		.pdf	Drawings
2	Finance	.xls	BOQ

Tender Fee Details, [Total Fee in ₹ * - 0.00]

Tender Fee in ₹	0.00	
Fee Payable To	Nil	Fee Payable At Nil
Tender Fee Exemption Allowed	No	

EMD Fee Details

EMD Amount in ₹	25,00,000	EMD through BG/ST or EMD Exemption Allowed	Yes
EMD Fee Type	fixed	EMD Percentage	NA
EMD Payable To	SBI	EMD Payable At	Bhubaneswar

[Click to view modification history](#)

Work /Item(s)

Title	Wagon Tippler				
Work Description	Wagon Tippler and upgradation of existing CHP				
Pre Qualification Details	As per tender				
Independent External Monitor/Remarks	As per tender				
Show Tender Value in Public Domain	No				
Tender Value in ₹	0.00	Product Category	Miscellaneous Works	Sub category	Supply and upgradation
Contract Type	Tender	Bid Validity(Days)	180	Period Of Work (Days)	550

Location	NALCO Damanjodi	Pincode	763008	Pre Bid Meeting Place	NALCO Damanjodi
Pre Bid Meeting Address	MnR Complex NALCO Damanjodi District Koraput Odisha 763008	Pre Bid Meeting Date	18-Apr-2023 10:00 AM	Bid Opening Place	Bhubaneswar
Should Allow NDA Tender	No	Allow Preferential Bidder	No		

Critical Dates

Publish Date	29-Mar-2023 09:00 AM	Bid Opening Date	10-May-2023 04:00 PM
Document Download / Sale Start Date	29-Mar-2023 09:00 AM	Document Download / Sale End Date	03-May-2023 01:00 PM
Clarification Start Date	NA	Clarification End Date	NA
Bid Submission Start Date	29-Mar-2023 09:00 AM	Bid Submission End Date	03-May-2023 01:00 PM

Tender Documents

NIT Document	S.No	Document Name	Description	Document Size (in KB)	
	1	Tendernotice_1.pdf	Wagon Tippler and CHP Upgradation	13211.40	
	2	Tendernotice_2.pdf	Drawings	18983.31	
Work Item Documents	S.No	Document Type	Document Name	Description	Document Size (in KB)
	1	BOQ	BOQ_785701.xls	BOQ	304.50

Auto Extension Corrigendum Properties for Tender

Iteration	No. of bids required for bid opening a tender	Tender gets extended to No. of days
1.	3	7


Bid Openers List

S.No	Bid Opener Login Id	Bid Opener Name	Certificate Name
1.	mihir.behera@nalcoindia.co.in	Mihir Kumar Behera	MIHIR KUMAR BEHERA
2.	purna.gummadi@nalcoindia.co.in	P Chandrasekhar Gummadi	Purna Chandrasekhar Gummadi
3.	ajaya.sahu@nalcoindia.co.in	Ajaya Kumar Sahu	AJAYA KUMAR SAHU
4.	sudesh.pattnaik@nalcoindia.co.in	SUDESH PATTNAIK	SUDESH KUMAR PATNAIK

Tender Properties

Auto Tendering Process allowed	No	Show Technical bid status	Yes
Show Finance bid status	Yes	Show Bids Details	No
BoQ Comparative Chart model	Normal	BoQ Compative chart decimal places	2
BoQ Comparative Chart Rank Type	L	Form Based BoQ	No
Bidders Elimination Process Required	No	Allow Preferential Bidder Elimination Process Required	No
Minimum Bidder for Elimination	3	Number of Bidder to Eliminate	1
Adopt Tender Cum Auction New Process	No		

Tender Inviting Authority	
Name	GM Materials
Address	NALCO CO Bhubaneswar
Tender Creator Details	
Created By	Mihir Kumar Behera
Designation	Senior Manager
Created Date	28-Mar-2023 06:47 PM

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	TENDER NOTICE	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00 DTD. 28/03/2023



NATIONAL ALUMINIUM COMPANY LIMITED

(A Govt. of India Enterprise)

P/1, Nalco Bhawan, Bhubaneswar - 751 013, India

CIN NO.# L27203OR1981 GOI000920


**NOTICE INVITING TENDER (NIT)
OPEN TENDER CUM REVERSE AUCTION**

No. - NBC/MM/510/3-8937/TIPPLER/2023

Date: 28/03/2023

National Aluminium Company invites bids through **e-tendering cum reverse auction** in two parts from bonafide indigenous manufacturers/ suppliers for **engineering, supply, storage, fabrication, erection, commissioning of Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India.** For further details and downloading Tender Documents please log on to www.nalcoindia.com / www.eprocure.gov.in. Bidders are requested to visit the above websites regularly for any modification/ addition/ bid due date extension for this tender as these information shall not be published in print media.


General Manager (Materials)

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	INSTRUCTIONS TO BIDDERS	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 01
			DTD. 28/03/2023


**NOTICE INVITING TENDER (NIT) CUM REVERSE AUCTION (RA)
FOR
INSTALLATION OF NEW WAGON TIPPLER, SIDE ARM CHARGER, HYDRAULIC
BREAKER, NEW CONVEYING SYSTEM AND UP-GRADATION OF CONVEYORS-3A/3B
AND DFDS SYSTEM IN EXISTING COAL HANDLING PLANT (CHP) IN STEAM-CUM-
POWER PLANT (SPP) OF NATIONAL ALUMINIUM COMPANY LTD. (NALCO) AT
DAMANJODI, ODISHA.**

INSTRUCTIONS TO BIDDERS

- 1.0 M/s. National Aluminium Company Limited (NALCO) (A Govt. of India Enterprise) invites bids through **e-tendering cum reverse auction** on Open Tender basis in two part-bid system from eligible bidders for engineering, supply, storage, fabrication, erection, commissioning of Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India.
- 2.0 Bids are to be submitted/ uploaded in complete accordance with enclosed Tender Documents/ attachments.
- 3.0 **TENDER DOCUMENTS:**
 - 3.1 The following documents are enclosed and form part of the tender documents:
 - (i) Instructions To Bidders
 - (ii) Annexure - I - Technical Specification
 - (iii) Annexure - II - Special Instructions to Bidders (Commercial)
 - (iv) Annexure - III - General Conditions of Contract (GCC)
 - (v) Annexure - IV - Addendum to Tender Documents (Commercial)
 - (vi) Annexure - V - Terms and Conditions for Erection, Testing, Commissioning at Site
 - (vii) Annexure - VI - Agreed Terms & Conditions (Indigenous)
 - (viii) Annexure - VII - Item Rate BOQ (Indigenous)
 - (ix) Annexure - VIII - Proforma for Contract-cum-Performance Bank Guarantee
 - (x) Annexure - IX - Proforma for Bank Guarantee for Advance Payment
 - (xi) Annexure - X - Proforma for Earnest Money Deposit
 - (xii) Annexure - XI - List of NALCO approved Banks & Bank Mandate Form
 - (xiii) Annexure - XII - SA 8000 Format for compliance
 - (xiv) Annexure - XIII - Proforma for Pre Contract Integrity Pact
 - (xv) Annexure - XIV - Restriction for suppliers from a country which shares a land border with India
 - (xvi) Annexure - XV - Declaration by the bidder of percentage of local content
 - (xvii) Annexure - XVI - Guideline to bidders on Reverse Auction (RA)

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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- 3.2 At any time prior to the bid due date and time, NALCO may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Document and issue amendment in the form of Addendum.
- 3.3 Any addendum thus issued will become part of bidding document and bidder shall submit original addendum/ compliance letter duly signed and stamped in token of his acceptance.
- 3.4 In order to afford prospective Bidders, reasonable time in which to take the amendment into account in preparing their bids, NALCO may, at its discretion, extend the bid due date.
- 3.5 Bidder should download the complete set of tender documents which is available in our website www.nalcoindia.com and also in the website www.eprocure.gov.in. Bidders are requested to visit the above websites regularly for any modification/ addition/ bid due date extension for this tender. This information shall not be published in print media.
- 3.6 Bidders shall treat the tender documents and contents therein as strictly confidential.
- 3.7 The tender document is and shall remain the exclusive property of the OWNER without any right to bidder to use them for any purpose except for the purpose of bidding.
- 3.8 The Bidder is expected to examine all instructions, forms, terms and specifications in the Tender Document. The Tender Document together with all its attachments thereto, shall be considered to be read, understood and accepted by the Bidder, unless deviations are specifically stated in seriatim (giving reference sl. no. of Tender Document) by the Bidder. Failure to furnish all information required by the Tender Document or submission of a bid not substantially responsive to the Tender Document in every respect will be at Bidder's risk and may result in the rejection of his bid.
- 3.9 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. 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. 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.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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3.10 CRITICAL DATES:

Online NIT downloading, bid preparation and submission date (both priced and un-priced) : **28/03/2023**, 18:00 Hrs. IST to **03/05/2023**, 13:00 Hrs. IST

Pre-bid meeting at NALCO, Damanjodi, Odisha : **18/04/2023**, 10:00 Hrs. IST

Date and Time of opening of the tender (un-priced only) : **10/05/2023**, 16:00 Hrs. IST

3.11 The National Aluminium Company Limited, Bhubaneswar hereinafter called 'NALCO/ OWNER' will receive bids in respect of the work, items and equipment to be furnished and erected as set forth in the accompanying documents. All bids shall be prepared and submitted in accordance with the instructions as per NIT.

3.12 Bids submitted after the time and date fixed for receipt of bids as set out in the Invitation to Bid are liable to be rejected.

3.13 The terms "Works" referred herein shall cover the entire scope of the proposal which includes supply and erection of items, equipments, labor and services including the successful completion of Performance and Guarantee Tests.

3.14 NALCO prefers to have maximum indigenous content in the supplies and services covered in the scope of this tender.

3.15 The breakup of the complete scope envisaged in this enquiry is attached at Annexure-I. All bidders are requested to indicate positively the division of work (a) to be directly undertaken by the Bidder, (b) envisaged to be undertaken by Bidder's Indian sub-contractor with Bidder's unit responsibility, and (c) to be excluded from Bidder's scope of responsibility.


3.16 **TIME SCHEDULE:**

One of the main considerations for award of the Contract shall be demonstrated capability of the bidder to maintain the time schedule for performing the specified works at all stages of activities. Bidder who have not executed in time similar job in the past may not be considered.

3.17 **BRAND NAMES:**

The specific reference in these specifications and documents to any material by trade name, make or catalogue number shall be construed to as establishing standards of quality and performance and not as limiting condition. However, bidders may offer other similar materials and equipments provided they meet the specified standards, design and performance requirements.

3.18 **GENERAL:** The clauses of this tender document shall be read along with General Conditions of Contract (GCC). Wherever there is a contradiction between clause of this tender document and GCC, the clause as mentioned in this tender document shall supersede the conditions of GCC to the extent applicable.


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4.0 PREPARATION OF BID:

- 4.1 All direct and indirect costs associated with preparation and submission of bid (including clarification meetings and site visit, if any) shall be to bidder's account and NALCO will in no case, be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.
- 4.2 The bid prepared by the Bidder and all correspondence/ drawings and documents relating to the bid exchanged by Bidder and NALCO shall be written in ENGLISH language. Any printed literature furnished by the Bidder written in another language should be accompanied by an ENGLISH translation. In case of any conflict, for the purpose of interpretation of the bid, the ENGLISH translation shall govern.
- 4.3 The bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person duly authorized to bind the Bidder to the Contract. The name and position held by each person signing must be typed or printed below the signature. The person or persons signing the bid shall initial all pages of the bid, except for unamended printed literature.
- 4.4 The complete bid shall be without alterations, interlineations or erasures, except as may be necessary to correct errors made by the Bidder, in which case such corrections shall be rewritten & initialed by the person or persons signing the bid.
- 4.5 The offer should be unambiguous and complete information should be furnished in the offer. Incomplete/ambiguous offers will be rejected outright.
- 4.6 Bidder is required to furnish the complete and correct information/documents required for evaluation of their bid. If the information/documents forming basis of evaluation is found to be false/forged, the same shall be considered adequate ground for rejection of bids and forfeiture of Earnest Money deposit.
- 4.7 Parties submitting tender on behalf of foreign principals/ manufacturers must submit their tender along with authorisation from their respective principals/ manufacturers to represent them in India. Offers received without a proper authorisation will be rejected.

5.0 SUBMISSION OF BID:

- 5.1 The bids are to be submitted **online before the bid due date and time** through Central Public Procurement Portal (CPP Portal), by logging into website www.eprocure.gov.in. Bidder should take into account corrigendum published, if any, on the tender document before submitting their bids. 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/DWF/JPG formats.
- 5.2 The bids are to be submitted **in two parts** in the following manner:

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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5.2.1 Part - I - Techno - commercial Bid:

The Part - I - Bid should contain the following:

- (i) Earnest Money Deposit
- (ii) Pre-Contract Integrity Pact
- (iii) All Technical details, Drawings, Data Sheets, Catalogues/ Literatures, etc.
- (iv) Proof of credentials, past experience, financial standing, and all documents to fulfil the Bidder's Qualifying Criteria as asked for in the tender documents, etc.
- (v) All form and format filled in as per tender document
- (vi) All certificates/ undertakings/ affidavits/ declaration required as per Tender Document
- (vii) Commercial details
- (viii) The Bill of Quantity (without Price figures). The bidder shall indicate "Quoted/ Not Quoted" against each SI. No. in the BOQ and submit the same duly stamped and signed in the un-priced bid. The priced part of this BOQ shall be submitted in the price bid only.
- (ix) Tender document including Corrigendum/Addendum, if any, and subsequent correspondences duly stamped and signed on each page as a token of acceptance
- (x) Certificate, if applicable, indicating that the bidder (indigenous) is Class-I local supplier with minimum percentage of local content in their product as per Public procurement (Preference to Make in India) (PPP-MII) order 2017 dated 16.09.2020 & subsequent revisions thereof. The certificate is to be issued by the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content. The Certificate issued by CA must contain UDIN No., Local content percentage (%) certificate issued from the statutory auditor or cost auditor of the company or from a practicing cost accountant or practicing chartered accountant may be submitted.
- (xi) Compliance certificate towards beneficiary relationship as per Order No. F.No. 6/18/2019-PPD, Dated 23.07.2020 & OM Dated 08.02.2021 issued by Ministry of Finance (Deptt. of Expenditure). Restriction for suppliers from a country which shares a land border with India. Declaration to be given.
- (xii) List of Partners/ Directors in the bidder company and a declaration that Partners/ Directors of the bidder company have no interest in any other bidders in respect of the same tender.
- (xiii) Affidavit & litigation history.
- (xiv) Any other information/details/documents/data required as per Bid Document.

5.2.2 Part - II - Price Bid:

The Part - II - Price Bids should contain the prices strictly as per format attached with the tender documents. Prices shall not appear anywhere else in the offer, and if prices are mentioned anywhere else the same shall not be considered.

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5.3 On - line submission of bids:

- 5.3.1 For online submission of bids, the bidder should have a valid Indian Digital signature certificate (Class II / Class III) issued by any Certifying Authority recognized by CCA India (e.g. Sify/nCode/eMudhra, etc).

Bidders are required to register themselves using the link "Online Bidder Enrollment" on the home page and enroll the valid digital certificate (URL: <https://eprocure.gov.in/eprocure/app>).

For this purpose, vendors/Bidders are advised to read the instruction available in the homepage of the CPP portal (<https://eprocure.gov.in/eprocure/app>) under various links such as "Help for Contractor", "Information about DSC", "FAQ", "and Resources required", "Bidders Manual Kit" etc. Bidder are advised to download & utilize the available information/documents under these links for activities like Registration/Enrolment in CPPP, obtaining User ID & Password, uploading & submission of e-bids/online bids etc.

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.

- The offers should be unambiguous and complete information should be furnished in the offer. Incomplete / ambiguous offers will be rejected outright.
- MSE bidders are requested to register their Udyog Aadhar Memorandum (UAM) issued by Ministry of Micro, Small and Medium Enterprises (MSME) on Central Public Procurement Portal. In this regards MSE bidders are required to give declaration of UAM number on CPPP, failing which such bidders will not be considered as MSE bidder.
- Bidders are advised to dial/contact the person mentioned below for detailed procedure to submit bid online in CPP portal well before the bid due date:

- Help Desk CPP portal, Contact Tel: +91 120 4200462, +91 120 4001002, +91 120 4001005


FMS CPP Portal (Nalco): e-mail: cphp_fms_corp@nalcoindia.co.in

- Mr. Mihir Behera, SM (Matls.), e-mail: mihir.behera@nalcoindia.co.in, Mob - +919437111103

- Ms. Sumita Sahay, GM(Materials), e-mail: sumita.sahay@nalcoindia.co.in, Mob – +919937307790

5.3.2 On – line Offer:

- 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. The bidder must prepare all the required documents for Part – I – Un – priced Bids and then upload the soft copies of

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the documents under Cover – 1 i.e. “Fee/PreQual/Technical” of CPP portal. However, wherever in the tender documents the bidder has been asked to submit the scanned copies of documents, the bidder shall upload the scanned copies of the documents under Cover – 1 i.e. “Fee/PreQual/Technical” folder of CPP portal.

- (ii) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Price Bid (BOQ) as given in the tender in .xls format must be downloaded and saved at bidders’ local PC / Laptop without any change. Bidders shall fill the required details/prices in BOQ, save it and upload the filled in BOQ in .xls format in the portal under Cover -2 i.e. “Finance” folder of CPP portal. 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.
- (iii) 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.
- (iv) Please note that only online bids will be considered for evaluation of offers.


5.4 **Hard copy of Offer:**

Bidders are requested to submit the offer strictly in online mode through Central Public procurement Portal (CPPP). For online submission of offer through CPPP, bidders are requested to upload all documents in the portal. However, original copies of only EMD, Integrity pact and other declaration/certificates, etc. as indicated at para 5.2.1 are required to be submitted in original in hard copy form in sealed envelope (Cover-1). These documents should reach NALCO on or before the date and time of submission of tender (Un-priced bid).

5.4.1 Cover - 1:

The Cover - 1 of the hard copy offer should contain the following documents:

- (i) Original EMD BG/ DD
- (ii) Original Integrity Pact
- (iii) Original copy of certificates/ undertakings/ affidavits/ declaration asked for in the tender
- (iv) A certificate by the bidder stating that the hard copy of offer submitted is same as the on-line offer uploaded by them in CPP portal.
- (v) Local content percentage (%) certificate.
- (vi) Restriction for suppliers from a country which shares a land border with India. Declaration to be given.

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The Cover - 1 of the hard copy should be submitted in a sealed envelope clearly superscribed **“COVER - 1 BID FOR WAGON TIPPLER FOR REFINERY, NIT NO. – NBC/MM/510/3-8937/TIPPLER/2023 DTD. 28/03/2023”**.

5.5 NALCO shall not be responsible for any postal delay and/ or misplacement. Late and Delayed Tenders will not be entertained.

5.6 **Bids/ Offers through E-mail or fax shall not be accepted.**

6.0 EMD:

6.1 The Part - I Bid must be accompanied by Earnest Money Deposit for **INR 25,00,000/- (Rupees Twenty Five Lakh Only)**.

6.2 The EMD should be submitted by way of Demand Draft/ Pay Order/ through e-payment (RTGS/NEFT mode INR currency) favoring “National Aluminium Company Limited” payable at Bhubaneswar, Odisha, India or by way of Bank Guarantee (BG) as per proforma enclosed with the Tender Documents. EMD (except for State/Central Government organizations, PSUs, start-ups and MSE Bidder)

Bidder(s) submitting the EMD amount through NEFT/RTGS/E-transfer mode shall fill up the details of Annexure – X after making the payment of EMD along with the scanned copy of Transaction Slip/ receipt of the Bank **on the same day of payment** by e-mail to purna.gummadi@nalcoindia.co.in with copy marked to mihir.behera@nalcoindia.co.in.

Details for RTGS Transaction/ E-Payment purpose are as below:


IFSC: SBIN0009817

Account No. : 10044880013

Banker: State Bank of India, NALCO Corp. Office Br., Bhubaneswar-751013.

6.3 The BG should be furnished from any of NALCO approved Banks as per the list enclosed with the Tender Document. The wording of BG should be strictly as per proforma and no deviation to the same shall be permitted. Seller is required to ensure the same from the issuing bank. The issuing Bank should be advised to send a direct confirmation to NALCO, clearly indicating the Tender No., towards issue of the BG. Alternatively, BG confirmation message may also be sent through SFMS message to our Banker State Bank of India, Commercial Branch, Bhubaneswar (IFSC Code: SBIN0006657, SWIFT CODE: SBININBB119) and beneficiary name as "NALCO, Corporate Office, Bhubaneswar". The BG for EMD shall remain undischarged for such a period as may be specified for keeping the tender open. The EMD BG should have a validity of at least three months beyond the period of validity of bid asked for in the tender document. The validity of the EMD BG may have to be extended by the bidder on request of NALCO, till the tender is finalized.

6.4 Bidders should upload a scanned copy of the BG/ DD along with their On - line Part - I - Bid. The original copy of the BG/ DD should be submitted in cover - I of the hard copy offer.

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6.5 Offer without EMD may be liable for rejection.

6.6 If the tenderer, after submitting his tender, revokes the offer or modifies the terms & conditions thereof, in a manner not acceptable to NALCO, the EMD BG shall be liable to be forfeited / enforced. In case the EMD has been paid in the form of DD, the EMD amount will not be refunded back in case of forfeiture of EMD.

6.7 State/ Central Government organizations, Public Sector Undertakings, Firms registered with DGS&D/ NSIC/ District Industries Centers (DICs)/ Khadi & Village Industries Commission (KVIC)/ Khadi & Village Industries Board (KVIB)/ Coir Board/ Directorate of Handicrafts & Handloom or any other body specified by Ministry of Micro, Small and Medium Enterprises (for the tendered item) and NALCO's Ancillary units and all start-ups recognized by deptt. of policy & promotion, Ministry of commerce and Industry Govt. of India are exempted from furnishing EMD. However, they must submit notarized (by a public notary) valid copy of their registration certificate for claiming the exemption.

MSE bidders are required to submit "Udyam Registration No." as per the notification no. 2/1(5)/2019-P&G/Policy (pt. IV) dated 06.08.2020 issued by Ministry of MSME along with technical bid, failing which such bidders will not be considered as MSE bidder.

6.8 After finalization of the tender, the EMD BG of unsuccessful tenderers will be returned. In case the EMD was submitted in the form of Demand Draft/ Pay Order/ through e-payment, the EMD amount will be refunded through e-payment for which the bidders will have to submit the duly filled in Bank Mandate Form attached with the Tender Documents. The EMD of successful tenderer shall be returned after submission of Contract-cum-Performance Bank Guarantee. If the successful bidder accepts the order but fails to submit the CPBG, the EMD will be retained. In such case differential amount towards CPBG and EMD may be deducted from the bills of vendor, which shall be released after receipt of acceptable Contract-cum-Performance Bank Guarantee (CPBG). In the event of non-execution of Order, the EMD will stand forfeited.


6.9 CONTACT PERSON AND ADDRESS OF NALCO:

The contact person and address of NALCO for submitting the hard copy of offer in sealed envelope is as follows:

GM (Materials)
National Aluminium Company Limited,
Nalco Bhawean, P/1,
Nayapalli, Bhubaneswar,
Odisha - 751 013

7.0 MODIFICATION & RE-SUBMISSION OF BIDS:

7.1 Modification of the submitted bid may be allowed online only before the deadline of submission of tender and the bidder may modify and resubmit the bid online as many

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times as he may wish till the closing date and time of the tender. Bidders may withdraw their bids online within the end date of bid submission.

- 7.2 For hard copy of the offer, the bidder may modify or withdraw their bid after the bid's submission, provided that the modification/ withdrawal notice is received by the Owners prior to the bid due date & time.


The Bidder's modification or withdrawal notice shall be prepared, sealed, marked and dispatched to the address mentioned at Sl. No. - 6.9 above. A withdrawal notice may also be sent by e-mail but must be followed by a signed confirmation copy dated not later than the deadline for submission of bids.

- 7.3 No bid (whether submitted online or offline) shall be modified subsequent to the due date & time or extension, if any, for submission of bids.
- 7.4 No bid (whether submitted online or offline) shall be allowed to be withdrawn in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder. Withdrawal of a bid during this interval shall result in the forfeiture of Bidder's Earnest Money Deposit.

8.0 OPENING OF BIDS:

Part - I Bid:

- 8.1 The Part - I - Un - priced bid i.e. Techno - commercial Bid shall be opened on the date and time specified in the Notice Inviting Tender (NIT).
- 8.2 It is the duty of the bidder to ensure that all documents required as per the tender has been uploaded properly in CPP portal.
- 8.3 NALCO reserves the right to extend Bid Opening Date. In case of extension of Bid Opening Date, the same shall be hosted in NALCO Website and CPP Portal. Special intimation shall be given to vendors who have shown interest in the tender.
- 8.4 The Part - I Bids will be opened on specified date and time as given in the tender or in CPP portal. Authorized representative of firms who have submitted valid tenders will be permitted to attend tender opening. However, they must bring authorization letter along with identity card while participating in bid opening. The Bidder's representatives, who are present, shall sign a bid opening statement evidencing their attendance. Bidders whose bids are not opened for any reason, will not be allowed to be present during bid opening. The Bidder(s) names only will be announced and recorded at the time of opening of un-priced bids. The Independent External Monitor (IEM) will oversee the compliance to the Integrity pact for this NIT.
- 8.5 The Part - II Bid of only those tenderer whose Part - I Bid is found to be techno-commercially acceptable will be opened. The On - line Part - II - Price bids of the techno - commercially acceptable bidders shall be opened.


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NALCO will intimate the date and time of the price bid opening to all techno - commercially acceptable bidders. The techno - commercially acceptable bidders may depute their representative to witness opening of the Part - II Bids. Bidder's representatives present for witnessing the opening of Part - II Bid should be duly authorized by a competent person and they must bring authorization letter along with identity card while participating in bid opening. The Bidder's representatives, who are present, shall sign a paper evidencing their attendance. The Bidder's names and bid prices will be read out at the time of opening of priced bids.

- 8.6 In the event of extension of the due date, if any tenderer requests in writing before the tender due date for withdrawing of their tender (in hard copy) which they have submitted, the request will be agreed to and their tender can be returned. In case of e-tender/ on-line bids the vendor may withdraw their offer from the system.
- 8.7 In case of withdrawal of deviations to NIT specification, if any, bidder insists for revision in price before opening of price bid and Nalco agrees for the same, the submission of price implication shall be in offline/ physical mode from the bidder in a sealed envelope by hand/ mail or password protected file through e-mail within a stipulated time. The submission of price implication will be intimated for information to all other techno-commercially acceptable bidders.
- 8.8 In case of necessity due to post tender minor changes in specifications/ scope of work/ terms & conditions of NIT, etc. before price bid opening, corrigendum shall be issued regarding the changes to all concerned techno-commercially qualified bidders and they shall be permitted to submit the additional or take-off price w.r.t. original offered price, if any, in offline mode in sealed envelope by hand/ mail or password protected file through e-mail within a stipulated time.
- 8.9 The additional or take-off price submitted in offline mode by the bidders shall be opened and uploaded in CPP portal (preferably as part of techno-commercial evaluation summary while configuring price bid opening) before opening of original price bids for information of all the participating bidders. The evaluation will be done taking into account the original on-line price bid along with offline price implications.

9.0 INTEGRITY PACT:

- 9.1 The accompanying '**Integrity Pact**' attached at **Annexure - XIII** of Tender documents is to be executed in two (02) originals.
- 9.2 The tenderer must sign the Pre-Contract Integrity Pact duly filled in, signed, and stamped (from their side) on Plain A-4 Size Paper & submit the same along with un-priced bid, failing which offer shall be liable for rejection.
- 9.3 All the pages of the Integrity pact are to be signed by the bidder.
- 9.4 Bidders are required to clearly indicate the name and designation of the signatory(ies) as well as the name and address of the witnesses.

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- 9.5 The Bidders should not change the contents of the Integrity Pact.
- 9.6 The two (2) originals of Integrity Pact signed and stamped on each page by the bidder have to be submitted in **cover - 1 of the hard copy offer**. The scanned copy of the Integrity Pact is to be uploaded along with their On - line Part - I - Bid.
- 9.7 The two originals of Integrity Pacts will be signed by the representative of NALCO. One original of the Integrity Pact will be retained by NALCO and the other original will be returned to the bidder through post/courier.

Only those bidders, who commit themselves to such a Pact with NALCO, would be considered competent to participate in the bidding process. In other words, entering into this Pact would be a preliminary qualification for the tender.

- 9.8 At present, there is a panel of three Independent External Monitors (IEM) in NALCO. Their contact details are given as below:

(i) Ms. Archana Ranjan IRS (Retd.)
E-mail: ranjan.archana@gmail.com,

(ii) Ms. Deepa Krishan IRS (Retd.)
E-mail: deepakrishan@gmail.com,

(iii) Dr. Meeran C Borwankar, IPS (Retd.)
E-mail: mcborwankar@gmail.com,

Bidder may write to either of the IEMs through e-mail for their grievances related to Integrity pact, if any, giving details of the tender, name of the tender issuing officer etc. for quick identification of the tender by the IEM to resolve their grievances.


Note:

1. Only representation in respect of Integrity Pact need to be addressed to the IEM and no query regarding tender terms and conditions should be address to the IEMs. Any clarification regarding the tender details and terms & conditions should be addressed to NALCO's officials.

2. For any tender related queries, bidder may write Mr. Mihir Behera, SM (Matls.), Mail ID: mihir.behera@nalcoindia.co.in or Ms. Sumita Sahay, GM(Materials), Mail ID: sumita.sahay@nalcoindia.co.in

10.0 CONTACTING THE OWNER

- 10.1 No correspondence, whatsoever until & unless called for by the buyer, shall be entertained after due date and time of receipt of tender and any uncalled for communication received later from the tenderers /agents will be ignored.

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- 10.2 Any efforts by a bidder to influence NALCO in its bid evaluation, bid comparison or contract award decisions may result in rejection of the bidder's offer.

11.0 **AWARD CRITERIA**

The Owner will award the Contract to the successful Bidder whose bid has been determined to be the lowest evaluated, responsive bid, provided further that the Bidder is determined to be qualified to satisfactorily perform the Contract.


- 12.0 Prior to the expiration of bid validity, NALCO will issue a Letter of Intent or Purchase Order to the successful Bidder. The Notification of Award will constitute the formation of the Contract. Delivery Period/ Completion Period shall be counted from the date of Notification of Award/ Purchase Order.

13.0 **OWNER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS**

NALCO reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or Bidders. The submission of any bid connected with these documents and specifications shall constitute an agreement that the Bidder shall have no cause for action or claim, against the Owner for rejection of his bid. The Owner shall always be at liberty to reject or accept any bid or bids at his sole discretion and the Bidder shall have no claim in that regard against the Owner. However, a bidder may seek clarification regarding the bidding document provisions, bidding process and/ or rejection of his bid. NALCO shall respond to such queries within a reasonable time.

14.0 **INFORMATION REQUIRED WITH THE BIDS**

- 14.1 The bids must clearly indicate the name of the manufacturer, the type or model of each principal item of equipment proposed to be furnished and erected. The bid should also contain drawings and descriptive materials indicating general Dimensions, material from which the parts are manufactured, principles of operation, the extent of pre-assembly involved, major construction equipment proposed to be deployed, method of erection and the proposed erection organizational structure.
- 14.2 The above information shall be provided by the Bidder in the form of separate sheets, drawing, catalogues etc., in all copies of the bid.
- 14.3 Any bid not containing sufficient descriptive material to describe accurately the equipment proposed may be treated as incomplete and hence rejected. Such descriptive materials and drawings submitted by the Bidder will be retained by the Owner. Any major departure from these drawings and descriptive materials submitted will not be permitted during the execution of the Contract without specific written permission of the Owner.
- 14.4 Oral statements made by the Bidder at any time regarding quality, quantity or arrangement of the equipment or any other matter will not be considered.

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- 14.5 Standard catalogue pages and other documents of the Bidder may be used in the bid to provide additional information and data as deemed necessary by the Bidder.

15.0 UNDERSTANDING AND CLARIFICATION ON DOCUMENTS & SPECIFICATIONS

- 15.1 The Bidder is required to carefully examine the specifications and documents and fully inform himself as to the conditions and matters, which may in any way affect the works or the cost thereof. If any Bidder finds discrepancies or omissions in the specifications and documents or is in doubt as to the true meaning of any part, he shall at once request in writing for an interpretation/ clarification to the Owner. The Owner, then will issue interpretations and clarifications as he may think fit in writing. After receipt of such interpretations and clarifications, the Bidder may submit his bid but within the time and date as specified in the invitation to Bid. All such interpretations and clarifications may accompany the Bidder's proposal.
- 15.2 Verbal clarifications and information given by the Owner or his employee(s) or his representative(s) shall not in any way be binding on the Owner.

16.0 LOCAL CONDITIONS


- 16.1 It will be imperative on each Bidder to fully inform himself of all local conditions and factors which may have any effect on the execution of the Works covered under these documents and specifications. In their own interest, the Foreign Bidders are requested to familiarize themselves with the Income Tax Act, 1961; the Companies Act, 1956; Customs Act, 1962 and other related acts and laws prevalent in India. The Owner shall not entertain any request for clarifications from the Bidders regarding such local conditions.
- 16.2 It must be understood and agreed that such factors have properly been investigated and considered while submitting the bids. No claim for financial adjustment to the Contract awarded under these specifications and documents will be entertained by the Owner. Neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by the Owner which are based on the lack of such clear information or its effect on the cost of Works to the Bids.

17.0 FIRM PRICE

- 17.1 The price quoted for the entire scope of work shall remain firm and fixed till complete execution of work.

18.0 CUSTOMS DUTIES AND TAXES

- 18.1 In case of domestic bids, all Custom Duties and levies payable on imported components, sub-assemblies and raw materials by the local Bidders shall be included in the their prices and no claim on this behalf will be entertained by the Owner.

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- 18.2 The Contractor shall include all taxes, duties, royalty of whatever nature, other local taxes etc. if any, in the quoted price.
- 18.3 As regards the INCOME TAX, surcharge on Income Tax and other taxes, the bidder shall be responsible for such payment to the authorities concerned.

Bidder may note that if any tax is deductible at source as per Indian Income Tax Law, the same will be so deducted before releasing any payment to the bidder. Accordingly, bidder shall have the responsibility to check and include such provisions of taxes in their prices and shall clearly spell out inclusions of taxes, if any, in their quoted prices.


19.0 **EFFECT AND VALIDITY OF BID**

- 19.1 The submission of any bid connected with these documents and specifications shall constitute an agreement that the Bidder shall have no cause for action or claim, against the Owner for rejection of his bid. The Owner shall always be at liberty to reject or accept any bid or bids at his sole discretion and any such action will not be called into question and the Bidder shall have no claim in that regard against the Owner.
- 19.2 The bid should be kept valid for acceptance for a period of 6 (six) months from the bid due date/ extended bid due date.

20.0 **AWARD OF CONTRACT**

- 20.1 Notification of Award of Contract will be made in writing to the successful Bidder by the Owner initially in the form of Letter of Intent/ Brief Order/ Purchase Order which will be formalized by a Contract to be signed by both Owner and Bidder. All contractual obligations including delivery shall commence from the date of Letter of Intent/ Brief Order/ Purchase Order.
- 20.2 Owner reserves the right to award one or more separate contracts in line with the terms & conditions specified in the accompanying technical specifications.
- 20.3 Within 07 (seven) days of receipt of the Brief Order / Purchase Order, the Bidder shall sign and return it to the Owner for their records as a token of their acknowledgement of acceptance of the Brief Order / Purchase Order, failing which it shall be deemed that the Brief Order / Purchase Order has been accepted by the bidder in toto.
- 20.4 The Effective Date of Order shall be considered as the date of Notification of Award/ Brief Order/ Purchase Order. All contractual obligations shall commence from the Effective Date of Order.

21.0 **DEVIATION TO BID DOCUMENT**

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The bidders are requested to carefully study all the contract documents like invitation to bid, instructions to bidders, special instructions to bidder, general terms & conditions of the contract and all other documents and they shall prepare a deviation statement, if any, clearly indicating the deviations sought for by the bidder.

Any deviation not mentioned in the statement and mentioned anywhere else in the bid will not be considered and if such items are not clearly explained in the deviation statement, it will mean that the contractor has agreed to all other terms & conditions mentioned in the above bid documents.

22.0 **CHECK LIST**

The Bidders are requested to duly fill in the checklists as mentioned in Tender Documents.

23.0 **SOCIAL ACCOUNTABILITY:**

We are Social Accountability SA 8000 Certified Company. It is expected that our Suppliers / Service providers confirm to the requirements of this International Standard SA 8000:2014. The bidder should ensure to follow the statutory social accountability norms of India also. The Survey Questionnaire (attached as at Annexure-XII) may please be filled up and sent along with the Bid.

24.0 **CRIMINAL PROCEEDINGS / CASES:**


The bidder or its Proprietor / Partner(s) / Director(s) of the firm should not have been convicted by a court of Law for an offence involving moral turpitude in relation to business dealings during the past seven (7) years. The bidder shall give an Affidavit to this effect. The Affidavit must be affirmed before the competent judicial authority or duly notarized by the Public Notary.

Bidders should upload the scanned copy of the declaration with their On - line Part - I - Bid. The original copy of the declaration should be submitted in cover - 1 of the hard copy offer.

25.0 **LITIGATION HISTORY:**

Bidder should furnish Litigation History of their firm or group firm. The litigation history shall include:

- (i) Arbitration cases pending
- (ii) Disputed incomplete works
- (iii) Pending civil cases against the firm or its Proprietor / Partner(s) / Director(s) involving moral turpitude in relation to business dealings.
- (iv) Pending criminal cases against the firm or its Proprietor / Partner(s) / Director(s) involving moral turpitude in relation to business dealings.
- (v) Punishments awarded under civil cases or criminal cases involving moral turpitude in relation to business dealings.

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26.0 LATE BIDS


- (i) E-tendering portal shall close immediately after the deadline for submission of bid.
- (ii) The online bid must be submitted before the bid due date and time.
- (iii) The Hard Copy of offer should reach us on or before the bid due date and time.
- (iv) Late bids will not be entertained.

- 27.0 The bidder has to furnish a declaration to the effect that they have not been banned or de-listed by any Government or Quasi Government agencies or PSUs of India. If they have been banned or de-listed by any Government or Quasi Government agencies or PSUs, then this fact must be clearly stated. The declaration/ undertaking should be in the bidder's official letterhead duly signed by the authorised signatory with official seal. Offer without this declaration are liable for rejection.

Bidders should upload the scanned copy of the declaration with their On - line Part - I - Bid. The original copy of the declaration should be submitted in cover - 1 of the hard copy offer.

- 28.0 The bidder shall furnish detailed information regarding the names of other firms/ agencies/ partnership firm/ wholly owned or partly owned/ subsidiary etc. where they are having financial/ professional stakes along with the Part - I - Bid. The bidder should also give a declaration/ undertaking that any such firm/ agency are not participating in the same tender. The declaration/ undertaking should be in the bidder's official letterhead duly signed by the authorised signatory with official seal. Offer without this declaration are liable for rejection.

Bidders should upload the scanned copy of the declaration/ undertaking with their On - line Part - I - Bid. The original copy of the declaration/ undertaking should be submitted in cover - 1 of the hard copy offer.

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INSTRUCTION FOR ONLINE BID SUBMISSION IN CPP PORTAL (as per CPP Portal):

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

- 1) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: <https://eprocure.gov.in/eprocure/app>) by clicking on the link **"Online bidder Enrollment"** on the CPP Portal which is free of charge.
- 2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- 3) 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.
- 4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (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.
- 5) 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.
- 6) 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

- 1) 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.
- 2) 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.
- 3) 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.

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PREPARATION OF BIDS

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

2) 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.

3) 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 / DWF/JPG formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

4) 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

1) 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.

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

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

4) Bidder should prepare the EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the concerned official, latest by the last date of bid submission or 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.

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5) 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.

6) 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.

7) 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 opener's public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.

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

9) 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.

10) 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

1) 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.

2) 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.



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Volume – I

General Description


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- 1.1 Introduction
- 1.2 Intent of Specification
- 1.3 Description of Existing Plant & Details.
- 2.0 Scheme of Up-gradation Package.
- 3.0 Scope of Work & Battery Limit
- 4.0 System Design Basis

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1.0 SITE DESCRIPTION

Damanjodi is a small town in the culturally rich and beautiful Koraput district in the Indian state of Odisha. It is primarily a hilly area with outstanding natural beauty and scarce population. A vast majority of the population of Damanjodi comprises the employees of National Aluminium Company (NALCO), Asia's largest and the world's seventh largest producer of aluminium. Most of population is cosmopolitan as the employees hail from all parts of the country.


National Aluminium Company Limited (NALCO) is Asia's largest integrated aluminium complex, encompassing bauxite mining (known as the Panchapatmali mines), alumina refining, aluminium smelting and casting, power generation, rail and port operations. NALCO is also involved in community development. Also popular as "Panchpatmali Mines" (meaning: The Mine is surrounded by Five Hills).

It has a reserve of bauxite ore for about 120 years for the continuous production of alumina, and then aluminium. However, those estimations were based on an annual extraction of 240,000 tons of bauxite from the mines. The town of Damanjodi has many surrounding places worth visiting. The HAL engine division in the adjacent town of Sunabeda is just a few minutes by road and is another well planned, self-sustaining township. Damanjodi is well connected by local and government bus and rail services to the nearest town of Koraput, the larger town of Jeypore, the township of Sunabeda and many other major towns and cities of the state of Odisha.

(A) SITE DATA INFORMATION

Site Location

Particulars	Details
Plant Location	Damanjodi
Altitude	Approximately 1000 meter above MSI.
District	Koraput
State	Odisha
Nearest Port & Airport	Visakhapatnam (A.P.) 175 km
Nearest Railway Station	Damanjodi (4 km)
Nearest Highway	National Highway No. 43 (Connected by a 12 km. road).

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(B) GEOGRAPHICAL DATA

Climatic Conditions

Particulars	Avg. (Min)	Avg. (Max)
Dry Bulb temp (° C)	03.0	46.6
Wet Bulb temp (° C)	14.0	21.6
Relative Humidity (%)	50.0	89.0

(C) RAINFALL

Particulars	Details
Rain Season	June to September
No. of rainy days per month	7 (avg.), 22 (max)
Annual rainfall (mm)	2061 (avg.) 2940 (max)
Max. rainfall in one day (mm)	354
Max. design hourly rainfall intensity (mm)	80


(D) BAROMETRIC PRESSURE

Particulars	Details
Monthly averages	
Max.	915.1 mbs
Min.	901.8 mbs
Yearly averages	
Morning (0830 hrs.)	909.8 mbs
Evening (1730 hrs.)	907.2 mbs
Design	901.0 mbs

(E) WIND VELOCITY & DIRECTION

Prevailing Wind direction percentage of days / year:

Particulars	Details
Morning (0830 hrs.) from	N(4), NE(4), E(5), SE(5), S(26), SW(33), W(16), NW(7), Caim (0)
Evening (1730 hrs.) from	N(28), NE(5), E(5), SE(7), S(6), SW(10), W(19), NW(20), Calm(0).
Wind Velocity (km. / hr)	
Maximum	60 KMPH
Minimum	19 KMPH
Basic pressure for the wind	150 kg / m ² up to 30 M height

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(F) SEISMIC CONDITION

Zone - II

(G) Rail / Air Connectivity

The rail connectivity has daily direct trains to the cities of Visakhapatnam (Andhra Pradesh), Howrah, Kolkata (West Bengal), and the capital city of Bhubaneshwar. The nearest airport is 4 hours away in the city of Visakhapatnam (which is about 210 Km). There are direct bus and rail services at various times of the day to and from Visakhapatnam.

1.1 INTRODUCTION


- National Aluminium Company Limited (A Govt. of India Enterprise) has expanded its Alumina Refinery Plant at Damanjodi, Odisha, from its earlier capacity of 1.575 MTPA to 2.1 MTPA and subsequently after de-bottlenecking; capacity has been increased to 2.275 MTPA. This 2nd phase expansion along with de-bottlenecking has called for additional process steam and power requirement. To meet this additional process steam and power demand, NALCO has added one Steam Generating Unit # 5 (SGU) of 250 TPH capacity along with 18.5 MW Back Pressure Turbine Generator # 4 (BPTG) as an extension of their existing steam-cum-co-generating power plant having 4 x 200 TPH pulverized coal fired Steam Generators and 3 x 18.5 MW Back Pressure Steam Turbine Generators. The expanded steam cum power generating plant is part of second phase expansion of Alumina Refinery Complex. Presently NALCO is under third phase of expansion of 1.0 MTPA alumina plant comprising of 300TPH pulverized coal fired Steam Generator and 18.5 MW Back Pressure Steam Turbine Generator.

1.1.1 The Coal Handling Plant supplying screened/crushed coal for Steam Generators (Boilers) is anticipated to handle coal at enhanced rate from present level of 1.0 MTPA to 1.50 MTPA in view of introduction of the fifth Boiler for additional steam demand.

1.1.2 With reduction of allowable unloading time for unloading by railways from 14.5 hours to 9 hrs, NALCO has suffered huge demurrage with the present system of manual unloading of coal rakes with existing low capacity of wagon tippler. In order to reduce the demurrage, improved wagon tippler has been essential.

1.1.3 It has been envisaged that with the introduction of improved wagon unloading arrangement, improved wagons in-haul, out-haul system alongwith the associated new conveying system and by increasing the conveying capacity of the Existing CHP and the associated equipment/systems, the demurrage cost can be waived out.

1.1.4 The entire Package of introduction of New facilities, revamping the existing facilities and dovetailing the New system with the Existing one, has been termed as Up-gradation Package.

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1.1.5 **UPGRADATION PACKAGE**

Up-gradation of the existing CHP consists of:

- (a) Installation of New Wagon tippler, Side Arm Charger, hydraulic Breaker, new conveying system and
- (b) Up-gradation of existing conveyors-3A/3B.

For detail description ref. Section 2.00

1.2 **INTENT OF SPECIFICATION**

This Specification is intended to cover design, engineering, manufacture, assembly / reassembly, constructional features, tests at manufacturer's works, forwarding, (duly packed for transportation), transportation, delivery to the work site for proposed Up-gradation of Existing CHP in SPP located at the premises of M/s National Aluminium Company Ltd. (NALCO), Damanjodi, in Koraput District, of Odisha; unloading, handling, in-plant transportation for storage at site complete execution of Civil/Structural and allied works, including complete erection, testing and successful commissioning of the plant and equipment / systems as a whole and training to CHP operating personnel and handing over the plant as whole in flawless operating condition to the Purchaser (NALCO) upto full satisfaction of the Consultant and the Purchaser (NALCO).

1.2.1 The areas as listed below for Coal Handling Plant have been considered in this technical specification along with balance units given in scope of work in section 3.00 vis-à-vis scheme of up-gradation plant section 2.00 (Vol. – I).


- i. Unloading of coal to new Wagon Tippler WT – 2.
- ii. Suitable up-gradation and revamping of existing conveyors-3A/3B to cater the capacity of 900 TPH.

1.2.2 NALCO presently in the process of appointing consultant for the instant project who will be Engineer-In –Charge for the project.

1.2.3 The bidder specification has been prepared in six volumes as listed in content and before each volume.


All the drawings are enclosed in Vol. – VI.

1.2.4 This technical specification calls for complete turnkey execution of the job covering the design, engineering, manufacture, supply, handling, storage, dismantling, erection, painting, testing, commissioning of plant & equipment complete with civil, structural, mechanical, electrical, instrumentation & air-conditioning, ventilation, DFDS System, firefighting various facilities like MCC Room, Control room, Pump-Compressor Room etc. and demonstration of

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performance guarantee parameters of the system of above mentioned area in a coordinated and integrated manner as per the relevant area in a coordinated and integrated manner as per the relevant clauses of the specification including retrofitting of new facilities with the existing layout.

- 1.2.5 The successful Bidder shall receive necessary utility services not covered in this TS at battery limits and a predetermined leveled site for installation of new Wagon Tippler in Coal Handling Plant. The details of the same have been elaborated in the succeeding chapters.
- 1.2.6 The technical specification shall be read in conjunction with other bidder documents like General Technical Specification (GTS), GTS (Civil), GCC of NALCO. Notice inviting Bidder (NIT), Bid data sheet, Commercial document of NALCO and any other document enclosed by Purchaser for design, supply & installation of plant and equipment (Turnkey basis). The provisions given in these documents shall be complimentary to one another. However, in case of any conflict between the provisions of these documents with respect to technical matter, the provisions in the technical specification will prevail.
- 1.2.7 This specification is for guidance only and the design & engineering shall be complete in all respect and any equipment or facility not covered in this specification but considered essential for proper installation and smooth operation, ease of maintenance of Plant / equipment and demonstration of PG parameters shall be deemed to be included in the scope of the bidder.
- 1.2.8 The railway facilities (for New Wagon Tippler WT-2) including laying of railway lines, modification of existing lines, interconnection, signaling and OHE shall be done separately, which is not included in this TS.
- 1.2.9 However, the execution of the proposed project would call for meticulous planning, monitoring and control during construction stage. The successful bidder along with consultant will co-ordinate with Expansion Project Consultant M/s M N Dastur for incorporation of the requirements of the Expansion project. The future conveyor as detailed in the attached drawings for this tender is for our present On-Going Expansion Project being looked by consultant, M/s M N Dastur.
- 1.2.10 Bidder is advised to visit the site before submission of the bid and familiarize himself with the general and local site conditions as well as all others matters which can, in any way, affect the work covered in this specification.
- 1.2.11 Some changes in the scope or any alternative scheme with respect to this tender specification is felt necessary by bidder, the same shall be clearly spelt out with add on / take out price.
- 1.2.12 The bidder shall study the specification along-with related documents and satisfy himself thoroughly regarding suitability of the plant and equipment and system, specified in the tender document and take full responsibility for guaranteed operation of the equipment with

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respect to output, reliable working as well as ease of operation, inspection and maintenance including replacement with minimum down time.

- 1.2.13 The bidder shall satisfy himself before submission of the offer, the nature and location of work place, kind of equipment, facilities, services, etc needed during performance of work, general and local conditions as well as all other matters which can, in way, affect the work covered in this specification.
- 1.2.14 The successful bidder shall be responsible for coordinating the supplies covered in the different parts of this Specification from different sources and execute the contract within agreed time schedule.
- 1.2.15 The bidder shall endeavor to use maximum indigenous equipment / facilities which may be available in India / be manufactured in India by Indian associates based on manufacturing drawings to be supplied by the bidder / his sub-suppliers. All indigenous equipment / components shall be selected from the list of Preferred Makes as enclosed.

1.3 **EXISTING COAL HANDLING PLANT**

Following are the details of the existing coal Handling Plant for reference of the bidders. It may please be noted there details are for reference only. Bidders should Cross check the details especially for upgraded conveyors before submission of bid.

1.3.1 **PRE-CRUSHING**


ROM coal of size 200 mm or below is transported to the plant site by broad gauge wagons and is unloaded by one Rotaside wagon tippler. Inhaul and outhaul operations of incoming and outgoing wagons are carried out by inhaul and outhaul beetle charger respectively.

From wagon tippler coal is unloaded into wagon tippler hopper. Coal is fed to conveyor 1A with the help of three vibrating feeders no. VFD-1,2 & 3. Flow is controlled in such a way that flow rate through conveyor 1A does not exceed 600 TPH.

Each vibrating feeder is preceded by Rack and Pinion gates (RPG- 1, 2 & 3) for isolation of feeders. Conveyor-1A conveys coal to TP-1 (Transfer Point-1) where it discharges through chute on conveyors 2A/2B. Subsequently conveyors 2A/2B carries coal to TP-2 and discharge on conveyors 3A/3B. Conveyors 3A/3B discharge coal to coal yard through four numbers of telescopic chutes (TC-1, TC-2, TC-3 & TC-4). Coal is shifted from the bottom of Telescopic chute and stacked at different places in the coal yard.

1.3.2 **CRUSHING AND POST CRUSHING ZONE**

Coal is reclaimed from the stock pile by pay loaders and fed through the reclaim hopper. There are four Reclaiming hoppers provided at coal yard. From four reclaim hoppers, coal can be fed to either of conveyor 4A or 4B through a set of eight vibrating feeders (VFD-4 to 11) preceded by eight Rack & Pinion gates (RPG-4 to 11). Conveyor 4A or 4B conveys the

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coal to top of the Crusher House and has been provided with Cross Belt Magnetic Separator (CBMS-1,2) and Magnetic Pulley (MP-1,2) for each conveyor for separation of tramp iron to protect the Crusher.

At Crusher House conveyor 4A/4B discharges coal to Vibrating Screen (VS-1,2) for separation of coal above 40 mm size. Over size coal (more than 40 mm size) is fed to either of two Ring Granulator type crusher and the below size coal (less than 40 mm size) gets by-passed from crusher and directly fed to either conveyor 5A or 5B. In crusher coal of size more than 40 mm will be reduced to less than 40 mm size and fed to either conveyor 5A or 5B

Conveyors 5A/5B conveys coal to TP-3, where coal is discharge to either conveyor 6A or 6B through Flap Gate (FG-7). At head end of each conveyor 5A and 5B, Cross Belt Magnetic Separator (CBMS-3,4) and Magnetic Pulley (MP-3,4) has been provided for separation of tramp iron to protect the Mill. Two numbers of belt weighers are mounted on conveyor 5A and 5B for the purpose of coal flow measurement. Conveyor 5A/5B discharges coal to conveyor-6A/6B and subsequently to conveyor-7A/7B and 7C/7D through a set of flap gates. Conveyor 7A/7B/7C/7D conveys coal to individual bunkers of the Boilers located in each boiler.


1.3.4 TECHNICAL DATA OF BELT CONVEYORS OF EXISTING COAL HANDLING PLANT

Sl. No.	Conv. No.	Capacity (TPH)	C/C Length (M)	Belt Width (MM)	Belt Speed (M/S)	Motor Rating (KW)	Grade of Belt	Belt Material	Belt Rating
1	1A	600	54.000	1000	2.3	35	M-24	N/N	630/3
2	2A/2B	600	160.100	1000	2.3	75	M-24	N/N	630/3
3	3A/3B	600	210.000	1000	2.3	100	M-24	N/N	630/3
4	4A/4B	300	327.600	800	1.9	75	M-24	N/N	630/4
5	5A/5B	300	241.500	800	1.9	75	M-24	N/N	630/4
6	6A/6B	300	103.500	800	1.9	37	M-24	N/N	630/3
7	7A/7B	300	121.800	800	1.9	30	M-24	N/N	630/3
8	7C/7D	300	103.800	800	1.9	30	M-24	N/N	630/3

1.3.5 Basic Technical Details of Conveyor Pulleys

(A) Conveyor Pulleys of existing Coal Handling Plant (Group II. Conveyors)

Convey or No.	Belt Width	Pulley Type	Shaft Dia. at bearing	Pulley Dia.	Pulley width	Bearing C/C Distance
3A	1000	Head Pulley	140	500	1150	1600
		Tail/Fixed Tripper/Takeup Pulley	100	400	1150	1600
		Snub Pulley	100	315	1150	1600
		Bend Pulley	75	315	1150	1380


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Convey or No.	Belt Width	Pulley Type	Shaft Dia. at bearing	Pulley Dia.	Pulley width	Bearing C/C Distance
3B 3B	1000 1000	Drive Pulley	140	500	1150	1600
		Snub Pulley	90	323	1150	1600
		Deflector Roller	50	219	1150	1240
		Tail/Take-up Pulley	110	400	1150	1600
		Bend Pulley	110	323	1150	1600
		Tripper Pulley	135	500	1150	1600

2.0 SCHEME OF UP-GRADATION PACKAGE

Brief description of the up-gradation package is given below for understanding the system. Elaborate details for procurement action furnished in vol. – II (section-6.00).


- 2.01 The Up-gradation Package of the existing Coal Handling Plant is conceptually developed and shown in the enclosed Flow Scheme drawing (Drg No CHP/NIT/MECH/02) which shall be read in connection with Plot Plan and Plant Layout drawing (Drg No CHP/NIT/MECH/01).
- 2.02 In flow scheme, plot plant, and layout drawings New Facilities, Existing & Up-graded Facilities and Existing Facilities have been shown in different colours for proper identification and better understanding. Conveyor Schedules, as shown in Flow Scheme drawing for general guidance for the Bidders, which shall be considered as preliminary and minimum recommended but not final. Bidder has to substantiate all motor powers by calculations as per relevant standard / codes.
- 2.03 A new **Wagon Tippler, WT-2 (motorized) and Side Arm Charger, SAC (hydraulic)** will be provided, by which **ROM coal -200 mm size** (occasionally 2-5% over size lump (Max. 2000 mm and average 600 mm) will be discharged on fixed grizzly mounted on top of new RCC Tippler Hopper at WTB-2 building. A new **Hydraulic Breaker** will also be provided at WTB-2 for breaking of oversize lumps of coal, to pass through the individual grizzly **deck openings of 200 mm x 200 mm**.
- 2.04 As per the scheme, coal will be delivered to the power plant normally **by BOXN Wagons** by the standard Rake.
- 2.05 Coal from BOXN wagons will be unloaded on **grizzly steel deck** mounted on wagon tippler hopper by means of WT-2 & SAC, at an average rate of 900 TPH. Coal from tippler hopper will be transferred to new tunnel conveyor 1B through **Rack & Pinion Gates and suspended type vibrating Feeders**. Tunnel Conveyor -1B will receive coal @ 900 TPH and will transfer coal to New On-ground Conveyor – 1C in New Transfer Point TP-1A. A belt weigher will be provided in conveyor-1B for measuring the quantum of coal. Conveyor -1C will receive coal @900 TPH and will transfer Coal to New conveyors2C/2D in New Transfer point TP-1B.

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- 2.06 New Conveyors 2C/2D will either discharge Raw coal to the ground through fixed Trippers at TC-5 or to the existing Conveyors - 3A/3B at the upgraded rate of 900 TPH at New TP-2A which will be located ahead of existing TP-2 towards coal yard. Conveyors - 3A/3B at present receive Coal from existing Wagon Tippler through Conveyors - 2A/2B at existing TP-2. Conveyors - 2A/2B receive coal from existing Conveyor - 1A within the tunnel of existing TP-1 @ original flow rate of 600 TPH. Thus the **capacity of existing conveyor-3A/3B to be up-gradaded @900 TPH (Rated).**

The fixed tripper house TC-5 on conveyor 2C/2D will be located in such a way that adequate clearance has to be provided from existing nallah and Railway track. As per present layout it is over 11.0 m. However, during detail engineering for further increase can be explored by the bidder by shifting TP-1B, keeping location of TP-2A (on conveyor 3A/3B) unchanged.

- 2.07 Existing Conveyors 3A/3B will receive coal from New Conveyors - 2C/2D at New TP-2A and @ upgraded rate of 900 TPH and will discharge on ground through existing Telescopic Chutes TC-1, TC-2, TC-3 and TC-4, as per earlier practice. There are 4 nos. fixed Trippers in Telescopic chute buildings TC-1, TC-2, TC-3 and TC - 4. The ground discharge from 4th Telescopic chute at present is affected by the head/drive pulleys of Conveyors 3A/3B. This will continue in the Up-gradation package also, when these conveyors will receive coal at New TP-2A @ 900 TPH and discharge on ground at the same rate.
- 2.08 The present flow rate through exist Conveyors - 3A/3B is 600 TPH which is received at existing TP-2 from existing Wagon Tippler WT-1 which has a lower rate of discharge (600 TPH). However, in the Up-gradation package coal will be received at an enhanced rate of 900 TPH through the New Wagon Tippler WT-2 and the ground discharge through Telescopic chutes will increase accordingly. Thus, there will be two rates of ground discharge viz 600 TPH or 900 TPH, when coal is received from two (2) sources i.e. Existing WT-1 or New WT- 2 respectively.
- 2.09 **Three (3) numbers new Vibrating Feeders of handling capacity 500 TPH will be provided below new Wagon Tippler Hoppers. Three** New Vibrating feeders are available at site. Party to check the usability of the same and if found usable than it required to contact the supplier for extension of the guarantee or else if found not suitable for use, the new vibrofeeders to be procured by the LSTK contractor. The LSTK contractor will be demonstrate the system overall guarantee parameters. The system guarantee includes all the equipment.
- 2.10 Dry Fog Dust Suppression system with all accessories shall be provided to capture coal dust at all new houses viz. at discharge of new WTB-2, new TP-1A, new TP-1B and new TP-2A. Dust Suppression Water System with fixed spray nozzles / sprinklers / other items as required shall be provided to suppress coal dust at grizzly of new WT- . Fire Water Systems with all accessories shall be provided to protect from fire at all new houses. Service Water System and Drinking Water System with all accessories shall be provided at all new houses to provide water as required, while Tenderer shall note that existing pumps will supply the necessary water for service and drinking purpose. Ventilation System with supply/exhaust fans, air filters, electrical drive motor, flexible connection at fan inlet and outlet, all duct work, supports and supporting structure, approach/maintenance platforms, civil and structural


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works at all the areas like all new underground tunnels, new MCC, Control Rooms shall be provided. Air Conditioning System with all accessories shall be provided at new wagon tippler Control Room, new MCC room.

3.0.0 SCOPE OF WORK & BATTERY LIMITS

3.1.0 GENERAL

- 3.1.1 The scope of work for this package shall cover design, engineering, preparation of general arrangement and marking drawings, fabrication / erection drawings, fabrication, manufacture / supply and transportation to site of the plant, erection and commissioning and performance guarantee for all items of mechanical, electrical, civil and structural power distribution, shop electrics, instrumentation & automation, illumination, telecommunication all utilities and services (including firefighting, DFDS, dust suppression, drinking water, service water etc.) fire detection and alarm etc as required for complete trouble free operation of upgraded and existing coal handling plant in integrated manner as elaborated in the subsequent sections of this TS on Turnkey Basis.
- 3.1.2 All works envisaged in this package shall generally be carried out by the Successful Bidder based on indicative drawings furnished in the TS. The Successful Bidder shall prepare all necessary general arrangement drawings including fabrication / erection drawings of proposed equipment and facilities. Preparation of complete Basic engineering, GA drawings, fabrication drawings, supply, erection, commissioning, PG test, handing over to Client etc. will be in the scope of this package. The motor KW rating of existing conveyors 3A/3B is to be upgraded. Successful bidder shall submit calculation and selection of motor, drive unit, idler pulleys and shaft diameters etc. as per latest IS code to purchaser for approval. Take up tower and counter weight is to be changed as per detailed calculation for upgraded conveyors 3A/3B.
- 3.1.3 Site cleaning, preparation, transfer of benchmarks, checking & fixing, aligning of structures, final cleaning of site after completion of the work will be under the scope of the successful Bidder. No separate payment will be made towards this and the cost, if any, will be deemed to be included in the total contract price.
- 3.1.4 The Bidder before submitting his tender, restrictions and all obstructions in the area and also ascertain all site conditions including the sub-soil conditions and shall allow for any extras likely to be incurred due to all such conditions in his quoted prices. After the award of work no additional claims will be entertained on these accounts under any circumstances. Bidder shall confirm the site visit by filling the schedule – Ref vol. V (schedule 10.3.1.).
- 3.1.5 The successful Bidder shall set out and level the work and will be responsible for the accuracy of the same. He shall provide all instruments and proper if so desired such checking, if any, shall not relieve of the responsibility for correct setting out.

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3.1.6 The Successful Bidder shall keep the site clean as an ongoing process of all rubbish, which may arise out of the work, executed by him and dispose them as directed by the Engineer in charge within a lead of 5 km.

3.1.7 The Successful Bidder shall protect all benchmark and reference pillars / lines from damage or movement during progress of work. In case of any damage the Bidder shall have to restore the same to its original condition.

- i. The Bidder shall visit the site and assess the involvement of demolition and site clearance, if required, within the plant area to construct the project & accordingly the cost is to be considered in his offer. All site investigations, surveys, grading and levelling and other additional works shall be carried out by the Contractor."
- ii. The base levels of the site is indicative only as mentioned in the drawing and documents.

iii. **The agency need to accept the site as it is and do their own survey to finalize the ground level in the drawings.**

- iv. The soil required for filling back after working if required to be brought from the location identified by NALCO within a radius of 6 KM.

3.1.8 The successful Bidder will coordinate with other agencies working at the site for the successful and timely implementation of the work. The successful bidder has to work in sync with the services/supply schedule of related packages for which civil works, erection works etc. are covered under the package. (Ref. vol-III.)

3.1.9 The Successful Bidder will make all necessary arrangement for crane, hoisting equipment & transportation of materials (raw and or fabricated) at site of work. Purchaser will not provide any cranes or other equipment to the successful Bidder for any site work.


3.1.10 Details of all new conveyors and modification have been furnished. However, at mentioned in section 6.4.6 the details are for reference and submission of bid only.

3.1.11 For upgraded conveyors 3A/3B (Group – II) drive kw and Belt tensions are increasing hence existing buildings floor beams need reinforcements. Basic details have been furnished. There will be additional foundation loads for Head pulley Frame and Drive Frame. New Drive Frame is required for upgraded conveyors. Supporting Floor Beams to be strengthened, if required. The successful bidder has to prepare detail scheme for approval and execute the job as per drawings duly approved by Purchaser / Consultant.

3.1.12 Recommended Spares for Two years Operation / Maintenance

Recommended spares and consumables for 2 years operation and maintenance of newly erected system shall be quoted along with the offer. However this will be separately considered for bid evaluation and is not mandatory to be procured by NALCO.

The estimated requirements of spares consumption per annum should also be indicated

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The successful vendor shall warrant that spare parts for the system would be available for a minimum of fifteen years. After this period, if vendor discontinues the production of spare parts, vendor shall give at least twenty four (24) months' notice prior to such discontinuation so that the owner may order his requirements of spares in one lot.

3.1.13 Data Sheet

The Bidder shall furnish all required information of equipment as per enclosed Schedule – is Vol. V. (Section 10.00 – Special Instruction to Bidder).

3.1.14 Exclusions & Deviations.

Exclusions as well as deviations from the Tender Specification, if any, shall be clearly stated under separate heads marked as “Exclusions” as per Schedule and “Deviations” as per Schedule respectively quoting the index and serial reference of Tender Specification. Special Instructions to Bidder Schedule (Ref schedule 10.3.2 & 10.3.3).

3.1.15 Consumables

The Bidder shall confirm the supply of all consumables required for erection, testing and successful commissioning of the system.

3.1.16 Initial Fill

Supply of the initial fill is in the Bidder's scope.


3.1.17 Special Tools & Tackles

The Bidder shall confirm the supply of all special tools and tackles required for erection, testing and successful commissioning of the system.

3.1.18 Quality Assurance Plan (QAP)

The Successful Bidder shall furnish a plan of quality assurance and quality control, both in respect of site works as well as supplies, which he proposes to follow for the purposes of assuring the quality of supply and workmanship at various stages. The Quality Assurance Plan (QAP) shall be mutually discussed and approved by the Employer. The same shall thereafter form part of the contract. QAP shall be submitted for all equipment and separately for all bought out items.

3.1.19 And other related job, not specifically mentioned herein but necessary for the successful completion of the project and safe, efficient and smooth operation of the system / equipment will also be under the scope of work of the Successful Bidder.

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3.2.0 The Bidders shall survey the site, study drawings / documents and discuss with the Purchaser / Consultant, if required, regarding any further technical clarification and satisfy himself with respect to the nature and extent of work involved.

3.2.1 The Successful Bidder shall submit drawings / documents for approval and reference of the Purchaser / Consultant based on the list to be discussed and mutually agreed upon in both hard & soft copies.

3.2.2 The technical specifications covering the details of equipment and drawings of this specification shall be taken for the purpose of tendering and design concept and shall not be taken as final and firm for the completion of the project. However, rated capacity of different equipment including other technical parameters furnished in the TS shall be strictly adhered to.

3.2.3 Items not specifically mentioned above which are included in scope of work are listed below.

- a) Bidder will furnish final basic & detail engineering drawings, manufacturing drawings of fast wearing items and non-standard items, as built drawings, erection drawings / documents, operating software, operation and maintenance manuals in soft editable format alongwith hard copies.
- b) Receipt of material, loading / unloading, storage, watch & ward, civil construction, complete erection, testing, commissioning, handing over of plant to Purchaser, demonstration of performance guarantee and post commissioning services. Preparation and approval of erection survey / alignment schemes, grouting protocols and other related site protocols.
- c) Deputation of representatives of equipment suppliers and technology suppliers to site for supervision of erection, testing and commissioning.
- d) Applying final finish coat of paint as per approved procedure & shades before handing over, first fill of lubricant & oil, special tools & tackles, mobile equipment, handling & hoisting equipment etc.
- e) Progress reporting as per agreed formats, providing documentary evidence of purchase orders on sub vendors with addresses of contact persons, attending all site progress review / engineering review meetings at NALCO, Damanjodi or at Consultant's Office, Kolkata opening an equipped site office with coordinator over seeing all activities.
- f) Arrangement of all erection equipment viz. cranes, hoists, winches, etc. and safety appliances as required for erection of plant & equipment. Appointment of safety officer by the contractor shall be included.
- g) Specialized training of Purchaser's / Consultant's personnel for operation, maintenance, for smooth handing over the plant.

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h) Testing and cold trial run of systems / sub-systems and integrated testing shall be carried out by the successful Bidder on continuous basis for complete Coal Handling System along with associated facilities followed by commissioning. On successful commissioning of the various sub-systems of the CHP, Performance Guarantee test of the entire plant shall be carried out as elaborated in the relevant chapter.

i) Receiving delivery of items at site, their proper storage, and handling at site, watch and ward services, removal of debris to a location specified by the Purchaser etc.

Site shall be handed over to the Purchaser in clean and orderly manner to the satisfaction of the site engineers after commissioning of the project.

j) Getting Purchaser's / Consultant's approval for the drawings prepared by the successful Bidder, obtaining required approval from statutory authorities, providing adequate personnel, equipment, tools & tackles for timely completion of the project.

k) For detailed scope of work and design parameters on various sub-systems & facilities, respective chapters under volume the Bidder Specification shall be referred to as and where applicable.

l) All the facilities required for proper functioning of the system and achieving the rated production shall be deemed to be covered in the technical specification, unless specifically excluded from the Bidder scope. The entire work shall be carried out on turnkey basis.

m) Getting statutory clearances from the authorities is in the purview of the vendor.

4.1 Exclusion from Scope of work.


- i) Roads in the Site apart from approach road
- ii) Landscaping
- iii) Drainage System apart from drainage from sump pump

4.2 Rail Track

Planning, design and construction of associated railway track work and cross drainage work shall be taken up under different packages. As such the same is excluded from the scope of this Technical Specification. However, Railway track within the tippler building is included in the scope of successful Tenderer. OHE (Over Head Electrification) signaling work for additional railway lines to be provided for the proposed tippler shall also be taken-up separately.

4.3 **BATTERY LIMITS**

Over all Battery Limits of the Upgraded CHP has been indicated in General Layout: PLOT PLAN (Drg No CHP/NIT/MECH/01).

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The Upgraded CHP battery limit starts from New Wagon Tippler Building up to the modification of existing conveyor 3A/3B.

To evaluate the Battery Limit the PLOT PLAN Drawing has to be studied by referring to the Section 2.00 (Vol - I) Scheme of Up gradation Package, wherein, elaborate description of the proposed package has been given.

The proposed up gradation Package description should be read in conjunction with the “Section 1.30 Description of Existing Plant”.

As described in the detail write up, Belt Conveyors are the life line of the plant,(Ref Sec. 6.4.6, Vol-II).All the Conveyors has been Categorized under 2 groups.(Ref. Section 6.4.6)

Group I – New Conveyors.

Group II – Up gradation of Existing Conveyors.

The above 2 groups of conveyor are within the Battery Limit.

The Battery Limit of the Upgraded Conveyors include all the Utilities like DFDS, Service Water, Drinking water facilities, firefighting system, new MCC, new wagon tippler control room, modification in existing CHP Control room software and hardware, pump compressor room are within the Battery Limit.


The scope of the Bidder shall be deemed to include all such items which although here not specifically mentioned in Battery Limit, but are needed to make the system complete in all respect for its safe, reliable, efficient and trouble free operation.

5.0 **SYSTEM DESIGN BASIS**

The mechanical and structural / civil system shall be designed for 900 TPH capacity for as per flow diagram.

- (i) The Coal delivered to the power station shall be of size 200 mm & below. Occasionally over size lump (Max:-2000mm, Average-600mm) is also be encountered.
- (ii) The coal may contain shale and sand stone as high as 20%. Also occasionally metal pieces like broken shovel teeth, brake shoe, wires etc. may also come along with coal.
- (iii) The coal “as received” shall contain varying percentage of fines. Coal with such fines may tend to form adhesive lumps, particularly during monsoon when surface moisture is at its maximum value.

The sizing and selection of the vital equipment viz. vibrating feeders etc. covered under the system shall be based on the above characteristic of coal and operating conditions, Bidder

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shall ensure that equipment/system efficiency shall not be effected particularly during monsoon when surface moisture is at its maximum value.

For the purpose of volumetric computation, the bulk density of the coal shall be taken as 800 kg/m³. Therefore, for calculation of belt conveyor capacity, for their drives & drive motors kW requirement, and sizing (volume calculations) of chute, hoppers etc. the above bulk density shall be considered. For all other purpose viz for stresses / load on structures, wagon tippler, side arm charger, sizing of actuators for flap gates, R&P gates, calculations of plugged chute/hopper loads etc.


All mechanical, and structural / civil system design shall consider simultaneous running of both the streams, starting of one stream with the other stream in standstill condition as well as starting of one stream with the other stream in operation.

- (iv) For coal Characteristics refer to relevant mechanical specifications.
- (v) For quality of water to be used in dust suppression system / other requirement of Coal handling plant refer relevant mechanical specifications.

System Requirement

Sl. No.	Description	Value
1	Max. lump size of ROM coal (received via Coal rakes)	(-) 200 MM, Occasionally oversized lump (max 2000 mm, AVG - 600 mm)
2	Hard Grove Index (HGI)	45 to 55
3	Bulk Density of Coal (for volume calculation)	800 kg/m ³
4	Max. Moisture Content	Up to 20%
5	Capacity of Belt conveyor	900 TPH
6	Belt Width	*
7	Troughing angle	*
8	Maximum Inclination of Belt	14 degree
9	Stock yard capacity	80, 000 Ton

* * * To be decided by vendor

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6.0 **EQUIPMENT SPECIFICATION**

Complete list of mechanical equipment and their detail specification is furnished below along with illustrative drawings. Equipment specifications are for procurement action of the Bidders. Specifications should not be evaluated in isolation but with system design approach as described in Scheme Up-gradation Package (CI.2.00).

6.1 **New Wagon Tippler**

The scope of work of the Bidder includes design, engineering, manufacture, inspection, assembly, shop testing, painting at manufacturer's shop as well as at site after erection, supply at site including dismantling for transportation, packing, loading and transportation, receipt at site, unloading, storage and re-conservation at site, erection, testing and commissioning of the following items at plant site.

Application

Rota-side Wagon Tippler shall be used for mechanized unloading of broad gauge wagons carrying raw materials such as Non-Coking coal, Boiler coal etc.


The wagon tippler shall be fed with loaded wagons one by one by a Side Arm Charger. Tipped empty wagons shall be collected on the empty side by ejection through side arm charger while placing loaded wagons on the tippler. The wagon tippler shall unload the materials into receiving hoppers for onward transportation to stock yard.

Specification


The Wagon Tippler shall be of robust construction and designed for continuous duty. Wagons shall be clamped automatically by a hydraulic and shall be suitable for all types of wagons. The geometry of the clamping system shall be designed to accommodate dimensions of full range of wagons mentioned below. The tippler structure and steel works shall be designed to conform the requirements of Indian Railways RDSO regulation as indicated in G33, Rev. Latest

The tippler shall consist of the following:

- Major components of Tippler are tippler drive unit, side/ end ring with gear teeth, tipper platform, brakes, counterweights, hydraulic clamping, main bearing & main shaft, cradle arm etc.
- A cradle consisting of a pair of heavy welded steel plate and sector rigidly connected by a large torsion box girder fitted at each end with pivot shafts. The whole cradle shall be carried on these pivot shafts mounted in spherical bronze bearings, in turn mounted on fabricated steel pedestals.

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- A rail table carried on a roller in a slotted bearing supported from an extension of the end sectors.
- Four transverse top clamp beams which shall be carried on arms pivoted from the main torsion box girder. These arms shall be connected at their lower end to ballast box which shall carry pawls for mechanical locking.
- Drive unit with electro-mechanical type arrangement etc.
- To cope with occasional jamming of sticky material, the top clamps shall be automatically locked is in inverted position, and disengage automatically as the tippler returns the wagons to its normal upright position.
- The drive design shall incorporate controlled hydraulic drive and shall be controlled from remote control post.
- The bearing shall be of antifriction type with dust seal. Suitable platforms shall be provided around tippler for ease of maintenance.
- The arrangement of the equipment shall offer convenient access for inspection and maintenance of all parts. Access ladders, working platforms, safety hand railings of min 1000 mm height shall be provided wherever required. All edges and openings shall be provided wherever required. All edges and openings shall be provided with toe-guards. Safety devices such as limit switches and mechanical stops shall be incorporated so as to ensure rotation of tippler within limits.
- Forced Lubrication with pump and piping manifolds shall be provided for the tippler. However, all parts of the equipment needing manual lubrication shall be easily accessible. All oil pipes and grease nipples shall be well covered to prevent damage from materials from falling on them.
- The tippler shall be interlocked electrically with side arm charger an succeeding equipment (feeders, conveyors etc.) with respect to operational and safety requirements.
- Tippler Table with rails, end frame with necessary rack segments, side beam with rubber pads.
- Wagon Tippler motorized drive (VFD) with cylinders, power pack, necessary hoses etc.
- The location of the WT Control Room has been proposed in front of new wagon tippler. However, the location of WT control Room be chosen in such a manner that the tippler operation and railways facilities are clearly visible by the operator.
- Any other item / accessory / fixtures to complete supply of the equipment.

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Equipment Data Sheet

Wagon Tippler

1.	Number	One (1) No. (for Raw Coal & Imported coal)
2.	Type	Electro-mechanical Rota-side, indoor type
3.	Type of wagon to be handled	BOXN
4.	Capacity	For wagons as per IS: 10095-1982, Reviewed In : 2022 (average 60-65T of coal loaded on each wagon)
5.	Load capacity of Tippler Platform	Tippler Platform to be designed considering the load of locomotives which will move over the platform.
6.	Wagon unloading	On fixed Grizzly fitted on top of RCC Tippler Hopper.
7.	No. of tips/hour	25 tips/hr
8.	Rail gauge	1676 mm
9.	Angle of tipping	Minimum 175 deg. Anti-clockwise looking from wagon entry side.
10.	Duty	16 hrs/day / (continuous)
11.	Type of clamping	Hydraulic
12.	No of clamps provided	To be furnished by Bidder
13.	Type of drive	VVFD type
14.	Vibrators	Electromagnetic type. Nos. to be furnished by Bidder for handling sticky materials
15.	Material carried by Wagons	ROM coal with bulk density 0.8 T / CuM Imported Coal with bulk density 1.0 T / CuM
16.	Material of construction of main parts/units in the part list	To be furnished by Bidder
17.	Mode of placement of Wagon	By Side Arm changer
18.	Load cell type & No	To be furnished by Bidder
19.	Average Cycle time with break-up	Unloading of 20 Nos. Wagons per Hour on an average maximum 25 wagons per Hour.
20.	Speed of rotation	To be furnished by Bidder
21.	Power consumption	To be furnished by Bidder
22.	Drive details	To be furnished by Bidder
23.	Type of motor	Induction Motor

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24.	Power transmission arrangement	Through pinion & electro-mechanical drive arrangement
25.	Mode of contort	To be furnished by Bidder
26.	Safety features as envisaged	Hydraulic Thruster Brakes & Limit Switches
27.	Type of lubrication arrangement	Manual/Forced
28.	Gross weight	To be furnished by Bidder
29.	Weight of single heaviest part	To be furnished by Bidder
30	Overall dimensions including C/C dimension between	To be furnished by Bidder
	Tippler Track & Charger Track	
31	Approving Agencies	NALCO / Consultant, Concerned Statutory/Regulatory Authority
32	Preliminary Installation GA drawing	To be furnished by Bidder
33	Load data for civil/structural	To be furnished by Bidder
34	Location	As shown in Layout.

6.2

Side Arm Charger

1 (One) no. Side Arm Charger to pull or push a full-rake of 58-60 loaded wagons as per IS: 10095 1982, Reviewed In : 2022 (average 60 T each). The Side Arm Charger shall complete with:

- Trolley with wheels & side guide roller, universal coupling arm along with Hydraulic system for luffing. The charger shall run on four nos. cast / forged steel wheels mounted on anti-frictional bearings.
- Travel drive complete with hydraulic motor, brakes and hydraulic power pack.
- Rails with foundation bolts & nuts, racks & pinions.
- End stops, Festoon Cable & Trolley with heavy duty carriage and supporting structures.
- Hydraulic Side Arm Charger coupler / decoupler.
- The system will be operated from Wagon Tippler Control Room.
- Any other item / accessory / fixtures to complete supply of the equipment.

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1. Emergency stopper for inhaul wagon rake once it is with in operating range of the side arm charger.
2. All related electrics and electrical equipment.
3. Supply of Side Arm Charger and Wagon Tippler shall be complete with its structural, mechanical and electrical components and standard accessories mentioned in the T.S.

Technical Specification/ Design Data

Application

The Side Arm Charger (SAC) shall be used for wagon positioning at the wagon tippler for unloading of materials. It shall be used for pushing/pulling a full rake of 58-60 wagons of gross weight per wagon as stipulated in IS: 10095 1982, **Reviewed In : 2022** (average 60 T each) and locating wagons one by one on tippler.


Working

A rake of 58-60 loaded wagons shall be brought in by a locomotive pushing/pulling and stopped with the leading wagon within range of the Side Arm Charger using track side marker boards (under Bidder's scope). The loco will be decoupled and dispatched and the charger shall be driven to the leading wagon. Its arm should be lowered and it shall be coupled to the first wagon of the rake. The rake shall be hauled forward by the charger until the front of the first wagon is about 4 meters away from the tippler. The charger shall stop and the first wagon shall be uncoupled from the train, adequate interlock for this to be provided. The charger shall then inch forward the leading wagon on to the tippler, automatically decouple itself & arm is raised before it travels back to the train. The tippler shall rotate for tipping the wagon. On reaching near the standing train, the charger arm shall be lowered and shall be coupled to the train ready for repeating the cycle. In the next cycle the rake shall be drawn up by one wagon length, the front wagon will be decoupled & the next cycle will be repeated. When the next wagon is located on the tippler table the previously tipped wagon shall be ejected simultaneously.

Specification

The supply includes Side Arm Charger with hydraulic power pack, power supply system, supports, electrics, buffer stop, rack & pinion, control cabin, automatic coupler/decoupler etc. The Side Arm Charger shall run on its own track parallel to the main track. It shall have a stroke of suitable length from a point on the inhaul side of tippler to a point on the out haul side.

It shall be fitted with an arm pivoted at right angles and operated through a hydraulic system for raising and lowering. The arm shall have an automatic coupler to couple/decouple the wagons.

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The charger frame shall consist of a single fabricated frame on which every other item shall be directly mounted to form a robust compact unit. The side arm shall be of welded construction. Raising and lowering of the arm shall be by means of a hydraulic cylinder driver through power pack mounted on the charger frame, A standard coupler enables automatic coupling of the arm to the wagon coupler and actuator release mechanism with a hydraulic cylinder in provided for decoupling.

The charger shall run on four steel wheels mounted on spherical roller bearings.

To resist the moment reaction of the pushing force, two pairs of steel side guide rollers shall be fitted. They shall be fitted on spherical roller bearings and shall have a simple lockable adjustment for true running and to take up wear. The side guide shall run on the sides of the rail heads of the charger running back.

The arm shall be welded construction. Raising and lowering of the arm shall be by hydraulic means.

The charger shall have adequate power for pushing a full rake load of 58-60 loaded wagons as stipulated in IS: 10095 1982, Reviewed In : 2022. It shall be hydraulically driven through rack and pinion arrangement.

The charger shall be electrically interlocked with tippler for proper sequential operation with respect to operational & safety requirements.

Easy access, adequate maintenance spaces, working platforms, inspection covers shall be provided for all the equipment located in the Side Arm Charger for safe and quick maintenance. All edges and openings shall be provided with guards. Chequered plates on floor shall be provided to prevent slipping.


Centralized forced system of lubrication provided for the equipment. However, all parts of the equipment needing manual lubrication shall be easily accessible. All oil pipes and grease nipples shall be well covered to prevent damage from materials from falling on them.

The Side arm Charger shall be suitable to push or pull rake load of loaded wagons with gross weight as stipulated in IS:10095 1982, Reviewed In : 2022 on straight track and shall be suitable to position all types of wagons at the centre of wagon tippler.


Equipment Data Sheet

Side Arm Charger

1.	Quantity	One (1) No
2.	Type	With hydraulic travel drive and hydraulically operated coupling / decoupling arm.

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3.	Type of Wagon to be handled	BOXN
4.	No. of wagons to be Pulled / Pushed	58-60 nos of loaded Wagon
5.	Gross weight of wagon to be considered for design purpose.	As per IS: 10095, 1982, Reviewed In : 2022 (average 60T of coal loaded on each Wagon)
6.	Draw bar pull	To be furnished by Bidder (Pushing / pulling effort for 58-60 nos. loaded wagons)
7.	Mode of control	From operator's cabin, as well as from Tippler, located on the charger Control Room (either individually or jointly with Wagon Tippler)
8.	Speed	0.5 m/sec forward & 0.5 m/sec reverse, (with full rake of wagons) and one slow speed for coupling
9.	Duty	16 hrs/ day (continuous)
10.	Power supply	Cable Reeling Drum (CRD)
11.	Travel Drive	Hydraulic Motor driven through Power Packs, positive driven through rack and pinion.
12.	Drive arrangement envisaged	Hydro Motor with Planetary Gearbox
13.	Rating of Drives	To be furnished by Bidder
14.	Material carried by Wagons	ROM coal with bulk density 0.8 T / M ³ Imported Coal with bulk density 1.0 T / M ³
15.	Gross weight of equipment	To be furnished by Bidder
16.	Axle Load	To be furnished by Bidder
17.	Dimensions (L x B x H) (main body)	To be furnished by Bidder
18.	Tractive effort for pushing pulling	To be furnished by Bidder
19.	Safety features	Guide rollers & limit switches
20.	Type of lubrication arrangement	Centralised lubrication (manually operated)
21.	No of carriage wheels	Four (4) nos
22.	No of guide roller	Four (4) nos
23.	Track Gauge	1480 mm (c/c)
24.	Travel length	Furnished by bidder
25.	Location & size of control deck (covered)	Mounted on machine
26.	Driving Torque	To be furnished by Bidder

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27.	Speed of hydraulic motor	To be furnished by Bidder
28	Overall dimensions including C/C dimension between Tippler Track & Charger Track	To be furnished by Bidder, 3700 mm C/C distance between tippler track and SAC to be checked & confirmed.
29	Preliminary Installation GA drawing	To be furnished by Bidder
30.	Load data for civil / structural work	To be furnished by Bidder
31	Rail Size	52 KG/M
32	Approving Agency	NALCO/ Consultant/ concerned Statutory/ Regulatory Authority

The rail dimension of side Arm Charger and wagon tippler must be same (52kg Rail)

6.3 **Hydraulic Breaker**

The hydraulic breaker – 1 No is intended for breaking of the oversize lumps (Avg.600 mm and maximum 2000 mm) of coal, shale or sand stone retained on the grizzly of the crushing plant.

The hydraulic breaker is designed for a stationary installation. It is to be mounted on a RCC pedestal located near edge of the receiving hoppers and has the following constructional features.

i) **Boom**


This is made of high strength alloy steel and ample dimensioned to withstand side, torsional and bending loads during raking and handling of oversized lumps and severe shock loads imparted during breaking.

ii) **Cylinders**

All cylinders are hydraulically operated. The cylinders and rods are ample dimensioned. These are fitted with self-aligning bushings to take side loads during raking. The pivot pins and bushings fitted to cylinders and booms are suitable selected to prevent ingress of dust and moisture and to provide for longer life.

iii) **Breaker**

The breaker is hydraulically operated to provide trouble free operation during breaking. The breaker is designed to suit the duty conditions required and shall impart sufficient energy to break oversized lumps.

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iv) **Hydraulic System**

The hydraulic system has sufficient capacity and is provided for the operation of all hydraulic Cylinders and equipment. The rating of the overall hydraulic equipment is well above the duty for which it is required and suitable for operation in tropical climate. The rated capacity of hoses are selected with a minimum of 3 times the working pressure of the fluid in the hosepipe.

v) **Control**

For operation of hydraulic cylinders, lever operated control valve are provided for independent control of boom, stick, swing and tilt cylinders.

vi) **Electric Motor**

The motor is totally enclosed fan cooled squirrel cage induction motor of class “F” insulation with Temperature rise limited to class “B” insulation suitable for operation at 415V, 3Phase, 50 Hz and fitted with cable boxes with glands suitable for PVC insulated. PVC sheathed and armored cable with aluminum conductor. The motor is suitable for operation at $\pm 10\%$ voltage fluctuations, $\pm 5\%$ frequency, $\pm 10\%$ combined variation.

vii) **Electrical**

Operators Control / Desk complete with Push Buttons, indicating lamps, Meter etc. are provided as per the requirement for independent trouble free operation of the Breaker.

viii) **Hydraulic Cylinders & Power pack**


All hydraulic cylinders and Power pack are selected based on the force to be imparted to the boom, stick & links for the breaking/raking operation and the on the speed to achieve the desired rated capacity of breaking/raking.

ix) **Boom, Stick, Links, Pins, Slewing base & Fixed base**

All kinds of mechanical members such as Boom, Stick, Links, Pins, Slewing base & Fixed base are designed amply after selecting suitable sections to sustain load as well as deflection during breaking/raking operations.

Technical Data Sheet

1.	Material to be handled / broken	Big size coal boulders / sand stone
2.	Maximum boulder size to be broken	Average 600 mm and maximum 2000 mm

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3.	Horizontal reach of Breaker	Minimum 300 mm to maximum 10000 mm over Fixed Grizzly of Tippler Hopper
4.	Maximum vertical reach of Breaker	500 mm to 4000 mm over Fixed Grizzly of Tippler Hopper
5.	Swing rotation of Boom	Minimum 150°
6.	Machine mounting	On a fixed base provided with Operator's Cabin and the entire base will be fixed on concrete foundation by the side of Tippler Hopper at Ground Level
7.	Breaking Arrangement	By hammer / poker arrangement of adequate mass (3 to 4 T) attached at the end of the end / last link.
8.	Breaking Capacity	125 T/ hour (minimum)
9.	Type of Breaker	Hydraulically operated
10.	Type of movement of Boom / Link	By Hydraulic Cylinder through Hydraulic Power Pack
11.	Swing and Luffing movements	By Hydraulic Cylinders through Hydraulic Power Pack
12.	HGI of Coal / Sand Stone	45-55
13.	Assembled weight of machine (MT)	Bidder to furnish
14.	Number of Drives and Drive Ratings in KW	Bidder to furnish
15.	Preliminary Installation GA drawing	Bidder to furnish
16.	Load data for civil/structural	Bidder to furnish

6.4 **BELT CONVEYOR**

Scope

6.4.1 The scope of work of the Bidder shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery for Purchaser's site, unloading, handling and storage at site, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics and standard accessories of the following components for all the conveyors indicated in the enclosed drawings.

- i) Motors
- ii) Gear boxes
- iii) Couplings/Magnetic Coupling for High Speed Coupling
- iv) Pulleys with bearing blocks – head, tail, snub, bend and take-up
- v) Idlers – carrying, return, impact pads, self-aligning and transition
- vi) Idler frames

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- vii) Belt cleaning devices
- viii) Hold back devices integral with Gear Box.
- ix) Electro-magnetic brakes
- x) Pull-cord switches with cord
- xi) Belt sway switches
- xii) Zero-speed switches
- xiii) Take up pulley frame with take up guides
- xiv) Bend pulley frame
- xv) Head pulley frame
- xvi) Tail pulley frame
- xvii) Drive base frame
- xviii) Guards – tail pulley, bend pulley, coupling
- xix) Discharge hood
- xx) Skirt Boards

6.4.2 The scope of the Bidder shall be deemed to include all such items which although here not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

6.4.3 The scope of supply and services of the Bidder shall include the following:


(a) Mechanical

- Each equipment shall be complete in all respect including, its drive units, cables, safety switches, structural, mechanical and other standard accessories.
- Provision of necessary fixtures, supporting angles and brackets required for mounting and supporting the equipment.

(b) Electrical

- LT AC motors and brakes with panels as required for the equipment.
- Switches as necessary for interlocking and control and safe operation of equipment.
- Complete flexible cable festoon arrangement with protective chain, cable guide & rollers, junction boxes etc. required for electric hoist including power & control flexible cables and their termination up to junction boxes. Junction boxes for power and control supply shall be separate and shall be supplied by the Bidder.
- Any other mounted electrics that may be required for satisfactory operation and maintenance of equipment supplied by Bidder.

6.4.4 Design Basis & Categorization

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The equipment shall be designed as per design criteria given below:

Hierarchy of Specifications

- a) Technical Specification
- b) General Technical Specification (GTS)
- c) Indian Electricity Rules & Statutory requirements of Central Govt. and State Govt.
- d) NALCO's General Condition of Contract (G.C.C).


Equipment complying with other recognized Standards such as IS, IEC, BS, VDE, and IEEE will also be considered if it ensures performance equivalent to or superior to Indian Standards.

The components and materials used and the equipment supplied shall conform to high standards of design, engineering and workmanship and shall be suitable for efficient operation and reliable service in steel plant conditions.


6.4.5

Design Basis

- Utilization of cross sectional area – 80% of theoretical cross sectional area indicated in IS 11592-2000 (for computation of design of belt conveyors).
- Design capacity of belt conveyors – 10% more than rated capacity to be considered while calculating motor power
- Troughing angle – 35°
- Friction factor (for kW calculation) of belt conveyors – 0.03
- Strength:- 630KN/m with 4 ply
- Belting
 - (a) Top cover thickness – 5 mm
 - (b) Bottom cover thickness – 2 mm
 - (c) Running tension < 80% of allowable belt tension
 - (d) Starting tension > 150% of allowable belt tension
- Carrying Idlers – 152.4 mm Outer Diameter with 5.0 mm shell thickness and 25 mm spindle diameter.
- Flat return IDLERS – 152.4 Outer Diameter.
- Spindle diameter – 20 mm (Min.)

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- Carrying idler spacing – 1000 mm. Spacing in the convex curve position of conveyor shall be limited to half the normal spacing of carrying idlers.
- Return idler spacing – 3000 mm spacing
- BELT TRACKER cum TRAINER Idler spacing
 - a) Carrying side -15 m
 - b) Return side – 30 m
- Impact idler spacing–500 mm or less–(min. 6 Nos.) for all upgraded convs. only.
- Impact Pad for new Conveyors.
- Deck plate – 3.15 mm thick at feed zone (5.0 m).
- Drive pulley – 12 mm thick. Ceramic lagging, minimum durometer hardness of 55 Shore a scale and shell thickness 12 mm minimum.
- Tail / Bend / take-up pulley – 10 mm thick vulcanized natural rubber lagging, minimum durometer hardness of 45 Shore A scale, and shell thickness 12 mm minimum.
- Pulley face width – As per IS 8531 – 1986, Reaffirmed in 1993.
- Pulley Shaft – major shaft diameter up to 160 mm – steel, class – 4 as per IS 1875 – 1992. More than 160 mm – forged steel, class-4 normalized as per IS:2004-1992.
- Plummer Block
 - a) Material - cast iron / cast steel
 - b) Bearing - Self aligning spherical roller bearing
 - c) Life - 30,000 working hrs min
 - d) Construction - Horizontal split type (one end fixed and the other end expn. Type)
- Reducer
 - a) Service rating of 1.5 times the calculated shaft kW and thermal capacity of gear box shall be better or equal to that of motor
 - b) Type – Helical / Bevel Helical.
 - c) KW rating shall be not less than 1.25 times the motor kW.
 - d) No worm gear except for traveling gate

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e) With Holdback device (Integral Hold Back for Inclined Conveyors)

- Brakes

Electromagnetic Thruster on conveyors wherever required

- To prevent roll back

- Roller type hold back device – To be provided on all inclined conveyors to prevent roll back.

- Take up

Screw take up – up to 40 m (with protected thread)
Automatic take up travels as per I.S. – VGTU/HGTU.

- High speed coupling – gear coupling / resilient coupling less than 30 kW

- Fluid coupling/Magnetic Coupling for 30 kW & more
(Pin bush coupling – Not Applicable)

- Low speed coupling – gear or resilient.

- External scraper

Multi sprung blade type.
Material scraped shall fall into main chute.
Blade material – metallic blade with tungsten carbide tips

- Internal scraper


V shaped, mounted on carrier assemblies with elasto-mount and nonmetallic polyurethane blade.

- Belt sway switch – At both ends and at 50 m interval (Approx) on both side of conveyor

- Zero Speed switch – away from the drive (1 No.) preferably at Tail pulley.

- Pull cord switch – at 30 m interval on both sides for each conveyor.

6.4.6 Belt conveyor Design Basis & Categorization

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Belt Conveyor System:

Belt conveyor system is the main lifeline of the plant. Design of Belt Conveyor system shall be suitable for coal parameters specified in System Design basis. Design of Belt conveyors will be as per IS – 11592 – 2000 (Design and Section of Belt Conveyors) and other relevant standards specified. All the conveyors of the upgraded CHP can be categorized under 2 Groups as described below. This categorization is only for convenience of prompt identification.

GROUP – I – New Conveyors – Qty – 4 Nos.

GROUP – II – Upgraded Existing Conveyor – Qty – 2 Nos.

For background of development of the up gradation project and for standardization purpose a further elaboration of the categorization may be useful, considering future up gradation provision and successful erection and commission.

GROUP – I – New Conveyors (1B, 1C, 2C/2D)

Detail specifications have been given for all conveyor & and other accessories will comply with design consideration, in line with basic details indicated. Bidder have to submit all design and selection details and Mechanical G.A. drawings with load data. Standardization of conveyor will be done on priority basis.

GROUP – II – Up gradation of Existing Conveyors (3A/3B)


With maintaining the center to center distance if required all the components are to be replaced. For the existing conveyors 3A / 3B only Idler and drive are to be upgraded. Only existing stringers and short posts are to be retained. Belt and pulleys are to be as per design consideration.

For all the upgraded Conveyors VGTU Take-up counter weight will be increased, for which necessary modification incorporation of additional counter weight (Structural steel type) will have to be undertaken.

For incorporation of DS – System, the existing skirts will need modification. All the Transfer Points where the upgraded drive are to be located, new drive frames will be required along with supporting floor beams relocation and strengthening, based on increased load details. Detail scheme for the same will be prepared and approval to be detailed from Purchaser/Consultant. Details of all the existing conveyors along with updated scheme have been furnished. G.A. Drawing of all the upgraded conveyors with profile have been furnished.

For details of existing conveyors ref Section 1.3 of Volume - 1 and the drawings enclosed.

Note: All motor powers indicated in respective conveyors specifications and drawings for both category of conveyor under Group-I and Group-II are for reference and quotation only. The successful Bidder has to furnish detail calculation as per IS11592-2000 for the purpose. In

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case the power rating calculated is less than what have been indicated in Technical Specification, Bidder has to provide the rating as per Technical Specification. However, if the Bidder calculated KW rating of the conveyors is more than what is mentioned in Technical Specification, the successful Bidder has to provide the same, without additional cost implication. The Performance Guarantee as specified in Volume-V, Section 13.0 has to be maintained.

6.4.7 Conveyor Belting

Belting shall be designed for heavy duty condition and shall be suitable for 24 effective working hours operations per day and 365 working days per year. Conveyor belt shall be fire resistant type. It shall be suitable for installation over conveyor system having 35° troughing angle and shall be suitable for operation at an ambient temperature of 50° C. It shall have sufficient resistant against exposure to open sunlight so that its qualities do not deteriorate while working in open sun. It also may have to work in rain and / or in conditions where relative humidity goes up 100%.

The fabric for belting shall be of Nylon. The belting shall be pre-stretched, straight ply, skin coated with open ends. It shall have sufficient strength to give required tension at 10 safety factor and 80% tension utilization. All belts shall be joined by hot vulcanized splicing.


The belt shall have sufficient lateral flexibility so that it suits the troughing angle requirements even when it is empty. The belt shall have sufficient longitudinal flexibility so that it can easily flex around different pulleys of the conveyor system. The belt shall have sufficient impact resistance to withstand impact at the loading points. The rubber cover used in the top and bottom cover of the belting shall be of M-24 grade. The edge shall be of cut edge construction.

On the carrying surface, at interval of maximum 12 meters, the belting shall be marked as follows:

- a) Manufacturer's name and trade mark, if any.
- b) Fabric designation as NN
- c) Belt designation i.e. KN/m (630KN/m)
- d) Code of rubber cover i.e. M-24.
- e) Last two digits of year of manufacturing
- f) Top cover:-5 mm
- g) Bottom cover:- 2mm
- h) No. of Ply:- 4 nos.

Belt roll shall be packed in wooden drums. This packing should enable easy unreeling of the belting. On the body of the wooden drum the direction of belt and location of end of the belting should be indicated so that belting can be properly placed while unreeling.

The design, construction, testing and performance of the belting shall comply with all applicable codes and as per IS and International Standards.

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Before dispatch, the finished material shall be subject to inspection by the Purchaser/ Consultant. The inspection shall be carried out in the presence of Purchaser/ Consultant, in terms of up to date engineering practice and relevant IS and International Standards in this respect, for which all facilities shall be provided by the Contractor at his cost. This shall internal, include the following:

- a) Full thickness belt test (As per IS-1891),
 - i) Breaking load, Kg/sq. cm for wrap and weft.
 - ii) Elongation under reference load (%)
 - iii) Elongation at break (%)
- b) Rubber cover test (Top/Bottom)
 - i) Tensile strength of cover, Kg/sq. cm
 - ii) Elongation at break (%)
 - iii) Adhesion between ply to ply and between covers and ply.
 - iv) Abrasion loss of rubber cover
- c) Physical dimension check
- d) Flexibility Test

All relevant type test certificates shall have to be produced during inspection and along with supply for necessary verification and approval.


6.4.8 Conveyor Pulleys

(For Conveyors of Group – I)

All pulleys shall be of welded steel construction, stress relieved before boring and machining and statically balanced. Solid end discs shall be designed and provided to give maximum strength. Pulleys shall be designed as per relevant Indian Standard and IPSS where applicable. Pulleys shall be connected to the shaft preferably through keyless friction grip connections unless otherwise agreed.

Shell thickness of the pulley shall be suitable for taking bending loads on the pulley. This shall not be less than 16mm for drive pulley and 12 mm for tail and other pulleys.

Drive pulleys shall be covered with minimum 12 mm thick diamond rubber/ceramic lagging. Tail, bend and take-up pulleys shall be covered with minimum 10 mm thick rubber lagging. The depth and width of the grooves in the lagging shall be 6 mm spaced at 30 mm interval. The eccentricity of pulley shell shall not be more than $\pm 0.5\%$ of the diameter prior to lagging. Drive pulleys shall be machined at steel faces prior to lagging. Shore hardness of rubber for drive pulleys shall be not less than 55 deg A and for other pulleys shall be not less than 45 deg A. All pulleys shall be statically balanced to minimize the vibration during running.

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Rolled steel may be used for pulley shafts of diameter up to 160 mm. Forged steel shall be used for shafts above 160 mm diameter. The deflection slope of pulley shaft at bearings shall be restricted to 1/2000 under rated load condition. The shaft diameter shall be in multiple of tens.

Pulley shafts shall be supported on self-aligning double row spherical roller bearings with adequate sealing and external lubrication arrangement in plummer blocks. One bearing for each shaft shall be fixed to prevent any movement of the shaft assembly and the other bearing shall be floating to have free axial movement. All lubricating nipples shall be readily accessible without removing the guards. All plummer blocks shall also have four mounting bolts. Welding on the pulley shell shall be tested radio graphically or by ultrasonic method. Pulley shafts shall be ultrasonically tested. Checking of out of roundness and static balancing tests shall be carried out before dispatch of the pulleys.

Above details are for pulleys of new conveyors (GROUP – I). For all upgraded conveyor existing bearing center will be retained.

6.4.9

Idlers


(For Conveyors of Group – I)

Three roll inline troughing idlers of equal length shall be used throughout. The angle of inclination of side horizontal shall be 35°. Troughing as well as return idlers shall be of reputed make and manufactured out of heavy duty ERW tubes as per IS:9296. Idlers shall be of “drop-in-slot” type.

The eccentricity (diametrical run out) of troughing and return idlers shall not exceed + 0.8 mm. Minimum shell thickness of idler tube shall be 5.0 mm. All idlers shall be fitted with either heavy duty deep groove ball bearings or seize resistant ball bearings. The bearings shall be held positively on the shafts. Multi-labyrinth seals shall be used for retention of grease. All bearings shall be greased and sealed for life against ingress of dust, water and escape of grease. All bearings shall be rated for minimum 40,000 working hours. Bearing housing of idler shall be made of pressed steel of CRCA sheet press fitted and preferably be welded with idler tube.

Self-aligning troughing and return idlers with vertical guide rollers shall be of above specified construction. All self-aligning idlers shall be provided with grease lubricated anti-friction bearings at pivot points. All grease fittings shall be of the button head type or equivalent and shall be accessible for the walkway side of the conveyor by piping. The grease tubing shall be made of aluminium. The grease fittings shall have adequate protection against dust collection.

Transition idlers of above specified construction shall be used adjacent to head and tail drums to permit proper support of loaded belt near the head and tail pulleys without excessive stress and stretch of the belt edges. The transition idlers shall be installed in steps of 10°, 20° toughing angles.

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Idler shaft shall be made of class – 4, IS-1875 or EN – 8, BS – 970 or bright bar of equivalent grade suitable for the duty requirement. Idler frame shall be made of rolled/formed steel with provision for securely bolting to the stringers of the conveyor frame. All fixing bolts shall have spring washers.

Clearance, gap etc. for the carrying and return idlers shall conform to the relevant IS/IPSS Standard to the extent possible. The fixing arrangement of carrying and return idlers shall be such as to permit adjustment of idler sets for the purpose of belt training. Allowance for such adjustment shall be provided on both sides of the conveyor and the play shall not be less than 10 mm on either side.

All idler rollers shall be painted with 2 coats of red oxide primer and 2 coats of enamel finish paint.

Following tests shall be carried at random on the assembled idler roller in the presence of Purchaser/Consultant.

- a) Friction factor test
- b) Idler running test at high speed.
- c) Test for dust proof
- d) Test for water proof
- e) Quality test.
- f) Alignment and co-axiality test

NOTE:-


- a) Idler details for new conveyors (GROUP – I) will be as per details furnished in the enclosed drawings (Drawing No. CHP/NIT/MECH/07)
- b) For upgraded conveyor (GROUP – II) - All existing idlers will be replaced as per specification of new conveyors.

6.4.10. Belt Cleaners

- a) External belt cleaners

External belt cleaners shall be provided at the discharge pulley of the conveyors. The cleaner shall have sprung metallic blades (in segments) with tungsten carbide tips.

Polyurethane deflector skirts shall be provided below the tips to prevent materials build up on the unit. The cleaners shall be mounted on an elasto mount system to facilitate automatic blade adjustment on wear. The inclination of the blades should be such as to effect efficient scrapping of the belt. The spring action of the individual metallic blades should ensure constant contact with belt during operation and suitable sprung deflection of contact with uneven

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surface of the belt. The blades shall be in segments for ease of replacement and mounting on the head pulley frame. The material scrapped should fall inside the discharge chute directly.

b) Internal scraper

'V' shaped internal scraper shall be provided on the upper side of the return belt near the tail end, fitted with wear resistant non-metallic scraper blade to remove spilled materials on the belt. The blade shall be adjustable after the wear.

6.4.11 Gear Boxes

Conveyors shall be driven through totally enclosed oil-cooled reduction Helical/Bevel-Helical gearing having anti-friction bearings with oil seals at shaft projection. These shall be suitable for continuous operation at full load and shall be suitable for shock loads. Wherever required, oil temperature rise over ambient shall be restricted by 50° C (Max.). Worm gear or chain drive shall not be used. The reducers shall be selected with a service rating of 1.5 times the calculated kW or 1.25 times of Motor kw whichever is higher. The transmission efficiency of the gearing shall not be less than 0.98 per stage. The material of gears, profile and geometry shall ensure high power/weight ratio with low volume. Gears and pinions shall preferably be solid centers to withstand shock loads. All reducers shall have permanent magnet plugs.

6.4.12. Couplings (H.S & L.S)


Flexible couplings shall be used between motor and gear-box (HS) and geared couplings (LS) shall be used between gear-box and drive pulley. The hub and sleeves of the geared coupling shall be of forged C-40 steel and bolts shall be of alloy steel. The hub teeth shall be of triple vary crown design. Traction type fluid coupling shall be used between motor and gear-box for drives of 30 kW and above capacities in combination with flexible connection coupling. All coupling bolts shall be replaceable without shifting of drive components.

6.4.13 Hold Back Devices

All inclined conveyors shall be provided with suitable roller type hold back devices (other than brakes) to prevent belt from running back in case of conveyor stoppage due to power failure or otherwise. Holdback rating shall be minimum 1.5 times the maximum calculated torque. Electro-magnetic Thruster brake shall be provided on all conveyors after calculating the coasting time. Brake shall have min 1.5 times the max. Calculated torque rating. Brakes shall be mounted on brake drum coupling at input shaft end of gear box.

6.4.14 Take Up

Automatic counterweight gravity take up shall be provided for conveyors above 40 meters in length. VGTU/HGTU shall be provided in all other conveyors. Take-up travel shall be as per IS:4774 (part-1) and it shall be complete with pulley carriage suitable for guide structure made of pipe. Take-up Travel and Counter wt. shall be as per IS codes and design consideration.

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NOTE:-

For all upgraded conveyors (GROUP – II) since Belt Tensions have increased marginally, the VGTU counter weight will also increase. The same have to be incorporated in existing VGTU arrangement. Indicative details have been mentioned in Conveyor Profile drawings. The figures are indicative. Successful bidder has to furnish detail calculation for approval of Purchaser/Consultant.

6.4.15 Discharge Hoods & Hopper

Hood shall be made of 6 mm thick mild steel plate for portion above the pulley frame. For portion of hood below the pulley frame and up to 500 mm below the floor, the thickness of plate shall be 10 mm. 10 mm thick liner plate shall be provided in this portion of hood in the material impact zone. The liners should be fixed by wedge type arrangement. The hood shall be in segments bolted to each other for ease of maintenance. The hood shall cover discharge opening for the chute as well as pulley. Rubber curtain and guard shall be provided at the entry of belt in the discharge hood. Easily adjustable baffle plates shall be provided in the hood to control trajectory of materials, if necessary. Chute liners will be fixed by wedge.

Hinged inspection door shall also be provided in the hood. The door shall preferably be located within a height of 1200 mm from the floor. Adequate opening shall be provided in the hood for withdrawal and adjustment of belt scrapers (Height of the deflector plate from the conveyor to be specified).

6.4.16 Guards

Guards on the conveyor shall comply with relevant IS/IPSS Standard. The guards shall be of expanded metal conforming to IS: 412 (current)


Safety guards shall be provided for all couplings, brakes etc. of the conveyor drive and screwed on the above base frame.

6.4.17 Conveyor Frames

Conveyor frames shall be made of joists and /or channels suitably stiffened and braced. The spacing of supports shall not exceed 3000 mm. Frames shall be connected to floor beams/civil foundation of junction house by bolting. Conveyor Frames cover Head Pulley Frame, Tail Pulley Frame, Bend Pulley Frames.

Minimum Steel sections recommended for conveyor Frames as follows.

- Head / Tail / Bend Pulley Frame – ISMC – 150/200
- Drive Frame – ISMC – 200
- Stringer – ISMC – 125

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d) Short Post – ISMC - 100

6.4.18 Deck Plates

Deck plates of minimum 3.15 mm thickness shall be provided. For other conveyors, loading zones (at least 5.0 m), within / junction / houses and at road / rail crossings etc. shall have deck plates. Suitable seal plates shall be provided at Gallery bottom chord wherever Gallery is crossing Rail Track and Road.

6.4.19 Skirt Boards

Skirt boards of minimum 3000 mm length shall be provided at the loading points of all conveyors, however wherever dust-suppression system with water spraying arrangement is provided – the length & height of the skirt shall be suitably designed. Wherever the loading points are nearer to each other, the skirt board shall be made continuous between them. Minimum length of skirt boards from the beginning of loading area in the chute shall be 2500 mm in the direction of belt travel. Skirt shall be totally covered where dust suppression system is envisaged or when handling dry fine materials (-10 mm). The thickness of skirt plate shall be minimum 10 mm. The top cover plate where provided shall be minimum 6 mm thick. Skirt plates shall be provided with suitable (minimum 10 mm thick) replaceable liners.


The arrangement for fixing rubber curtain and rubber on skirt boards shall be such as to ensure quick adjustment. The thickness of rubber curtains shall be minimum 10 mm. Skirt rubber shall be in segments and the design shall ensure automatic flexing of rubber for proper sealing. Shore hardness of skirt rubber shall be min. 55° A. Skirt rubber shall be minimum 10 mm thick.

Height of Skirt Board shall be compatible with DFDS requirements. At all feed points DFDS system requirement have been specified for all conveyor of Group – I, II. Hence in the upgraded conveyors (GR-II) Skirt boards are to be modified.

6.4.20 Drive Base Frame

The drive unit consisting of motor, gear-box, coupling and brakes along with protective guards shall have a common base frame and shall be fabricated from heavy structural sections and plates. Suitable bracings should be provided wherever necessary on the drive unit base frame and structure to make it rigid. Proper arrangements shall be provided with gear-boxes and motors to maintain correct alignment with finish pads for mounting. The drive base frames shall be bolted to the structural floor beams / civil foundation of junction houses. Necessary load data and foundation details shall be furnished by the successful.

For all conveyors (both Group I & II) new Drive Frames to be used. For upgraded conveyors (Group II) existing drive frames with modifications will not be used. For upgraded drive frame vertical support locations to be retained to the extent possible. Support beams in Transfer Point & Drive House of upgraded conveyor may need strengthening reinforcement due to

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additional load of upgraded conveyors, in line with details furnished in enclosed conveyor and building G.A. of existing items.

6.4.21 Pull Cord Switches

Pull cord switches shall be provided for emergency stoppage of conveyor. The first switch shall be about 4000 mm away from the driving pulley and subsequently at not more than 30 m interval. The pull wires shall run along the entire length of each conveyor on both sides. Where mobile trippers are used on conveyors, the pull wires shall run along the hand-railings on conveyor walkways. All pull cord switches shall have individual local indication lamps to indicate when operated.

6.4.22 Belt Sway Switches

Belt sway switches shall be provided on each conveyor for protection against excessive sway of the belt. A pair of switch shall be installed near the head end and a pair near the tail end and a pair of switch shall be installed at 50 m interval thereafter. A pair of these switches shall also be provided before the belt weighing scales.

6.4.23 Zero Speed Switches/Under speed switches

Zero Speed Switches shall be provided for each conveyor to stop the drive in case of excessive slippage. Provision shall be made such that preceding conveyor does not start unless the running conveyor picks up 80% of the rated speed.


6.4.24 Chute Jamming Detectors

Chute jamming detectors shall be provided on all chutes. The detectors shall be so located or protected that they do not come in contact with regular flow of material. The detector shall, also, be protected against deposit of the particles causing false alarm or stoppage of the conveyors. The position of each detector shall be decided based on the braking time of the delivery conveyor at rated capacity and the holding capacity of the chute.

6.4.25 Drawing Enclosed

Separate G.A & Profile Drawings for all Belt Conveyor enclosed (As Listed in Drawing List – Volume-VI). Power (KW) indicated are for reference and guide line. Length and Lift of conveyors indicated may change during detail engineering. Successful bidder will survey and finalize conveyor levels and distances.

The successful bidder shall make his own calculation in respect of belt speed, motor kilowatt, belt tension etc. of belt conveyors to ensure satisfactory performance of the conveyor components and system as a whole. The drive motor selected shall not be of lesser KW than what is indicated and the belting chosen shall not be of inferior equality than what is specified.

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The starting torque of drive motor and the high speed coupling shall be so chosen as to allow soft start condition.


6.4.26

Erection Norms

Erection of all equipment shall be carried out as per manufacturer's recommendation.

Unless specified otherwise by equipment manufacturers, equipment shall be installed within the tolerances indicated below:

a)	Supporting structures for drive pulleys, tensioning drum, intermediate frame, electric motor, gearbox & idler supporting structure.	:	In height 3.0 mm In horizontal plane – 1/1000 of length in mm
b)	Driving pulley	:	1/1000 of pulley in vertical plane.
c)	Axis of conveyor & center line of drum.	:	10 mm in horizontal plane
d)	Tension pulley	:	± 2 mm in vertical plane ± 2 mm in horizontal plane
e)	Idler arrangement	:	± 2 mm in vertical plane ± 2.5 mm in horizontal plane
f)	Rail mounted equipment like trippers, shuttle conveyor etc. in longitudinal direction of the same rail	:	2 mm / m of rail 5 mm / 25 m of rail 15 mm Max.
g)	Rail gauge	:	± 5 mm
h)	Difference in rail level with respect to one another base	:	$\pm 1\%$ of rail gauge for rigid $\pm 2\%$ of rail gauge for flexible base
i)	Difference in height of connecting rails at joints	:	Less than 0.3 mm
j)	Horizontal gap between rails at joints	:	Less than 0.3 mm
k)	Location of end stopper (in plan) with respect to one another	:	$\pm 1\%$ of gauge but max 20 mm.
l)	Deviation of rail in plan with respect to true line	:	± 10 mm but shall not exceed ± 1 mm in 2 m length
m)	Tilt of rail in horizontal	:	$\pm 8\%$ of rail head plane width


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n)	Deviation in conveyor centre line	:	2 mm for 1 m length, 5 mm for 2 m length but 15 mm max for total length
o)	Absolute bearing vibration velocity r.m.s. for rotating machines (to be measured by vibration measurement instrument)		
	i) Up to 15 KW	:	Less than 0.7 mm/sec
	ii) Up to 300 KW	:	Less than 1.1 mm/sec

6.4.27

Performance Tests & Guarantee Parameters

- I. After the equipment are completely erected at Purchaser's site, each item/equipment will be thoroughly checked for correctness and completeness of the installation and they shall be subjected to final tests as to performance and guarantee to be carried out in the presence of Contractor and the Purchaser / Consultant to demonstrate that the performance of the equipment conforms to relevant standards and specifications meet the requirements as given in this specification. The tests / checks to be conducted shall be generally as under:
- II. For each equipment, the load test shall be conducted in stages. The equipment shall be run for 8 to 10 hours continuously (cumulatively) at no load, 25%, 50%, 75%, 100% of the rated capacities or at rate mutually agreed upon between Contractor and Purchaser / Consultant. The intervening period shall be available for making adjustments and arrangements by the Contractor as may be required.
- III. All the specified speeds of the equipment shall be measured under full load conditions.
- IV. Proper operation of all positional limit switches and all safety switches, alarm for conveyors like pull cord switch, zero speed switch, belt sway switch etc. shall be demonstrated by the Contractor in the presence of Purchaser / Consultant.
- V. During operations of the equipment at no load and at full load, performance of all the drives shall be checked in respect of current drawn by the motors, temperature rise, vibrations, gear box noise and its heating, bearing heating etc. consumption of power and various consumptions like lubricants etc. shall also be measured and compared with the respective rated values.
- VI. Any other observations/tests felt necessary for judging the performance of the machines and mutually agreed between Contractor and Purchaser shall be carried out.
- VII. If during the test runs, there is an interruption exceeding 2 hours due to any cause other than power failure or shortage of input materials for which the Purchaser is responsible, the test run shall be discontinued and fresh date shall be decided mutually by both the parties.

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VIII. The equipment shall be considered to have performed satisfactorily when

- i) Rated capacity of equipment is demonstrated with all its drives and accessories functioning properly over a minimum period of eight (8) hours.
- ii) It runs successfully for a continuous period of 15 days at the rated capacity.

6.4.28 Drawings / Document / Information to be furnished by successful Bidder

The number of copies of drawings/data and other documents shall be as per TS.


1 List of drawings/data to be submitted along with tender

- a) General arrangement drawing of conveyors etc. showing overall dimension, profile, idler spacing, take-up arrangement, motor kW, drive arrangement etc. along with chutes, scrapper, skirt boards, switches, wheel load, wheel spacing, wheel diameters travel drive, power supply arrangement for travel drive etc.
- b) General Arrangement of conveyor-equipment showing overall dimensions and weight as well as GA of motor with its component list.
- c) Supplier's name for conveyor components (like idlers, pulleys, motors, and gearbox, coupling) catalogues for these items shall be furnished and mounting dimensions in separate drawings shall be submitted for Approval of Purchaser / Consultant before commencement of manufacturing.
- d) List of commissioning spares proposed by the Bidder.
- e) List of recommended spares for two years maintenance of plant and equipment along with itemized price.
- f) Duly filled up questionnaire given below.
- g) List of imported components in the equipment, if any.

2 List of drawings to be submitted for approval (by successful Bidder)

Following design data, calculations and drawings shall be submitted by the Successful Bidder to in stages for approval.

- All the drawings/data listed in clause above, giving all the details, loads/ power requirement etc.

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- In addition to the above, the Purchaser/ Consultant reserve the right to insist on submission of calculations / drawings / data for any mechanical, structural or electrical equipment / component as required.


3 Drawing / data / calculation / for reference (by successful Bidder)

- Load data and foundation pedestal plan for head end, tail end, drive base frame etc., specially where the Junction House / building is provided by another supplier / purchaser.
- Any other load data / information required by Purchaser / Consultant for design of building / structures.
- All drawings and documents are to be approved by Purchaser / Consultant.
- Procedure for erection & testing and commissioning. This shall also be furnished in soft copy.
- Spare part list and drawings
- Catalogues / literatures
- Operation and maintenance manual.
- Final test certificates
- As built drawings
- Ordering specifications for operating consumables / supplies

6.5 Vibrating Feeder


Vibrating feeder complete with: VFD Drive & electrical, Lined trough, Local panel, Structure/ frames with nuts & bolts, sleeves, etc. For supporting vibrating feeder & components on RCC/ steel structure, Cables for cabling/wiring of the system.

- Vibrating feeders shall be electromechanical type. Feeder shall consist of adequately sized trough mounted on flexible springs supported from platform with adequate clearance space.
- One of two unbalanced motors shall vibrate the trough. The amplitude and frequency of vibration and the supporting structure design should be such that equipment along with its structure should work satisfactorily with minimum noise level. The chute above the vibrating feeder shall be designed so that there is free flow of material.
- The vibrating feeders shall be lined with SS-304 liner of adequate thickness. The hopper outlet configuration shall be suitable for the selected size so that smooth flow is ensured.

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- Provision of variation of capacity by mechanical as well as electrical means to take care of variation in coal characteristics shall be incorporated in the design.
- The liner shall be secured with the main plate by means of countersunk bolts/suitable fastening arrangement.
- Provision to change the angle of inclination of the vibrating feeder shall be kept.
- The vibrating feeder shall have the provision to adjust feed rate. Feed rate adjustment would be required to obtain specified output even for change of physical properties like moisture, lump size etc. of the material.
- Proper sealing should be provided between thorough and the chute work.

Sl. No.	Item Description	Technical Particulars
1	General particulars	
2	Quantity	3 (three) nos. below New Tippler Hopper (VVF Drive)
3	Material to be handled	ROM Coal of size (-) 200 mm with moisture content 8-10% (18-20% during monsoon)
4	Type of Feeder Drive	Un-balance Motor (3 nos. VVF Drive)
5	Capacity requirement	500 TPH for each of 3 nos Feeder below New Tippler Hopper
6	Capacity adjustment	0-500 TPH for each of 3 nos Feeder below New Tippler Hopper
7	Hours of operation	Continuous
8	Feeding Arrangement	From below the RCC Hoppers
9	Weight of each Feeder	Bidder to specify
10	Preliminary Installation GA Drawing with overall dimensions	Bidder to furnish
10.1	Motor ratings	Bidder to specify
11	Constructional feature	Bidder to specify
12	Vibrator tray	Heavy duty mild steel tray with min. SS Liner of adequate thickness (Min. 12 mm)

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12.1	Down slope of the tray	10° maximum
12.2	Type of Mounting	Suspended Type
12.3	Type of discharge rate controller	Unbalanced weight

6.6

Flap Gates

The motor operated flap gates shall be provided in transfer chutes as specified and shall be complete with electrically operated actuators. The gates shall be of robust construction and suitable for trouble free operation. The face of the flap gate shall be made out of 20 mm thick SAILMA plate or equivalent material.

The equipment shall be capable of being operated for at least 15 switching at rated load and thrust and shall be suitable for 10 nos. consecutive switching at rated load and thrust. The equipment shall be shop tested to prove this requirement.

The motor rating for the actuator shall be so selected as to provide sufficient thrust for operation of the flap gates against the moving weight of coal and/or flap gate. The flap gate travel shall be in the range of 60 deg to 70 deg. The motor shall be completely dust tight.

Lever arm shall be provided between actuator and flap gate shaft for obtaining required thrust.


The actuators shall be capable of preventing any over travel. Suitable travel dependent limit switches controlling the travel of the flap gates on either direction shall be furnished. These shall be placed internal to the drive unit and shall be completely dust proof. The limit switches shall be capable of adjustments to vary the total length of travel of the gates.

Suitable thrust dependent limit switches shall be provided in the actuators, which shall trip off the actuator motor in case of excessive thrust due to jamming of gates during its travel in either direction. The same shall also be integral to the drive unit and shall be dust proof.

Provision for alternate manual operation shall also be made using declutch able hand wheel. The diameter of hand wheel shall be selected considering convenient force to be applied by a single operator. However, minimum diameter of hand wheel shall be 500 mm. Limit switch for safety of person operating the hand wheel shall be provided.

All the two way chutes shall be provided with flange and flap gate with a provision to mount an actuator in future.

Provision must be there to keep the flap gate at middle vertical position, so as to run both the streams at the time of requirement.

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Suitable stiffening shall be provided between the two faces of the gate plate. At the end of the travel the total length of edge of the flap gate shall rest on a suitable projected surface from chute to prevent leakage of coal dust through the available clearance between chute and flap gate.

Maximum feasible counterweights shall be provided for better utilization of system.

Suitable self-aligned double row ball bearings in dust tight housing shall carry the gate shaft. Suitable provision for regressing shall be provided.

For standardization purposes, only one standard type of actuator for flap gates shall be provided. The standard type actuator shall be selected for maximum thrust as calculated for various locations. Flap gate actuator as a whole and individual component wise shall be completely interchangeable for all locations.

The material of shaft shall be EN-8 or equivalent. The diameter of the shaft shall be suitable for motor stalled condition and associated twisting.


Approach/maintenance platforms complete with the chequered plate floor, hand rails, ladders etc. shall be provided for all flap gates.

Shaft & flap gate shall be tightly fitted to each other.

On both faces of flap gate main plate, 10 mm thick TISCRAAL liner plate or equivalent material shall be provided.

Equipment Data Sheet :


<u>SI No</u>	<u>Item Description</u>	<u>Technical Particulars</u>
1.0	Service Requirement	
1.1	Type	Linear actuator operated, 2-Position
1.2	Location	As per Flow Diagram /As per List below
1.3	Required numbers	5 Nos.
1.4	Capacity	900 TPH
1.5	Coal size handled	□ (-) 200mm (occasionally -400 mm)
1.6	Chute valley angle and gate position	60 degree
1.7	Hours of operation / day	Continuous
2.0	Flap Gate Requirement	

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<u>SI No</u>	<u>Item Description</u>	<u>Technical Particulars</u>
2.1	No of switching per hour	15/hr and 10 nos consecutive switching at rated load and thrust
2.2	Travel	As required
2.3	Actuator type	Electric
2.4	Speed of travel	50 mm/sec (min)
2.5	Minimum thrust	500 Kg
2.6	Minimum Stroke Length	300 mm
3.0	Material of Construction	
3.1	Gate	Tiscral/equivalent plate, 20 mm thick, welded construction
3.2	Shaft	EN-8
3.3	Shaft size	100 mm dia. min
3.4	Chute Plate	SAILHARD or equivalent
4.0	Bearing	
4.1	Type	Dust proof, self-aligning anti friction ball or roller
4.2	Type of sealing	Double labyrinth (min)
4.3	Method of lubrication	Single shot, pressure lubrication
5.0	Miscellaneous Requirement	
5.1	Type of protection	IP-55
5.2	Type of limit switches	Thrust dependent Position dependent

LIST OF FLAP GATES

SI No	Flap Gate No	Location	Details	Capacity
1	FG-2C/2D	Fixed Tripper House TC-5 on Conv.2C/2D	Conv.-2C/2D	900TPH
2	FG-15(New)	New TP-1B	Conv-1C to Conv 2C/2D	900TPH
3	FG-16(New)	New TP-2A	Conv-2C to Conv 3A/3B	900TPH
4	FG-17(New)	New TP-2A	Conv-2D to Conv 3A/3B	900TPH

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NOTE:- 1) Locations of all flap gates have Been Marked in the Flow Scheme Drawing CHP/NIT/MECH/02 for prompt understanding. Successful bidder of have to supply separate drawings for all the locations mentioned above.

6.7

Rack & Pinion Gates

Double rack and pinion type with manual operation shall be provided at various locations as specified. The gate shall be mounted such that coal load does not act vertically on gate.

Suitable manually operated rod gates shall be provided over rack and pinion gates for their easy operation and maintenance.


The rack and pinion gate shall be guided properly and suitable rollers with bearings sealed for life and dust proof shall be provided.

The rack and pinion gates shall be of mild steel construction with liner plate of 10 mm thick tiscral or equivalent material. The gates shall be operated by means of double rack and pinion. The material for rack & pinion wheel shall be cast steel and shaft shall be EN-8. Manual effort required to operate the rack and pinion gate shall not exceed 25 kg. Maximum time for closing/opening shall be 24 sec.

Approach/maintenance platforms complete with chequered plate floor, hand railings, ladder etc shall be provided for all gates.

Equipment Data Sheet:

SI No	Item Description	Technical Particulars
1.0	Type	Manual Operated Double rack and pinion type with provision manual operation
2.0	Location	Below new Wagon Tippler Hopper
3.0	Quantity	3 nos.
4.0	Material size	(-) 40 mm to (-)200 mm (-400mm occasionally)
5.0	Material flow rate	0-500 TPH
6.0	Hours of operation	Continuous
8.0	Locking device to be provided	Yes
11.0	Material of construction	
11.2	Rack	Cast Steel
11.3	Pinion	Cast Steel
11.4	Drive Shaft	EN-8, C-40
11.5	Safety guard	MS
11.6	Guide Roller	CI, IS-210, FG-160

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SI No	Item Description	Technical Particulars
11.7	Chain & sprocket	IS : 2429
12.0	Bearing	Bidder to indicate
12.1	Type	Dust type anti friction ball bearing with double labyrinth seal
12.2	Life	Minimum 30000 working hours
12.3	Method of lubrication	Oil/Grease pressure lubricated

6.8 **CHUTES & HOPPER**

The valley angle of chutes shall be 60 degrees from horizontal. The actual valley angle and chute design shall be finalized after carrying out coal flowability studies at worst conditions. Min valley angle shall be 55°.


Transfer chutes shall be adequately sized and sloped to ensure smooth flow of coal without any accumulation anywhere.

Direct impact of material on conveyor belt shall be avoided by providing an inclined surface at 60 degrees valley angle at the feeding point to guide the material in the direction of belt travel. Further, chute construction below flap gate shall be such that there will be no accumulation of coal dust between chute and flap gate in that zone.

In view of increase in speed at Impact zone stone Box type design may be adopted. Proper trajectory calculation to be furnished with chute G.A. drawings.

Hoppers and Chutes shall be made of minimum 10 mm thick MS – plates with liners SAILHARD or equivalent of 10 mm thk with adequate stiffeners. Long chutes guiding flow from considerable height shall be provided with impact plates wherever change in direction of flow takes place. Hinged inspection doors (generously sized) of leak proof construction shall be provided for access / maintenance purpose, at approachable heights, of the chutes. All chutes should have one inspection door at every floor and for the ones in between the floors, suitable access ladder and platform etc. shall be provided. Maximum distance between two inspection doors in a chute shall be 2 mtrs. For sealing at inspection doors labyrinth type arrangement (with rubber inserted in grooves) to be provided. In addition to mounting bolts, swiveling eccentric handle (s) to tighten the door further against rubber shall also be provided. Liner plates shall be fixed by wedge on the chute plates.

Bottom side of the chutes on which the coal slides shall be welded to the side plates to form a trough. Bottom sides along with its adjacent sides shall be flanged and made from MS / SAILHARD or equivalent LINER material of 10 mm thickness. The non-striking surface i.e. the covers of the trough shall be of 10 mm thick mild steel and bolted to the flange provided on the trough. Inside welding shall be provided in the corners for permanent sealing. Further, the chute boxes, not more than 1.5 m in length, shall be joined through bolted flange connection to the chute legs.

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Bolted flange joints shall be of dust tight construction and necessary sealing material shall be provided in all the flange connections for adequate sealing.

Complete chute work in the region of flap gates shall be fabricated from SAILHARD or equivalent. In case of vertical chutes (valley angle more than 80 degree) complete chute work shall be of 10 mm thick M.S or with 10 mm thk. Liner of SAILHARD or equivalent. While finalizing the chute work inside the building, arrangement for shifting and replacing chute legs, proper handling arrangement / wall openings, trolleys, hoists shall also be provided.


Hoods over the conveyor head pulleys shall be made of minimum 6 mm M.S. Plates and shall be provided with hinged and gasketed inspection doors with suitable access to them. Further, rubber seal shall also be provided at the very inlet of head chute to minimize dust nuisance. (Ref. Section 6.4.15) wherein detail description have been given for Discharge Hood.

All conveyor discharge chute will be designed in such a way that snub pulley is covered.

For Wagon Tippler RCC Hoppers, the hopper mouth opening have been increased to 1600 mm and a transition piece of steel have been incorporated with SS liner (12 mm thick) with 2 Nos. Air Cannon for each of 3 Hoppers. This is for elimination of flow problem for handling imported coal with fines having higher moisture content.

Equipment Data Sheet:

Sl. No.	Item Description	Technical Particulars
1.0	Chutes & Hoppers	3 nos of capacity 150T each
1.1	Minimum valley angle	60°
1.2	Material of Chute work Sliding zones & adjacent side.	10 mm Thk MS with 10 mm Thk SAILHARD Liner
	Non striking / non sliding zones	10 mm thk MS
	Chutes with valley angle 60° and above	All for sides of 16 mm Thk. M.S pl. with Liner pl. 10 mm Thk. equivalent
	In the zone of flap gates	12 mm thk with 10 mm Liner.
	Discharge Hoods overhead pulleys	6 mm thk. M.S.
2.0	Inspection doors	Hinged & leak proof construction
2.1	Chute Construction	
	Comers	One face of removable bolted flange connection

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SI. No.	Item Description	Technical Particulars
	Joints	Bolted flange joints of dust tight construction
	Bolt size	Min. M-16
	Bolts spacing	Not more than 150 mm C/C
	Fixing Arrangement	Bolts with plain and spring washers

6.9 Electric & Manual Hoist

Suitable handling arrangements shall be provided for all equipment's to transfer the equipment to maintenance area within the building and / or to transfer the equipment outside the building up to ground level for further transportation. For this purpose Bidder shall provide monorails and hoist blocks with cross travel facility.


For the Hoists with more than 3.0 ton lifting capacity or more than 10.0 M lift, motor operated hoist blocks for both long travel and lift shall be provided. Other hoist blocks shall be of hand operated type for both travel and lift. However, all monorails coming out of the building shall be provided with electric hoist blocks, irrespective of load and lift. Adequate length of Cantilever shall be provided in monorails to lower the equipment to ground level clearing the building sidewalls.

The center line of monorail shall not deviate by more than 500 mm from the center of gravity of any equipment that is to be lifted. Bidder shall take clear note of the fact that the number and monorail hoisting system shall also be decided considering the movement of the equipment being lifted over/by the side other equipment's without removing the later. The necessary levels of floors in various buildings shall be decided considering the above requirement.

Monorails shall be extended outside the building to handle the equipment to ground level. Suitable machinery well / hatch and removable hand railing / grating shall be provided on various floors of buildings, as necessary.

Electrically operated mono girder type hoists shall consist of following major components.

- Electrically operated trolley complete with drive motor (Trolley travel speed maximum 15 m/min).
- Hoist cable, hoisting block and hooks complete with drive motor (Hoisting speed maximum 6 m/min).
- Limit switch to prevent over hoisting, over lowering and over travel.
- Festoon arrangement of feeding power to trolley assembly.

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(e) Erection hardware.

(f) Pendant control station suspended from hoist.

The hoist shall be designed and constructed in accordance with the latest revision of IS:3938 and shall be suitable for duty class 2.

Trolley movement and hoisting shall be effected by using two separate motors. However the motors shall be suitable for 150 starts per hour at 40% CDF.

Trolley shall be designed to accommodate a wide range of beams and shall be capable of traveling on straight as well as curved monorails with the design being such to maintain uniform distribution of pressure on the flanges.

Motor operated geared trolley shall have two (2) pairs of wheels, one pair of which shall be driven through motor.

Wire rope shall be of pre-formed type, hemp cored, and regular lay 6/37 construction with a breaking strength of 160-175 kgf/mm². Reverse bend of ropes is not acceptable. Minimum number of falls of rope shall be four (4).

All electromechanical brake shall provide restraining torque. Brake lining shall be of asbestos.

Cast iron parts, wherever used, shall be of minimum grade 30, IS:210.


All hand operated chain pulley blocks shall be designed to IS:3832, the operating hand chain shall conform to IS:2429 (1) grade 30 pitched and polished and the load Chain to IS:3109 grade 40. The chain pulley block shall be suitable for duty class 2. Hooks shall be of high tensile steel and heat treated as Clause 7.1 (b) IS:3815.

All hoists/chain pulley blocks shall be selected to have minimum headroom and shall be selected to lift heaviest piece of equipment. Further it shall be possible to handle any equipment without disturbing equipment.

The hand chain wheels shall be of cast steel, the wheels shall be with flanges and designed to ensure effective operation of hand chain. Further, suitable local brake shall be provided as per IS:3832 to arrest and sustain loads in all working positions.

The velocity rates, effort on chain required to raise the safe working load and travel and speed shall be within the limit specified in IS:3832. Proof load test shall be carried out as per IS:3832.

The hoist mechanism shall consist of a grooved rope drum driven by electric motor through gears, Each end of the rope shall be anchored to the drum in such a way as the anchorage is readily available for maintenance. Each rope shall have not more than two (2) full turns of the drum when

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the hook is at its lowest position and one (1) spare groove when the hook is at its highest position. The leading rope taken by the drum should not slope sideways when slack and it should not be caught between the gear wheel.

Rope drum, gear box, block etc. should be fabricated out of weld able quality steel.

Trolley load hook shall be swiveling type forged circular shank section: and shall confirm to IS: 3815.

All gears and bearings shall be lubricated by grease. All lubricating points shall be grouped together in easily accessible position.

The bottom block shall be of enclosed type and shall have guard against rope jamming in normal use. It shall have standard forged swivel shank fitted on antifriction thrust bearing. Lock to prevent hook from rotation and locking arrangement to prevent accidental unlocking shall be provided. Pulley of the bottom block shall be provided with antifriction bearings.

All parts requiring replacement / inscription / lubrication shall be accessible without need for dismantling of other parts / structures.

All components of hoists of identical capacity and duty shall be interchangeable.


Hoists shall have permanent inscription on each side readily recognizable from floor level stating safe working load.

Pendant shall be provided with up/down/forward/reverse travel push buttons and indicating lamps, Its power supply shall be limited to 24 V AC.

The control panel shall be wall mounted type & easily approachable from the floor by a standing man.

For Inspection / maintenance of hoist components a fixed platform with ladder shall be provided of each hoist.

SI No.	Item Description	Technical Particulars
1.	Type	Electrically operated hoist & trolley. And Manually operated hoist & trolley as required.
2.	Speed control of hoist	Bidder to indicate
3.	Monorail track	Straight/Curved
4.	Gear	
4.1	Type	Helical
4.2	Material	Forged/cast steel


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5.	Brake	
5.1	Type	Electro-magnetic or equivalent.
5.2	Brake to be provided for	Hoist & trolley
5.3	Holding torque	150% of the load torque for hoisting & 125% for trolley.
5.4	Method of actuation.	Automatic / Manual.
6.	Bearing	
6.1	Type	Ball/Roller
6.2	Life (Hrs)	30,000 working hours
6.3	Lubrication	Oil/grease
6.4	Shaft	Steel-En8/Equivalent
7.	Class of Hoist	
7.1	Class – 2 for Electrical Hoist Class – 1 for manual Hoist	
8.	Hook	
8.1	Material	As per IS-3815
8.2	Design	As per IS:8610
9.	Wire Rope	
9.1	Factor of safety	Six (6)
9.2	Construction	Construction 6 x 37/6x36 as per IS-3938, regular lay with a minimum strength of 160-175 Kgf/Sq.mm.
10.	Other requirements	As per IS:3938 & is:2266
11.	Hoist Drum & Sheave	
11.1	Material	MS/Cast Steel as per IS-3933
11.2	Other requirements	As per IS:3938
11.3	Hoist drum surface	Hard faced.
12.	Catalogue / Leaflet provided	Bidder to provide
13.	Inching operation of hoist motor	Required

LIST OF ELECTRIC HOIST IN BUILDINGS

ELECTRIC HOIST

Building	Capacity (Ton)
Wagon Tippler	10.0 T
TP – 1A	3.0 T

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Building	Capacity (Ton)
TP – 1B	3.0 T
TP-2A	2.0 T

6.10 **Sump Pumps**

Sump pumps (self-priming) along with level switches & piping up to nearest plant drain (max up to 50.0 mtrs. from outside the building) shall be provided at all locations wherever natural drainage is not possible.

6.10.1 **The technical particulars shall be as below:**


2 Nos. (1 working + 1 Stand – By, have been envisaged in Wagon Tippler Building)

1	Type		Wet. Pit. vertical shaft type
2	Capacity		Minimum 50 m ³ / hour Ability to handle large solids upto 40 mm size.
3	Drain Pits		Minimum 2.2 X 2.0 m X 1.5 m X Deep Sump Pit for incoming slurry. Level switches for high and low levels of slurry shall be provided.
4	Casing and rotor housing		Ni-Cast Iron (350 BHN)
5	Rotor		Ni-Cast Iron (350 BHN)
6	Shaft		Medium carbon steel
7	Gland		Bronze
8	Wearing rings		Stainless steel
9	Shaft enclosing tube		Carbon steel

Impeller shall be specially designed to pass large solids or unscreened liquids. The construction and material shall be suitable for pumping coal / dust contaminated water with a minimum of maintenance.

Independent piping shall be provided up to the terminal point for each of the pumps.

BELT WEIGHER (BW – 1B)

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6.11.1 **Scope of Work**

The scope of work of the Bidder shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery FOR Purchaser's site, unloading, handling and storage at site, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics and standard accessories of electronic micro-processor based Belt Weigher as covered under this specification.

The scope of the Bidder shall be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

- Commissioning spares as required during testing and commissioning of the equipment.
- Required quantity of initial fill of oil, grease, lubricants, hydraulic fluid etc. and other consumables which are necessary for cleaning / flushing including erection, testing and commissioning the equipment shall be in the scope of supply of the Bidder.
- Necessary tools and tackles for each equipment required for maintenance, testing or inspection of the equipment.

6.11.2 **TECHNICAL SPECIFICATION**

1. **General**

Belt weigh scale for measurement of flow rate and total-quantity shall be provided at specified locations as per relevant requirement as indicated in data sheets. System shall be complete with flow rate indicator, totaliser, control panel etc.


2. **Codes & Standards**

The design, manufacture, inspection and testing of Belt Scales shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The Belt Scales shall conform to the latest edition of the following standards and codes. Other internationally acceptable standards/codes, which ensure equal or higher performance than those specified, shall also be accepted.

IS:11547 Electronic weighing in motion system

6.11.3 **BELT WEIGHER (WEIGHTOMETER)**

Type	Microprocessor based Electronic, multi-idler belt weigher
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Capacity	0-900 TPH
Material handled	Coal
Bulk density	As per process
Flow	Free flow
Weighing scale range	0-1000 TPH
Temp. range of operation	+5° C to +50° C
Duty	Continuous
Calibration	Test chains/ standard weight
Accuracy	± 0.5% FS or better for installation and verification (static) ± 1.0% FS or better for normal running (dynamic)
Weight sensor	Strain gauge type load cell
Speed measurement	Non-Contact Type
Electronic Unit	The electronic unit for signal processing shall be mounted at new MCC Room.
Quantity	1 no.
Location	On Conv.-1B
Tag nos.	BW – 1B
Belt width	To be decided by Vendor
Belt speed	2.5 m/sec
Belt Type	Nylon-Nylon
Material size	ROM Coal (-200 mm)
Troughing angle	35°
Type of weighing	Electronic Load cell type
Type of load cell	Taco-Generator
Weighing bridge length	Vendor to specify
Weighing range	5 -110% of nominal capacity of 900 TPH
Accuracy at full load	+/- 0.5% of actual weight
Operating Voltage/ Power requirement	Vendor to specify

6.12

Dry Fog Dust Suppression System

INTRODUCTION

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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PRINCIPLE OPERATION

The dry fogging system, agglomerates (attaches) the airborne dust particles to micron sized water droplets so that the particles become heavy enough to be returned to the product stream by the force of gravity. Unlike water spray systems, dry fogging uses very little water and does not wet the process material, only the airborne dust. No expensive surfactant or binding type chemicals is required. Dust control efficiencies can be as good as a dust collection system, but with lower capital, installation, and operating cost.

The reason the dry fog system works so efficiently is due to ability to atomize water into micron – sized droplets of similar size to the dust particles that are of concern. To achieve agglomeration at the dust source point, two conditions need to exist; 1) Enough water droplets of the same size as the dust particles have to be generated and 2) Both dust particles and water droplets have to be contained in the same area so that agglomeration can occur.


FOG NOZZLES

The design of the system should be based on a unique nozzle that can produce a very dense fog of 1-10 micron size water droplets that literally blanket the dust source and keep the dust particles from becoming airborne. It is important to note that the dry fogging system wets the dust, not the material.

The nozzles are air driven device for fogging liquids by passing them through a field of high frequency sound waves. This is accomplished by compressing air upstream of a specially designed converge section of the nozzle. The result is an air stream that will accelerate past the speed of sound in the diverge section. When it passes the speed of sound, a primary shock wave is generated at the mouth of the nozzle. To enhance the fogging capability, a resonating chamber in the path of the air stream reflects the air stream back at itself to amplify the primary shock wave. Once the shock wave is generated, water is delivered through annular orifices where it is sheared into relatively small droplets. These small droplets are then carried by the primary air stream into the shock wave and exploded into thousands of micron size fog droplets. The air then escapes around the resonating chamber and carries the droplets downstream in a soft, low velocity fog pattern. The nozzle has no moving parts and is constructed of 100% stainless steel to provide years of trouble free service. Dissolved minerals pass through the nozzle without clogging and any undissolved solids and easily filtered out by our system.

FOG CONTAINMENT

As explained in the “PRINCIPLE OF OPERATION” section, both the dust particles and the fog droplets have to be contained in the same area so that agglomeration can occur. The reason for this is because conditions such as material flow ambient wind and low relative humidity can mitigate the affects of the fog blanket, reducing reaction time and therefore affect the efficiency of the system.

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The enclosure should be modular type and should be engineered for the exact no of application point.


With conveyor transfer points, there must be sufficient room for the fog to fully develop, particularly in the receiving belt area. In addition, it is necessary to maintain the tightness of skirt boards and insure that conveyor covers are in place an inspection doors are closed so as not to affect the efficiency of the system. The bidder should recommend the type of modification required specially for feed point and discharge area of all existing conveyors under scope of up-gradation.

6.11.1

APPLICATION POINTS

The Details of application points are given in the application table below. Each application point shall be provided with requisite number of Spray Bar Assemblies fitted with Dual-fluid Dry Fog Atomizing Nozzles. The Application Points are for both new conveyors.

Circuit will be provided with Flow Activation Stations (FAS) for ON/OFF control of the System. The Flow Activation Station will have provision for both Manual and Automatic Operation, In the Manual Mode, the System will become operational through a Selector Switch provided on the FAS. For auto operation of the System sensing devices such as Speed Switch cum Belt Load Monitors / Limit Switches etc. shall be installed in the conveyor system to give signal when the Conveyors are running under load. For certain specific locations such as vibro-feeders etc. the End User has to provide potential free contact at FAS when the equipment is in operation under load. In auto mode the system can also be operated through signal from plant PLC instead of through sensors. Details should be read in conjunction with FLOW SCHEME, & PLANT LAYOUT Drawings where clear demarcation have been made between existing plan under up-gradation and for new conveyors and buildings. The dust concentration in the area after implementation of DFDS should be within desirable limit prescribed by concerned pollution control authority (PM10:-100µg/Nm³ and PM-2.5:-60 µg/Nm³ on 24hrs basis).

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APPLICATION TABLE FOR DRY FOG SYSTEM

DSS-1.		
Premises Served : Wagon Tippler and Coal Transfer Points		
Sl.no.	Application Area	Application Points
1	WTB-2(NEW)	Discharge of Vibro Feeder-12
2		Discharge of Vibro Feeder-13
3		Discharge of Vibro Feeder-14
4		Receipt of Conv-1B from VF-12
5		Receipt of Conv-1B from VF-13
6		Receipt of Conv-1B from VF-14
7	TP-1A (New)	Discharge of Conv-1B
8	TP-1B (New)	Discharge of Conv-1C
		Receipt of Conv-2C from Conv-1C
9		Receipt of Conv-2D from Conv-1C
10	TP-2A (New)	Discharge of Conv-2C
11		Receipt of Conv-3A from Conv-2C
12		Receipt of Conv-3B from Conv-2C
13		Discharge of Conv-2D
14		Receipt of Conv-3A from Conv-2D
15		Receipt of Conv-3B from Conv-2D
TOTAL DRYFOG DUST SUPPRESSION SYSTEM		


Dust Suppression above Wagon Tippler Hoppers and in Fixed tripper House TC-5 will be done through spring nozzles/sprinklers.

6.13

VANTILATION SYSTEM

GENERAL

This section of specification covers details of system specifications, detailing the areas to be ventilated, basis of design, brief description of the system, equipment and services to be furnished. The supply, delivery and erection of the entire equipment and accessories listed here shall be in Bidder's scope.

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Description of Ventilation System scheme (specification should be read in conjunction with details of Air Conditioning System section).

6.13.1 **SCOPE OR WORK**

The areas to be ventilated by Mechanical Ventilation process (using roof extractors / Supply and / or Exhaust fans) shall consist of but not limited to the following:

- a) Underground Tunnel of Conv-1B. from Wagon Tippler Building to pent House. (Ref conv. profile drawing where tunnel section and length indicated).
- b) Electrical Rooms (excluding control room where air conditioning is envisaged)

6.13.2 **CODES & STANDARDS**

The design, manufacture and performance of equipment shall comply with all currently applicable statues, regulations and safety codes in the locality where equipment are to be installed. Nothing in this specification shall be considered to relieve the Supplier / Contractor of this responsibility.

6.13.3 **DESIGN PHILOSOPHY – VENTILATION SYSTEM**


The capacity of Supply air fans, exhaust air fans / roof extractors, ducting system shall be designed as per the Design Philosophy & Equipment specification elaborated below. Sizing calculations for all the equipment shall be submitted for approval of Purchaser.

The number of air changes per hour in evaporative / mechanically ventilated areas shall be as follows:-

Sl. No.	Area	Air changes
1.	General areas (Tunnel)	20
2.	Electrical rooms	15

All ventilation system shall operate on 100% fresh air.

All mechanically ventilated areas shall be positively ventilated by means of supply air fans, generally in combination with exhaust fan /roof extractors. Wherever exhaust fan / roof extractors are not provided, such as MCC / switchgear rooms, the pressurized condition shall be maintained with gravity operated backdraft dampers. However, as exception, hazardous areas and fumes / odor generating areas such as toilets shall be negatively ventilated by means of exhaust air roof exhausters and inlet louvers.

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Supply air fan catering for electrical switchgear / MCC and battery rooms shall be provided with pre-filters and fine filters, while supply air fans for other areas shall be provided with pre-filter only.

All the equipment of Ventilation system shall be designed for continuous duty for continuous operation of 24 hours a day.

For fans and blowers continuous Motor rating (at 50 deg. C ambient) shall be at least ten percent (10%) above the maximum load demand of the Fan / blower at the design duty point.

For Belt drives, the belts shall be sized for 150% of the rated power and there shall be minimum of two belts per drive.

Supply air fans, exhaust air fans / roof ventilators of each area shall be provided with their local starter panel.

6.13.4 EQUIPMENT DESCRIPTION – VENTILATION SYSTEM

6.13.4.1 Centrifugal Fan

The casing shall be of welded construction fabricated with heavy gauge galvanized sheet steel or MS sheet with spray galvanization. In case of spray galvanization zinc deposition should conform to class 275 of IS 277. The minimum thickness of casing shall be 3 mm. It shall be rigidly reinforced and supported by structural angles. The seams shall be permanently sealed airtight. Split casings shall be provided on larger sizes of fans. Casing drain with valves shall be provided wherever required.


The impeller shall have die – formed backward – curved blades tie welded to the rim and back plate to have a non-overloading characteristic of the fan. Rim shall be spun to have a smooth contour. If required intermediate stiffening rings shall be provided. Shaft sleeves shall be furnished wherever required. The impeller along with driven pulley shall be dynamically balanced as per relevant standard.

The bearing shall be self-aligning, heavy duty ball, roller or sleeve bearing. They shall be adequately supported. They shall be easily accessible and lubricated properly from outside.

Inlet guard shall be spun to have a smooth contour, Inlet screen, if provided, shall be of galvanized wire mesh of 25 mm square.

Base plate with necessary number of spring type vibration isolators or ribbed neoprene rubber pad or cushy foot mounting shall be provided. The vibration isolators should have a minimum of 70% efficiency.

The first critical speed of the rotating assembly shall be at least 25% above the operating speed.

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6.13.4.2 **DUCTING:-**

The entire air distribution system shall be balanced by the contractor to supply the air quantity as required in various region / rooms. The final balancing of air quantities shall be through each grills / diffuser. Proper steps shall be taken to maintain a uniform temperature throughout the room.

The air distribution system shall be made from galvanized steel sheet. Galvanization of the steel sheet, shall conform to Grade – 275 of IS: 277, 1992.

Ducts shall be supported by 10 mm MS Rods and 40 x 40 x 3 MS angles. The duct supports shall be at a distance of not more than 2500 mm. The MS rods shall be hung by dash fasteners fixed to the ceiling slab. All supporting material shall be provided.

Where the sheet metal duct connects to the intake or discharge of fan units a flexible connection of at least 150 mm width shall be provided of closely woven, rubber impregnated double layer asbestos / canvas or neoprene coated fiber glass. The materials shall be attached to angle iron frames on equipment and to similar frames on duct or casing by means of a steel band or collar fitting over the end of the flexible connection and bolted through angle iron frame so as clamp securely between the band and the angle frame.

Plenums chambers shall be constructed in 18 gauges GSS, supported on 40 x 40 x 6 mm MS angle frames. However, cross bracing of the plenum shall be similar to the bracing detail of rectangular duct as detailed above. All vertical angles shall be riveted approximately 125 mm centers to the casing.

Diffusers and Grills


Diffusers / grills shall be of extruded aluminum powder coated. All supply air diffusers / grills shall be complete with volume control dampers. Supply air grills / diffuser shall be double deflection type. Air volume control damper shall be operated by a key from the front of grills / diffusers.

Thickness of Grills, Diffuser, Damper shall be as follows:

- a) Frame 16 gauge
- b) Louvers 18 gauge

Suitable vanes shall be provided in duct collar to have uniform / proper air distribution. Bank of baffles wherever required shall also be provided. Air velocity through diffusers & grills shall not exceed 2 m/sec (for A/C system) and 4 m/sec (for ventilation system).

Insulation

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The surface to be insulated both thermally and acoustically shall be thoroughly cleaned. Pressure / Hydrostatic tests shall be carried out before application of insulation.

Two coats of primer paint shall be applied on the clean surface and then CPRX Compound (Shalimar Tar products or equivalent) shall be uniformly applied @ 1.5 kg/sqm on the surface to be insulated.

6.13.4.3 **PERFORMANCE TESTING**

The bidder for workmanship, materials and satisfactory performance shall guarantee all the equipment. The guarantee for performance shall cover individual items and systems including electrical for their ratings / outputs as well as for the integrated operation of the equipment and its auxiliaries as a whole.

The guarantee tests shall cover but not be limited to the following rated parameters for smooth operation of air conditioning and ventilation system.

- a) Design dry bulb temperature in ventilated area.


Low Pressure Air Distribution System

The air distribution system shall be sized to have a constant frictional drop along its length. The maximum air velocity shall be restricted to 6 m/sec for air conditioning and 8 m/s for ventilation ducts.


The noise level within the air conditioned area shall be restricted to 65 dB (A) level. Acoustic insulation shall be provided inside duct surface for a length of 7 m from AHU mouth.

6.14 **AIR CONDITIONING SYSTEM**

1. Air conditioning will be done inside New Wagon Tippler Control Room and in part of new MCC Room with 50% standby arrangement. Bidder will consider Heat Load inside the respective room based on standard practice and relevant parameters.
2. Inside temperature will be considered as $73 \pm 2^{\circ}$ F DB and 65° F WB and relative humidity will be $60 \pm 5\%$; whereas outside ambient condition are to be considered as 97° F DB and 79° F WB (Ref. Section 1.00 Site Description vol-I).
3. As per standard specifications, 1.5 Air Changes per hour as Fresh Air will be considered.
4. The air-cooled packaged units shall be floor – mounted units. All components except condenser will be located inside the units only, however condenser needs to be installed in the ambient condition. The evaporator shall have 3 row cooling coil of copper tubing of 9.5 mm OD with extended aluminum fins for higher heat transmission efficiency.

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5. Each floor mounted packaged air – conditioners should be comprising of Hermetically Sealed Scroll Compressors of identical capacity in independent circuit housed within the unit so that in case of low inside load or during off peak condition number of compressors in operation can be minimized.
6. The blower fan shall be selected for low RPM for quiet operation and should be belt driven.
7. The unit shall have washable non-woven polyester medial enclosed by HDPE mesh air pre-filter with 90% efficiency down to 20 micron. The filter shall be mounted in a filter frame so that it is held in position during operation of the unit.
8. The supply airside of the indoor unit shall be insulated with 12 mm fiberglass bonded by non-water soluble fire retardant thermosetting resin.
9. The packaged type air-conditioners shall be accompanied with separate microprocessor based control panel along with necessary starter, switch, fuse etc to facilitate the following features -
 - Automatic selection of compressor to ensure energy efficient.
 - Run time equalization between all compressors.
 - Accurate temperature sensing through electronic thermostat.
 - Memory backup in case of power failure.
 - Digital control of temperature through fuzzy logic.
 - Auto restart after power failure.
 - Built in time delay protection compressors from instant Stop / Start.
 - Single and reverse phase protection.
 - Fault diagnostic facilitating safety trips and fast corrective action.
10. The indoor unit shall have type accessories like HP /LP cutout switch for safety protection of the compressor, liquid line valve and catch all dryers.
11. The packaged / hi-wall split air – conditioners shall be suitable for operation of 415 V \pm 10%, 3 phase, 4 wire, 50 Hz electrical power supply.
12. Floor mounted packaged AC will be installed inside the plant room which will be adjacent to the conditioned space.
13. The cold air will be distributed through GSS duct and square diffuser. The return air will come back to the plant room above the false ceiling through diffusers. Necessary volume control damper and fusible link fire damper shall be supplied as per requirement and approved drawing.
14. The acoustic insulation will be provided with 12 mm thick 48 kg / cu.m density rigid board as per standard design. The tail end of the duct will be thermally insulated with 25 mm thick 24 kg / cu.m density glass wool with aluminium foil faced.

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15. Heater and PAN Humidifier will be provided as required to main humidity level inside the room through the year.
16. One number distribution panel for each packaged room will be installed inside the package room. Necessary supply power with double earthing shall be provided in the package room. Further arrangement of power cabling, control cabling and earthing for package AC, heater and humidifier will be done by the Bidder.
17. Fine filter shall be provided as mentioned in the specification. To increase the TSP, additional booster fan will be added to the duct.
18. HI split will be in WT control Room and MCC Room.
19. Condenser / Condensing unit will be installed nearest to the indoor unit.
20. Supply and termination of adequate 3 phase, 4 wire, 415 + 10% volts, 50 + 3% Hz, power supply along with double earthing at the MCB DB shall be supplied by the Bidder.
21. All sorts of civil works such as provision for foundation for equipment, condenser and PAN humidifier, cutting and making good of floor / ceiling slabs or other structures including wall chasing, finishing and re-painting for the passage of pipes or cables, dismantling of walls, all kind of false ceiling work, paneling work, flooring work, suitable trap for termination of condense water drain pipes within 3 mtrs, works related to concealment of pipes / ducts / cables, are included in successful bidder scope of work.

6.15 **WATER SYSTEM**

Scope of work


The scope of work shall include design, engineering, fabrication, manufacturing assembly & supply, erection / construction / laying, commissioning, testing & performance guarantee tests etc of plant & equipment and piping etc of complete water supply facilities including technological structures, pipe-support structures, etc as specified and required for the complete water system for CHP complex as specified in this chapter as well as various chapters of this bidder specification turnkey basis.

The water system for the contract can broadly be divided in 3 parts.


- i) Service Water System
- ii) Fire Fighting System
- iii) Drinking Water System

All supply will be made available from the existing supply lines as confirmed by Purchaser. No separate pump has been envisaged.

The scope of work shall include the following activities.

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- i) Design, engineering, manufacture / fabrication, assembly, shop testing, painting, packing sequential delivery FOR site, unloading, unpacking, storage at site, preparation & submission of all drawings for civil, mechanical, structural, piping, construction & erection drawings, construction & erection as per approved drawings, site-testing, painting, commissioning and fulfillment of guarantee performance of all plant & equipment of water supply facilities for the entire CHP complex including drinking water system, industrial service/make-up water system and water based fire-fighting system, in accordance with the water system requirements of the proposed plant.
- ii) Supply of pipeline supports, thrust blocks / anchor blocks, R.C.C. pedestals etc. for overhead / on-ground / underground pipelines.
- iii) Supply of all technical literature, drawings & documents, general arrangement drawings, assembly & sub-assembly drawings of all the plant & equipment, constructions & erection drawings, as-built drawings, operation & maintenance manuals, manufacturing drawings, etc.
- iv) Submission of all drawings at (iii) above, design calculations, data sheets for various equipment, pipeline sizing calculation and for approval of Purchaser / Consultant and finalizing the same as per approval of Purchaser / Consultant. The approval of the same however does not absolve the contractor from his responsibilities.
- v) Supply of commissioning spares & consumables; a list there of shall be submitted by the Contractor.
- vi) Bidder shall submit an itemized price-list of two years operation and maintenance spares.
- vii) Supply of special tools, tackles for construction, erection operation and repair & maintenance of the plant & equipment.
- viii) All necessary connections for hook-up with Purchaser's system at battery limits.
- ix) Supply of erection, testing & commissioning equipment and material.
- x) Piping network flushing fluids, chemicals & consumables.
- xi) Inspection and performance testing of individual equipment and system as a whole.
- xii) Bidder shall provide two nos drainage pumps, one working, one standby, each of capacity 50 m³ / Hr, 30 mWC head to drain out the seepage water from the new Wagon Tippler Complex. The pumps shall be capable of handling slurry water.

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- xiii) The Bidder scope covers extension of fire-fighting line, drinking water line and service water line from the battery limits to various consumer points of the proposed CHP complex in line with present technical specification.
- xiv) Diversion of existing water pipelines required for installation of the proposed units covered under this package is included in the scope of work of the Bidder.

Industrial quality make-up water will be made available to the successful Bidder at only one point at a pressure of approx 1.0 kg/cm² only near CHP complex area. The top of the pipeline (carbon steel) shall be approximately 1.2 m below the area ground level.

Contractor shall extend the same from battery limit with an isolation valve in a valve-pit along with flow meter to their proposed systems for service / water requirement for the entire plant area. Bidder shall indicate the service water quantity requirement, pipe size, end connection, etc. at the battery limit.


6.15.1 **Service Water System**

The Service Water tapping points considered for new transfer towers only. The water supply for the new tapping points will be provided from existing service pump unit. Piping from existing service unit to new transfer towers tapping points shall be bidder scope and provide isolation valves, hose reels with box and QRC per each tapping point as per details given below.

Each tap off point will be suitable for using 3 Cu. M/hr of water. One hose, 30m long is provided in each building.

TAP POINTS DETAILS

Sl. No.	Application Area	Application Points	No. of Tapping Points Nos.	No of Hose Reels with QRC, Nos.	Remarks
1	Galleries	Conv. 1B	6	3	Tap off points for every 30 mt. for new conveyor galleries / tunnels
		Conv. 1C	8	4	
		Conv. 2C/2D	6	3	
2	Transfer towers/buildings	WTB-2	3	1	
		PH-3	1	1	
		TP-1A	4	2	
		TP-1B	6	3	
		TP-2A	2	1	

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WATER PUMPING UNIT

Water supply for above tapping points will be provided from existing Service pump unit.

MECHANICAL HOSE REEL DRUM

A mechanically operated hose reel drum with 25 m dia, 25m long hose with quick release coupling shall be provided as per above application table.

6.15.2 Drinking water

Drinking water will be made available to the successful Bidder at only one point at a pressure of 1.5-2.0 kg/cm² only near CHP complex area. The top of the pipeline (carbon steel / G1) shall be approximately 1.2 m below the area ground level.

Bidder shall extend the same from battery limit with an isolation valve in a valve-pit to their proposed systems / shops, offices, toilets, drinking water platforms, water coolers, etc. for the entire plant and the Bidder shall indicate the drinking water quantity requirement, pipe size, end connection, etc. at the battery limit.

The Drinking water systems are to be provided in all transfer towers, wagon tippler complex

The Drinking Water System shall consist of:-

- Pipeline
- Tapping Points


6.15.3 Fire-fighting water

Industrial quality water will be made available to the successful Bidder at one point at requisite pressure near the CHP complex battery limit as shown / marked in the layout drawing. The top of the pipeline (carbon steel) shall be approximately 1.2 m below the area ground level.

Contractor shall extend the fire-water pipeline from battery limit to the entire upgraded plant area as described below.

Application Table:-

Building	WTB-2, TP-1A, TP-1B, TP-2A
Conveyor Galleries	Conv. 1B, 1C, Conv. 2C / 2D, Upgraded Conv. 3A/3B

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6.16 **FIRE FIGHTING SYSTEM**

Technical Specification for complete fire protection system to be provided for new houses and conveyors and associated facilities.

6.16.1 **Introduction**

An elaborate system of fire protection shall be provided to fight as well as reduce any occurrence of fire in new junction houses, conveyor galleries and associated facilities. The system shall be planned in conformity with Tariff Advisory Committee guidelines, BIS and other relevant standard/codes.

Major facilities envisaged are as follows:

- A. Fire Hydrant System.
- B. Portable Fire Extinguishers
- C. Fire Detection & Alarm System
- D. Mulsifier system in Conv.-1B


Fire alarm, linear heat sensing system shall be considered along the conveyors. Heat and smoke detector, photo sensor (all intelligent type) shall be considered in other areas. The fire alarm control panel shall be located in the wagon tippler control room. As the wagon tippler control room shall be manned only during rake unloading, a contact from the fire alarm panel has to be hooked up with the proposed I/O rack at new wagon tippler MCC so that the alarm is annunciated at Main CHP control room.

6.16.2 **Scope of work and services**

The scope covers design, engineering, supply, erection, painting, testing, commissioning and hand over of complete Fire Fighting System envisaged for the new junction houses, conveyor galleries and associated facilities.

Major work comprises of following:

- a. Taking water connection from the battery limit.
- b. Fire Hydrant system for new conveyor-1B
- c. Portable fire extinguishers
- d. Fire Detection & Alarm System
- e. Piping, valves, sluice gates etc.
- f. All electrics
- g. Erection, testing, commissioning, PG Test and Warranty for the complete

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- firefighting system
- h. All the requirements of TAC for complete FFS shall be incorporated by the bidder in their scope irrespective of whether the details are described in specification and/or shown in the drawing or not.

6.16.3 **DRAWING/DOCUMENT TO BE FURNISHED ALONG WITH THE OFFER**

The following documents/information shall be furnished by the Bidder along with his offer:

- Scope of work with general description of system and equipment offered specifying the important features supplemented with scheme drawings. The description to be accompanied by single line diagrams and equipment layout to enable the Purchaser to have a proper appreciation of the equipment and its operation.
- Specification of equipment/material along with their makes/catalogues. Approval certificates from authorizing bodies for various components of the system.
- List of commissioning spares.
- List of special tools and tackles.
- Certificate of approval from TAC and similar other authorizing body for various component of the system.

6.17 **PAINT SCHEDULE**

6.17.1 **Paints**

Paint shall be applied in accordance with paint manufacturer's recommendations. The work shall generally follow IS 1477 – 1971 (Part II) for jobs carried out in India and SSPC – PA – 1 or DIN 55928 or equivalent.


General compatibility between primer and finishing paints shall be established by the paint manufacturer supplying the paints.

In the event of conflict between this general procedure on painting and the paint manufacturer's specification, the same shall be immediately brought to the notice of the Purchaser. Generally in cases of such conflicts, manufacturer's specifications/recommendations shall prevail.

Before procuring the paint in bulk, it is recommended to obtain sample of paint and establish "Control Area of Painting". On Control Area, surface preparation and painting shall be carried out.

If required, samples or paint shall be tested in laboratories to establish quality of paint with respect to:

- Viscosity
- Adhesion/Bond of paint in steel surfaces

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- (iii) Adhesion/Simulated salt spray test.
- (iv) Chemical analysis (percentage of solids by weight)
- (v) Normal wear resistance as encountered during handling & erection
- (vi) Resistance against exposure to acid fumes, etc.

Whole quantity of paint for a particular system of paint shall be obtained from the same manufacturer. (ref. list of Approval Vender, Section 6.24)

The Successful Bidder shall be responsible for supply of paints and this responsibility shall not be passed on to the sub-contractor.

The painting material as delivered to the Successful Bidder, must be in the manufacturer's original container bearing thereon manufacturer's name brand and description. Paint/Painting material in containers without labels or with illegible labels shall be rejected, removed from the area and shall not be used.

Thinners wherever used shall be those recommended by the paint manufacturers and shall be obtained in containers with manufacture's name and brand name of thinner legibly printed, failing which the thinner is liable to be rejected and shall not be used.

All paint containers shall be clearly labeled to show the paint identification, data of manufacture, batch number, special instruction, shelf life etc. The container shall be opened only at the time of use.

All paints shall be stored in accordance with the requirements of laid down procedure by the paint manufacturer.


All ingredients in a paint container shall be thoroughly mixed to break-up lumps and disperse pigments before use and during application to maintain homogeneity.

The proposed make, quality and shade of the paint shall have the approval of the client, as specified here in under.

The colour code of the finishing paint to be followed will as per Section 6.23.09 (Table – II) Successful Bidder after finalisation of order. The undercoat shall have different tint to distinguish the same from the finishing coat.

The Successful Bidder shall furnish paint manufacturer's test report or technical data sheet pertaining to the paint selected. The data sheet indicate among other things the relevant standards, if any, composition in weight percent of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash point, method of application, quality of surface preparation required, corrosion resistance properties and colour shades available.

6.17.2 General

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Each coat of paint shall be continuous free of pores and of even film thickness without thin spots.

Each coat of paint shall be sufficiently dry before application of next coat.

Paint shall be applied at manufacturer's recommended rates. The number of coats shall be such that minimum dry film thickness specified is achieved. The dry film thickness specified is achieved. The dry film thickness of painted surfaces shall be checked with ELCOMETER of measuring gauges to ensure application of specified DFT.

Zinc rich primer paints wherever applicable which have been exposed several months before finishing coat is applied shall be washed down thoroughly to remove soluble zinc salt deposits.

The machine finished surfaces shall be coated with white lead and tallow before shipment or before being put into the open air.

Areas which become inaccessible after assemble shall be painted before assemble (after obtaining painting clearance from the inspecting authority) after requisite surface cleaning as specified.

Paint shall not be applied when the ambient temperature is 5 deg C and below of 45 deg C and above. Also paint shall not be applied in rain, wind, fog or at relative humidity of 80% and above unless the manufacturer's recommendations permit. Applications of paint shall be only be spraying or brushing as per IS 486 – 1983 and IS 487 – 1985.

Primer paint shall be applied not later than 2 – 3 hours after preparation of surface, unless specified otherwise.

Edges, corners, crevices, depressions, joints and welds shall receive special attention to ensure that they receive painting coats of the required thickness.


Surfaces which cannot be painted but require protection shall be given a special attention to ensure that they receive painting coats of the required thickness.

Surfaces in contact during shop assembly shall not be painted. Surfaces which will be inaccessible after assembly shall receive minimum two coats of specified primer.

Surfaces to be in contact with wood, brick or other masonry shall be given one shop-coat the specified primer.

6.17.3 Site/Field Painting

Wherever shop primer painting is scratched, abraded or damaged, the surface shall be thoroughly cleaned using emery paper sand paper and power driven wire brush wherever

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warranted, and touched up with corresponding primer. Touching up paint shall be matched and blended to eliminate conspicuous marks.

If more than 50% of the painted surface of an item requires repair, the entire item shall be mechanically cleaned and new primer coats shall be applied followed by intermediate and finishing coats as per painting specification.

All field welded areas on shop painted items shall be mechanically cleaned (including the weld area proper, adjacent areas contaminated by weld spatter or fumes and areas where existing primer paint is burnt).

Subsequently, new primer and finishing coats of paint shall be applied as per painting specification.

The first coat of finish paint at site shall be applied preferable within three months of the shop paint.

6.17.4 **Structural**

All fabricated steel structure, fabricated steel pipes, etc. shall have a minimum of two coats of primer paint before dispatch to site.

Parts of steel structures embedded in concrete shall be given a protective coat of Portland cement slurry immediately after fabrication and after surfaces of this part is thoroughly cleaned from grease, rust, mill scales, etc. No paint shall be applied on this part.

6.17.5 **PAINTING SCHEMES**


For a complete painting scheme of any item being painted, all types of paints are to be procured from the same manufacturer as approved by the purchaser.

6.17.5.1 **Legend**

SP	–	Surface preparation quality as per SIS standard
2P1	-	Two (2) coats of Primer paint type P1
1I1	-	One (1) coats of Intermediate paint type I1
2FT	-	Dry Film Thickness in microns developed
CRT	-	Clean and Retouch

Type of paint products like P1 to P9, I1 to I4 and F1 to F10 have been specified under Annexure – 02.

The painting scheme to be followed for various structure/equipment exposed to different condition is briefly given in Annexure-03 for guidance to the bidder.

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The colour code for different applications are indicated in Annexure-04. Wherever colour codes are not specified the same is to be mutually agreed between the Purchaser and Successful Bidder.

6.17.6 **GUARANTEE**


The Successful Bidder shall guarantee that the physical and chemical properties of the paint materials conform with the specification of paint products.

The Successful Bidder shall submit internal test reports from paint manufacturers regarding the quality of paint whenever asked by the Purchaser / CES.

Guarantee period shall commence from the data of completion of finishing coat of paint. The guarantee period will be indicated depending on the type of surface preparation and system of painting. To fulfill this obligations the Successful Bidder may obtain from the painting manufacturer, guarantee for the performance of paint/painted surfaces.

Surface Preparation Grade

SI. No.	Surface Preparation	Swedish Std SIS 055900	DIN Std. Din 55928 (Part 4)
1	<u>Blast cleaning to white metal :</u> Removal of all visible rusts, mill-scales, paint and foreign matters.	Sa 3	Sa 3
2	<u>Blast cleaning to near white metal :</u> 95% of any section of surface area is free from all rusts, mill-scales and visible residues.	Sa 2.5	Sa 2.5
3	<u>Blast cleaning to commercial quality :</u> At least 2/3 of any section of the surface area is free from all rusts, mill-scales and visible residues.	Sa 2	Sa 2
4	<u>Brush-off blast cleaning :</u> Removal of all loose mill-scales, rust and foreign matters etc.	Sa 1	Sa 1
5	<u>Power tool cleaning :</u> Very thorough scrapping and wire brushing to remove loose mill-scale, rust and foreign matters to have pronounced metallic shine.	St 3	St 3

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SI. No.	Surface Preparation	Swedish Std SIS 055900	DIN Std. Din 55928 (Part 4)
6	<u>Hand tool cleaning :</u> Removal by hand brushing of loose mill-scale, loose rust and foreign matters.	St 2	St 2

PAINT MATERIALS

6.17.7

PRIMER PAINTS (P)

Primer paint products shall be applied only on dry and clean surfaces.

Primer Paint – P1 (Phenolic – Alkyd Based)

A single pack air drying phenolic modified alkyd composition with zinc phosphate as a primer paint conforming generally to IS : 2074.

Air drying time	- About 60 minutes (touch dry) - Overnight (hard dry)
Dry film thickness (DFT)/Coat Temperature resistance	- 40 microns (min) - Upto 100° dry heat


Primer Paint – P2 (Chlororubber Based)

A single pack air drying high build chlorinated rubber based zinc phosphate primer.

Percent chlororubber	- 20 to 22 (% Chlorine above 65% in chlororubber)
Air drying time	- About 15 minutes (touch dry) - Overnight (hard dry)
DFT/Coat	- 50 microns (min)
Temperature resistance	- Up to 65° C dry heat

Primer Paint – P3 (PVC Copolymer Alkyd Based)

Polyvinyl chloride (PVC)	- Alkyd zinc phosphate – redoxide based primer
Ratio	: PVC copolymer + alkyd resin (1:1)

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Pigments	:	Zinc phosphate & Fillers
Air drying time	-	24 hours
DFT/Coat	-	80 microns
Temperature resistance	-	Upto 80° C dry heat

Primer Paint – P4 (Epoxy Based)

A two pack air drying Epoxy polyamide resin based red oxide-zinc phosphate primer.

Epoxy content (% wt.)	-	15 to 18.
Air drying time	-	About 30 minutes (touch dry)
DFT/ Coat		30 microns (min)
Temperature resistance	-	Upto 120° C dry heat

Primer Paint – P5 (Epoxy Based)


A two pack air drying Epoxy polyamide with zinc dust of at least 92% zinc dust on the dry film.

Epoxy content (% wt.)	-	8 to 10
Air drying time	-	Less than 10 minutes (touch dry) Less than 2 hours (hard dry)
DFT/Coat	-	40 microns (min)
Temperature resistance	-	Upto 300°C dry heat

Primer Paint – P6 (poly – Vinyl Butyral Resin Based)

A two pack air drying polyvinyl butyral resin based wash primer with rust inhibitive pigments.

Air drying time	-	5 to 7 minutes (touch dry) 2 hours (hard dry)
DFT/Coat	-	8 microns
Temperature resistance	-	Upto 65°C dry heat

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Application for - Galvanised iron, aluminium, light Alloys etc. on which the adhesion of conventional paints are poor.

Primer Paint – P7 (Ethyl Zinc Silicate, EZS Based).

A two pack heavy duty zinc dust rich silicate primer which protects the surface with just a single coat.

Total solids (3 wt)	-	84 + / - 2
Density (g / cc)	-	3.07 + / - 0.05
Air drying time	-	To top coat 16 hours
DFT / coat	-	60 microns

Temperature resistance - Upto 450 deg C dry heat **Primer Paint – P8**
(High Build Coal Tar Epoxy)

A two pack cold cured H.B. epoxy coal tar coating – no primer is required.

Mixing ratio	-	Base: Hardener (4 : 1 by vol .)
Air drying time	-	48 hours (hard dry) Full cure 7 days
DFT / Coat	-	100 microns

Wood Varnish –P9


Treated oil based primer pigmented with suitable pigments:

Air drying time	-	16 hours for application of top coat.
Coverage	-	10 to 14 sq. m/litre

INTERMEDIATE PAINTS (I)

These paints shall be applied over primer coats as an intermediate layer to provide weather proof seal of primer coats.

Intermediate Paint-II (Phenolic alkyd based)

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A single pack high build phenolic based paint with micaceous iron oxide (M10).

Air Drying Time 2 days (hard dry) DFT /Coat	- 4 to 6 hours (touch dry) - 75 microns (min)
Temperature resistance	- Upto 100 deg C dry heat
Compatible with	- Primer P 1

Intermediate Paint – 12 (Chlororubber based)

A single pack air drying high build chloro based paint with MIO.

Air Drying Time	- 15 minutes (touch dry) - 24 hours (hard dry)
DFT / Coat	- 70 microns (min)
Temperature resistance	- Upto 65 deg C dry heat
Compatible with	Primer P2, P3 & P4

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Intermediate Paint-13 (PVC – Alkyd Based)

PVC Copolymer	-	Resin 1 : 1
Pigments	-	Micaceous iron oxide (MIO)
DFT / Coat	-	80 microns (min)
Temperature resistance	-	Up to 80 deg C dry heat
Compatible with	-	Primer P2 & P3

FINISH PAINTS (F)

Finish paint coats shall be applied over primer coats and intermediate coats after proper cleaning and touch up of primed surface.

Finish Paint – F1


A single pack air drying high gloss phenolic alkyd modified synthetic enamel paint suitably pigmented.

Air drying time	-	3 to 4 hours (touch dry)
	-	24 hours (hard dry)
DFT / Coat	-	25 microns (min)
Temperature resistance	-	Upto 100°C dry heat
Compatible with	-	Primer P1 Intermediate I1
Colour	-	Generally all shades

Finish Paint – F2

A single pack air drying polyurethane enamel of high gloss and hard finish suitably pigmented.

Air drying time	-	2 to 2½ hours (touch dry)
	-	6 hours (hard dry)
DFT/Coat	-	30 microns (min)
Temperature resistance	-	Upto 100°C dry heat
Compatible with	-	Primer P1 & P8 and

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Intermediate

Colour

Generally all shades

Finish Paint – F4

A ready mixed oil-alkyd based synthetic enamel paint of high gloss and hard wearing properties.

Air drying	-	6 to 8 hours.
Coverage	-	14 to 16 Sq. m / liter
Temperature resistance	-	Upto 60°C dry heat
Compatible with	-	P8
Colour	-	Generally all shades

Finish Paint – F5


A single pack air drying plasticized chlororubber paint suitably pigmented.

Air drying time	-	30 minutes (touch dry) 24 hours (hard dry)
DFT/Coat	-	35 microns (min)
Temperature resistance	-	Upto 65°C dry heat
Compatible with	-	Primer' P2 & P3 Intermediate 12 & 13
Colour	-	Nearly all shades except few.

Finish Paint - F6

A PVC – Copolymer alkyd based enamel.

Density	-	1.17 ± 0.05
Total solids (1 wt)	-	55 ± 2
DFT / Coat	-	40 microns
Compatible with	-	P2 and P3

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Finish Paint – F7

A two pack air drying epoxy polyamide enamel suitably pigmented.

Air drying time	- 2 to 3 hours (touch dry) 7 days (full cure)
DFT / Coat	- 40 microns (min)
Temperature resistance	- Up to 130°C dry heat
Compatible with	- Primer P4 & P5 Intermediate I4
Colour	- Generally all shades.


Finish Paint – F8

A single pack synthetic rubber based aluminium paint


Air drying time	- 2 hours (touch dry)
	- 24 hours (hard dry)
DFT / Coat	- 25 microns (min)
Temperature resistance	- Upto 200°C dry heat
Compatible with	- No Primer paint except primer P6 is applicable in case of non-ferrous substrate.
Colour	- Smooth aluminium

TABLE – I :PAINTING SCHEME


SI. No.	Description	Painting Scheme		Total DFT
		At Shop	At Site	
1.1	Technological steel structures for plant and equipment			
	Indoor	SP – Sa 2.5 2P1	CRT 2F1	130
	Outdoor	SP – Sa 2.5	CRT	205

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Sl. No.	Description	Painting Scheme		Total DFT
		At Shop	At Site	
		2P1 111	2F1	
1.2	Fabricated steel structures at site for rung ladders, cat-ladders, gates, rolling shutters, etc. (Springs/rubbing surfaces excluded) - Indoor / Outdoor	SP – St-2 and /or St-3 2P1	CRT 2F1	130
1.3	Walkways, stairs, platforms etc. which are of wearing surface - Indoor	SP – St-2 and / or St-3 2P1 SP-	CRT 2F1	130
	- Outdoor	SP – S12 and / or St-3 2P1 111	CRT 2F1	250
1.4	Steel doors and windows - Indoor / outdoor	SP-St-2 and / or St-3 2P1 111	CRT 2F2	215
2.0	<u>MECHANICAL EQUIPMENT</u>			
2.1	Mechanical equipment (Temp. not exceeding 80°C)			
2.1.1	Static equipment like storage tanks, vessels, bins, bunkers, cyclones, scrubbers, etc. - Indoor	SP – Sa 2.5 2P3/2P4	CRT 2F5/2F6	240/140

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SI. No.	Description	Painting Scheme		Total DFT
		At Shop	At Site	
	- Outdoor	SP – Sa 2.5 2P2/2P3+112/113	CRT 2F5/2F6	240/320
2.1.2	Rotary/moving equipment and machineries like crushers, vibratory feeders, vibratory screens, bin activators, blowers, fan, air/gas compressors, pumps, gear boxes, machine housings etc. - Indoor - Outdoor	 SP-Sa 2.5 2P3/2P4 SP-Sa 2.5 2P3 + 113/114	 CRT 2F6/2F7 CRT 2F6/2F7	 240/140 320/340
3.0	Pipe / Duct work (Overground)			
3.1	Non – insulated (temperature up to 80°C) - Indoor - Outdoor	 SP – St2 and or St3 2P1 SP – St2 and/or St3 2P1 + 111	 CRT 2F1 CRT 2F1	 130 205
3.2	Insulated (hot) - Indoor/Outdoor	 SP-St2 and / or St3 1P1	 Remove paint and insulate	
4.2	Others			
4.1	Standard mobile equipment like wagon Tippler, Side Arm charger, Weigh Bridge.	As per manufacturer's standards		


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Sl. No.	Description	Painting Scheme		Total DFT
		At Shop	At Site	
4.2	Laboratory equipment like ovens, screens, magnetic stirrers, samplers, etc.	Stove enamelling	CRT	110
4.3	Steel structures partly immersed in water	SP – Sa 2.5 2P8	CRT	200

TABLE – II : COLOUR CODE

The colour codes are mentioned for all the items including pipe work. Shades of finish coat of paint applied over respective item indicated below are tentative and subject to alteration as per Purchaser's request or due to compatible paint system adopted. The service for which colour code/bands are not specified are to be mutually agreed for by the Purchaser & the Successful Bidder.

Sl. No.	Items Painted	Colour	Colour No. of IS:5
1.	<u>Structures</u>		
	Building frames including bracings, side girts, louvers etc.	Aircraft grey	693
	Crane girders / Monorail for Electric Hoist.	Azure blue	104
	Crane stops/Monorail Stops/Buffer.	Post office red	538
	Gutters	Black bituminous	-
Sl. No.	Items Painted	Colour	Colour No. of IS:5
		aluminium	
	Fire escape platforms ladders, etc.	Signal red	537
	General hand railing, top runners	Lemon yellow	355
	Rung ladders	Lemon yellow	355
	All members blocking passages fro movement	Lemon yellow	355
	Trestles, towers and pipe bridges	Dark admiralty grey	632
	Conveyor gallery structures	Aircraft grey	693
2.	<u>Equipment and Machinery</u>		
	General indoor equipment	Light grey	631
	General outdoor equipment	Dark admiralty	632

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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Sl. No.	Items Painted	Colour	Colour No. of IS:5
	Crane bridges, trolleys, hooks etc. and other mobile equipment	Base : Lemon yellow Stripes : Black (100 mm wide)	355
	Tanks	Base : Same as for general equipment Strips : Same shade as for piping around the tank at half the tank height	
	Fire – fighting equipment	Signal red	537

Pipe work


Colours shall be as given below. The base colour shall be applied throughout entire length except on surfaces of materials such as asbestos, aluminium, bras, bronze, galvanized steel, stainless steel and other corrosion resistant alloys and rubber/ synthetic polymers. In such cases identification colour bands of at least 500 mm width shall be provided near each branch, valve and at distances not exceeding 10m either as local colour coatings or coatings adhesive type of suitable material or label attached to the pipe work. Additional identification bands superimposed over the base colour shall be provided near each branch, valve and at distance not exceeding 10m. The bands shall be atleast 25mm wide except in care of double bands where the first band shall be about 100mm wide. Direction of flow shall be clearly marked on the pipelines at intervals not exceeding 10m and all branches and change directions.

Service	Colour	Colour No. of IS:5
Drinking water	Base – Sea green	217
	First band – French blue	166
	Second band – Signal red	537
Service water / DFDS – Water Line	Base – Sea green	217
	Band – Light orange	557
Compressed air	Base –Sky blue	101


6.18

LIST OF APPROVED VENDORS FOR MECHANICAL EQUIPMENT


Sl. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
1	BELT(FABRIC TYPE) Belt Conveyor)	SEMPERTRANS(NIRLON)	INDIA (MUMBAI)
		PNOENIX YULE LIMITED	INDIA (KOLKATA)
		HINDUSTAN RUBBER	INDIA (MUMBAI)

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Sl. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
		ORIENTAL RUBBER	INDIA (PUNE)
		ANIL RUBBER	INDIA (NEW DELHI)
2	WAGON TIPPLER & SIDE ARM CHARGER	L&T	INDIA
		ELECON	INDIA (GUJARAT)
		TRF	INDIA (JAMSHEDPUR)
		METSO	INDIA (NEW DELHI)
		THYSSEN KRUPP	INDIA
3	IDLERS	KALI	INDIA (CHENNA)
		ELECON	INDIA (GUJARAT)
		TRF	INDIA (JAMSHEDPUR)
		HI-TECH	INDIA (KOLKATA)
4	PULLEYS	THYSSENKRUPP INDIA	INDIA (HYDERABAD)
		ELECON	INDIA (GUJARAT)
		TRF	INDIA (JAMSHEDPUR)
		MASCOT INTERNATIONAL	INDIA (KOLKATA)
		HI-TECH	INDIA (KOLKATA)
5	GEAR BOXES	PREMIUM ENERGY TRANSMISSION LIMITED (Formerly David Brown)	INDIA (PUNE/FALTA)
		ELECON	INDIA (V V MAGAR)
		SIEMENS (FLENDER)	INDIA (KHARAGPUR) / GERMANY
		NEW ALLENBERY WORKS	INDIA (KOLKATA)
6	FLUID COUPLING (Traction Type)	FLUIDOMAT	INDIA (DEWAS)
		VOITH INDIA	INDIA (HYDERABAD)
		PREMIUM ENERGY TRANSMISSION (PEMBRIL)	INDIA (AURANGABAD/PUNE)

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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Sl. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
7	GEARED COUPLING	ELECON	INDIA (V.V.NAGAR)
		WELLMAN WACOMA	INDIA (KOLKATA)
		NEW ALLENBERRY WORK	INDIA (KOLKATA)
		GBM	INDIA (KOLKATA)
		FEWNER	INDIA (KOLKATA)
8	FLEXIBLE COUPLING	CUBIC TRANSMISSION PVT LTD	INDIA (HYDERABAD)
		ELECON	INDIA (V V NAGAR)
9	THRUSTOR BRAKES	ELECTROMAG	INDIA (MUMBAI / VAP)
		EMCO PRECIMA	USA (CHARLESTON)
		SIBRE (HINDON)	INDIA (MUMBAI)
		BCH	INDIA (FARIDABAD)
		STROM-KRAFT	INDIA (MUMBAI)
10	ELECTRIC HOIST	HERCULES (INDEF) / ELEQUP TOOLS	INDIA (MUMBAI)
		EDDY CRANE (ELMECH)	INDIA (PUNE)
		AVON CRANES	INDIA (GURGAON)
		REVA INDUSTRIES	INDIA (DELHI / FARIDABAD)
		TRACTEL TRIFOR	INDIA (FARIDABAD)
		CONSOLIDATED HOIST	INDIA (PUNE)
11	MANUAL HOIST (chain pulley block)	HERCULES (INDIA)	INDIA (MUMBAI)
		WH BRADY	INDIA (MUMBAI)
		TRACTEL TIEFOR	INDIA (FARIDABAD)
12	RACK & PINION GATE	UNITED TECHNOMECH	INDIA (MUMBAI/PUNE)

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SI. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
		PREISION PROCESSING EQPTS CO	INDIA (KOLKATA)
		STRATEGIC WEIGHING SYSTEM	INDIA (CHENNAI)
		DA ENGINEERING	INDIA (HOWRAH)
13	FLAP GATE	PREISION PROCESSING EQPTS CO	INDIA (KOLKATA)
		UNITED TECHNOMECH	INDIA (MUMBAI/PUNE)
		MINING & MATERIAL HANDLING EQPT PVT LTD	INDIA (KOLKATA)
		STRATEGIC WEIGHING SYSTEM	INDIA (CHENNAI)
		DA ENGINEERING	INDIA (HOWRAH)
14	BELT WEIGHERS	PRAYAS ENGINEERING	INDIA
		SCHENCK PROCESS	INDIA (RANCHI)
		ACME AUTOMATION	INDIA
15	VENTILATION SYSTEM	C.DOCTOR	INDIA (AHMEDABAD/KOLKATA)
		APC	INDIA (KOLKATA)
		F. HARLEY	INDIA (KOLKATA)
		RIECO INDUSTRIES LTD	OMDOA (PUNE)
		BATILIBOI	INDIA (MUMBAI)
		INDVENT	INDIA (KOLKATA)
16	DRY FOG DUST SUPPRESSION SYSTEM		INDIA (AHMEDABAD/KOLKATA)
		TPS	
		APC	INDIA (KOLKATA)
		PREMIER	INDIA (KOLKATA)

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Sl. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
		ENVIRONMENT	
		F.HARLEY	INDIA (KOLKATA)
		KAVERI ULTAPOLYMER	INDIA (KOLKATA)
		EAGLE AGRO	INDIA (RAJKOT)
		SPRAYING SYSTEMS	INDIA (BANGALORE)
17	VALVES (CI & GM)	LEADER	INDIA (JULLANDER)
		AUDCO (L&T)	INDIA(CHENNA)
		BDK	INDIA (HUBLI)
		H SARKAR	INDIA (KOLKATA)
		FOURESS	INDIA (BANGALORE)
		LEVCON VALVES	INDIA (BANGALORE)
18	PUMPS (DS/SW/CWPW/SUMP)	BEACON INDUSTRIES & PUMPS LTD	INDIA (CHENNAI)
		KSB PUMPS LTD	INDIA (PUNE)
		KIRLOSKAR BROTHERS LIMITED	INDIA (KIRLOSKARWADI)
		SAM TURBO	INDIA (COIMBATORE)
19	PIPES	TATA	INDIA (JAMSHEDPUR)
		JINDAL	INDIA (HOOGHLY)
20	PACKAGED AIR CONDITIONER	VOLTAS	INDIA (THANE)
		BLUESTAR	INDIA (SILVASA)
		CARRIER AIRCON	INDIA (GURUGAON)
		LG	INDIA (NOIDA)
		HITACHI	INDIA (NEW DELHI)

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SI. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
21	AIR CONDITIONER UNIT	VOLTAS	INDIA (THANE)
		CARRIER AIRCON	INDIA (GURGAON)
		BLUESTAR	INDIA (SILVASSA)
		LG	INDIA (NOIDA)
		DAIKEN AIR CONDITIONING INDIA PVT LTD	INDIA (GURGAON)
22	SERVICE WATER SYSTEM, DRINKING WATER SYSTEM	TPS	INDIA (DELHI)
		C. DOCTOR	INDIA (KOLKATA)
		APC	INDIA (KOLKATA)
23	FIRE WATER SYSTEM	TYCO	INDIA (KOLKATA)
		PERFCT ENGINEER	INDIA (KOLKATA)
		C. DOCTOR	INDIA (AHMEDABA)
24	HYDRAULIC CYLINDER / LUFFING CYLINDER	WIPRO	INDIA (BANGALORE)
		BOSCH REXROTH	INDIA (AHMEDDABAD)
		VELJAN	INDIA (HYDERABAD)
		PARKER HANNIFIN (I) PVT LTD	INDIA (MUMBAI)
		EATION FLUID POWER (VICKERS)	INDIA
25	LUBRICATION SYSTEM	LINCOLN HELIOS	INDIA (BANGALORE)
		CENLUB	INDIA (BANGALORE)
		LUBIN	INDIA (THANE)
		DELIMONT	PUNE

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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SI. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
		HYDROCRAFT ENGINEERS	INDIA (KOLKATA)
		HYDROLUBAIR	INDIA (KOLKATA)
26	EXTERNAL SCRAPERS & SKIRT RUBBER	HOSCH EQUIPMENT (INDIA) PRIVATE LIMITED	INDIA (KOLKATA)
		TECHNOFAB (Martin)	INDIA (DELHI)
		KAVERI ULTAPOLYMER	INDIA (BANGALORE)
27	AIR COMPRESSOR	KIRLOSKAR PNEUMATIC	INDIA (PUNE)
		INGERSOLL RAND	INDIA (DELHI)
		ELGI	INDIA (COIMBATORE)
		ATLAS COPCO	INDIA (PUNE)
28	GEARED MOTOR	ELECON / PBL	INDIA (V.V NAGAR)
		SEW	INDIA
29	VIBRATING FEEDER	TRF	INDIA (JAMSHEDPUR)
		ELECON	INDIA (V.V NAGAR)
		L&T	INDIA (KANDBAHAI)
		KRUPP	INDIA (PUNE)
		MCNALLY BHARAT	INDIA (KUMARDUBI)
30	BELT TRACKER	HOSCH	UK
		FLEXCO	INDIA
		TRU-TRACK	INDIA
		MARTIN	INDIA
31	BEARING	SKF	INDIA
		FAG	INDIA

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SI. No.	ITEM	VENDOR	COUNTRY OF ORIGIN/LOCATION
32	HYDRAULIC BREAKER	L&T	INDIA (KANDBAHAL)
		ROCKPROCESS EQUIPMENT	N. IRELAND
		SANDVIK LTD.	INDIA (PUNA)
33	CABLE REELING DRUM (CRD)	ELECTROZAVOD	INDIA
34	PAINTS	BERGER PAINTS INDIA LIMITED	INDIA
		ASIAN PAINTS LIMITED	INDIA
		ICI	INDIA
		KANSAI NEROLAG PAINTS LIMITED	INDIA
		CIPY POLYURETHENE LTD	INDIA (PUNE)
<p>NOTE : Successful Vendor shall Procure the Equipment from above list of Approved Vendor. If it is not in their manufacturing Range, other reputed Vendor may be considered by NALCO subject to submission of Credentials and approvals from reputed organizations. The approvals to be taken from NALCO & Consultant prior to procurement of item.</p>			

6.19 CODES AND STANDARDS:


The design, manufacture, inspection and testing of Systems equipment shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The equipment shall conform to the latest edition of the following standards and codes. Other internationally acceptable standards/codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the Bidder of the required statutory responsibility. In case of any conflict in the standard and this specification, the decision of the Purchaser / Consultant shall be final and binding.

6.19.1 American Iron & Steel Institute (AISI)

American Society for Mech. Engineers (ASME)

American Society for Testing & Materials (ASTM)

American Wire Gauge (AWG)

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Institute of Electrical & Electronic Engrs. (IEEE)

Instrument society of America (ISA)

National Electrical Code (NEC)

National Electrical Manufacturers Association (NEMA)

United States of America standards (USAS)

Bureau of Indian Standards (BIS)

Conveyor Equipment Manufacturers Association (CEMA)

6.19.2

Code No.

Description

IS:778 Gun Metal gate, globe & check valves for general purpose.

IS:780 Sluice valves for water works purposes (50 to 300 mm)

IS:1239 Mild Steel tubes & fittings,

IS:2379 Colour for the identification of pipe line.

Code No.

Description

IS:2906 Sluice valves for water work purposes.

IS:3589 Electrically welded steel pipes for water, gas & sewage (200 to 2000 mm)

IS:5312 Swing check type reflux (non return) valves.


IS:1520 Horizontal centrifugal pump for clean, cold fresh water.

IS:5120 Centrifugal pump for clean, cold & fresh water

IS:3938 Specification for Electric Wire Rope Hoist

IS:3832 Hand operated chain pulley blocks

IS:2429 Round steel short link chain


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IS:3109	Short link chain grade M(4)
IS:3815	Points hooks with shank for general engineering purposes
IS:210	Cast Iron Castings
IS:11592	Code of practice for selection and design of Belt Conveyors.
IS:3823	Dimensions for vibrating conveyors and feeders with rectangular or trapezoidal trough.
IS:3688	Dimensions for shaft ends
IS:3681	General plan for spur & helical gears
IS:7403	Code of practice for selection of standard worm and helical gear boxes
IS:11547	Electronic weighing in motion system
IS:3588	Specification for electrical axial flow fans
IS:2312	Propeller type AC Ventilation fans
IS:3963	Specification for roof-extractor units

Code No.

Description


IS:4894	Centrifugal Fans
IS:655	Specification for Metal Air Duct
ARI:210	Standard for Unitary air conditioning equipment.
ARI:270	Standard for application, installation and servicing of unitary equipment.
ARI:8183	Specification for bonded mineral wool.
IS:661	Thermal insulation for cold surfaces.
IS:4671	Expanded polystyrene for thermal insulation purpose.

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IS:8148	Packaged Air conditioners.
IS:7155	Codes of Practice for Conveyor Safety.
IS:1891 (Part – 1)	General Purpose Belting
IS:8598	Idlers and Idler Sets for Belt Conveyors
IS:4009 (Part – 1)	Conical Head Grease Nipples
IS:3531	Pulleys for Belt Conveyors.
IS:11592	Code of practice for selection and design of Belt Conveyors.
IS:4776 (Part-I)	Specification of Troughed Belt Conveyor.
IS:9295	Specifications of Idlers for Belt Conveyor.
IS:3935	Electric Hoist.

Note:- For other Codes & Standard to followed have been mentioned in different sections of equipment specification. For other discipline of work like Electrical, Civil & Structural the complete list of codes & standard to be followed have been mentioned.


In case Successful Bidder wants to follow any other standards on codes the same can be followed with due approval from Purchaser / Consultant.

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Volume – III


SECTION-1

SPECIFICATIONS FOR CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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VOLUME – III

GENERAL

1.00.00 INTRODUCTION

The complete design, supply & construction of all Civil, Structural & Architectural works shall be performed conforming to the specification, Codes & Standards along with the criteria & specifications as stated herein after, which however, are not meant to provide a complete description of each & every system but state the minimum acceptable standards for the plant as a whole or certain individual components.

This section-I of Volume III lists Codes and Standards to be adopted and the principal structures of the plant, and briefly describes the basic concept, requirements and features pertinent to each. Documents to be submitted have also been brought out in this section along with the procedure to be followed for the same.

2.00.00 CODES AND STANDARDS


Following is a general listing of Codes and Standards to be used in the design and construction of the Plant. The latest editions/ revision of following codes and standards along with addendums/ amendments, if any, shall be followed:

2.01.00 General

- a) Internationally accepted design Codes and Standards where Indian Codes are not available and which are equivalent to Indian Standards.
- b) National Building Code of India.
- c) "Accepted Standards" and "Good Practice" listed in the appendix to National Building Code of India.
- d) IS-1200 : Method of measurement of Building and Civil Engineering Works.
- e) IS-1256 : Code of Practice for Building Byelaws.

2.01.01 Earthwork


- a) IS-1498 : Classification and identification of soils for General Engineering purposes.
- b) IS-3764 : Safety Code for excavation work.

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c) IS-7293 : Safety Code for working with construction machinery.

2.01.02 **Concrete**

- a) IS-269 : Ordinary and low heat portland cement.
- b) IS-383 : Coarse and fine aggregate from natural sources for concrete.
- c) IS-432 : Mild Steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
- d) IS-455 : Portland Slag Cement.
- e) IS-456 : Code of Practice for Plain and reinforced concrete.
- f) IS-460 : Test Sieves (all parts).
- g) IS-516 : Methods of test for strength of concrete.
- h) IS-1199 : Methods of sampling and analysis of concrete.
- i) IS-1566 : Hard drawn steel wire fabric for concrete Reinforcement.
- j) IS-1786 : High strength deformed steel bars and wires for concrete reinforcement.
- k) IS-1834 : Hot applied sealing compounds for joints in concrete.
- l) IS-2386 : Methods of test for aggregates for concrete (all parts).
- m) IS-2502 : Code of practice for bending and fixing of bars for concrete reinforcement.
- n) IS-3370 : Code of practice for concrete structures for storage of liquids (all parts).
- o) IS-3414 : Code of practice for design and installation of joints in buildings.
- p) IS-4948 : Welded steel wire fabrics for general use.
- q) IS-6452 : High Alumina Cement for Structural use.
- r) IS-7320 : Concrete slump test apparatus.

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- s) IS-7861 : Code of practice for extreme weather concreting (all parts).
- t) IS-8041 : Rapid Hardening Portland Cement.
- u) IS-8112 : High strength ordinary Portland Cement.
- t) IS-10262 : Recommended guidelines for concrete mix design.

2.01.03 Foundations


- a) IS-1904 : Code of practice for structural safety of buildings : Shallow foundations.
- b) IS-2950 : Code of practice for design and construction of raft foundations.
- c) IS-2974 : Code of practice for design and construction of Machine foundations (all parts).
- d) IS 2911 : Code of practice for Design and Construction of Pile Foundation.

2.01.04 Loading

- a) IS-875 : Code of practice for Structural safety of buildings - loading standards.
- b) : Bridge Rules of Government of India, Ministry of Railways (Railway Board).

2.01.05 Masonry

- a) IS-712 : Building limes.
- b) IS-12894 : Pulverized Fuel Ash Lime Bricks
- c) IS-1127 : Recommendations for dimensions and workmanship of natural building stones for masonry work.
- d) IS-1528 : Methods of sampling and physical tests for refractory materials.
- e) IS-1597 : Code of practice for construction of stone masonry (all parts).
- f) IS-2212 : Code of practice for brickwork.
- g) IS-2116 : Sand for masonry mortars
- h) IS-2185 : Concrete masonry units.


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(all parts - Hollow and Solid concrete blocks).

- i) IS-2250 : Code of practice for preparation and use of masonry mortars.
- j) IS-2572 : Code of practice for construction of hollow concrete block masonry.
- k) IS-3414 : Code of practice for design and installation of joints in buildings.
- l) IS-4441 : Code of practice for use of Silicate type chemical resistant mortars.
- m) IS-4860 : Acid Resistant Bricks.

2.01.06 **Doors, Windows and Ventilators**

- a) IS-399 : Classification of commercial timbers and their zonal distribution.
- b) IS-883 : Code of practice for design of structural timber in building.
- c) IS-1003 : Timber paneled and glazed shutters (all parts).
- d) IS-1038 : Steel doors, windows and ventilators.
- e) IS-1081 : Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
- f) IS-1361 : Steel windows for industrial buildings.
- g) IS-2835 : Transparent sheet glass for glazing and framing purposes.
- h) IS-1948 : Aluminium doors windows and ventilators.
- i) IS-1949 : Aluminium windows for industrial building.
- j) IS-2191 : Wooden flush door shutters (Cellular and hollow core type).
- k) IS-2202 : Wooden flush door shutters (solid core type).
- l) IS-3103 : Code of practice for Industrial ventilation.
- m) IS-3548 : Code of practice for glazing in buildings.


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- n) IS-3614 : Fire check doors.
- o) IS-4021 : Timber door, windows and ventilator frames.
- p) IS-4351 : Steel door frames.
- q) IS-6248 : Metal rolling shutters and rolling grills.

2.01.07 **Roof and Flooring**

- a) IS-2204 : Code of practice for construction of reinforced concrete shell roof.
- b) IS-3201 : Criteria for the design and construction of precast concrete trusses.
- c) IS-2210 : Criteria for Design of R.C. shell structures and folded plates.
- d) IS-809 : Rubber flooring materials for general purposes.
- e) IS-1195 : Bitumen mastic for flooring.
- f) IS-1196 : Code of practice for laying bitumen mastic flooring.
- g) IS-1198 : Code of practice for laying, fixing and maintenance of linoleum floors.
- h) IS-1237 : Cement concrete flooring tiles.
- i) IS-1443 : Code of practice for laying and finishing of cement concrete flooring tiles.
- j) IS-2114 : Code of practice for laying in situ terrazzo floor finish.
- k) IS-2571 : Code of practice for laying in situ cement concrete flooring.
- l) IS-5491 : Code of practice for laying in situ granolithic concrete floor topping.
- m) IS-12894 : Pulverized Fuel Ash Lime Bricks
- n) IS-1197 : Code of practice for laying of rubber floors.
- o) IS-2441 : Code of practice for fixing ceiling coverings.

2.01.08 **Waterproofing**

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- a) IS-1322 : Bitumen felts for waterproofing and damp proofing.
- b) IS-1346 : Code of practice for waterproofing of roofs with bitumen felts.
- c) IS-1609 : Code of practice for laying damp proof treatment using bituminous felts.
- d) IS-3036 : Code of practice for laying lime concrete for a waterproofed roof finish.
- e) IS-3037 : Bitumen mastic for use in waterproofing of roofs.
- f) IS-3067 : Code of practice for general design, details and preparatory work for damp proofing and water proofing of buildings.
- g) IS-3384 : Bitumen primer for use in water proofing and damp proofing.
- h) IS-4365 : Code of practice for application of bitumen mastic for waterproofing of roofs.

2.01.09 **Soil Engineering**


- a) IS-1498 : Classification and identification of soils for general engineering purposes.
- b) IS-1892 : Code of practice for sub-surface investigation for foundations.
- c) IS-2131 : Method for standard penetration test for soils.
- d) IS-2720 : Methods of test for soils (all parts).

2.01.10 **Water Supply, Drainage and Sewerage**

- a) IS-404 : Lead pipes
- b) IS-458 : Concrete pipes
- c) IS-651 : Salt glazed stoneware pipes and fittings.
- d) IS-771 : Glazed fire-clay sanitary appliances (all parts).
- e) IS-774 : Flushing cisterns for water closets and urinals other than plastic cisterns.
- f) IS-783 : Code of practice for laying of concrete pipes.
- g) IS-1172 : Code of basic requirements for water supply, drainage and sanitation.

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- h) IS-1626 : Asbestos cement building pipes, gutters and fittings (all parts).
- i) IS-1742 : Code of practice for building drainage.
- j) IS-2064 : Code of practice for selection, installation and maintenance of sanitary appliances.
- k) IS-2065 : Code of practice for water supply in buildings.
- l) IS-2470 : Code of practice for installation of septic tanks (all parts).
- m) IS-3114 : Code of practice for laying of Cast Iron pipes.
- n) IS-4127 : Code of practice for laying of glazed stoneware pipes.
- o) IS-12251 : Code of practice for Drainage of Building Basement.
- p) IS-1200 : Method of measurement : Laying of water and [Part-XVI] sewer lines including appurtenant items.
- q) IS-1536 : Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
- r) IS-1537 : Vertically cast iron pressure pipe for water, gas and sewage.
- s) IS-3486 : Cast iron spigot and socket drain pipes .
- t) IS-5329 : Code of practice for sanitary pipe work above ground for buildings.
- u) IS-3076 : Low density polyethylene pipes for potable water supplies.
- v) IS-1538 : Cast iron fittings for pressure pipes for water, gas and sewage.
- w) IS-1230 : Cast iron rainwater pipes and fittings.
- x) IS-1729 : Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
- y) IS-784 : Prestressed concrete pipes.
- z) IS-1726 : Cast iron manhole covers and frames.
- aa) IS-5961 : Cast iron grating for drainage purposes.

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- bb) IS-5219 : "P" and "S" traps.
[Part-I]
- cc) IS-772 : General requirements for enamelled cast iron sanitary appliances.
- dd) IS-775 : Cast iron brackets and supports for wash basins and sinks.
- ee) IS-777 : Glazed earthenware wall tiles.
- ff) IS-2548 : Plastic water closet seats and covers (all parts).
- gg) 2527 Code of practice for fixing rainwater gutters and down pipes for roof drainage.

2.01.11 **Paving and Road works**

- a) IS-73 : Paving bitumen
- b) IS-702 : Industrial Bitumen
- c) IS-1201 : Method of testing tar and bituminous materials. thru' 1220
- d) Practice followed by Indian Road Congress (all parts).

2.01.12 **Earthquake Resistant Design**


- a) IS-1893 : Criteria for earthquake resistant design of structures.
- b) IS-4326 : Code of practice for earthquake resistant design and construction of buildings.

2.01.13 **Structural Steelwork**


- a) IS-800 : Code of practice for general construction in steel.
- b) IS-802 : Code of practice for use of structural steel in Overhead Transmission Line.

Part-I : Load and permissible stresses.


Part-II : Fabrication, Galvanising, Inspection and Packing.
- c) IS-806 : Code of practice for use of steel tubes in general building construction.

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- d) IS-808 : Rolled steel beams, channels and angle sections.
- e) IS-813 : Scheme of symbols for welding.
- f) IS-814 : Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
- g) IS-816 : Code of practice for use of metal arc welding for general construction in mild steel.
- h) IS-817 : Code of practice for training and testing of metal arc welders.
- i) 818 Code of practice for safety and health requirements in electric and gas welding and cutting operation.
- j) IS-819 : Code of practice for Resistance spot welding for light assemblies in Mild Steel.
- k) IS-919 : Recommendations for limits and fits for engineering.
- l) IS-1024 : Code of practice for use of welding in Bridges and Structures subjected to Dynamic loading.
- m) IS-1161 : Steel tubes for structural purposes.
- n) IS-1182 : Recommended practice for Radiographic Examination of Fusion Welded Butt joints in steel plates.
- o) IS-1200 : Method of measurement of steelwork and ironwork.
[Part-VIII]
- p) IS-1239 : Mild steel tubes, tubulars and other wrought steel fittings (all parts).
- q) IS-1363 : Black hexagonal bolts, nuts and locknuts (dia. 6 to 39 mm) and black hexagon screws (dia.6 to 24 mm). [all parts]
- r) IS-1364 : Precision and semi-precision hexagon bolts, screws, nuts and locknuts (dia. range 6 to 39 mm). [all parts]
- s) IS-1365 : Slotted counter sunk head screws (dia range 1.6 to 20 mm).
- t) IS-1367 : Technical supply conditions for threaded steel fasteners.
- u) IS-1443 : Code of practice for laying and finishing of cement concrete flooring tiles.

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- v) IS-1608 : Method for tensile testing of steel products.
- w) IS-1730 : Dimensions for steel plate, sheet and strip for structural and general engineering purpose.
- x) IS-1731 : Dimensions for steel flats for structural and general engineering purposes.
- y) IS-1852 : Rolling and cutting tolerances for hot rolled steel products.
- z) IS-1977 : Structural steel (Ordinary quality)
- aa) IS-2016 : Plain Washers
- bb) IS-2062 : Steel for General structural purposes.
- cc) IS-2074 : Ready mixed paint, air drying, red oxide zinc-chrome, priming.
- dd) IS-2633 : Methods of testing uniformity of coating of zinc coated articles.
- ee) IS-3613 : Acceptance tests for wire-flux combinations for submerged-arc welding of structural steels.
- ff) IS-3664 : Code of practice for Ultrasonic Pulse echo testing by contact and immersions methods.
- gg) IS-3757 : High strength structural bolts.
- hh) IS-4000 : High strength bolts in steel structures.
- ii) IS-4759 : Hot dip zinc coatings on structural steel and other allied products.
- jj) IS-5334 : Code of practice for Magnetic Particle Flaw detection of welds.
- kk) IS-7215 : Tolerances for fabrication of steel structures.
- ll) IS-7280 : Base-wire electrodes for sub-merged arc welding of structural steels.
- mm) IS-7318 : Approval test for welders when welding
[Part-I] procedure approval is not required.
- nn) IS-8500 : Structural steel - microalloyed (medium and high strength qualities).

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oo) IS-9595 : Recommendation for metal arc welding of carbon and carbon manganese steels.

pp) AWS D.1.1 : Structural Welding Code.

qq) IS-11592 : Code of Practice for selection and design of belt conveyor

2.01.14 Painting

a) IS-348 : Specification for French Polish.

b) IS-427 : Specification for Distemper, dry colour as required.

c) IS-428 : Specification for Distemper, oil emulsion, colour as required.

d) IS-1477 : Code of practice for painting of ferrous metal
[I & II] in buildings.

e) IS-2338 : Code of practice for finishing of wood and
[I & II] wood based materials.

f) IS-2339 : Specification for Aluminium Paints for general purposes in dual containers.

g) IS-2395 : Code of practice for painting concrete, masonry and plaster surface.

h) IS-2932 : Specification for enamel, synthetic, exterior - a) undercoating, b) finishing.

i) IS-2933 : Specification for enamel, exterior - a) undercoating, b) finishing.

j) IS-5410 : Specification for cement paint.


2.01.15 a) Indian Road Congress (IRC) Bridge Codes

b) Indian Railway Standard Bridge Rules

2.01.16 Environmental Protection

Charter on Corporate Responsibility for Environmental Protection (CREP) published in Gazette of India dated 27.08.2003.

3.00.00 SCOPE OF CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS

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The scope of civil work comprises all necessary investigations, survey, foundations, building, superstructures and infrastructure required for the complete upgraded operating coal handling plant.

The work under this Section consists of all Civil, Structural and Architectural works, but not limited to items mentioned below.

- Topographical Survey
- Area Grading, leveling & dressing (finished grade levels shall be as mentioned elsewhere in this Section)
- Geo-Technical investigation
- Demolition of existing structures / facilities, if any, and site clearance.
- Plant area approach roads and drainage system.

Buildings and facilities:-

The buildings and facilities for the upgraded coal handling plant may be classified into two groups as shown in Drawing No. 47111070/M/GL/01, Rev.3, titled General Layout Plot Plan of upgradation package, such as :-

A) Existing Buildings and Facilities with Modification

This group comprises the following :


- 1) Conveyor Bridges and Trestles for Conv. 3A & 3B
- 2) Telescopic Chute Buildings TC-1, TC-2, TC-3 & TC-4

These building structures and facilities shall be investigated for increased conveyor belt tension and other required modifications due to upgradation of the system from 600 TPH to 900 TPH. Transfer Point TP-2 structure has also to be investigated for increased belt tension and any other required modification. All necessary strengthening/modification of the structures shall be carried out by the Contractor.

B) New Buildings & Facilities

This group comprises the following:

- 1) Wagon Tippler WT-2 with Control Room (with toilet at suitable location)
- 2) Tunnel and Pent House PH-3 for Conv. 1B & future Conveyor No. 1

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- 3) Bridges and Trestles, including foundation, for Conv. No. 1B, 1C, 2C & 2D
- 4) Transfer Points TP-1A, TP-1B, TP-2A and Fixed Tripper House TC-5 including foundations.
- 5) Electrical MCC Room
- 6) Pump & Compressor Room PCR – 1

Any other work not covered above but required for completion and proper functioning of the CHP shall form part of the scope.

The civil structural and Architectural works pertaining to above buildings and facilities include supply of all materials, design, detail engineering and construction of all sub and super structures including fabrication and erection of steel structures and providing finishes including flooring, paving, Side cladding with sheeting/brick masonry, plastering, painting, false ceiling, doors & windows, plumbing, roof treatment, etc. complete in all respect to render the premises functional to the satisfaction of the Owner.

Ash bricks ONLY TO BE USED for various civil works for this project.

The scope shall also include setting up by the Contractor a complete testing laboratory in the field to carry out all relevant tests required for the civil works for the project.

The Bidder shall visit the site and assess the involvement of demolition and site clearance, if required, within the plant area to construct the project & accordingly the cost is to be considered in his offer.


The bidder must also get first hand information about the existing structures, particularly steel structures, regarding any distress due to corrosion.

Replacement/strengthening of corroded structural members is included in the scope of this contract.

The work shall have to be carried out both below and above the ground level.

The work shall be executed according to the relevant Indian Standard Codes, and in its absence, the work shall be executed according to the best prevailing Central Public Works Department (CPWD) practices or to the recommendations of relevant American and British Standards or to the instructions of the Owner's Engineer. This shall prevail in respect of civil works for which no specification has been prescribed in this section.

The work shall be carried out according to the design & detail drawings to be developed by the Contractor and approved by the Owner / Owner's authorised Consultant. For all building, structures, foundations, etc., necessary layout and details are to be developed by

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the Contractor keeping in view the statutory & functional requirement of the plant & facilities and providing enough space & access for operation, use and maintenance. Sizes of buildings mentioned elsewhere in the tender document are the minimum required. These shall be revised upward, if necessary, due to the considerations stated above.

The land will be given to the Contractor by the Owner on as is where is basis. All site investigations, surveys, grading and levelling and other additional works shall be carried out by the Contractor.

The layout and levels of all structures shall be made by the Contractor at his own cost from the general grid of the plot and the only acceptable bench mark of NALCO. The Contractor shall be solely responsible for the correctness of the layout and levels.

All necessary statutory clearances, including clearance from factory inspector, RDSO, etc shall be obtained by the Bidder prior to execution of work under scope of this specification.

All the quality standards, tolerances, welding standards and other technical requirements shall be strictly adhered to by the Contractor by executing standard Quality Approved Program, approved by owner/Consultant.

4.00.00 **COAL HANDLING PLANT STRUCTURES / UTILITIES / COMPONENTS**

As mentioned in clause no. 3.00.00, the buildings and facilities for the upgraded Coal Handling Plant may be classified into two groups as follows :-

- A) Existing Buildings and facilities with modification.
- B) New Buildings and facilities.


The existing buildings and facilities under group A shall be inspected at site by the bidders and information/available drawings shall be collected before bidding for the job.

4.01.00 The various buildings/structures/facilities in the Coal Handling Plant pertaining to Group – B are described below :

4.01.01 **Wagon Tippler, Underground Conveyor Tunnels**

The new wagon tippler will be located as per Plot Plan Dwg. No. CHP/NIT/MECH/01.

The substructures for wagon tippler and conveyor tunnels up to pent house shall be of RCC construction considering all superimposed & equipment loads, earth, water & surcharge pressures, loads due to B.G. locomotives & rolling stock loads etc. The conveyor tunnels shall be of RCC construction. The large horizontal forces for wagon tippler may

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be resisted by provision of RCC shear wall / horizontal bracing etc. The hoppers shall be RCC lined with 50mm thick guniting.

A drain sump shall be provided in WT hopper. Drains shall be provided near the tunnel walls on either side of conveyor tunnel. Drains shall be provided with grated covers with openings not larger than 20mm square.

Superstructure for wagon tippler shall be of structural steel shed provided with Corrugated Galvanised Iron (CGI) sheet cover for roof and side cladding. Steel staircase 1000mm wide with hand railing of 32NB (medium) M.S. pipe shall be provided.

All the conveyor galleries, tunnel, transfer points etc should have adequate fire protection/mulsifier system

4.01.02 **Junction Tower / Transfer Point**

Junction tower shall have RCC foundations and structural steel superstructure.


All overground transfer points shall have RCC foundations. The superstructure for TP's shall be structural steel framed with adequate bracing arrangement. Roof and side cladding shall be Corrugated Galvanized Iron (CGI) sheeting. Roof and all intermediate floors will be of reinforced concrete minimum 150 mm thick of concrete minimum M25 grade. All grade floor will be 150 mm thick reinforcement of 10 Tor @ 250 c/c top and bottom both ways. Wherever equipment is located granolithic / ironite floor finishing shall be provided, otherwise IPS floor will be provided. Roof shall be provided with water proofing treatment. All junction tower and TP shall have profile sheet. Intermediate floor shall be RCC. For PPGI profile sheet minimum thickness shall be 0.5mm.

NB.: The incomplete foundations for TP-1A is required to demolished and fresh foundation as per the agreed and approved drawing is required to be constructed.

4.01.03 **Coal Handling Control / Electrical Building**

The control room for the wagon tippler shall be of RCC framed structure with brick masonry walls and RCC roof, designed to be completely dust proof. Large glazed windows shall be provided for a complete view of the tippler area from the control room. Provision for fire escape stair shall be provided in accordance with TAC requirement. Architectural detail shall be as per Vol. III/Section - 4. Toilets of suitable size shall be provided for the Main and WT control rooms.

4.01.04 **Over ground Galleries and Trestles**

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Over ground galleries shall be of covered type and shall be of structural steel consisting of box lattice girders braced at top and bottom and supported between trestles. Side and roof cladding shall be of CGI sheet with intermittent translucent sheets for natural lighting.

Walkway portion of over ground conveyor galleries shall be of chequered plate (6.0mm) with antiskid bar or expanded metal grating. The maximum span of standard gallery shall generally be 24 m. However, in exceptional cases it may be exceeded. The galleries for double stream conveyors shall have one central walkway and two side walkways and single stream conveyors shall have two side walkways. M.S. hand railings shall be provided at sides. At crossing points for roads, buildings and railway lines and other important locations seal plate shall be provided below conveyor.

For conveyor gallery having slopes greater than 10 degree, stepped walkways of tread 250 mm (min.) of chequered plates (6.0mm) with nosing and toe guard shall be provided all along the conveyor.


Suitable floor washing arrangement shall be made in the conveyor gallery with down comers.

In between transfer house / buildings four legged trestles shall be placed at a maximum interval of 90 m. The arrangement shall be such as to ensure that force in the longitudinal direction of conveyor gallery of length not more than 90 m will be transferred to four legged trestle. Two legged trestles at regular interval may be placed between four legged trestles. The end supports resting on the four legged trestles can have either ends hinged or one hinged and the other on slide type. Slide type support shall be with PTFE bearing to allow both rotation and movement.

End of conveyor gallery which will be supported over transfer points, shall be so detailed that only vertical reaction is transferred from gallery and no horizontal force in longitudinal direction is transferred from gallery to transfer points. Similarly no horizontal forces from transfer points will be transferred to gallery.

All RC trestle pedestals shall be raised by (+) 0.5m above FGL.

Trestles shall be of structural steel braced adequately and provided at suitable locations. Location of trestles shall be decided carefully so that there is no interference with underground and over ground structures, tunnels, trenches, drains, etc. The minimum clearance over road crossing shall be 6.0 metres and over rail crossing shall be 7.5 metres. For PPGI profile sheet minimum thickness shall be 0.5mm shall be used for roofing and wall cladding. Purlin Spacing as per the IS standard.

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Site leveling and grading for the plant area shall be within scope of this contract. Work shall have to be carried out as per grading layout plan approved by the Owner/Owner's Consultant.

4.01.06 **Construction Facilities for early works**

The Bidder shall develop and construct all necessary facilities like concrete mixing plant, Construction store, Fabrication yard and Raw material storage area at no extra cost to the Owner. The associated Construction roads and drains connecting these facilities shall also be constructed by the Bidder. The Bidder shall visit the site and locate suitable areas for these facilities.

5.00.00 **DOCUMENT SUBMISSION**

Design and Construction documents pertaining to all Civil, Structural and Architectural works that will be required to be submitted to Owner/ Owner's Consultant/Review Consultant for their approval have been brought out under following clauses. Approval of these documents by the Owner/Consultant shall not relieve the Contractor of his responsibility for any errors and fulfillment of Contract requirements.


5.01.00 **Design Document**

Design Document shall comprise Mechanical/Electrical assignment Drawings, design data, design assumptions & references, detailed structural analysis (including computer out put, if any) & design calculations and design drawings.

Design calculations and drawings shall be submitted and reviewed only after approval of corresponding Mechanical/Electrical/System general arrangement drawings. The contractor shall submit approved GA drawings along with three (3) copies of design documents (except design drawings) and eight (8) copies of design drawings for comments/approval of the Owner/Consultants. Soft/electronic copy of 2D and 3D analysis file and drawing shall be submitted with first submission. On final approval of the drawing and design, Contractor shall submit three (3) copies of design calculation and ten (10) copies of the drawing with one soft copy in CD each to the Owner and consultant for distribution.

5.02.00 **Construction Document**

Based on approved design drawing, detailed drawings for construction will be prepared by the Contractor. For reinforced concrete structures and foundations detailed bar bending schedules in approved format shall be prepared for each detailed drawing. For structural steel work the Contractor will prepare detailed fabrication drawing along with bill of materials.

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Four (4) copies each of detailed drawings/ fabrication drawings along with bar bending schedule/bill of materials need be furnished to Owner/Consultants for their reference and record.

5.03.00 **As Built Drawings**

"As-built" drawings shall be prepared by the Contractor after completion of construction / erection incorporating all the changes, if any, done on Engineer's instruction/approval. After completion of construction, Contractor shall submit eight (8) copies of the all drawings, irrespective of any changes during construction, marked "As Built" with one soft copy in CD each to the Owner.


6.00.00 **LAYOUT**

Before starting the work, the Contractor shall carry out the setting out of foundation and structures and provide levels, with reference to general existing grid and benchmark. If the Contractor uses the grid, benchmark and reference pillar made by other Contractors, he shall co-ordinate with the Contractor and shall satisfy himself of the accuracy of the reference marks. If he is required to set out the foundation afresh, he shall do so independently with reference to the one existing grid and benchmark, which has been followed by other agency at the instruction of the Engineer. In case any discrepancy be found, it shall be immediately brought to the notice of the Engineer for any rectification/modification necessary. No complaint shall be entertained at a later stage. The Contractor shall accurately set out the position for holding down bolts and inserts. This exercise is required to be completed within one month from the issue of LOA.

If required, in the option of the Engineer, he shall construct and maintain pillars for grid, references and benchmarks and maintain them till the completion of the construction. He shall also help the Engineer with instruments, materials and labours for checking the detailed layouts and levels. The Contractor shall be solely responsible for the correctness of the layout and levels, and Engineer's approval shall not be deemed to imply any warranty in carrying out the works correctly. The Tenderers shall take into account the cost of these in quoting their price.

7.00.00 **WORKSMANSHIP**

Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. Welding shall be done by experienced and certified welders in proper sequence using necessary jigs and fixtures. Fabrication shall be done in shops having proper equipment for cutting, strengthening, drilling, welding of structural steel work and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye- laws of the local Govt., Municipal or other authorities require

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the employment of licensed or registered workmen for various trades, the Contractor shall arrange to have the work done by such registered or licensed personnel. In case of manufactured materials, the Contractor shall have, with no additional cost to the Owner, the services of the supervisors of the manufacturers to ensure that the work is being done according to the manufacturer's specifications.

8.00.00 **TEMPORARY WORK**

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of the Engineer, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by other agencies. If it is necessary to remove any of the temporary work at any time to facilitate execution of the work or with the work of other agencies, such removal and re-erection, if required, shall be carried out by the Contractor at the direction of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.


9.00.00 **INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE**

Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to Owner.

10.00.00 **SEQUENCE OF WORK AND PROGRESS REPORT**

The sequence in which the works are to be carried out shall be as approved by the Engineer in accordance with the construction method accepted by the Engineer and to be followed by the Contractor. A programme of work is to be submitted for the Engineer's review and approval and this has to be periodically updated and modified as per actual progress to enable timely completion.

The Contractor shall regularly submit to the Engineer progress reports for periods of working as specified by the Engineer showing up to date progress on all important items of work.


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Volume – III

SECTION-2


SPECIFIC DESIGN REQUIREMENTS

[CIVIL]

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SPECIFIC DESIGN REQUIREMENTS [CIVIL]

1.00.00 INTRODUCTION

This section outlines following:


- a) A brief description of Soil Characteristics.
- b) Design considerations for Reinforced Concrete Structures.
- c) Design considerations for Foundations.

2.00.00 Geo - Technical System

- a) Results of geotechnical investigation carried out earlier at ash silo area within the plant are available with the Owner. Intending Bidders may collect the same from the Owner for reference before bidding. However, the Owner does not take any responsibility for the correctness and interpretation of the result of this report or making any recommendation regarding sub-soil condition and sub-structure system to be adopted by the Bidder. Any variation of the said information shall not constitute a valid reason in affecting the terms and conditions of the bid. The Bidder shall fully satisfy himself about the nature of soil expected to be encountered, including the type of foundation, bearing capacity, sub-soil water etc., prior to the submission of his bid.


Interested vendors may carry out the soil/ geotechnical investigation test for CHP up gradation project at their own cost before due date of submission of bid. Copy of the test report to be submitted by the vendor along with their technical bid.

- b) However, after issue of Work Order, Successful bidder shall carry out his own geotechnical investigation before he commences detailed design and working drawings for finding out the allowable bearing pressures, expected settlements, type of foundations, etc. Soil investigation by the Contractor shall be done along with laboratory testing, in sufficient depth and numbers as necessary, for complete determination of sub-soil condition before the execution of work. The Contractor shall get the approval for the field and laboratory testing scheme proposed by him from the Owner before undertaking geotechnical investigation work. The soil investigation shall be submitted to the Owner for approval and the approved report shall become the basis for design of sub-structure. Approval of the owner shall in no

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way relieve the contractor of his sole responsibility in regard to stability and safety of his design.

- c) A comprehensive soil report shall be prepared by the Contractor through any capable geotechnical firm which covers all information regarding field, laboratory tests & recommendations, which shall include but not limited to the following basic items.
- Procedure of investigations employed.
 - Net safe bearing capacity and settlement computation for different types of foundations for various widths & depths.
 - Recommendations regarding stability of slopes and method of compaction for filling.
 - Aggressiveness of percolating water through sub-soil/rock fissures to reinforced concrete foundation/sub-structures and also recommended protective measures, if required.
 - Bore hole & trial pit logs on standard proforma showing the depths, extent of various soil strata etc.
 - A set of longitudinal & transverse profiles connecting various boreholes shall be presented in order to give a clear picture of the site, how the soil/rock strata is varying vertically and horizontally.
 - Modulus of sub-grade reaction from plate load test for pressure ranging up to 6 Kg/cm². The recommended values shall include the effect of size, shape and depth of foundations.
 - Deformation modulus from plate load test.
 - Coefficient of earth pressure at rest and stress strain modulus of soil from Menard pressure meter test.
 - Recommendations regarding earth pressure as a function of depth below grade as applied to side walls of underground structures. Values of co-efficient of permeability shall be included in the report.
 - Recommendations regarding method and slope of deep excavations.

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- Potential of rock slides and methods of stabilisation for slides for very steep cut if applicable.
 - Recommendations for the type of cement to be used and any treatment to the underground concrete structures based on the chemical composition of soil and sub-soil water.
 - Soil resistivity tests and its recommendation.
- d) When pile foundation is adopted, test piles for determination of parameters of piles shall be done before commencement of actual piling design and construction work.

Following minimum numbers of test shall be carried out.

- Minimum 3 tests each for vertical & lateral capacity of piles.
- Minimum 1 test for uplift capacity of piles.

3.00.00


LOADS

All structures and portions thereof shall conform to the latest revision of relevant Indian Standard specifications and also to the various other technical requirements. For any structure, which carries Indian Railway Loading or is situated in the vicinity of Railway Lines, the design has to conform to the Indian Railway Standard Specifications and approval must be obtained from Railway Authority including the clearance etc. All structures shall be designed to sustain within the stress limitation as specified in the Code, all dead loads plus assigned live, equipment, wind, seismic or other design loads.

a) Dead Loads

Dead load shall include the weight of all structural components and architectural appurtenances incorporated in the structures plus hung loads and any other permanent, externally applied load. This should also include equipment dead load. The content of chutes, bins and hoppers shall be measured at full capacity for this purpose. Hung loads and the contents of chutes, bins and hoppers shall be listed separately so that they can be excluded from dead load when dead loads are acting as stabilizing loads for uplift.

The following unit weight of material shall be considered for computation of loads. Loads given in IS:875 (part-I) shall be made use of for material not listed below.

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Materials

Unit weight

Plain cement concrete	:	24.0 kN/cum
Reinforced cement concrete	:	25.0 kN /cum
Structural steel	:	78.5 kN /cum
Brick work	:	19.0 kN /cum
Cement plaster	:	21.0 kN /cum
Floor Finish	:	24.0 kN /cum
Coal	:	12.0 kN /cum


b) Live Loads

Live loads in different areas shall include dust loads, minor equipment loads, cable trays, small pipe racks/hangers, operation/maintenance loads etc. The loads considered shall not be less than those specified in IS: 875 (Part II).

The loads listed hereunder are minimum loads for the areas involved. Special use areas shall be investigated and loading revised upward as necessary. Hung loads shall be based on minimum loading equivalents of 1.0 kN/Sq.m for piping and 0.5 kN/Sq.m for electrical, ventilation and airconditioning. Loadings resulting from concentrations of facilities in specific areas shall be substituted where listed base loading is excluded.

1) All Buildings :

- i) Flat roofs : 1.5 KN/sq.m + 1 KN/sq.m
dust load
- ii) Inclined roof : In accordance with IS 875
for live load + 0.25 KN/sq.m for dust load.
- iii) Stairs and platforms : 5 KN/sq.m
- iv) Corridor : 5 KN/sq.m
- v) Removable, gratings chequered,
plates walkway etc. : 5 KN/sq.m

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- vi) Ground Floor : 10 kN/Sq.m
 - vii) Cable Spreader Floor : 7.5 kN/Sq.m
 - viii) Office Floor : 5 kN/Sq.m
 - ix) Switchgear & MCC Floor : 10 kN/Sq.m
 - x) All other Floors : 5 kN/Sq.m
- 2) All TPS and Crusher house floors : 10 KN/sq.m
 - 3) Walkways of Gallery : 3 kn/sq.m or a concentrated load of 2 KN at center + dust load of 1 KN/sq.m
 - 4) Underground Structures/Trenches/pits

Minimum surcharge shall be 20 kN/Sq.m. For structures in vicinity of roads and heavy vehicular movement surcharge shall be considered as applicable as per loading specified elsewhere in this specification. Trenches/pits inside building shall be designed for a surcharge equal to Live Load intensity of Ground Floor or 15 kN/Sq.m whichever is greater.

The loads for all Railway load bearing structures like Wagon Tippler, underground TPS, tunnels and the analysis and design of these structures shall be strictly in accordance with the provisions of Indian Railway Bridge Rules and Indian Railway code of practice. The axle load for analysis and design shall be considered as 30 MT. Coal heap of 1.2 M height shall be considered above hopper top for design of coal tray, hopper and supporting elements of wagon tippler. The Bidder shall adopt appropriate locomotive model as per latest I.R.S for number and spacing of wheels.

Roof slab of machinery hatches shall be designed for a live load of 5.0 KN/sq.m with dust load of 1.0 Kn/sq.m.

Conveyor tunnels under roadways shall be designed as per loads conforming to latest I.R.C standard. Tunnels under railway track shall be designed for the load of fully loaded rail wagons moving at the specified speed as per Railway Bridge Rules.

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For tunnels slope exceeding 10 degree, RCC steps with hand rail shall be provided along walkways.

5) Covers for Trenches / Channels

Self-weight of top slab and a uniformly distributed load of 4.0 kN/Sqm on each panel or one 0.75 kN central point load, whichever is critical, shall be considered. At road crossings, the covers shall be designed for vehicular movements as per IRC standards

Reduction in Live load as per provision of IS:875 shall not be permitted.

The areas covered with equipment shall be designed on the basis of weight of equipment (flooded/operating) in addition to an uniform live load of 5.0 kN/Sqm or specifically defined live load whichever is greater.


Foundations and fixing arrangements for items of equipment, which generates vibration, will be designed to prevent transfer of such vibrations to the adjoining structures.

For loads caused by moving equipment over the floor for installation, consideration shall be given to the shoring of beams and floor, from floors below.

c) Equipment Loads

- i) Weight of equipments, ducts, tanks, pipes, conduits, chutes etc. shall include maximum possible loading conditions i.e. flooded material contents and associated impacts, test loadings, anchorage and constraint effects
- ii) Air and gas duct loadings will include weight of insulation, duct attachments, dust accumulation loads, seismic, wind and other loads as applicable.
- iii) All structural components shall be designed to accommodate anticipated concentrated loads which will or may be applied during the life of the plant.

Where both concentrated and uniform loads cannot act simultaneously, the structure or component shall be analyzed for both conditions of loading and shall be designed for most critical condition.

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d) Wind Loading

Wind loading will be in accordance with Indian Standard Code IS:875 (Part 3) for a basic wind speed as per details given in Site Condition (Ref. Section 1.00 of Volume-I). Terrain Category-2 shall be considered for all structures.

Risk coefficient (k_1) shall be considered as 1.07 for all structures.

For slender and wind sensitive tall structures, along wind forces shall be computed for dynamic effect using Gust factor method. The structures shall be designed for the higher of the forces obtained from gust factor and peak factor method.

Analysis for dynamic effect of wind shall be carried out for structures whose height to lateral dimension ratio is greater than 5 and / or if the fundamental frequency of the structures is less than 1 Hz.

e) Seismic Loading


The lateral forces will be established in accordance with the recommendations of IS:1893 (Latest Version only). The site falls in Zone-II as identified in the map in IS:1893 (Part-1) : 2002. Importance factor shall be taken as 1.75 in general.

Seismic forces and distribution of base shear shall be computed as per relevant clauses of IS1893 (Part-4): 2005.

Response spectrum method shall be used for seismic analysis as per IS : 1893 (Part-4) : 2005 for tall and irregular buildings / structures like all Transfer points and Crusher house.

f) Temperature Loads

The structures shall be designed to withstand stresses due to fifty (50) percent of the total temperature variation. The total temperature variation for temperature loading should be taken as two thirds (2/3) of the average annual variation in temperature. The average maximum annual variation for this purpose will be taken as the difference between the mean daily minimum temperature during the coldest month of the year and mean daily maximum temperature during the hottest month of the year.

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Mean Daily minimum ambient temperature during coldest month of the year =
(Ref. Section 1.00 of Volume-I)

Mean Daily maximum ambient temperature during hottest month of the year =
(Ref. Section 1.00 of Volume-I)

Expansion and contraction due to changes of temperature of materials of a structure shall be considered and adequate provision shall be made for the effects produced as per provision in the relevant IS codes.

g) Earth Pressure Load

Earth pressure for all underground structures shall be calculated using coefficients of earth pressure at rest, coefficient of active or passive earth pressure (whichever is applicable). However, for design of substructure of wagon tippler and conveyor tunnels earth pressure at rest shall be considered.

In addition to earth pressure and ground water pressure, etc., surcharge load shall also be considered for the design of all underground structures including channels, sumps, cable & pipe trenches, etc., to take into account the railway and vehicular traffic in the vicinity of the structure.

h) Monorail Loads


All lifting beams and monorails shall have their design loads increased for impact factor of 10% of lifted load of hoist for monorail and support design.

i) Construction Loads

The integrity of the structures shall be maintained without use of temporary framing struts or ties and bracing so far as possible. However, construction or crane access considerations may dictate the use of temporary structural systems. Special studies shall be made and documented by bidder to ensure stability and integrity of the structures during any periods involving use of temporary bracing systems.

j) Other Loads

Stresses imparted to structures due to differential settlements, variation of water table, erection and maintenance load, creep and shrinkage shall also be considered in design of all structures.

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All structures situated in the vicinity of railway lines shall be designed conforming to the Indian Railway Standard Specification.

3.01.00 Stability of Structures

Design shall be checked against buoyancy due to the ground water during construction and completion stages for structures like underground tunnels, pits, trenches, basements, etc. Minimum factor of safety of 1.25 against buoyancy shall be ensured considering empty condition inside and ignoring the superimposed loading. For purpose of calculating downward load due to any overburden, only the mass located vertically above the projected area shall be taken into consideration.

All building sub-structures including pump houses shall be checked for sliding and overturning stability during both construction and operating conditions for various combination of loads. Factor of safety for these cases shall be taken as mentioned in IS:456 and other relevant IS codes. However, following minimum factor of safety shall be followed.


- a) Factor of safety against overturning due to wind, seismic or other lateral load shall be 1.5 minimum.
- b) Factor of safety against sliding shall be 1.4 minimum.
- c) Factor of safety against uplift due to hydrostatic forces shall be 1.25 and due to any other loads shall be 1.5.

Stability of the structure shall also be investigated for loading conditions during construction, repair or other temporary measures. Lower factor of safety may be used for such loading conditions as per relevant IS codes.

In case where dead load provides the restoring force, only 0.90 times characteristic dead load shall be considered. Imposed loads shall not be considered as restoring force.

Ground water table shall be considered at Plant Finished Grade Level for design of foundations and all underground structures.

3.02.00 Load Combinations

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While designing consideration shall be given to the following load combinations:

- i) DL + LL
- ii) DL + LL + PL + Equip
- iii) $0.9 \times DL + EL$ (for DL only)
- iv) $0.9 \times DL + WL1$
- v) $0.9 \times DL + WL2$
- vi) DL + LL + PL + Equip + EL
(* Appropriate portion of LL which is considered for working out EL shall only be taken)
- vii) DL + LL + PL + Equip + WL1
- viii) DL + LL + PL + Equip + WL2

Where the above loads are :

DL = Dead load of structures, floors, walls etc.

LL = General live load on floors

PL = Pipe/Cable Load


Equip = Equipment loads

WL1 = Wind load from left to right

WL2 = Wind load from right to left

EL = Earthquake load

The above load combination is based on the assumption that thermal stress can be demonstrated to be negligible. Otherwise appropriate thermal stress increase shall be included for further worst combination.

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In calculating wind loads, appropriate internal thrust / suction shall be considered along with external pressures as per IS:875 (Part 3) - 1987. All possible load conditions considering external and internal pressures shall be considered in analysis and design for each combination number (iv), (v), (vii) & (viii) above to assess worst effect on whole structure as well as its components.

Appropriate allowable increase in permissible stresses as per IS codes, may be taken only under normal loads along with wind and seismic conditions. However, for members which are designed primarily to resist wind, no increase in permissible stresses will be permitted.

Applicable load factors to be used for design of RCC structures by Limit State Method as per IS:456.

Load Combinations for Underground Structures

Following loading conditions shall be considered in addition to the loading from super structure for the design of sub-structure of wagon tippler and other underground structures.

Earth pressure, surcharge pressure and ground water pressure from outside

Design shall also be checked against buoyancy due to ground water during construction and operation stage. Minimum factor of safety as per IS:3370 against buoyancy shall be ensured considering empty condition ignoring superimposed loads.


3.03.00

Design Concepts

Wind and seismic forces shall not be considered to act simultaneously.

For design of all underground structures/foundations, ground water table shall be considered at the Finished Ground Level.

If R.C.C. floors and roofs except those cast over metal decking are assumed to act as diaphragm transmitting lateral loads to braced bays then main beams/girders shall be provided with shear connectors. However, whenever large/more number of cutouts is provided in the floor slab, horizontal floor bracings shall be provided below slab to transfer horizontal force to columns without considering diaphragm action from slab. Shear

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connectors shall also be provided over beams having R.C.C. slab on one side and opening /chequered plate / grating on other side.

For R.C.C. roofs cast over metal decking, horizontal bracings must be provided below slab to transfer horizontal force to columns.

PTFE bearing shall be provided where horizontal loads are not to be transferred.

For calculation of seismic load, equipment load shall be considered as Dead Load.

Ultrasonic pulse velocity tests shall be carried out for the RCC deck for crusher foundations having VIS to ascertain the homogeneity & integrity of concrete.

Gratings / chequered plates shall not be considered as restraining members for compression flange of beams/girders. Diaphragm action shall also be not considered in design. Adequate horizontal bracings to be provided.


4.00.00

DESIGN OF REINFORCED CONCRETE STRUCTURES

- a) Reinforced Concrete Structures shall be designed in accordance with the requirements of IS-456 & IS-875 or as specified in this specification for all possible combination of loads, e.g. dead load, live load, crane loads, wind or seismic loads, soil loads and surcharge loads.

The following grades of concrete as per IS-456 shall generally be used. For grades M30, M25 & M20 only design mix concrete shall be used:

- i) M-30 : Vibrating machine foundations.
- ii) M- 25 : Wagon tipplers , Tunnels, Underground Hoppers and TPs, all other equipment foundations, foundations and superstructure of all plant and nonplant buildings, all outdoor civil works including trenches, pits, culverts, Pre-cast plank, all ground floor slab-on-grade and column base encasements.
- iii) M-20 : Pavement.
- iv) M-15 : Plinth protection work.

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v) M-10 : Mud mat below all foundations, plinth beams, drains, trenches, pits etc.

vi) M-7.5 : Fill
Concrete.

b) Reinforcing bars shall be TMT bars of minimum grade Fe415 conforming to IS-1786 and Mild Steel bars conforming to IS : 432 (Grade I).

c) For equipment foundations (supported on VIS) such as crusher deck, Ordinary Portland Cement (grade 43) shall be used. For all other concrete work included in the scope of this specification Ordinary Portland Cement or Portland Slag Cement shall be used.

d) The design of R.C. Structures shall be carried out by limit state or working stress method as per the provisions of IS-456.

e) All underground RC basement - like structures with provision of water proofing treatment including tunnels subjected to subsoil/liquid pressure shall be designed as per IS 456 with crack width limitation of 0.2 mm. Similar structures without water proofing treatment shall be designed as uncracked section as per IS 3370.

Grouting material :


Grouting shall be done with Conbextra GPX-2 of 'Fosroc' or equivalent for Equipment foundations and Conbextra GP-1 or equivalent for all structural column bases. For pipe-supports grouting shall be done with 1:1:2 cementsand - 6mm down stone chips.

f) For reinforcement detailing IS:5525 and SP:34 shall be followed.

g) The walls shall be provided with reinforcement on both faces for sections 150 mm or more, even if not required from design consideration.

5.00.00 FOUNDATION DESIGN

The design of foundation shall be carried out by Limit State or working stress method as per the provisions of IS-456: 2000 and on the basis of the soil investigation Report done by the Bidder.

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Structural concrete for foundation work shall be M-25, unless a higher grade is specified elsewhere in this specification.

5.01.00 **Foundations**

Foundations for coal handling plant structures are those for TP's, Wagon Tippler, conveyor tunnels and trestles, electrical room, pump and compressor room etc.

5.02.00 **Heavy and rotating Equipment Foundations**


The design of equipment foundations shall be as per IS 2974 & IS 456. Loadings (both static and dynamic) of major equipment such as Coal crusher shall be obtained from the manufacturer's certified drawings of the specified equipment. The foundations for crusher shall rest on suitable vibration isolation system consisting of springs and damper (M/s. GERB). The spring units shall conform to DIN 2089 and DIN 2096.

For static and dynamic analysis of machine foundation following data will be furnished by the equipment manufacturer.

- a) Loading diagram showing static and dynamic loads and points of application of loads.
- b) Operating speed of m/c.
- c) Weight of rotating parts; maximum eccentricity of rotating mass from the geometric axis of rotation.
- d) Location of C.G. of machines in all three axes.
- e) Mass Moment of Inertia.
- f) Allowable amplitude/velocity of vibration at machine bearing points.

Crusher Foundation (Not in scope)

Detailed dynamic analysis shall be done for the top deck together with springs and dampers and the natural frequencies and amplitudes of vibration shall be determined. A mathematical model of the top deck shall be formulated with three – dimensional beam / plate finite elements for the purpose of analysis with the spring idealized with vertical and horizontal stiffness. The mass of the machine together with that of the top deck shall be considered for the analysis.

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Natural frequencies up to at least 10% above the operating speed shall be determined and these frequencies shall be checked against the design criteria.

Forced response dynamic analysis shall be carried out for the operating condition unbalance forces using a sinusoidal forcing function. Unbalance forces as given by the equipment manufacturer shall be used for his purpose.

Isolation Efficiency

The vibration isolation system shall be designed for about 90% isolation efficiency.

De-coupling

A ratio of the least 10 (ten) shall be ensured between the stiffness of the supporting structure and the stiffness of the spring system in the vertical direction to achieve de-coupling between the two (the stiffness of the spring system being lower). This ensures that dynamic analysis of the supporting structure need not be carried out.

Amplitude Criteria

Amplitudes, in both horizontal and vertical directions, shall be maintained within the allowable limits as per IS code and as specified by the equipment manufacturer, whichever is more stringent.

Transient Resonance

Transient resonance, which may occur during the start – up or coasting down condition of the crusher, shall be checked and the amplitudes in such a condition should not exceed one – and – half times those at operating speed, if not specified otherwise by the equipment manufacturer.

Strength Criteria


The following criteria shall apply for the design of top deck:

Dead loads, live loads, Seismic loads and dynamic loads shall be considered for the design. The most unfavorable combination shall be considered for design.

Seismic loads shall be assumed to act together with dynamic loads for a one millimeter eccentricity in the rotor.

Fatigue shall be considered while designing for dynamic forces. A fatigue factor of 2.0 shall be used on all dynamic forces to arrive at the equivalent static force for the purpose of design.

Working stress method shall be used for the design of R.C.C. deck.

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The R.C.C. top deck shall be at least of M30 grade of concrete as per IS : 456.

The static deflection of the crusher supporting beams at the points of spring attachments shall not exceed the value specified by the manufacturer.

5.03.00 Allowable Settlement

The total permissible settlement and differential settlement of the foundations will be governed by IS:1904, IS:13063 and from functional requirements whichever is more stringent.

Maximum allowable total settlement should be restricted to 25mm for foundations of crusher house and wagon tippler..


Maximum allowable total settlement should be restricted to 40mm for all other foundations.

6.00.00 GENERAL REQUIREMENTS

6.01.00 Minimum Thickness of Structural Elements

The following minimum thickness shall be followed:

Flat roof slab	125 mm
Suspended floor / slab / walkways / canopy slabs, etc	150 mm
Ground floor slab (non-suspended)	150 mm
Water Retaining slabs / walls	200 mm
Cable / pipe trenches / underground pits / walls and base slab	125 mm
All footings (including raft foundations)	200 mm
Parapets	125 mm
Sunshades	75 mm at edge

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Pre-cast louvers / fins	50 mm
Pre-cast trench cover slabs / floor slabs / louvers	75 mm
Paving	150 mm

The underground walls/raft of basement, tunnel shall be designed adopting sound engineering practice. The minimum thickness of various components shall be as follows irrespective of method of design adopted.

Wall of depth 0 – 5 M	: 300 mm
Wall of depth from 8 – 10 M	: 500 mm
Wall of depth from 10 – 15 M	: 700 mm
Base slab of underground basement and roof of tunnel	: 500 mm

6.02.00 **Minimum Heights for Pedestals/Encasements of Steel Columns**

Pedestals to Steel Columns for building structures

In case the top of pedestal is kept at a lower level so that the column base plate together with gussets and stiffeners remain below finished floor level (FFL) the column bases as well as the column sections shall be encased in concrete above FFL as per following.

- a) Open area : 300 mm above paved level
- b) Covered area : 100 mm above FFL


Stair and ladder pedestal shall be kept 200 mm above the finished floor level.

Pedestals to Steel Columns for Equipment structure :

- a) Equipment in open area : as required (300mm min)
- b) Equipment in covered area : as required (150 mm min)
- c) Structures and equipment : as per vendor's data subject to supplied by vendor minimum as specified above

6.03.00 **Ground floor slab-on-grade**

Ground floor slab-on-grade shall be minimum M-25 grade RCC construction laid over minimum 75mm thick lean concrete. Minimum 250mm thick graded stone (63mm down size) soling with interstices filled

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with sand shall be provided as sub base below lean concrete. The sub-base shall be laid over rammed and well compacted earth fill compacted sand fill as specified elsewhere in this specification. unless the thickness required from design consideration is more.

The ground floor slab shall be of minimum 150 mm thick with double layer reinforcement of 8 dia at the rate of 200 c/c both ways.


6.04.00 **Stairs, Platforms, Handrails**

All internal stairs, platforms and walkways shall either be of RCC or minimum 6mm thick chequered plate construction. All outdoor stairs, platforms and walkways shall either be of RCC or minimum 40mm thick grating.


All handrails and posts shall be of 32NB medium duty M.S. pipes as per IS:1239 (Part I).

7.00.00 **MISCELLANEOUS DESIGN / CONSTRUCTION CRITERIA**

- 1) All masonry walls from ground floor shall be placed on reinforced concrete grade beams. However, light internal partitions may be placed on ground floor slab. Minimum embedment of the grade beam below ground level shall be 300 mm.
- 2) The steel column base plate along with stiffening gusset plates shall not be protruded above floor level.
- 3) The steel columns below ground floors and up to minimum 100mm above finished floor level shall be encased in concrete.
- 4) Ramps for building entrance shall be cast in situ RCC slab and the slope of ramps shall not be stiffer than 1 (vertical) to 6 (horizontal).
- 5) Minimum 75 mm thick lean concrete M-7.5 shall be provided below all underground structure, trenches etc., to provide a base for construction.
- 6) All buildings shall have RCC/steel framed super structure. All walls shall be non-load bearing infilled panel walls.


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- 7) Duct banks consisting of PVC/GI conduits for cables shall be provided with reinforced concrete encasing of M20 grade. The minimum depth of top of duct bank from grade level shall be 500mm.
- 8) Angles 50 x 50 x 6 mm (min.) with lugs shall be provided for edge protection all round of cut-outs/opening in floors, edge of drains supporting grating covers, edges of RCC cable/pipe trenches, manholes supporting covers, supporting edges of pre-cast covers and any other places where breakage of corners of concrete is expected.
- 9) Trenches located outside building shall project at least 100mm above the finished formation level so that no storm water shall enter into the trench. The bottom of the trench shall be sloped suitably for draining out the collected water into the sump pit. The pre-cast covers shall be of minimum M-25 grade and shall not weight more than 65 kg. Lifting hooks shall be provided in the pre-cast covers. The minimum drainage slope along line shall be 1 in 500.
- 10) For open drains concrete lining of minimum M20 grade on sides & bottom shall be provided. The thickness of lining shall be minimum 100mm or as per design consideration whichever is higher.
- 11) All underground concrete structure such as basement, sumps water-retaining structure shall be designed for water tightness.
- 12) All underground concrete structure like basements, sumps, water retaining structure etc., shall have plasticizer cum water proofing cement additive conforming to IS-9103. In addition limit on permeability as given in IS-2645 shall also be met with. The concrete surface of these structures in contact with earth shall also be provided with two coats of bituminous painting for
water/damp proofing. In case of water leakage in the above structures, injection method shall be applied for repairing the leakage.
- 13) All joints, including construction and expansion joints for the water retaining structure and others below subsoil water level shall be made water tight by using PVC ribbed water stops with central bulb. The minimum thickness of PVC water stops shall be 6 mm and minimum width shall be 230mm.

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- 14) Concrete hume pipes for underground service shall of class NP3/NP2 as per IS-458.
- 15) For all buildings suitable arrangements for draining out of water collected from equipments, leakages, floor washing, fire-fighting etc., shall be provided for each floor.
- 16) All walls and slabs shall have two layers of reinforcement for section having thickness 150 mm and above.
- 17) All gratings shall have bearing bars or flats 32mm x 5mm spaced at 30mm c/c with 10 dia cross bars at 100 mm on centers. Stairs treads made of grating shall be provided with non-skid abrasive nosing.
- 18) Unless stated specifically elsewhere in this specification, the clear height of roof/beam from finished floor shall not be less than 4.5 M for plant building and 3.5 M for non-plant building.
- 19) Unless stated elsewhere specifically in this specification, the finished floor level of any building shall be at least 300 mm above from finished grade level.
- 20) Sealing of joints shall be done by two part polysulphide sealant and shall be from approved manufacturer conforming to IS: 12118. Material shall consist of poly-sulphide polymer and a curing agent


If any similar design criteria mentioned elsewhere in this specification contradict the above, the stringent of the criteria shall be adopted for design.

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SPECIFIC DESIGN REQUIREMENT [STRUCTURAL]

1.00.00 STRUCTURAL STEEL DESIGN

- a) Structural steel design will be carried out as per the National Building Code with specific consultation to IS-800-1984 (latest Edition) unless noted otherwise. Deflection of structures pertaining to belt conveyor system shall be as per IS 11592 (Code of Practice for selection and design of belt conveyor) (latest Edition).
- b) Lateral forces along the length of the building will generally be resisted by bracings in horizontal and vertical frames. The transverse lateral load will be resisted by stiff jointed frame action. Additional bracing or moment connection will be used to assure stability of the structures.
- c) Structural steel shall conform to Grade E-250 Quality A of IS:2062 for rolled steel members or plates up to 20 mm thickness. For plates above 20 mm thickness, steel conforming to Grade E-250 Quality B of IS:2062 shall be used.
- d) Shop connections will be all welded and field connections will be bolted or welded. Field bolts, wherever provided shall be high tensile of 20 mm dia. or of higher diameter and of property class 8.8 as per IS-1367 for all major connections. The bolted joints shall be designed for friction type connection and the H.T. bolts shall be tightened to develop the required pretension during their installation. However, the nominal connections in the field like purlins, stairs, wall beams etc. will be done by 16 mm dia. M.S. black bolts (minimum 4.6 class) conforming to IS-1363 unless specified otherwise.
- e) Welding shall be in accordance with the recommendations of IS-816 - Code of Practice for use of metal arc welding for general construction in mild steel and IS-9595 - Recommendation for Metal Arc Welding of Carbon and Carbon Manganese Steels. Built-up members will be fabricated using submerged arc welding procedure unless manual arc welding is specifically required. All butt welds in plate girders and columns will be full penetration. All butt welds will be radio graphically or ultrasonically tested as per relevant IS codes and standard practice. The bare wire electrodes for submerged arc welding shall be as follows:

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Filler wire : AWS-A-5.17-EH14

Flux will be agglomerated type of classification

AWS-A-5.17-F7A2EH14

- f) Shop primer paint will be single coat of red oxide zinc- chromate primer conform to IS-2074. The surface preparation will be done in accordance with IS : 1477 (Part I & II) – Code of Practice for Finishing of Ferrous Metals in Buildings. Second coat of primer shall be applied after erection and final alignment of the erected structures. Two or more coats of synthetic enamel paint conforming to IS:2932 of approved shade and quality shall also be applied after erection. Total Dry film thickness of the finished paint shall not be less than 110 microns.
- g) All welding electrodes shall be of Low Hydrogen type conforming to IS:814 and shall be EB5426H₃JX type. All electrodes, flux, wire etc. shall be of ADOR Welding Ltd., ESAB India Ltd., D & H Secheron Electrodes Pvt. Ltd. Or any other equivalent manufacturer approved by Owner.

Alternatively, flux coated arc welding (FCAW) conforming to AWS-E70T-5 which is a modified procedure of MIG/CO₂ (solid wire) can be used.


If submerged arc welding is used, the bare wire electrodes shall be as follows :

Filler wire	:	AWS-A-5.17-EH14
Flux	:	agglomerated type of classification AWS-A-5.17-F7A2EH14

- h) Minimum preheat & inter pass temperatures for welding over 40mm to 63mm (thickness of the thicker part at the point of welding) will be 66°C and for over 63mm, it will be 110°C. However, higher preheat & inter pass temperatures may be required due to joint restraint etc. and will be followed as per approved welding procedure.
- i) Minimum tests to be carried out during fabrication and erection of structural steel shall be as follows :

Steel

Ultrasonic Test: Plates above 25mm thick will be subjected to ultrasonic test as per ASTM-A435 or equivalent to check the presence of lamination.

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Fillet weld:

Dye Penetration Test : 5% of the total length, Dye penetration will be carried out to the root run.

Butt weld :

Dye Penetration Test : 10% of the total length, Dye penetration will be carried out to the root run after back gouging

Radiographic Test : Generally splicing should not be provided in tension flange of Bunker Girders and crane girders. Spot radiography shall be carried out on 100% joints in tension zone and 10% joints in compression zone. Minimum 300mm length will be spot radiographed. When radiograph is not possible ultrasonic test will be carried out after grinding the surface.

Ultrasonic Test : 10% of all other Butt welds except crane girder and bunker girder shall be subject to spot radiographic test and the entire balance butt weld for ultrasonic test.

j) Connections

Connection of vertical bracings with connecting members and diagonal truss members shall be designed for full tensile capacity of the bracings.

Size of fillet weld for flange to web connection for built up column section will be as follows:


Full shear capacity for box section.

80% of full shear capacity or actual shear (if indicated in drawings) or 0.5 times of the web thickness whichever is more for I section. Weld will be double fillet.

All welds will be continuous. The minimum size of fillet weld will be as per relevant IS code or 6mm whichever is higher.

Shear connections shall be designed for 75% of section strength for rolled sections and 80% of section strength for built up section or rolled section with cover plates. Design shear force should be more than actual shear.

Moment connections between beam and column will be designed for 100% of moment capacity of the beam section.

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All butt welds shall be full penetration butt welds.

Connection of base plate & gusset members with the columns will be done considering that total load gets transferred through weld.

All splicing work shall be of full strength. Shop splicing for all sections other than rolled sections shall be carried out by full penetration butt welds. Shop splicing of all rolled sections shall be carried out using web and flange cover plate.

2.00.00 **LOADS**

Loads as defined under clause 3.00.00 Section-2 will be applicable.

In addition following should be considered.

a) Coal and Coal Hopper/Bin Loads

Coal Weight : 8.0 kN/Cu.M for storage volume calculation


: 12.0 kN/Cu.M for load calculation

Angle of internal friction = 31 Deg. (as per IS-9178 Part-I)

3.00.00 **LOAD COMBINATIONS**

While designing consideration shall be given to the following load combinations :

- i) DL + LL
- ii) DL + LL + PL + Equip
- iii) $0.9 \times DL + EL$ (for DL only)
- iv) $0.9 \times DL + WL1$
- v) $0.9 \times DL + WL2$
- vi) DL + LL + PL + Equip + EL
(* Appropriate portion of LL which is considered for working out EL shall only be taken)
- vii) DL+LL+ PL + Equip + WL1

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viii) DL+LL+ PL + Equip _+ WL2

Where the above loads are :

DL = Dead load of structures, floors, walls etc.

LL = General live load on floors

PL = Pipe/cable load

Equip = Equipment loads

WL1 = Wind load left to right

WL2 = Wind load right to left

EL = Earthquake load

Appropriate allowable increase in permissible stresses as per appropriate IS codes, may be taken only under normal loads along with wind and seismic conditions. However for members which are designed primarily to resist wind, no increase in permissible stress will be permitted.


Appropriate impact factor shall be considered as per IS:875 (Part 2) - 1987 while calculating crane/hoist loads.

In calculating wind loads, appropriate internal thrust / suction shall be considered along with external pressures as per IS:875 (Part 3) - 1987. All possible load conditions considering external and internal pressures shall be considered in analysis and design for each combination number (iv), (v), (vii) & (viii) above to assess worst effect on whole structure as well as its components.

The above load combination is based on the assumption that thermal stress can be demonstrated to be negligible. Otherwise appropriate thermal stress increase shall be included for further worst combination.

4.00.00 **OTHER SPECIFIC REQUIREMENTS**

All steel framed structures shall be either “ rigid frame “ or “ simple space frames “ or a combination of two.

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Lateral forces shall be resisted by stiff jointed moment connections in rigid frame design. The column bases shall generally be fixed to concrete foundation pedestal by providing moment resistant base detail.

Simple space frame design utilises single-span beam systems, vertical diagonal bracing at main column lines and horizontal bracing at the roof and major floor levels. The most of plant steel buildings shall be designed as simple space frame structures. Crusher House building may be a combination of rigid and simple frame system.

Concrete floors shall be considered to provide continuous lateral support to the top (compression) flange of the support beams. However wherever large cut outs are provided in the floor slabs horizontal floor bracing shall be provided. Grating/chequered plate floor shall neither be considered to provide lateral support to the top flange of supporting beams nor to provide a shear diaphragm. Adequate lateral support in the form of shear connector and horizontal bracing shall be provided as required.

Floors for vibrating machines of all kind together with supporting framework shall be adequately braced in both horizontal and vertical planes. Floors or structure supporting mechanical equipment shall be designed to minimise vibration, avoid resonance and maintain alignment and level.


Chequered plates shall conform to IS:3502.

All indoor gratings shall be electro forged type and outdoor gratings shall be welded type. Minimum thickness of grating shall be 40mm for indoor installation and 32mm for outdoor installation. The opening size shall not be more than 30mm x 100mm. The minimum thickness of the main bearing bar shall be 5mm. All gratings shall be hot dip galvanized @ 610 gm/sqm.

Where a steel beam or member is to be connected on RCC structure, it shall be connected using an insert plate and preferably through shear connection.

The working point of the bracing connection shall be the center of column and girder to which it connects, where practical. The connections of gusset plates to column and girders shall be made to include provisions for eccentricity in connection. The double angle back-to-back with gusset plate in between shall not be used in dust-laden areas. Where double angles are not adequate, beam sections with web in the plane of bracing are used.

Permissible stresses for different members shall be allowed to exceed up to 33.33% only under normal loads along with wind and seismic conditions. However, members which

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are designed primarily to resist wind such as bracing members, no increase in permissible stresses will be permitted. However, permissible stresses in bolts and welds shall be allowed to exceed up to 25 % only under wind and seismic conditions.

Permissible Deflections

The permissible deflections of various steel members under normal loading conditions shall be as specified below. For calculation of deflections in structures and individual members dynamic effects shall not be considered, unless specified otherwise. Also, no increase in deflection limits shall be allowed when wind or seismic load are acting concurrent with normal loading conditions.

Vertical Deflection

- a) For beams supporting dynamic equipment : Span / 500
- b) For beams supporting floors / masonry : Span / 325
- c) For beams supporting pipes (pipe racks) : Span / 400
- d) For roofing and cladding components : Span / 250
- e) For gratings and chequered plates : Span / 200 subject to
a maximum of 6 mm
- f) For monorails : Span/500

Horizontal deflections

The permissible horizontal deflections shall be as per following unless specified otherwise:


- a) Single storey building : Height / 325
- b) Multistoried building : Height / 325
- c) Transfer points : Height/1000
- d) Trestle : Height / 1000

Provisions of IS:800 and relevant IS Code shall be followed for limiting deflections of structural elements not listed above.

Minimum Thickness of steel elements

The minimum thickness of various components of a structure and hot rolled sections shall be as follows. The minimum thickness of rolled shapes shall mean flange thickness regardless of web thickness. Structural steel members exposed to significantly corrosive environment shall be increased suitably in thickness or suitably protected otherwise as per good practice and sound engineering judgment in each instance.

- a) Trusses, purlins, girts and bracing : 6 mm

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- b) Columns and beams : 8 mm
- c) Gussets : 8 mm
- d) Stiffeners : 8 mm

- e) Base plates : 12 mm & above
- f) Chequered plates : 6 mm o/p & above
- g) Grating flats : 5 mm
- h) Minimum thickness of structural members other than gratings and chequered plate directly exposed to weather and inaccessible for painting and maintenance shall be 8 mm.

Minimum Sizes of steel elements


The flange width of purlins supporting light weight concrete slab shall not be less than 65 mm and for those supporting roof sheeting and wall cladding it shall not be less than 50 mm. Width of steel rolled section connected to other member shall be at least 50 mm. The depth of beams for platform of all structures shall not be less than 125 mm.

Slenderness and Depth Ratio

The slenderness ratio of main members in tension, compression or bending shall be in accordance with IS:800-1984.

The following limiting ratios of depth to span shall preferably be considered as a general guide.

Truss	1 / 10
a) Rolled beams and girders for	1 / 24 Ordinary floors and rafters
b) Supporting floor beams for vibrating Machinery / equipment	1 / 15
c) Roof purlins and girts	1 / 45

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SECTION-4

SPECIFIC DESIGN REQUIREMENTS

[ARCHITECTURAL]

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SECTION-4

SPECIFIC DESIGN REQUIREMENTS

[ARCHITECTURAL]

1.00.00 SCOPE

The architectural services shall cover finishing work of all buildings/structures/ facilities of coal handling plant augmentation work included under the specification starting from brick work, partition walls, roof protection, finishing of walls, floors and ceilings, false ceiling, doors, windows as required; potable water system, sanitation etc.

Note :-


Fly ash bricks for the total work for this package shall be issued free of cost inside the plant.

2.00.00 DESIGN REQUIREMENTS

2.01.00 Architectural Design

- a) Natural light shall be used to the maximum extent especially in the form of north light/skylight. For adequate light and ventilation, National Building Code recommendation shall be followed.
- b) Entrance canopies, chajjas (projections, recesses) over openable windows and door openings on exterior facades shall be provided.
- c) All the buildings shall be architecturally designed to meet the National Building Code.
- d) Architectural design and detailing aspects of all the buildings shall be rendered through professional services of an Architect. Statutory requirement and any clearances from local authority may be required to be met with, wherever essential.

The Bidder shall develop the architectural layout of all the buildings listed in this document as per the final approved equipment disposition and other layout

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considerations indicated elsewhere in this specification. These drawings shall need the approval of the owner before construction. The contractor shall also have to submit perspective views if so desired by the owner at no expenditure to the owner. Approval from statutory authorities, e.g. Factories Inspector, Explosives

Inspector, Loss Prevention Association of India/Tariff Advisory Committee etc. shall be the responsibility of the contractor without any obligation of the owner.

The entire complex shall have an architectural character and style of its own and shall be visually and functionally integrated with the existing landscape. The bidders must visit the site and have a feel of the overall environment, so that a harmonious as well as integrated architectural concept of the proposed phase of development is achieved. Special care must be taken to enhance the visual and technological quality of development by adopting updated technology, materials, finish etc.

2.02.00 **Buildings**


2.02.01 **Transfer Points (TP's)**

The superstructure of over ground transfer points shall be structural steel framed with adequate bracings. Roof and side cladding shall be corrugated galvanised iron (CGI) sheeting. Floors shall be of reinforced concrete finished with 40 mm thick heavy duty cement concrete floor finish with metallic hardener. Windows shall be side hung steel windows with wired glass. Wherever monorails are projecting outside for lifting equipment or material, steel sliding doors shall be provided. Other doors shall be hollow metal (steel) flush doors with pressed steel frame.

2.02.02 **Control Room/Electrical Building**

The Control Room/Electrical Building shall be of RCC framed structure with brick masonry walls and RCC roof and floors. The control room shall be designed to be completely dust proof. Control Room shall be provided with aluminium glazed partitions and double aluminium doors with air lock. Fire proof doors shall be provided in cable spreader room and other areas having fire hazard. MCC room shall have hollow metal steel flush door with pressed steel frame. All windows shall be steel windows with glazing. Floor finish in control room shall be with 3 (three) mm thick antistatic PVC tiles as per IS:3462 laid as per IS:5318 over concrete under bed of 37 mm thickness. Toilets shall have 8 mm thick non-skid ceramic tile flooring with 5 mm thick glazed ceramic tile dado. Floor finish in all other areas shall be 40 mm thick heavy duty cement concrete with metallic hardener. Control room walls shall be painted with Acrylic emulsion paint over Plaster of Paris. All other walls shall have oil bound distemper paint. Control room shall have LLOYD lineal panel system false ceiling.

2.02.03 **Overground Galleries**

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Overground galleries shall be covered type and shall be of structural steel consisting of box lattice girder braced at top and bottom, and supported between trestles. Side and roof cladding shall be of CGI sheets with intermittent translucent sheets for natural lighting.

2.03.00 **Partition Wall**

All intermediate walls shall be full brick thick wall in 1:6 cement sand mortar. Half brick thick wall in 1:4 cement: sand mortar with 2 nos. 6 mm dia rod in every fourth layer shall be provided. For long walls intermediate RCC pillars and RCC horizontal tie shall be provided. Full glazed partition in anodized aluminium frame shall be provided for operator's cubicles for clear view of the operating equipment and in Control room area.

2.04.00 **Plastering**

Exterior & rough side : 18 mm thick minimum with 1:6 cement-sand mortar of interior brick wall in two layers. Where external finish will require rich plastering for special finish plaster shall be of 1:4/1:3.

Interior wall : 12 mm thick with 1:6 cement-sand mortar


Ceiling : 6 mm thick with 1:4 cement-sand mortar shall be provided to all exposed ceilings.

2.05.00 **False Ceiling**

Aluminium pre-painted false ceiling, either LLOYD lineal panel system or LLOYD aluminium tile/plank system for control rooms and other important areas, with suspension system as per manufacturer's details shall be used. The false ceiling work shall take care of all illumination, fire detection & fighting, HVAC and all other service requirement. False ceiling shall be provided with 25 mm thick insulation of resin bonded mineral wool conforming to IS: 8183. Wherever underdeck insulation is required the insulation shall be 50 mm thick resin bonded rigid mineral wool / polystyrene block with protective aluminium foil lining.

2.06.00 **Doors**

- a) Generally hollow metal (steel) flush doors with pressed steel frame shall be provided for plant and utility areas.
- b) Rolling steel shutters shall be used where frequent use is not envisaged and large openings are required. Operation shall be manual/mechanical/ electrical depending on the size of opening.

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- c) Special areas like control rooms and other special area shall be provided with minimum 15 micron pre-coated i.e colour anodized aluminium glazed partitions with air lock facilities having two sets of doors.
- d) Fire rated doors with panic bar shall be provided in cable spreader rooms and other areas having fire hazard and also to all fire exists as per TAC requirement.
- e) Doors shall be provided at appropriate location to prevent dust ingress from outside.
- f) Wooden panel doors shall be provided for toilet entrance and toilet internal doors shall be solid core PVC.
- g) Weather stripping shall be provided to all outside doors as well as airconditioned areas and all other doors where dust-free environment is required.

2.07.00 **Facilities in Buildings**

Adequate toilet and drinking water facilities shall be provided in Control Room/Electrical Building for personnel working in Wagon Tippler area. Number of toilet fixtures shall be adequate for the occupancy as per National Building Code.

However minimum 1 Water Closet, 1 washbasin, 1 urinal shall be provided in each toilet.

2.08.00 **Potable Water System and Plumbing**


2.08.01 This system for various buildings shall be connected to the drinking water and service water systems.

2.08.02 Water outlets shall be provided for an instantaneous flow rate of approximately 7 Cu.M/Hr. (25 GPM).

2.08.03 System will satisfy state and local plumbing codes.

2.08.04 Following I.S. Codes for the system shall be followed :

- a) IS-2065 : Code of Practice for water supply in buildings.
- b) IS-1172 : Code of basic requirements for water supply, drainage and sanitation.
- c) IS-1200 : Laying of water and sewer lines including appurtenant (Pt. XVI) items.

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- d) IS-1239 : Specification for mild steel tubes and mild steel tubulars and other wrought steel pipe fittings. (10 mm to 15 mm nominal diameter).
- e) IS-3589 : Specification for electrically welded steel pipes for water, gas and sewage (220 mm to 2000 mm nominal diameter).

2.08.05 Potable water shall be supplied to basins, water closets, urinals, sinks, water coolers, showers and other plumbing fixtures. Soil and waste piping shall drain through traps to the yard sanitary sewer system.

2.09.00 Roof Drainage Systems

2.09.01 The system shall be provided for removal of water from roof surface to avoid damage to the roof structure of all buildings and shall consist of the following :

- Roof Drain Heads
- Rain Water Down comers
- Gully pits

IS-1742 code of practice for building drainage shall be followed for this purpose.

Multiple drains (min.2) shall be provided for all roof areas.


System will be designed to handle rainfall in the area and in accordance with stipulations of IS-1742.

Any roof more than 8.0 metres above grade shall have access from within the building for cleaning of roof drains.

Roof drains will conduct water to storm sewers. No rain water pipes shall be exposed to outside view.

2.10.00 Glazing & Glazed Partition

- Glazing in Control room between A.C. and non-A.C. areas shall be insulating glass consisting of two 6 mm thick toughened float glass sheet hermetically sealed and separated by 12 mm gap for thermal insulation. Clear glass shall be provided where clear view is required. In other areas tinted glass may be provided.
- 4 mm thick ground glass shall be provided for toilets.
- Glazing between two A.C. areas shall be with 6 mm thick clear float glass.

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- d) All glazing shall be in aluminium frame having 15-micron colour anodization.
- e) 6mm thk. Wired / laminated glass shall be used for windows / ventilators at higher level for safety.
- f) 24mm thick insulated double glazing having 6mm thick tinted heat-reflecting type float glass on outer side and 6mm thick clear float glass on inner side with 12mm air gap & hermetically sealed shall be mounted on 15 micron coloured anodised aluminium frame suitable for structural glazing system.

2.11.00 Sealant

Silicon sealant or polyurethane sealant shall be used in all joints around exterior doors, windows, etc. for proper water-lightness.

2.12.00 Damp Proof Course

40 mm thick 1:1.5:3 concrete with waterproofing admixture.

Water proofing compound shall be of Zydex , SIKA, or similar approved.

2.13.00 Plinth Protection

Minimum 750 mm wide P.C.C. plinth protection along building periphery shall be provided with surface drain of required size and slope, to suit storm water quantity, shall be provided.

2.14.00 Miscellaneous Metal Railing

Unless otherwise indicated, the posts and handrails of stairs, railings etc. shall be of 32 mm dia GI pipes as per IS-1239, Part (1).


2.15.00 Painting

Exterior Masonry Surface : Buildings shall be finished with waterproof cement paint over plaster.

Exterior Steel Work : Anti-corrosive synthetic enamel paint over anti corrosive primer.

All Woodwork : Synthetic paint over a coat of primer.

All Internal Steel Work : Synthetic enamel over a coat of primer.

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Interior Office Spaces, : Acrylic emulsion paint over 2 mm Control Rooms,
All A.C. Areas thick Plaster of Paris punning.

Other Areas : Oil bound distemper over plastered surface
as indicated in finish schedule in this document.

Fire Door : Post Office red shade shall be provided.

3.00.00 **DESIGN DATA FOR ARCHITECTURAL WORKS IN BUILDINGS**


1. Brick works - internal : 250 mm thick brick wall with 1:6 and external
Cement : Sand mortar. Grade of brick shall be of Class designation - 5 as per
relevant IS Codes.
2. Half brick thick wall : 1:4 cement: Sand mortar with 2 nos. 6 mm dia M.S. rod
in every fourth layer.
3. One-third brick thick wall : 1:3 cement: sand mortar with 2 nos. 6 mm dia M.S. rod
at every alternate layer.
4. Damp proof course : 1:1.5:3 Concrete with a minimum of 2% admixture
of water proofing compound.
5. Plaster :
Exterior & rough side : 18 mm thick with 1:6 cement-sand of interior brick wall mortar in
two layers except where special finish provided.

Interior : 12 mm thick with 1:6 cement-sand mortar

Ceiling : 6 mm thick with 1:4 cement-sand mortar
6. Plaster of Paris Punning : 2 mm thick punning to be provided to
all areas receiving acrylic emulsion or acrylic distemper paint.
7. False Ceiling : Aluminium pre-painted false ceiling, either
lineal panel system or aluminium tile/plank system.

Approved make: LUXALON by Hunter
Douglas, LLOYD, Armstrong or similar
approved.
8. Floor finish : a) Generally, unless noted otherwise, finish to utility
areas shall be 40 mm thick heavy-duty cement concrete with metallic hardener
on concrete slab.

Approved make : Ironite or similar

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- b) All areas of toilet, including W.C and urinal shall have non-skid ceramic tiles floor. Dado shall be of glazed tiles of minimum 5/6 mm thickness up to 100 mm higher than lintel level starting from finish floor level.

Approved Make : Ferrastone/Hardstone of BOSS Profiles Ltd, RESTILE Ceramics Ltd. , Marbonite, Kajaria, Nitco, Endura of H R Jonson, or similar approved.

- c) Wherever access flooring is required this shall consisting of fire resistant phenyl formaldehyde bonded particle board panels (600 x 600 x 35 mm) with 2mm thick flexible antistatic PVC topping and 0.5mm thick aluminium foil lining at bottom and PVC strip edging on sides of each panel mounted on steel pedestals of adjustable height and supporting steel grid system provided under floor space, or overall 40mm thick

antistatic PVC flooring having 3mm thick antistatic PVC tiles laid over adhesive as per recommendation of the manufacturer.

Approved make of PVC Tile : Krishna Vinyl, Armstrong or similar approved.

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9. Doors and Windows : a) Doors in plant and utility areas shall be double plated (18G) hollow flush door with pressed steel frame as per IS:4351. The door shutters shall be 45mm thick with two outer sheets of 18G rigidly connected with continuous vertical 20G stiffeners @ 150mm c/c. Side, Top & Bottom edge of shutter shall be reinforced by continuous pressed steel. The doors shall be sound deadened by filling the inside void with mineral wool.

Approved make : Agew Steel Mfrs P Ltd, Godrej or similar.

- b) Fire rated doors shall be double cover plated type with mineral wool insulations and with panic device shall be provided on division walls of cable spreader rooms and at all fire exit points as per recommendation of Loss Prevention Association of India/Tariff Advisory Committee. These shall be as per IS:3614. Fire resistance grade of the doors shall be as per LPA / TAC requirements. However, minimum fire resistance grade shall be for two (2) 2 hours.

Approved Make : Godrej, Navair, Promat, Gandhi Entrance Automation Pvt Ltd, or equivalent.

- c) Main Entrance of Control Room, Control Equipment Room shall be provided with air-locked lobby with provision of double doors of aluminium framework with glazing with double swing type. Doors of control room, control equipment room, computer room, etc. shall be full glazed pre-coated minimum 3mm thick aluminium i.e. coloured anodized aluminium. Glazing between air-conditioned areas shall be

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single glass whereas that between air-conditioned and non-airconditioned area shall be with hermetically sealed insulating glass.

Approved Make : Domal Systems of HYDRO, Hindalco, or equivalent.


- d) Doors of W.C. and shower shall be wooden panel door.
- e) Pre-coated (polyester painted) steel windows and ventilators shall be used.

Approved make : Ncl Altek & Seccolor Ltd.

10. Rolling Shutters : Rolling shutters as per IS: 6248 with suitable operating arrangement (manual, mechanical and/or electric) according to size shall be provided in buildings to facilitate handling and transportation of equipment. The curtains of rolling shutter will be of interlocking scrolls made of hot rolled double dipped galvanised steel lath section of 18swg tested mild steel strips at 75mm rolling centres, locked with galvanised malleable iron clips. The bottom lath will be coupled to a locked plated fabricated from 3mm thick galvanised steel plate and security riveted with stiffening angles.

Approved Make: : DiTEC-Gandhi Entrance Automation Pvt Ltd or similar approved.

11. Glazing: : a) Glazing for windows in general shall be minimum 4 mm clear float glass and as mentioned elsewhere in this document.
- b) Glazing in Control room between A/C & non-A/C area shall be with double glazed insulating glass consisting of 2 nos. 6 mm clear toughened float glass with 12 mm air gap in between, hermetically sealed.
 - c) Minimum 6.0 mm thick toughened float glass shall be provided in doors, partitions, etc.


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- d) 24mm thick insulated double glazing having 6mm thick tinted heat-reflecting type outer float glass and 6mm thick plain inner float glass with 12mm air gap & hermetically sealed shall be mounted on 15 micron coloured anodised aluminium frame suitable for structural glazing system.


Approved make : AIS of Asahi India Glass Ltd., Pilkington Glass India Pvt. Ltd. or approved equivalent.

12.

- Stairs:
- a) All stairs shall have not more than 13 risers in one flight but in case of fire escape stairs, 15 risers may be allowed instead of 13 risers. Height of risers and width of treads shall be 180 mm (maximum) and 250 mm (minimum) respectively for fire escape stairs and 166mm (maximum) & 250mm (minimum) for general staircases. Minimum width of stairs shall be 1000mm for fire escape stairs and 1200 mm for general stairs. In general rises shall be 150 mm.
- b) Aluminium angle nosing shall be provided for edge protection of RCC stairs. Moulded marble nosing shall be provided for the main stairs finished with marble slab / Kota slab finishes.
- c) 32Ø NB medium class G.I pipe Handrail for stairs, minimum 1.0 metre high, shall be provided around all floor/roof openings, projections/balconies, walkways platforms, concrete and steel stairs. 1200mm high railing may be provided for external fire escape stairs. Handrail shall be two rail systems with the top rail 1000mm/1200mm above the walkway/ platform/floor surface and the intermediate rail 500mm below the top rail. Guardrail post spacing will be proportional to the length of the protected horizontal opening but will not exceed 1500mm c/c to posts.

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13. Draining out water from floors : In all buildings, suitable floor drainage system to drain out water collected from equipment, leakages, floor washings, fire fighting etc. shall be provided in each floor.
14. Fencing : Minimum 3.0 metre high fencing above toe wall shall be provided around building transformer area, other areas where fencing is necessary due to statutory requirements. Fencing shall comprise 2.5 metre high with galvanized chain link fencing of minimum 8 10 gauge of mesh size 75 mm and galvanized concertina. Galvanized barbed wires of a height of 0.6 metres shall be provided above the chain link fence. The diameter of steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge. Steel entry gate matching construction shall be provided for all fenced areas. Top of toe wall shall be minimum 200 mm above the formation level.
15. Water Supply and sanitation a) RCC roof water tank of adequate capacity depending on the number of users for 8 hours storage shall be provided for each building.
- b) Galvanized MS Pipe of medium class shall be used for internal piping work for potable water supply.
- c) Extra heavy cast iron pipes with lead joints shall be used for sanitary work below ground.
- d) Heavy cast iron pipes with lead joints shall be used for sanitary work above ground level.
- e) Each toilet shall contain following best quality fittings/porcelain fixtures in adequate numbers as per National Building Code. In toilets primarily meant for workers an additional squatting type WC shall be provided. Minimum one exclusive toilet facilities for handicapped shall be provided in each floor.
- Water closet – Indian & European type.

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- Large flat back urinal with porcelain divider.
- Shower set.

Wash basin – Counter-top wash basin to be provided in office areas selectively as per Owner's desire.

- Sink – Stainless steel sink with integrated drain-board to be provided in janitor's closets, kitchen, pantry areas of "FRANKE" or similar approved make.
- Metal storage cabinets, under-counter as well as overhead, shall be provided in janitor's room, kitchen, pantry and similar areas as per requirement of Owner.
- Minimum 600 mm long porcelain tray.
- Minimum 500 mm long stainless steel towel rail.
- Stainless steel liquid soap holder.
- Recessed porcelain soap tray in shower area.

Stainless steel toilet paper roll holder.

- Robe hooks
- 450x750 mm high square edge 6 mm thick float glass mirror of adequate width to match toilet layout and interior décor.
- Septic tanks with up-flow filter including all accessories and extra heavy cast iron soil lines shall be provided.
- Effluent from septic tank shall pass through chlorination chamber to bring down BOD level to acceptable limit before discharging to nearest drain.
- Drinking fountains in adequate numbers.

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The exact number of fittings and fixtures, brand, colour etc. shall, however be finalized during detail engineering stage and same shall be of Owner's choice and Approval.


Note

Toilets in general shall have white porcelain fixtures, low down cisterns, sensor operated urinals etc. Toilets for handicapped persons shall have adequate grab bars, barrier-free access and appropriate fittings and fixtures.

Approved Make of toilet fixtures: KOHLER, Hindware, Parryware, Nycer, Cera or similar approved.

Approved make of toilet fittings: KOHLER, Jaquar, ESCO, ESS ESS, or similar.


16. Statutory rules :
- a) Vendor shall comply with all applicable statutory rules pertaining to Factories Act, Rules of Tariff Advisory Committee (TAC), and Water Act for pollution control etc.
 - b) Provision of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of fire escape, locker room for workmen, pantry, toilets, rest rooms etc.
 - c) Provision for fireproof doors, number of staircases, fire separation walls, encasing of structural members (in fire prone areas) etc. shall be made according to the recommendation of Loss Prevention Association of India / Tariff Advisory Committee.
 - d) Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

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VOLUME: IV


SECTION: 5

TECHNICAL SPECIFICATIONS: ELECTRICAL

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SUB-SECTION: E-0

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ATTACHMENTS

ANNEXURE –A	: SITE DESIGN DATA
ANNEXURE –B	: LIST OF ELECTRICAL DWGS/ DOCUMENTS TO BE SUBMITTED BY THE BIDDER
ANNEXURE –C	: MAKE LIST
ANNEXURE –D	: FORMAT FOR ELECTRICAL LOAD DATA

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1.00.00 SCOPE OF WORK

1.01.00 The scope of work under this specification shall cover supply including design, engineering, manufacture, assembly, shop fabrication, testing at works, transportation to site, unloading and storing at site, erection, testing, commissioning, trial operation of new and upgraded (existing) electrical equipment for new Wagon Tippler, Belt Conveyors etc. as described in Mechanical section of this Tender Document including associated Substation. The scope of supply shall also cover erection consumables, hardware's, labour, tools, tackle, erection and commissioning spares etc. The scope of work shall include all mechanical, civil, structural and architectural works associated with installation of the electrical system and equipment at site.

The Bidder shall quote for 2 years "Recommended Spares" separately.


1.01.01 This specification shall be applicable to all equipment to be supplied and erected in accordance with detailed scope of work and accompanying electrical sub-sections.

1.01.02 In case of any conflict /contradiction among various electrical sub-sections, this specification E-0 (General Electrical Specification) shall govern unless otherwise clarified by the Purchaser/Consultant.

1.01.03 The Bidder before submitting his tender should visit the site to ascertain all restrictions, obstructions in the proposed area, work related to up-gradation/ modification of existing equipment and all site conditions including the sub-soil conditions. Based on his assessment after site visit, the Bidder shall include extra work / item if any, (which is likely to be considered for completion of the job), in his quoted price. After award of work no additional claims shall be entertained on this account under any circumstances by the Purchaser.

1.02.00 Broad scope of electrical work is outlined below. Items that are not specifically mentioned but are required to make the system complete in all respects shall be deemed to be included in the scope without any extra cost implication to the Purchaser.

The power for the new installation shall be arranged by the Bidder from Purchaser's existing 11kv Switchgear no 5HA, Panel no. 5 & 18 to new Switchgear Building near Wagon Tippler, through 11kV(UE), 3CX300 mm² XLPE A &S Aluminum conductor cables. The cable route shall follow the existing pipe bridge to the extent possible otherwise overhead cable trestle shall be provided by the Bidder particularly to cross the coal yard and to enter to TP-2A. New cable trays of 600mm wide shall be provided by the Bidder on existing pipe bridge (cable shall run above pipe) and new cable trestle for power and control cables. The cable route is shown tentatively on drawing no CHP/NIT/ELECT/09. Separate cable trays shall be provided by the Bidder for 11 kV cable, LT cable (1.1kV grade or less) and control cables for transformer protection, etc. Bidder also has to provide spare cable trays for future use of Purchaser.

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The modifications in Panel no.5 & 18 of Purchaser's existing 11kV Switchgear no 5HA is in the scope of the Bidder.


Vendor to take approval from NALCO/ consultant for all Schematic drawings and GA drawings before supply & modifications.

The Bidder shall inspect the existing panels and verify the cable route / length during his site visit and shall keep provisions for the work in this quoted price.

The power distribution scheme for the new installation is shown in Single Line diagram dwg no. CHP/NIT/ELECT/02.

1.02.01 Major equipment to be supplied/ up-graded (existing equipment) by the Bidder are as follows:

- A. Two (2) nos. 630A 11KV Load Break Isolator located at the new Switchgear Building, near the new wagon tippler.
- B. Two (2) nos. 2.5 MVA, 11/0.433 KV dry type transformer located inside the new Switchgear Building, as stated above.
- C. One (1) no. 415V Switchgear located at new Switchgear Building.
- D. One (1) no. 415V ACDB, located in new Switchgear room.
- E. One (1) no. 415V MLDB, in new Switch Gear room.
- F. One (1) set of 110V DC Battery, battery charger and DCDB, located in new Switchgear Building.
- G. Local Push Button Stations for all drives including up-graded existing drives and local motor starters for ventilation fans, sump pump, etc.
- H. Local load break Isolators for all LT motors including upgraded existing drives of Conveyor 3A/3B.
- I. Multiplication of field contacts for process safety switches/interlocks shall not be realized in LV Switchgear. However, the same shall be carried out in PLC under the scope of Electrical work under this package. Hardware interfacing with LV Switchgear and PLC system are under the scope of this package.
- J. Supply, installation, laying and termination of new power and control cables for all the up-graded existing drives/equipment/local P.B. stations etc. The existing cables, after replacement, shall be returned to the Purchaser's store.
- K. UPS & UPS battery bank

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1.02.02 VVVF panels for process drives as required, e.g. for vibrating feeders and Wagon Tippler etc at New Wagon Tippler Building. The VVF Panels shall be installed in a separate air conditioned room along with I/O racks and Battery charger of Switchgear Building.


1.02.03 Cables / Bus duct

- A. 11 KV (UE), 3C X 300, XLPE A&S Al conductor power cables for power supply to 11/0.433 kV transformers, located inside the new Switchgear Room (near new Wagon Tippler), from Purchaser's existing 11KV Switchboard No.5HA, Panel No. 5&18 at 1st floor of Boiler Switchgear room of unit 5.
- B. 415V, 4000A (min.) non phase segregated Bus duct from 11/0.433kV transformers to 415V Switchgear.
- C. 1.1KV HRPVC A&S, Al conductor power cables and 1.1kV PVC A&S, twisted pair and screened 2.5mm² Cu conductor control cables for interconnection amongst all equipment, interconnection with Purchaser's 11kV Switchgear and interfacing of Bidder's LV Switchgear/ Transformers with PLC system (Remote Terminal Units) located in existing CHP Control Room

1.02.04 Cabling and Cable Tray system:


- A. All cables shall be run along over head cable trestles and/or along the conveyor galleries via horizontal/vertical cable trays. Outdoor cable trays shall be vertical in general. For short portion, underground concrete cable trench with cable trays inside may be accepted subject to Purchaser's approval.
- B. Cabling viz. cable laying along with cable accessories, cable trays with supporting structures, termination and jointing kits, trenches, overhead trestles etc. as required for Bidder supplied cables for the new installation as well as for upgradation of existing equipment.
- C. 70% space of each cable trays can be filled up, the rest 30% are to be left for future use by others.
- D. Inside the industrial building/shed/plant, cable tray shall run above man height, along the wall/structure and cable drops shall be at the nearest wall/ column. From wall/ column to motor/PB station, cable shall run through GI Pipe/shallow trench below floor. Protective GI Pipe shall be provided for all cables at the floor level. For crossing railway track concrete cable duct bank shall be provided. Cable cellar shall be provided for new Switchgear Building.

1.02.05 Illumination system indoor & outdoor and for road lighting as required for the new installation are under the scope of this specification. This shall include transfer

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houses, pent houses, conveyors, wagon tippler complex, pump house, Switchgear building, etc. High mast lighting shall be provided for rail yard in Wagon Tippler complex. LED type Luminaire may be considered for indoor lighting complete lighting system shall be energy efficient.

- 1.02.06 Complete earthing (including underground earth grid) and lightning protection of equipment, cable raceway system, buildings and structures including interconnection between Bidder's earth grid with that of the Purchaser are under the scope of this specification.
- 1.03.00 Exclusions and Deviations
- 1.03.01 Exclusions and/ or deviations from the Tender Specification if any, shall be clearly stated under separate heads marked as "Exclusions" and "Deviations" quoting the subsection no. and clause reference of the Tender Specification. Otherwise it shall be considered that the Bidder has quoted conforming to the requirements of Tender Specification without any exclusion and deviation.
- 2.00.00 CODES AND STANDARDS
- 2.01.00 Equipment
- 2.01.01 All electrical equipment and materials shall conform to latest applicable standard publications of International Electro-technical Commission (IEC) or equivalent standards published by the Bureau of Indian Standards (BIS) and other standards mentioned in the various sub-sections of this specification .In case of a conflict between IEC and other standards, the requirement of IEC shall govern.
- 2.01.02 Equipment and materials conforming to any other standard which ensures equal or better quality, may be accepted. In such cases, copies of the English Version of the standard adopted shall be submitted along with the bid.
- 2.02.00 Installation
- 2.02.01 All electrical installation work shall comply with the provisions of the Indian Electricity Act, the Indian Electricity Rules as amended upto date, relevant IS Codes of practice and recommendations of Tariff Advisory Committee (TAC) .In addition, other rules and regulations applicable to the work shall be followed .In case of any discrepancy, the more restrictive rules shall be binding. As per CEA regulation local ELBO guidelines has to be adhered to. For site job, the executing vendor shall have requisite license issued by ELBO Odisha.
- 2.02.02 Nothing in this specification or in the accompanying sub-sections shall be construed to relieve the Contractor of his responsibility.


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3.00.00 GENERAL REQUIREMENT


- 3.01.00 For the purpose of design of electrical equipment/systems, an ambient temperature of 50°C and relative humidity of 100% shall be considered.
- 3.02.00 The equipment shall be designed to operate in a highly dusty and corrosive environment as prevalent in co-generation plants.
- 3.03.00 For equipment installed in air-conditioned rooms, design ambient temperature can be considered 35° C, with 2 x 100% air-conditioning system provided.
- 3.04.00 The electrical parameters and intended utilization of these voltage levels are as given below:

<u>Voltage Level</u>	<u>Description</u>	<u>Utilization</u>
11KV	11000V, 3ph, 3 wire, 50Hz Non-effectively earthed; Fault level: 40kA	To feed from 11/0.433kV Transformers
415V	415V, 3ph, 4 wire, 50Hz, Effectively earthed; Fault level: 50kA	To feed all equipment other than HT drives.

- 3.04.01 Any other AC voltage level if required for the system, shall be arranged by the Bidder, through suitable transformation.
- 3.04.02 All electrical equipment shall be suitable for a supply voltage variation of $\pm 10\%$, frequency variation of $\pm 5\%$ and a combined absolute variation of 10 (absolute sum).
- 3.04.03 All DC equipment /components fed from the Bidder's battery shall be suitable for voltage variation of + 10% to-15% of the nominal voltage.
- 3.05.00 The electrical layouts for Switchgear and control buildings shown in enclosed drawings are indicative and of minimum sizes required. However, in case a larger size of room/building is required the same will be provided by the Bidder without any extra cost implication to the Purchaser.
- 4.00.00 FACILITIES
- 4.01.00 Facilities by Purchaser

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- 4.01.01 For construction power, depending on availability of spares, Purchaser shall provide one (1) 415V power supply feeder in his existing 415V switchboard, on chargeable energy basis. Bidder has to arrange power to his work place from Purchaser's switchboard through his own cables.
- 5.00.00 DESIGN CRITERIA FOR EQUIPMENT/ MATERIALS
- 5.01.00 11000V Switchgear (Modifications in existing switchgear panels)
- 5.01.01 The spare transformer feeder panel no. 5 & 18 of existing 11KV Switchgear No.5HA shall be suitably modified by the Bidder to feed Bidder's 11/0.433KV Transformers.
- 5.01.02 Modifications in transformer feeder panels shall be carried out as per drwg. No.CHP/NIT/ELEC/01, Rev-0. All new relays in modified panels shall be numerical communicable type.
- 5.02.00 Transformer
- 5.02.01 The transformers listed under the scope of this package are for stepping down the voltage level from 11KV to 0.433KV to feed Bidder's 415V Switchgear.
- 5.02.02 The transformers shall be air natural resin encapsulated, indoor dry type with cable connection at HV side and bus-duct connection at LV side as specified.
- 5.02.03 The impedance of the transformer shall be as per IS norms.
- 5.02.04 The size of Transformer shall be verified based on the following:
- Size shall be greater than or equal to total KVA of continuous load
+ (coincident/duty factor x total KVA of intermittent load other than valves)
+ (0.2 x total valves KVA)
+ KVA of largest rated valve or damper motor
+ 15% margin on the sum of the aforesaid values.
- Coincident factor/duty factor of intermittent loads such as hoists, etc. are to be taken as 0.5.
- 5.02.05 2x100% feeding arrangement shall be provided i.e. the total loads to be considered for sizing of each transformer.
- 5.02.06 After selecting the transformer size and its impedance, a check on the voltage regulation and fault level should be carried out. Voltage drop at the largest motor terminals with all other loads running shall be within the acceptable limits during starting and normal running of motor, as specified elsewhere.
- 5.02.07 The transformer rating shown in single line diagram as 2.5 MVA is minimum. The contractor to furnish transformer sizing calculation for approval of the Purchaser.

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5.03.00 415V Switchgear

- 5.03.01 The 415V Switchgear listed under the scope of this package are for the power feed to Bidders LT loads including ACDB, MLDB, and Battery chargers etc, Welding sockets shall also be connected to the 415V Switchgear.
- 5.03.02 The Switchgear shall be indoor, metal-clad, single front, cable entry at bottom and floor mounted with draw-out type air circuit breakers and switch- fuse contactor/switch fuse units. SFU and Contactor rating should be one size higher than what is required to achieve type 2 Co-ordination. All feeders in switchgear shall be draw out type.
- 5.03.03 The Switchgear shall be provided with at least 10% spare feeders and feeders for Purchaser's future loads as shown in the enclosed Single Line Diagram.
- 5.03.04 Dual output current/voltage transducer shall be provided for remote metering.
- 5.03.05 Control transformer provided inside the Switchgear shall be of cast resin type.
- 5.03.06 All relays for motor protection up to 30kW shall be digital type protection relays and above 30 kW numerical communicable type relays shall be used.
- 5.03.07 All motors shall be switch-fuse and contactor operated. For motors rated 75kW and above vacuum contactors with SFU shall be used.
- 5.03.08 Air Circuit Breaker handling truck shall be provided for handling of circuit breakers. Control supply for ACB shall be 110V DC.
- 5.03.09 Protection relays shall be used solely for protection only. Control of breakers shall not be permitted in any way from the relay. Synchronization facility to be provided between the two incomers.

5.04.00 415/240V ACDB

- 5.04.01 The 415/240V ACDB listed under the scope of this package are intended to provide auxiliary power supply to various equipment.
- 5.04.02 ACDB shall be fixed type and of single front construction.
- 5.04.03 ACDB shall be provided with 10% spare feeders as stipulated in relevant sub-section.
- 5.04.04 ACDB shall have bottom cable entry.

5.05.00 Indicating Meters

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5.05.01 All indicating meters in HT and LT switchboards/panels shall be digital type of Schneider/secure make only. Multifunction meter (MFM) shall be provided for LT Switchgear incomer and all conveyor / large capacity motor $\geq 30\text{KW}$.

5.06.00 Cables

Power Cables shall be sized based on following considerations:

- A. Rated current of the equipment plus 20% spare capacity.
- B. Short circuit withstand capability.
 - i) For fuse-protected feeders, cable shall be capable of withstanding the let through short-circuit current.
 - ii) For HV breaker controlled outgoing feeders, cable shall be capable of withstanding the system fault level for 0.2 sec.
 - iii) For LV breaker operated incomer feeders, the cable shall be capable of withstanding the system fault level for 0.12 seconds.
- C. Maximum allowable voltage drop during normal running condition shall not exceed 3% under full load conditions and 10% during motor starting conditions.


5.06.01 Cables shall be derated for site ambient and ground temperatures, grouping and soil thermal resistivity. Contractor shall furnish detailed cable selection / sizing calculations for approval. Voltage grade of cables shall be of earth grade when used in solidly earthed system and unearthed grade when used in non-effectively earthed system. The screen for HT cable shall be sized for 300 A for 2 seconds.

5.06.02 Bidder shall generally use the following sizes of cable:


- A. 11KV XLPE: 300 sq.mm.
- B. 1.1KV HRPVC-insulated power cables: 2.5 sq.mm (Cu conductor) and 6, 10, 16, 25, 35, 70, 120, 185, 300, 630 sq.mm.
(N.B 6 to 300 will be 3.5/4 core and 630 will be single core)
- C. 1.1KV PVC-insulated control cables 2.5 sq.mm: 2C, 3C, 5C, 7C, 10C, 14C & 19C (Cu Conductor)

5.07.00 110V Battery & Battery Charger

5.07.01 Battery and Battery charger provided in Switchgear room shall primarily cater to closing, tripping, protection, indication & motor spring circuits of 415V air circuit breakers. The minimum rating of battery shall be 160AH.

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- 5.07.02 Battery shall be of maintenance free VLRA type only.
- 5.07.03 The battery shall be of one (1) hour duty cycle.
- 5.07.04 The battery charging equipment will be static type and will be designed to supply the continuous DC load in addition to float/trickle/boost charging of the battery. Battery charger set will comprise of one float charger and one float cum boost charger.
- 5.07.05 Built-in AVR will be provided to maintain the float charger DC output voltage within 1% from 'No load' to 'Full load' and for AC line voltage variation of $\pm 10\%$. Boost charger
Shall be capable of quick charging the battery. Charger shall have sufficient capacity to restore a fully discharged battery to a state of full charge in 8 hours. Float and boost charging voltage is to be determined by the Bidder depending on the type of battery and recommendation of Battery manufacturer.
- 5.08.00 Illumination System
- 5.08.01 Lighting fixtures (LED type only as per IS 10322/IS 16107) shall generally be group controlled from lighting panel itself. However, for office areas, control rooms, stores etc. control shall be provided through switch boxes. Each switch may control maximum 3 nos. fluorescent fixtures.
- 5.08.02 Each area shall be illuminated by more than one circuit, fed from different phases.
- 5.08.03 Main Lighting Distribution Board shall consist of the following:
- Lighting Transformer (Dry type)
 - TP Load break Isolator on primary side of transformer.
 - 4P MCCB on secondary side.
 - TPN SFU outgoing feeders.
- 20% spare capacity shall be kept in lighting transformer.
- MLDB shall have at least four (4) spare feeders and two more for Purchaser's use.
- 5.08.04 Lighting panels of 6 way & 12 way are proposed for feeding the lighting fixtures. For 6 way panels, minimum one way shall be kept as spare feeder and for 12 way panels, 2 ways shall be kept as spares.
- 5.08.05 Maximum lighting load allotted on each way of lighting panel shall not exceed 2 KVA. Total connected load of a lighting panel shall be restricted to the following:

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12 way panel: 12KVA

6 way panel : 6KVA

- 5.08.06 Wiring for lighting circuits and receptacle circuits shall be carried out in separate conduits and through separate feeders.
- 5.08.07 The size of lighting wires/cables shall be so selected such that the total voltage drop from MLDB to the lighting fixture/receptacle does not exceed 3%.
- 5.08.08 Ceiling fan shall be provided in maintenance room, office and other places as and where required, as per Purchaser's requirement.
- 5.08.09 415V, TPN, 63A welding sockets with switch (to be fed from 415V Switchgear) shall be provided in the following area, in general:
- A. One (1) each in Switchgear room, cable cellar and transformer rooms.
 - B. One (1) in WT control room.
 - C. One (1) in each Conveyor Gallery.
 - D. One (1) in each TP.
 - E. One (1) in each floor of WT complex.
 - F. One (1) each in Pump room and Compressor room.
 - G. Area General illumination shall be controlled through ASTROTIMER.
- 5.08.10 20A, 240V AC industrial type receptacles shall be provided in the following areas.
- A. Two (2) each in Switchgear / Cable cellar / Transformer rooms / VVVF room / Hydraulic room / Maintenance room / Pump room / Compressor room..
 - B. Two (2) each in WT Complex and WT Control room.
 - C. Two (2) in each Conveyor Gallery and TP.
 - D. One near each exit door of closed building/room for "EXIT" lamp.

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- 5.08.11 Portable emergency lights with built-in battery and charger shall be provided at strategic points for the safe exit of the operating personnel.
- 5.08.12 For WT complex, Conveyor galleries, TPs, Compressor room, Pump room etc., the lighting circuit/wiring emanating from the lighting panel shall be generally carried out by 3Cx2.5sq mm (Cu) HR PVC, armored power cable.
- In Switchgear building and WT control room, lighting & receptacle circuits shall be drawn by 2.5 sq. mm (Cu) PVC wires through GI conduits.
- 5.09.00 Motor
- 5.09.01 All motors shall be energy efficient (IE2 or IE3), 3 phase, squirrel cage induction type with DOL / VVVF starting.
- 5.09.02 Squirrel-cage induction motors shall be used for VVVF drives where required.
- 5.09.03 All the motors shall conform to the requirements as stipulated in the relevant subsection. However, conveyor motors shall also meet the following requirements:
- Motors shall be suitable for three (3) consecutive hot starts followed by One (1) hour interval at standstill with max. 20 start per day and shall be suitable for minimum 20,000 starts during the life time of the motors.
 - Motor starting current vs. starting time shall be plotted at site during commissioning stage for all belt driven equipment. It shall be within the necessary parameters indicated during the design stage. Necessary instruments and transducers for this shall be provided by the Contractor.
 - All the motors shall be 415V and motor kW rating shall be restricted to maximum 200kW.
 - Motor synchronous speed shall be limited to 1500 rpm.
 - All relevant Motor data sheets and drawings have to be supplied by the bidder to NALCO.
- 5.10.00 VVVF Panels
- 5.10.11 Each VVVF drive panel shall have provision of manual bypass DOL starting arrangement by the manufacturer.

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5.10.12 Suitable air conditioned room to be considered for the installation of VVVF panels. Supply and installation of AC machines in the above room shall be under the scope of the Bidder.

6.00.00 EARTHING & LIGHTNING PROTECTION

6.01.00 All individual buildings shall be provided with underground earth grids which shall be connected together by minimum two nos. parallel earth conductors below ground. Such interconnected earth grid shall be connected with Purchaser's earth mat/ring at two points in each direction as available. Soil resistivity measurement for designing grounding system is included in scope of this package. Separate earth pit shall be provided for electronic equipment grounding.

All buildings and conveyor galleries shall be provided with lightning protection system.

All earth pits shall be chemical earth pit type.

7.00.00 FAULT LEVEL

The system fault levels shall be considered as follows:

- i) 11 KV : 40KA for 1 sec
- ii) 415V : 50KA for 1 sec

8.00.00 DEGREE OF PROTECTION FOR ENCLOSURE

Degree of Protection for various enclosures as per IS: 13947 shall be as follows:

8.01.00 HT Switchgear:

(a) 11kV Load Break Isolator : IP 4X


8.02.00 Transformers:

- (a) Indoor/Outdoor Transforms : IP 65
- (b) Cable Box : IP 55
- (c) Kiosks and marshalling Box : IP 55

8.03.00 415V Switchgear/DBs : IP 54

8.04.00 Motors : IP 55

8.05.00 Control and Relay Panels

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(a) In Air-conditioned areas : IP 32

(b) In other areas : IP 52

8.06.00 Pushbutton Station and any other Kiosk/Box/Panel/Enclosure

(a) Indoor/Outdoor : IP 55

(b) In dusty areas, e.g. conveyor galleries, transfer points, crusher house, bunker fl. Etc. : IP 65

8.07.00 Junction boxes for cables/wires : IP 55

8.08.00 Outdoor lighting fixtures : IP 55

8.09.00 Battery charger panel : IP 42

9.00.00 PAINTING & PAINT SHADE

9.01.00 All sheet metals panels such as control/protection/PLC panels/desk, HT & LT Switchgears/ AC distribution boards, MLDB/LPs etc. shall be painted with epoxy-based paint shade. Finish colour of all panels shall be light grey shade 631 of IS-5 and that for transformers shall be battleship grey of IS-5.


10.00.00 TYPE, ROUTINE & ACCEPTANCE TESTS

10.01.00 General.


10.01.01 All equipment/ systems to be supplied shall confirm to type tests as per relevant standards and shall be of proven type.

10.01.02 The Bidder / Contractor shall furnish the reports of all the type tests carried out within five years preceding the date of bid opening as per specification and relevant standards for all components/ equipment/ systems. These reports should be for the tests conducted on identical/ similar components/ equipment/ systems to those offered/ proposed to be supplied under this contract.

10.01.03 In case Contractor is not able to submit report of type test(s) conducted in last five years, or in case type test(s) report(s) is not found to be meeting the specification/relevant standard requirements, then all such tests shall be conducted under these contract by the Contractor free of cost to the Purchaser, and reports shall be submitted for approval.

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- 10.01.04 Even if the Contractor furnishes valid test report as indicated above, Purchaser may get some type tests conducted under this contract as specified in subsequent clause below in this section for which Bidder shall include in this total bid price the cost of carrying out all such type tests. The charges for each of this type tests shall be given separately in the relevant schedule for price adjustment purpose, in case of waiver of any test at a later date.
- 10.01.05 All acceptance and routine tests as per relevant standards and specification shall be carried out by the bidder. Charges for these shall be deemed to be included in the bid price.
- 10.01.06 Bidder/Contractor shall furnish the test reports of all type tests (irrespective of conducting/repeating the test under this contract) as per relevant standards and codes as well as other specific tests required under this specification. An indicative list of such tests is given below. Please note that this list of tests is not exhaustive and Purchaser may ask for submission of test reports of any other test as per relevant standards.
- 10.02.00 11000 V Load Break Isolator
- 10.02.01 Test reports for following type tests shall be submitted as applicable:
- (a) Short Circuit duty test.
 - (b) Short time withstand test.
 - (c) Lightning impulse withstand test.
 - (d) Temperature rise test.
 - (e) Measurement of Resistance of main circuit.
- 10.03.00 415V Switchgear/ ACDB/ DCDB/ MLDB:
- 10.03.01 The following tests shall be conducted:
- (a) Short time withstand test on main circuit and earth circuit.
 - (b) Temperature rise test.
 - (c) Verification of making and breaking capacity.
- 10.04.00 Transformer
- 10.04.01 The following type tests on transformer shall be conducted:
- (a) Capacitance and tan delta of windings.
 - (b) Short circuit test

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(c) Temperature rise test

10.04.02 Test report for the following type test shall be submitted for approval:

(a) Noise level.

10.05.00 Motors

LT Motors:

Only type test reports or the test as per IS shall be submitted for motors above 45KW.

10.06.00 Power and Control Cables:

10.07.01 The following type tests shall be carried out on all sizes of cables of 11 kV grade and above:

(a) Partial discharge test.

(b) Bending Test.

(c) Dielectric power factor test

i) As a function of voltage

ii) As a function of temperature

(d) Heating cycle test.


(e) Impulse withstand test.

(f) Measurement of eccentricity and ovality.

10.06.02 The following type tests shall be carried out on one size each (to be selected by Purchaser) of LT Control/Instrumentation/HRPVC power/XLPE power and HT cable of each voltage grade:

(a) Conductor:

- | | | |
|----------------------|---|--|
| (i) Annealing Test | : | For Copper Conductor only. |
| (ii) Tensile Test | : | For Aluminium Conductor only. |
| (iii) Wrapping Test | : | For Aluminium Conductor only. |
| (iv) Resistance Test | : | Applicable for all types of materials. |


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(b) Armour Wires/ Strips

- | | | |
|-------------------------------|---|--|
| (i) Measurement of materials. | : | Applicable for all types of materials. |
| Dimensions | | |
| (ii) Tensile test | : | Applicable for all types of materials. |
| (iii) Elongation test | : | Applicable for all types of materials |
| (iv) Torsion test | : | For round wire only. |
| (v) Winding test | : | For strips only. |
| (vi) Resistance test | : | Applicable for all types of materials. |
| (vii) Zinc coating test | : | For GS strip/ wires only. |

(c) For HRPVC/PVC/ XLPE Insulation & PVC sheath:

- | | | |
|---|---|--|
| (i) Test for thickness | : | Applicable for all types of materials. |
| (ii) Tensile test & test before and after | : | Applicable for all types of materials. Elongation ageing |
| (iii) Ageing in air oven | : | Applicable for all types of materials. |
| (iv) Loss of mass test | : | For PVC insulation and PVC sheath only. |
| (v) Hot deformation test only. | : | For PVC insulation and PVC sheath |
| (vi) Heat shock test | : | For PVC insulation and PVC sheath only. |
| (vii) Shrinkage test | : | Applicable for all types of materials. |
| (viii) Thermal stability | : | For PVC insulation and PVC sheath only. |
| (ix) Hot set test | : | For XLPE insulation only. |
| (x) Water absorption test | : | For XLPE insulation only. |
| (xi) FRLS characteristics of outer sheath | : | For all types of cables. |

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Test reports of the following test shall be submitted:

10.07.01 Lighting Fixtures:

- (a) Test for mechanical strength
- (b) Heating test
- (c) Endurance test
- (d) Protection against electric shock
- (e) Thermal shockproof test for glass (as applicable)
- (f) Test for dust tightness
- (g) Wind loading test (on street/yard lighting luminaries)
- (h) Power factor measurement test


10.07.02 Lamps- rating and life test for each type and rating of lamp (at rated voltage).

10.07.03 Test reports for the following items as per relevant standards shall be submitted.

- (a) Degree of protection test for lighting panel.
- (b) Miniature circuit breaker of each rating.
- (c) Conduits of each size.
- (d) Degree of protection test on junction boxes and receptacle boxes.

10.07.04 All type test reports as per relevant standards for the following items shall be submitted:

- (a) Well glass vapour proof, dust tight fixtures.
- (b) Floodlight LED fixtures.
- (c) Streetlight LED fixtures.
- (d) Industrial type LED fixtures.
- (e) High & Medium bay type fixtures.

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10.08.00 Battery:

10.08.01 Following type tests on two cells of the battery, even if type test certificates of these tests are submitted by the Bidder for Purchaser's approval:

(a) Test for capacity test for voltage during discharge.

(b) Ampere hour & watt hour efficiency test.

(c) Endurance test.

10.09.00 Cabling, Earthing and Lightning Protection:

10.09.01 Test reports as per relevant standards for all the materials/ accessories including cable tray support system shall be submitted.

11.00.00 DRAWINGS, DATA & MANUALS:

11.01.00 Documents to be submitted for approval (A)/information (I) after award of Contract.

A. Layout

(i) Equipment & Cable tray layout in plant areas under scope of this package like Switchgear Building, Conveyors, Wagon Tippler complex, Transfer Points, Pent houses, Pump and Air compressor building, etc. A

B. Motor

(i) Dimensional G.A Drawing A/I

(ii) Foundation Plan & Loading I

(iii) Cable end box details A/I

(iv) Thermal withstand curves- hot & cold I


(v) Starting and speed torque characteristics at 80% and 100% rated voltage. I

(vi) Complete motor data A/I


(vii) Erection and maintenance manual I

(viii) Routine test report A

C. Valve Actuator / Flap Gate

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(i)	Technical Catalogue of manufacturer	I
(ii)	Schematic and wiring diagram	A/I
(iii)	Limit switch contact development details	A/I
(iv)	Routine test report	A
D.	11kV Load Break Isolator	
(i)	Overall G.A drawing with dimensions	A/I
(ii)	Wiring diagrams	A
(iii)	Manufacturer's technical catalogues	I
(iv)	Instruction Manual	I
(v)	Routine test report	A
E.	415V Switchgear / DB	
(i)	Single line diagram	A
(ii)	Overall G.A Drawing with dimensions	A
(iii)	Control Schematics	A
(iv)	Wiring diagram	A
(v)	Relay setting calculation	A
(vi)	Manufacturer's technical catalogue for ACB.	I
(vii)	Instruction manual	I
(viii)	Manufacturer's Technical catalogues for MCC components.	I
(ix)	Routine test report	A
F.	Cables	
(i)	Complete cable data	A/I
(ii)	Shop test report	A

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G. VVVF Drive

- | | | |
|-------|--|---|
| (i) | General arrangement drawing | A |
| (ii) | Control Schematic & Operational write-up | A |
| (iii) | Wiring Diagram | A |
| (iv) | Instruction manual | I |
| (v) | Functional and routine test report | A |

H. Transformer


- | | | |
|-------|---|---|
| (i) | General arrangement drawing, Foundation data, List of accessories | A |
| (ii) | Wiring diagram of Marshalling Box | A |
| (iii) | General Arrangement of HV & LV Terminal Box | I |
| (iv) | Manufacturer's technical catalogue | I |
| (v) | Instruction manual | I |
| (vi) | Routine test report | A |

I. Cable Raceway System


- | | | |
|-------|--|---|
| (i) | Outdoor (Interplant) cable layout with cable tray & trestle sections of each route | A |
| (ii) | Indoor cable layout with tray sections of each route | A |
| (iii) | Tray/conduit loading data | A |
| (iv) | Dimensional details of cable trays and supporting arrangement. | A |
| (v) | Cable/conduit schedule | I |
| (vi) | Interconnection diagram | I |

J. Grounding & Lighting Protection


- | | | |
|-----|--|---|
| (i) | Grounding & Lightning protection layout (overall) with interconnection with Purchaser's system | A |
|-----|--|---|

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- (ii) Grounding & Lightning protection layout and arrangement for each plant /building A
- (iii) Details of earth electrode, riser, conductor, air termination ,test points A
- K. Battery & Battery Charger
- (i) Battery & battery charger layout A
- (ii) GA of charger panel I
- (iii) Schematic diagram of charger A
- (iv) Wiring diagram of charger A
- (v) Battery cell voltage characteristic and data I
- (vi) Duty cycle diagram A
- (vii) Battery sizing calculation in IEEE-485 format A
- (viii) Sizing calculation of charger main equipment A
- (ix) Instruction manual A
- L. Illumination System
- (i) General arrangement drawing of lighting panel and junction box . A
- (ii) Single line diagram for lighting power distribution A
- (iii) Lighting layout of all areas under this package A/I
- (iv) Manufacture's technical catalogue for all boards, panels JB's , fixtures ,receptacles and other accessories used I
- (v) Routine test report for all procured/manufactured items A
- M. General (Enabling documents for review of all other documents pertinent to the system/equipment)
- (i) Detailed load list in Purchaser's format (Ref. Annexure-D) I
- (ii) Transformer Sizing calculation A

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- | | | | |
|--------|--|---|---|
| (iii) | Board wise single line diagrams and key interconnection diagram | A | |
| (iv) | Adequacy check for Purchaser's provided feeder rating | A | |
| (v) | Busbar sizing calculation for SWGR,DB and panels | A | |
| (vi) | Cable sizing calculation based on short circuit, voltage and motor drop (running starting) and continuous current carrying capability. | | A |
| (vii) | Control schemes with block interface and block cabling diagram for incomers, bus coupler motor feeders, transformer feeders etc. | A | |
| (viii) | Control Logic diagram | A | |
| (ix) | Electrical Equipment IO list (both analogue and digital) | A | |
| (x) | Equipment Data sheet (For all equipment supplied under this package) | A | |
| (xi) | Grounding & Lightning protection calculation | A | |
| (xii) | Lighting design calculation for determining fixture quantity for each area | A | |
| (xiii) | Lighting power calculation | A | |
| (xiv) | Relay setting calculation | A | |
| (xiv) | Battery Sizing calculation | A | |
- 11.01.01 The successful Bidder shall submit technical particulars (in the format attached with this tender for all the equipment), from the actual manufacturers, supplied under this package.
- 11.01.02 The above list of documents is not exhaustive. Purchaser may ask for any other drawings/data sheet/manual etc. as deemed necessary for completing the review of engineering documents and the successful Bidder shall submit such documents.
- 11.01.03 The successful Bidder shall ensure that submission of design/sizing calculation listed under clause no. 11.01.00 (M) precedes submission of other engineering documents of that system/equipment .This is an essential pre-requisite for review work.

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ANNEXURE- A

SITE DESIGN DATA

1. Average daily maximum temperature : 47°C
2. Average daily minimum temperature : 14°C
3. Design maximum ambient temperature : 50°C
4. Design minimum ambient temperature : 14°C
5. Maximum relative humidity : 90%
6. Seismic condition : Zone II as per
IS: 1893 ANNEXURE-B

LIST OF ELECTRICAL DRAWINGS/DOCUMENTS TO BE SUBMITTED WITH TENDER

- A. Motor
 - i) Motor data
 - ii) Type test report
- B. Valve actuator
 - i) Technical catalogue of manufacturer
 - ii) Type test report
- C. Transformers
 - i) Type test report
- D. 415V Switchgear / DB
 - i) Single line diagram
 - ii) Manufacturer's technical catalogue for ACB
 - iii) Manufacturer's technical catalogue for Switchgear components
 - iv) Type test report
- E. Cables

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i) Cable data

ii) Type test report

F. Battery

i) Manufacturer's technical catalogue

G. VVVF Drive

i) Data Sheet

ii) Control schematic

iii) Manufacturer's technical catalogue

H. Illumination system


i) Single line diagram for lighting power distribution

ii) Manufacturer's technical catalogue for all boards, panels, JB's, fixture, receptacles and other accessories used.

iii) Type test report for all procured/manufactured items.


NOTE: i) The technical particulars sheets for the equipment attached with the Tender Document shall be filled up by the Bidder and submitted with his Tender.

ii) The above list of documents is not exhaustive. Purchaser may ask for any other drawings/data sheet/manual etc. as deemed necessary for completing the review of the tender.


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**ANNEXURE-C
MAKE LIST**


SL NO	ITEM	NAME OF MANUFACTURER
1	11KV Isolator	<ul style="list-style-type: none"> Siemens ABB BHEL Alstom Schneider Electric JYOTI LDT. GE INDIA CROMPTON GREAVES PANICKER SWITCHGEAR
2	415V Switchgear	<ul style="list-style-type: none"> L&T Siemens Schneider Electric ABB
3	Transformer	<ul style="list-style-type: none"> ABB CGL Alstom KEC Bharat Bijilee VOLTAMP EMCO ALFA TRANSFORMER AREVA
4	LV SWGR./PMCC/Motor Control Center/ACDB including components	<ul style="list-style-type: none"> Siemens L&T ABB Schneider Electric GE Power
5	DCDB/Local Control stations/MLDB/Control Desk /MCB(DIN RAIL MOUNTED)	<ul style="list-style-type: none"> L&T Techno Commerce Schneider Siemens Pyrotech (South) HAVELLS MDS SWITCHGEARS LEGRAND (INDIA) C&S HPL (INDIA) HENSEL ELECTRIC

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6	Battery & Battery Charger	1. Exide 2. AMCO 3. Amara Raja 4. EMERSION NETWORK 5. HBL 6. HIND RECTIFIER 7. CHABBI ELECTRICAL 8. CALDYNE AUTOMATIC
7	Cables	1. CCI 2. Universal Cable 3. Gloster 4. NICCO 5. THERMO CABLE 6. UNIFLEX 7. RPG CABLE 8. FINOLEX
8	Cables	9. Torrent 10. LAPP 11. UNIFLEX 12. SBEE CABLES 13. RADIANT CABLE 14. KEI
9	DC Electromagnetic Brakes	1. Electromag Devices 2. Strom Kraft Controls 3. HANSELL ELECTRIC FAFECO LIMITED 4. PETHE INDL. MARKETING 5. KALINGA ENGINEER
10	LV AC Motors	1. CGL 2. Marathon 3. Siemens 4. KEC 5. Bharat Bijilee 6. BALDOR ELECTRIC 7. NGEF 8. TOSHIBA
11	LT AC Motors (Crane Duty)	1. CGL 2. KEC
12	LED Lighting Fixture	1. G.E 2. CGL 3. Philips

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		4. Bajaj 5. VENTURE LIGHTING 6. HAVELLS 7. HPL INDIA 8. SYSKA
13	Master Controller	1. Electromag devices 2. Storm-Kraft Controls 3. Siemens
14	Protective relays / Contactor	1. Alstom(EE) 2. ABB 3. L&T 4. Siemens 5. Schneider Electric 6. GE 7. C&S 8. ROCKWELL AUTOMATION 9. P&B 10. ESUN REYROLLE
15	Fuse	1. L&T 2. Alstom 3. Siemens 4. HAVELLS 5. GE 6. HPL 7. C&S ELECTRIC 8. LEGRAND 9. ANTRIEB TECHNIK
16	Indicating Lamp(Cluster LED only)	1. L&T 2. Siemens 3. FREQUENCY 4. EPE INDUST 5. C&S 6. ABB 7. BCH LIMITED
17	Push button	1. Siemens 2. L&T 3. BCH

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18	Indicating Meter / MFM (Digital Type)	1. Schneider Electric 2. Secure 3. Rishab 4. COMMERCIAL ENGINEERING 5. AUTOMATIC ELECT 6. INDUSTRIAL CONTROL & DRIV 7. ODIN CONTROL
19	Rotary Switch	Kaycee Siemens L&T
20	Energy Meter (Digital Type)	1. Schneider Electric 2. Secure 3. SIEMENS 4. L&T 5. ABB 6. INDUSTRIAL CONTROL & DRIVE 7. HPL SOCOMTECH
21	Terminal Block	Elmex(Disconnecting Type) Connect Well Phoenix Contact
22	Control Wire	Lapp Kabel CCI Finolex
23	Limit Switch	Siemens BCH
24	Breaker control Switch	Alstom(EE)-Type-Ods Precisa Indcoil
25	C.T./P.T.	AE JYOTI Kappa


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		Pragati ABB Ltd. TRANS & RECTIFIER corporation BHEL
26	MCCB	L&T Siemens Schneider ABB
27	Lighting Transformer	TRANSFORMER & RECTIFIER Universal Magnetics VOLTAMP(Vadodara) CGL KALPA ELECTRICAL BINANI KAPPA ELECTR SILKANS ELECTRIK
28	415V Bus duct	Powergear Adroit Engineers Stardrive (Chennai) Techno Commerce
29	Any other item not mentioned above	L&T/Siemens/ABB/CGL/BHEL or with prior approval of NALCO

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ANNEXURE-D
FORMAT FOR ELECTRICAL LOAD DATA
Nalco- Upgradation of CHP

Sl.no	Process selection	Switch gear/ MCC	Name	Drive/ Tag no	Name plate Rating	Absorbed KW	Absolute KVA	Voltage/Phase/Frequency	Power Factor	No.s of drive	Running	Stand By	Power supply feed from


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VOLUME: IV

SECTION: 5


SUB-SECTION: E-1

ELECTRIC MOTOR

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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<u>CLAUSE NO</u>	<u>DESCRIPTION</u>
1.00.00	GENERAL
2.00.00	STANDARDS
3.00.00	SERVICE CONDITIONS
4.00.00	TYPE AND RATING
5.00.00	PERFORMANCE
6.00.00	SPECIFIC REQUIREMENTS
7.00.00	ACCESSORIES
8.00.00	TESTS

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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1.00.00 GENERAL

1.01.00 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.

1.02.00 In case of any discrepancy, the driven equipment specification shall govern.

2.00.00 STANDARDS

2.01.00 All motors shall confirm to the latest applicable IS and IEC Standards/Publications except when otherwise stated herein or in the driven equipment specification.

2.02.00 Major standards which shall be followed are IS-325, IS-12615 and IEC-34. Other applicable Indian Standards for any component part shall also be followed.

3.00.00 SERVICE CONDITIONS

3.01.00 The motors will be installed in hot, humid and tropical atmosphere, highly polluted and corrosive.

3.02.00 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in E-0.

3.03.00 For motor installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in the determination of the design ambient temperature.


4.00.00 TYPE AND RATING

4.01.00 A.C Motors

4.01.01 Motors shall be energy efficient (IE2 /IE3), general purpose, constant speed, squirrel cage, three/ single phase, induction type. LT motor shall be energy efficient type as per applicable IS-12615. Synchronous speed of the motors shall be limited to 1500 r.p.m.

4.01.02 All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.

4.01.03 The motor name-plate rating at 50°C shall have at least 15% margin over the input power requirement of the driven equipment at rated duty point unless stated otherwise in driven equipment specification or in general electrical specification.

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4.01.04 The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service. Vendor to submit Torque vs Speed curve of motor and load on single plot for wagon tippler, all conveyors & any other motors of size greater than 30 KW.

4.01.05.1 A) Motor up to 200KW shall be rated for use on 415V, 3phase, 50Hz. effectively grounded system. All motors shall be switch-fuse and contactor operated. For motors rated 75kW and above vacuum contactors shall be used.

B) Motors above 200 KW shall be rated for use on 6600v, 3phase, 50Hz. Non effectively grounded system.

5.00.00 PERFORMANCE

5.01.00 Running Requirements

5.01.01 Motor shall run continuously at rated output over the entire range of voltage and frequency variations of the power supply system.

5.01.02 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.

5.02.00 Starting Requirements


5.02.01 Motor shall be designed for direct on line starting at full load voltage. Starting current shall not exceed 6 times full load current for all auxiliaries inclusive of IS tolerance.

5.02.02 The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.

5.02.03 Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals.

5.02.04 a) The motor shall be capable of three equally spaced starts in one hours, the motor initially being at a temperature not exceeding the rated load operating temperature.

b) The motor shall be capable of two starts in succession with coasting to rest between starts and the motor initially at rated operating temperature.

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5.02.05 Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energized shaft rotating at 125% rated speed in reverse direction.

5.02.06 The motor shall start smoothly and maintain steady operation. The motor characteristics such as speed, starting torque, acceleration time etc. shall be properly co-ordinate with requirement of driven equipment. Maximum torque shall not be less than 205% of full load torque.

5.03.00 Locked Rotor Withstand Time

5.03.01 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 seconds for motors up to 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time.

5.03.02 Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.

5.03.03 Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilizing motor rated capacity.

6.00.00 SPECIFIC REQUIREMENTS

6.01.00 Unless otherwise required by the process equipment, the motor shall be self ventilated type, either totally enclosed fan cooled (TEFC) or closed air circuit air cooled (CACA). All motor enclosures shall conform to the degree of protection IP-55 unless otherwise specified. Motor for outdoor or semi-outdoor service shall be of weather-proof construction. The cooling fan shall be directly driven from the motor shaft.


6.02.00 For hazardous area, approved type of increased safety/flame proof enclosure shall be furnished.

6.03.00 Winding & Insulation

6.03.01 All insulated winding shall be of copper.

6.03.02 6600V motors shall have class F insulation but limited to class B temperature rise at rated operating conditions. The winding shall withstand 1.2/50 microsecond switching surges of $4U + 5kV$ ($U =$ Line Voltage). The coil inter-turn insulation shall be suitable for 0.3/3 microsecond surge of 20KV for 6.6KV system, followed by 1min. power frequency high voltage test of appropriate voltage on turn to turn insulation.

6.03.03 HT motors shall have class F insulation with temperature rise of winding limited to class B.

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6.03.04 LT motors shall have class F insulation with temperature rise of winding limited to class B.

6.03.05 Windings shall be impregnated to make them non-hygroscopic and oil resistant. For HT motors, only reisin poor type insulation shall be used.

6.04.00 Tropical Protection

6.04.01 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

6.04.02 All fittings and hardware shall be corrosion resistant.

6.05.00 Bearings

6.05.01 Motor shall be provided with antifriction bearings. Sleeve bearings are to be avoided as far as possible.

6.05.02 Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type (Mitchel or Kingsbury) is preferred.

6.05.03 Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area.

6.05.04 Sleeve bearings shall be split type, ring oiled, with permanently aligned, close running shaft sleeves.


6.05.05 Grease lubricated bearings shall be pre lubricated and shall have provisions for inservice positive lubrication with drains to guard against over lubrication.

6.05.06 Oiled bearings shall have an integral self cooled oil reservoir with oil ring inspection ports, oil sight glass with oil level marked for standstill and running conditions and oil fill drain plugs.

6.05.07 Forced lubricated or water cooled bearing shall not be used without prior approval of Purchaser.

6.05.08 Lubricant shall not deteriorate under all service conditions. The lubricant shall be limited to normally available types with IOC equivalent.

6.05.09 Bearings shall be insulated as required to prevent shaft current and resultant bearing damage.

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6.06.00 Noise & Vibration

6.06.01 The noise level shall be limited within the values prescribed in IS: 12065.

6.06.02 The peak amplitude of the vibration shall be within limits specified in IS: 12075.

6.07.00 Motor Terminal Box

6.07.01 Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base-plate/foundation.

6.07.02 Terminal box shall be capable of being turned 360 Deg. in steps of 90°, unless otherwise approved.

6.07.03 The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor.

6.07.04 The terminal box shall have sufficient space inside for termination/ connection of XLPE (6.6kV)/ HRPVC (415V) insulated armoured aluminium cables.

6.07.05 Terminals shall be stud or lead with type, substantially constructed and thoroughly insulated from the frame.

6.07.06 Terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.


6.07.07 The terminal box shall be capable of withstanding maximum system fault current for a duration of 0.25 sec.

6.07.08 For 6600V motor, the terminal box shall be phase segregated type unless Elastic mould termination with protective covers are provided. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.

6.07.09 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable size and type used.

6.07.10 The gland plate for single core cable shall be non-magnetic type.

6.08.00 Grounding

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6.08.01 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer. Grounding conductor size and material are specified elsewhere.

6.08.02 The cable terminal box shall have a separate grounding pad.

6.09.00 Rating Plate

In addition to the minimum information required by IS, the following information shall be shown on motor rating plate:

- a) Temperature rise in °C under rated condition and method of measurement.
- b) Degree of protection.
- c) Bearing identification no., recommended lubricant and running hours between lubrication fill up.
- d) Location of insulated bearings.

7.00.00 ACCESSORIES

7.01.00 General

Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application.

7.02.00 Space Heater


7.02.01 Motor rating of 30kW and above, shall be provided with space heaters, and suitably located for easy removal or replacement.

7.02.02 The space heater shall be rated 240 V, 1 phase 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.

7.02.03 For motor without space heater, the motor winding shall be provided with continuous heating from 24 V, 1 phase 50 Hz supply.

7.03.00 Temperature Detector

7.03.01 All 6600 V motors shall be provided with six (6) winding temperature detectors, two (2) per phase.

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7.03.02 6600 V motor bearing shall be provided with duplex type temperature detectors.

7.03.03 The temperature detector mentioned above shall be resistance type, 3wire, platinum wound, 100 Ohms at 0°C.

7.03.04 All the RTDs both for winding and bearing of 6.6KV motors shall be directly connected to PLC input card for monitoring from the operator console as well as for data logging purpose. Temperature scanner shall not be used.

7.04.00 Indicator/Switch

7.04.01 Dial type local indicator with alarm contacts shall be provided for the following:

- a) 6600V motor bearing temperature both at driving & non-driving end.
- b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor.

7.04.02 Flow switches shall be provided for monitoring oil flow of forced lubrication bearing, if used.

7.04.03 Alarm switch contact rating shall be minimum 1A at 110V DC and 5A at 240V AC.

7.05.00 Accessory Terminal Box

7.05.01 All accessory equipment such as space heater, temperature detector, current transformers, etc. shall be wired to and terminated in terminal boxes, separate from and independent of motor(power) terminal box.

7.05.02 Accessory terminal box shall be complete with double compression brass glands and pressure type terminals.


7.05.03 The degree of protection for accessory terminal box shall be same as for motor.

7.06.00 Drain Plug

Motor shall have drain plugs so located that they will drain the water resulting from the condensation or other causes from all pockets of the motor casing.

7.07.00 Lifting Provisions

Motor weighing 25 Kg or more shall be provided with eye bolt or other adequate

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provision of lifting.

8.00.00 TESTS

8.01.00 Upon completion, each motor shall be subject to standard routine tests as per IS. In addition, any special test called for in the driven equipment specification shall be performed.

8.02.00 Type test requirement shall be as given in Sub-Section E-0.

8.03.00 For HT motors, testing and inspection shall be carried out as per Annexure – E of subsection E –0.


8.04.00 Test and approval certificates of following relevant authorities must be obtained for motors with flame proof enclosure.

Central Mining Research Station – Dhanbad.

Directorate General of Mines Safety – Dhanbad.

Chief controller of Explosives – Nagpur. Directorate
General Factory Advice Service – Bombay.
ISI certification.

ISI license mark for flameproof enclosure.


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ELECTRIC MOTOR ACTUATOR

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1.00.00 GENERAL

1.01.00 All electric motor actuators shall be furnished in accordance with this general specification and the accompanying driven equipment specification.

2.00.00 STANDARDS

2.01.00 All electrical equipment shall conform to the latest applicable IS, ANSI and NEMA Standards, except when stated otherwise herein or in driven equipment specification.

2.02.00 Major standards which shall be followed are IS-9334 and IS-325. Other applicable Indian standards for any component part shall also be followed.

3.00.00 SERVICE CONDITIONS

3.01.00 The actuator shall be suitable for operation in hot, humid and tropical atmosphere, highly polluted and corrosive.

3.02.00 Unless otherwise noted, electrical equipment /system design shall be based on the service conditions and auxiliary power supply given in specification E-0.

4.00.00 RATING

4.01.00 For isolating service the actuator shall be rated for three successive open-close operation of the valve/damper or 15 minutes whichever is longer.


4.02.00 For regulating service, the actuator shall be suitably time –rated for the duty cycle involved with necessary number of starts per hour, but in no case less than 150 starts per hour.

5.00.00 PERFORMANCE

The actuator shall meet the following performance requirements:

5.01.00 Open and close the valve completely and make leak-tight valve closure without jamming.

5.02.00 Attain full speed operation before valve load is encountered and imparts an unseating blow to start the valve in motion (hammer blow effect).

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5.03.00 Operate the valve stem at standard stem speed and shall function against design differential pressure across the valve seat.

5.04.00 The motor reduction gearing shall be sufficient to lock the shaft when the motor is deenergized and prevent drift from torque switch spring pressure.

5.05.00 The entire mechanism shall withstand shock resulting from closing with improper setting of limit switches or from lodging of foreign matter under the valve seat.

6.00.00 SPECIFIC REQUIREMENT

6.01.00 Construction

6.01.01 The actuator shall essentially comprise the drive motor, torque switches, limit switches, gear train, clutch, hand wheel, position indicator, space heater, internal wiring and terminal box.

6.01.02 The actuator enclosure shall be totally enclosed, dust tight, weather proof, suitable for outdoor use without necessity of any canopy.

6.01.03 All electrical equipments, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

6.01.04 The actuator shall be designed for mounting in any position without any lubricant leakage or operating difficulty.

6.02.00 Motor


6.02.01 The drive motor shall be three phase, squirrel cage induction machine with Class B insulation and weather proof construction designed for high torque and reversing service.

6.02.02 The motor shall be designed for full voltage direct online start with starting current limited to 6 times of full load current.


6.02.03 Electric motor for the actuator shall be 415V, 3 phase, Squirrel cage induction motor and shall be high torque and low inertia type.

6.02.04 The motor shall be capable of starting at 85% of rated voltage and running at 80% of rated voltage at rated torque and at 85% rated voltage at 33% excess rated torque for a period of 5 minutes each.

6.02.05 Earthing terminals shall be provided on either side of the motor.

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- 6.03.00 Limit Switches
Each actuator shall be provided with following limit switch:-
- 6.03.01 2 torque limit switches, one for each direction of travel, self – locking adjustable torque type.
- 6.03.02 4 end of travel limit switches, two for each direction of travel.
- 6.03.03 Each limit switch shall have 2 NO + 2NC potential free contacts. Contacts ratings shall be 5 Amps at 240V A.C or 0.5 Amps at 220V D.C.
- 6.04.00 Hand wheel
Each Actuator shall be provided with a hand wheel for emergency manual operation. The hand wheel shall declutch automatically when the motor is energized.
- 6.05.00 Position Indicator
One (1) built in local position indicator for 0-100% travel shall be provided with each actuator.
- 6.04.00 Space Heater
A space heater shall be included in the limit switch compartment suitable for 240V 1-phase, 50Hz, supply.
- 6.06.00 Wiring
All electrical devices shall be wired up to and terminated in a terminal box. The internal wiring shall be of 1100V grade, adequate size for the power rating involved but in no case less than 2.5 sq. mm. copper. All wiring shall be identified at both ends with ferrules. Each wire shall be ferruled by plastic tube with indelible ink print at both ends having terminal block no., terminal nos., and destination nos. as per approved drawing.
- 6.07.00 Terminal Box
The terminal box shall be weather proof with removable front cover and cable glands for its cable connection. The terminal shall be suitable for connection of 2.5 sq. mm. copper conductors.
- 7.00.00 TEST
The actuator and all components there of shall be subjected to routine factory tests as per relevant IS standards. In addition, if any special test is called for by the purchaser, the same shall be performed.


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LV EQUIPMENT


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1.00.00 CODES AND STANDARDS

- 1.01.00 Major standards which shall be followed are IS: 13947 and IEC: 947. Other applicable standards for any component, if not covered in the listed standards, shall also be followed.

2.00.00 SERVICE CONDITIONS

- 2.01.00 The equipment shall be suitable for hot, humid, and tropical atmosphere, heavily polluted with dust and corrosive chemical fumes.

3.00.00 DESIGN CRITERIA

- 3.01.00 Busbars of switchgears shall be sized to carry continuously the associated transformer secondary current plus a 20% margin. busbars of DBs shall be sized to carry continuously the total running load (including Purchaser's load wherever applicable) plus a 20% margin.

All busbars shall be capable of withstanding the mechanical forces and thermal stresses due to maximum short circuit current.

- 3.02.00 In-cubicle ratings of incomer and bus-section breakers/switches shall be identical, to the associated busbar rating.


- 3.03.00 For continuous operation at specified ratings, the temperature rise of various equipment/components shall be limited to the permissible values specified in relevant standards and/or this specification.

4.00.00 SPECIFIC REQUIREMENTS

4.01.00 Construction


- 4.01.01 Switchgears shall be draw out type. DBs shall be fixed type. Switchgears and DBs shall be of single-front construction and shall be mounted on floor. The design construction shall be such as to permit extension at either end.

- 4.01.02 In switchgear room and control room, enclosures of all Switchgears and Boards shall conform to the degree of protection IP 4X. For all other locations the enclosures for same shall have degree of protection of at least IP 54. Minimum thickness of sheet metal used shall be 2mm.

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The design shall be such that the specified degree of protection is achieved even after a breaker control module has been taken out of the panel.

- 4.01.03 Switchgear assemblies shall comprise of continuous line-up of single/multi-tier cubicles. Installation of circuit breakers shall however be limited to the bottom two tiers only. Not more than two breakers for outgoing feeders shall be accommodated in one vertical section. Each of the incomer and bus coupler breakers however shall not share a vertical section with any other breaker.
- 4.01.04 Switchgears and DBs shall be fully compartmentalized with metal/insulating partitions between compartments. Working height shall be limited between 450mm and 1800mm from floor level.
- 4.01.05 Each vertical section shall have a removable back cover. All doors and covers shall be gasketed.
- 4.01.06 Breaker cubicles shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position.
- 4.01.07 For breaker panels, all switches, lamps, and indicating instruments shall be flush mounted on the respective compartment door whereas relays and other auxiliary devices shall be mounted in a separate compartment.
- For DB modules, all push-buttons, lamps and indicating instruments shall be flush/semiflush mounted on respective module compartment.
- 4.01.08 A full-height vertical cable alley with cable supports shall be provided in each section to facilitate unit wiring. The alley shall be liberally sized to accommodate all cables and shall have removable cover at the front for access.
- 4.01.09 Wherever two breaker compartments are provided in the same vertical section, insulating barriers and shrouds shall be provided in the rear cable compartment to avoid accidental touch with the live parts of one circuit while working on the other.
- 4.01.10 A horizontal wire-way extending the entire length of the assembly shall be provided on the top for inter-panel wiring.
- 4.01.11 Incomers shall be provided at the ends of an assembly and bus section, wherever required, shall be provided at the middle of the assembly.
- 4.01.12 After isolation of power and control circuit connections, it shall be possible to safely carry out maintenance in a compartment with the busbar and adjacent circuit live.

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Necessary shrouding arrangement shall be provided for this purpose over the cable terminations located in cable alley.

- 4.01.13 Unless otherwise stated, equipment rating shall be as per attached single line diagrams. Module selection chart is specified for guidance of the Tenderer in respect to requirement of module space and component rating.
- 4.01.14 The minimum clearance in air between phases and between phases and earth for the entire run of horizontal and vertical busbars shall be 25mm. For all other components, the clearance between two live parts, a live part and another earthed part, and isolating distance shall be at least 10mm throughout. Wherever it is not possible to maintain these clearances insulation shall be provided by barriers. However, for horizontal and vertical busbars, the clearances mentioned above should be maintained even when these are sleeved or insulated. All connections from bus burs up to fuses shall be fully shrouded to minimize the risk of phase to phase and phase to earth shorts.
- 4.02.00 BUS AND BUS TAPS
- 4.02.01 All Switchgears and AC Boards shall be provided with three phase busbars and neutral busbar. All DCDBs shall be provided with two busbars. All busbar compartments shall be completely enclosed.
- 4.02.02 Horizontal and vertical busbars and bus connections shall be of high conductivity copper/aluminium/ aluminium alloy.
- The maximum temperature of busbars and bus connections shall be limited to 90°C i.e. 40° C rise over 50° C ambient.
- No diversity factor shall be allowed for temperature rise.
- 4.02.03 Vertical busbars shall be designed for a minimum current rating of 200 A.
- 4.02.04 All bus connections shall be provided with anti-oxide grease. Adequate contact pressure shall be ensured by means of two-bolt connection with plain and spring washers and locknuts.
- 4.02.05 Bimetallic connectors shall be provided for connections between dissimilar metals.
- 4.02.06 Cross-section of the busbars shall be uniform throughout the length of the assembly. All busbars and bus connections shall be supported and braced to withstand the stresses due to maximum short circuit current and also to take care of any thermal expansion.


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Busbars shall be provided with heat shrinkable PVC sleeves and shall be color coded for easy identification.

- 4.02.07 Bus support insulators shall be of non-hygroscopic PVC mould.
- 4.03.00 Switchgear/ DB Modules
- 4.03.01 Switchgear/ DB modules shall have self-aligning power/control disconnects. All disconnects shall be silver plated to ensure good contacts.
- 4.03.02 Modules of same size and type shall be physically and electrically interchangeable.
- 4.03.03 The design of draw out modules shall be such as to permit easy withdrawal/ re-insertion of the unit with guide-rails to ensure correct alignment.
- 4.03.04 Draw out modules where specified shall have three distinct positions, namely SERVICE, TEST and ISOLATED.
- 4.03.05 In the SERVICE position, both power and control circuits shall be engaged. It shall not be possible to open the module door when the module is in SERVICE position.
- In the TEST position the power circuits shall be disengaged but the control Circuit shall be engaged. It shall be possible to close the module door when the module in TEST position. Racking in of the module from TEST to SERVICE position shall not be possible unless the module door in closed.
- In the ISOLATED position, both power and control circuits shall be disengaged.
- 4.03.06 Breaker operated incomers and bus sections shall be provided with one (1) TESTNORMAL-SWGR selector switch. Breaker operated motor feeders shall be provided with TEST-NORMAL-TRIAL selector switch.
- 4.04.00 Circuit Breaker
- 4.04.01 Circuit Breakers shall be draw out, three pole, air break type with stored energy, trip free mechanism and shunt trip coil. It shall be suitable for a duty cycle of 0– 3 min - CO - 3 min - CO. Circuit Breakers shall be EDO type i.e., electrical closing and electrical tripping facility is to be there.
- 4.04.02 All incomer/ bus-section breakers and motor feeder breakers shall have motor wound spring charging mechanism.

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- 4.04.03 Each breaker-operated feeder shall be provided with protective devices as specified in Annexure-A.
- 4.04.04 All breakers with motor wound spring charging mechanism shall have facility of manual spring charging also. Control voltage shall be 110V DC for closing, tripping and spring charging.
- 4.04.05 For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open- close-open operation of the circuit breaker shall be possible after failure of power supply to the spring charging motor.
- 4.04.06 Mechanical safety interlock shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.
- 4.04.07 Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.
- 4.04.08 Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter, mechanism charge/discharge indicator and electrical anti-pumping feature.
- 4.04.09 In addition to the auxiliary contacts required for normal breaker operation and indication, each breaker shall be provided with the following for interlocking purpose:
- Position/cell switch with minimum 4 NO + 4 NC contacts.
 - Auxiliary switch, with minimum 6 NO + 6 NC contacts, mounted on the stationary portion of the breaker panel and operated mechanically by a sliding lever from the breaker in SERVICE position.
- Alternatively, electrically reset latching relay may be used for the purpose. The exact requirement of contacts of the position/cells switch, limit switch, auxiliary switch and latching relay shall be decided by the Bidder taking into account the scheme requirement and spares. Limit/auxiliary switches shall be convertible type that is, suitable for changing NO contact to NC contact and vice-versa.
- 4.04.10 Spring charge limit switch shall be provided for breakers with motor wound spring charging mechanism. These limit switches shall be provided with minimum 2NO + 2NC contact.
- 4.04.11 Limit/auxiliary switches shall be convertible type that is, suitable for changing NO contact to NC and vice-versa.
- 4.04.12 Air circuit breaker handling truck shall be provided in each MCC room.

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4.05.00 Switches

4.05.01 Switch handle shall have provision for padlocking in ON and OFF position.

4.05.02 The compartment door shall be interlocked mechanically with the switch such that the door cannot be opened unless the switch is in OFF position. Means shall be provided for releasing this interlock at any time.

4.05.03 Switches shall be capable of withstanding the let-through fault current of back-up fuses or circuit breakers.

4.06.00 Fuses

4.06.01 Fuses shall be HRC cartridge type with operation indicator.

4.07.00 A.C. Starter

4.07.01 Contactors

- a) Motor starter contractors shall be of air break, electromagnetic type as per IS:13947 Part-4, Section-1 suitable for DOL starting of motor and shall be of utilization category AC-3 for ordinary and AC-4 for reversing starters.
- b) Contactor starters shall comply with the requirements of IS: 8544 (Part-1) in respect of co-ordination of the characteristics of contactor, overload relay, and fuse. The type of co-ordination shall be Type-2 as per IS-8544.


4.07.02 Thermal Overload

- a) Thermal overload relays shall be manual reset type and ambient temperature compensated with adjustable settings.
- b) Single phasing preventer shall be provided as an inbuilt feature of the thermal overload relay.

4.08.00 Control and Indication


4.08.01 The general scheme of connections for control, interlock, and protection is shown in the enclosed drawings for guidance for the Bidder. Detailed requirements of individual circuits shall be developed by the Bidder meeting the requirements of this specification.

Following indicating lamps shall be provided for the feeders:


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- i) Breaker operated feeders : “ON”, “OFF”, “TRIP”, “SPRING CHARGED” and “TRIP CKT. HEALTHY”.
- ii) Contactor operated motor feeders : “ON”, “OFF” and “TRIP”.
- iii) All other feeders : “ON”, “OFF”.

- 4.08.02 All indicating lamps shall be of high intensity cluster LED type with low voltage glow protection as in built feature.
- 4.08.03 For control supply, 2 × 100% adequately-rated 415/240V control transformers (fed from different bus) with provision of momentary paralleling during change-over and with necessary taps shall be provided. Auxiliary busbars shall be used to distribute 240V AC control supply. The control supply of different modules shall be tapped individually from the auxiliary busbars. Transformer ratings shall have adequate spare capacity. **Similarly separate control transformer are to be provided for space heater supply.**
- 4.08.04 DCDBs shall be provided with indication to monitor healthiness of the incoming DC supplies.
- 4.09.00 METER AND METER SELECTOR SWITCH
- 4.09.01 All indicating instruments (96 x 96 mm) shall be digital type, flush-mounted on front panel and accuracy class of $\pm 1.5\%$. Each meter shall have zero adjuster on the front.
- 4.09.02 Watt-hour meters shall be provided in draw out cases. Either built- in test facilities or test blocks shall be provided to facilitate testing of meters without disturbing C.T and V.T secondary connections. Energy meter shall be three phase multifunction, digital type with communication port for DCS interface.
- 4.09.03 Meter selector switches shall be maintained contact, stay-put type, with knob handle. Ammeter and voltmeter selector switches shall be four position types. Ammeter selector switches shall have made before break contacts, to prevent open circuiting of CT secondary.
- 4.10.00 Current and Voltage Transformer
- 4.10.01 All current and Voltage Transformers as required for metering and specified protection shall be completely encapsulated, cast resin insulated type. The accuracy class shall be as below:

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		<u>CT</u>	<u>VT</u>
	PROTECTION	5P20	3P
	METERING	I.0 (ISF<5)	1.0
4.10.02	Feeders requiring remote metering and/or current monitoring shall be provided with current transducers with calibration for full scale reading.		
4.11.00	Relays		
4.00.01	Relays shall be of draw out design with built –in testing facilities and flush mounted at the front of panel .Small auxiliary relays may be in non-draw out execution and mounted within the cubicle.		
4.11.02	Relays shall be rated for operation on 110V secondary voltage and 1A secondary current as shown on drawings .Number and rating of relay contacts shall suit job requirements.		
4.11.03	Unless mentioned otherwise in the specification, protective relays shall be multifunction type numerical relays.		
4.11.04	Multifunction numerical relays shall be selected to provide an integrated protection, continuous measurement and monitoring functions. Features such as self-diagnosis and external testing, disturbance recording, sequence of event recording, time stampings shall be available with the relay. Relevant data shall be possible to be stored in non-volatile memory backed up by battery .The relay shall have multiple setting groups, optically isolated input /output, front LCD display and menus, fixed function and, programmable LED's, keypad and password protection .All function including protection, automation, communication, LED's, input /output shall be programmable and can be modified, if required, using the front panel user interface. Communication port (RS-485) for local and remote (with MODBUS protocol) communication shall be located in the front and rear part of the relay .A laptop loaded with support software (complete version)shall be supplied for local off line programming, measurements, extracting and viewing of events ,disturbance etc. The relays shall be housed in dust tight enclosure, suitable for IP 52 degree of protection.		
4.11.05	The bidder shall furnish, install & co-ordinate all relays to suit the requirements of protection, interlock and bus transfer schemes as broadly indicated in the annexure and drawings.		
4.11.06	All protective relays, auxiliary relays, and timers shall be provided with hand reset operation indicator (flag) or LEDs with push button resetting.		

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4.12.00 Secondary Wiring

- 4.12.01 Wiring shall be done with flexible, 650V grade PVC insulated Switchboard wires with stranded copper conductors of 2.5 mm² for control & current circuits and 1.5 mm² for voltage circuits.

4.13.00 Terminal Blocks

- 4.13.01 Terminal blocks shall be 660V grade box-clamp type with marking strips, similar to ELMEX 10mm² or equal. Terminals for C.T. secondary leads shall have provision for shorting. Terminal blocks used for interface with DCS via termination cabinet shall be suitably sized to facilitate proper termination of interconnecting cables.

4.14.00 Cable Termination

- 4.14.01 Generally, all assemblies shall be designed for cable entry from the bottom.

- 4.14.02 Gland plates shall be minimum 4 mm thick. The gland plate and supporting arrangement for I/C power cables shall be of non-magnetic material.

4.15.00 Ground Bus

- 4.15.01 A ground bus, rated to carry maximum fault current, shall be provided which shall extend the full length of the assembly.

- 4.15.02 All stationary units shall be directly connected to the ground bus for effective grounding. The frames of all circuit breakers and draw out V.T. modules shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.


- 4.15.03 All hinged doors shall be earthed by flexible copper braid.

4.16.00 Nameplates

- 4.16.01 Nameplates of approved design shall be provided on each cubicle, at the top of the assembly and on each instrument & device mounted on or inside the cubicle.

4.17.00 Space Heaters and Plug Sockets

- 4.17.01 Each vertical section shall be provided with thermostat controlled space heater and 5A, 3 pin plug socket.

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- 4.17.02 In addition, feeders for-motors with space heater (for motors rated 30 kW and above) shall be wired-up for feeding the motor space heater automatically through suitably rated auxiliary NC contact of breaker or power contactor of starter module.
- 4.18.00 A.C. / D.C. Power Supplies
- 4.18.01 Necessary AC and DC auxiliary power supplies as required for control and service shall be arranged by the successful Tenderer.
- 4.19.00 Tropical Protection
- 4.19.01 All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus & insects.
- 4.19.02 In view the plant consists of extensive material handling and chemical processing, special anti-corrosion measures in painting shall be taken as necessary.
- 5.00.00 TEST
- 5.01.00 The equipment shall be completely assembled, wired, adjusted and tested at the factory as per the relevant standards.
- 5.02.00 Routine Tests shall be carried out as per relevant standards.
- 5.03.00 Type Tests shall be carried out as per specification E-0.

ANNEXURE -A


RATINGS & REQUIREMENTS

1.0 General

Type : Metal-clad, draw out (Switchgear/PCC), Metal-clad, fixed (DB).

Service : Indoor

Enclosure : In switchgear room and control room, all panels shall have degree of protection of IP-4X. For all other locations, the panels shall have degree of protection of at least IP- 54.

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1.1 System	:	<u>A.C.</u> <u>D.C.</u>
Voltage	415V±10%	±110V10%
Phase	3-phase and neutral	—
Frequency	50Hz± 5%	—
Combined voltage and 10% (absolute sum) – frequency variation		
System grounding	Solidly grounded	Ungrounded

- 1.2 Rated Current at 50°C ambient
Busbar to be decided by the Bidder.
*
Circuit Breaker to be decided by the Bidder. *

Switches 16A to 630A. *

[* The actual value will be decided by the Bidder after substantiating the same by calculation.]

1.3 Short Circuit Rating	<u>A.C.</u>	<u>D.C.</u>
Interrupting	50kA	25 kA
Short time for 1 sec	50kA	25 kA
1.4 Hipot for 1 minute (minimum)	2.5 kV	1.5 kV

1.5 A.C /D.C. Power Supply


Control Voltage for circuit Breaker	: 110V D.C. ±10%.
Service Voltage	: 240V A.C. ±10%, 1ph, 50Hz ±5%.

2.0 Circuit Breaker

2.1 Duty Cycle	: 0-3'-CO-3'-CO.
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2.2 Breaking Current

A. C. Symmetrical	: 50KA.
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2.3 Making Current : 105KA peak.

2.4 Auxiliary Voltage


Closing : 110V D.C. (85- 110%).

Tripping : 110V D.C. (70- 110%). Spring Charging :
110V D.C. (85- 110%).

3.0 Contactor duty : Class III-category, AC3 for unidirectional drives.

4.0 Switch duty

Motor feeders : AC23. Other feeders :
AC22.

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ANNEXURE-B

PROTECTION

1.0 The minimum protections to be provided for circuit breaker controlled feeders are listed below:

a. Incoming Feeder


- i) 3-Inverse time O/C relays (51) for phase faults. ii) 1-Inverse time O/C relay (51 N) for Earth faults.
- iii) VT fuse failure to protect under voltage operation against PT primary and secondary fuse failure detection scheme.

b. Outgoing Power Supply Feeders

- i) 3-Inverse time O/C relay (51) for phase fault.
- ii) 1-Inverse time O/C relay (51 N) for Earth fault.

NOTE:

1. All inverse time O/C relay shall be 3 sec version.
2. Apart from protection relays mentioned above, electrically operated breakers shall be provided with anti-pumping (94), trip annunciation (3), lockout (86) and trip circuit supervision (74) relays. Lockout relay shall be hand-reset type.
3. Fuse failure relay shall be provided on the secondary side of voltage transformer to monitor H. V. & L. V. fuses.
4. It is deemed to be bidder's responsibility to offer those relays only which are not to be phased out of manufacturing range.

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ANNEXURE-C

COMPONENT/MODULE SELECTION TABLE


NOTE: Cable sizes given bellow are indicative and minimum. Sizes shall be subject to validation by design calculation as per stipulation of Specification.

OUTGOING FEEDER- AC


<u>TYPE</u>	<u>SWITCH RATING</u>	<u>FUSE RATING</u>	<u>CABLE SIZE(SQ. MM)</u>
AF	63A	32A	4C-I6- AL
BF	63A	63A	4C-35- AL
CF	100A	100A	3.5C-95- AL
DF	200A	200A	3.5C-300- AL
EF	400A	400A	4xIC-630-AL Or 2x3 .5C-300- AL
FF	630A	630A	7xIC-630-AL Or 3x3 .5C-300-AL

OUTGOING FEEDER- DC

<u>TYPE</u>	<u>SWITCH RATING</u>	<u>FUSE RATING</u>	<u>CABLE SIZE (SQ.MM.)</u>
DAU	16A	16A	2/C-2.5 Sq.mm. Cu.
DAF	32A	32A	2/C-2.5 Sq.mm. Cu.

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<u>TYPE</u>	<u>SWITCH RATING</u>	<u>FUSE RATING</u>	<u>CABLE SIZE (SQ.MM.)</u>
DBF	63A	63A	2x 2/C-16 Sq.mm- AL
DCF	100A	100A	4/C-35 Sq.mm- AL
DDF	200A	200A	2 x 4/C-35 Sq.mm - AL
DEF	400A	400A	2 x 1/C-630 Sq.mm- AL


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VOLUME: IV

SECTION: 5

SUB SECTION: E-4

MCC, ACDB, DCDB, PUSHBUTTON STATION AND LOCAL ISOLATOR

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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1.00.00 CODES AND STANDARDS

1.01.00 Major standards which shall be followed are IS: 13947 and IEC: 947. Other applicable standards for any component, if not covered in the listed standards shall also be followed.

2.00.00 SERVICE CONDITIONS

2.01.00 The equipment shall be suitable for hot, humid and tropical atmosphere, heavily polluted with dust .

3.00.00 DESIGN CRITERIA

3.01.00 Bus bars of MCC/DBs shall be sized to carry continuously the total running load of the MCC/DB (including customers load, wherever applicable) plus a 20% margin.

All bus bars shall be capable of withstanding the mechanical forces and thermal stresses due to maximum short circuit current.

3.02.00 In cubical ratings of incomer and bus section breakers/switches shall be identical to the associated bus rating.

3.03.00 All motors rated above 110KW shall be breaker Controlled by ACB in conjunction with Vacuum contractor.

3.04.00 Motors rated upto and including 110KW shall be contactor operated. For motors above 75KW Vacuum Contactors along with SFU are needed.


3.05.00 For continuous operation at specified ratings, the temperature rise of various equipments/components shall be limited to the permissible values specified in relevant standards and /or this specification.

3.06.00 Circuit breakers shall not produce any harmful over voltage during switching off of induction motors. If required, surge protective devices shall be included in the scope of supply to limit over voltages.

4.00.00 SPECIFIC REQUIREMENTS

4.01.00 Construction

4.01.01 MCCs /DBs shall be indoor, air insulated and metal-clad type. The design construction shall be such as to permit extension at either end of MCCs/DBs.

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4.01.02 MCCs shall be draw out type.DBs shall be fixed type.

4.01.03 MCCs /DBs shall be floor mounting

4.01.04 MCCs/DBs shall be of single front construction.

4.01.05 MCC/DB assemblies shall comprises of a continuous line up of dead front , free standing vertical sections , housing the control modules in multi tiers formation .For MCCs having breaker, the installation of circuit breaker shall however be limited to the bottom two tiers only. Not more than two breakers shall be accommodated in one vertical section.

All MCCs/DBs shall be front wired and front – connected.

4.01.06 MCCs/DBs shall be compartmentalized with metal /insulating partitions between compartments.

Working height for panels shall be limited between 450mm and 1800 mm from floor level.

630 A/400A switch used as incomer / outgoing feeder shall have minimum vertical space of 500 mm for cable glanding point to termination point.

4.01.07 Each breaker /control module shall be housed in separate cubicle, complete with an individual front access door having sufficient openings with concealed type hinges.


Each vertical section shall have a removal back cover. All doors and covers shall be neoprene rubber gasketed. Back cover shall be hinged type.

4.01.08 Breaker cubicles shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position

4.01.09 For breaker panels , all switches , lamps and indicating instruments shall be flush mounted on the respective compartment door whereas relays and other auxiliary devices shall be mounted in a separate compartment.


For MCC/DBs modules, all push button, lamps and indicating instruments shall be flush/semi- flush mounted on respective module compartment.

4.01.10 For single –front assemblies, a full height vertical cable alley with cable supports shall be provided in each section to facilitate unit wiring .

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The alley shall be liberally sized to accommodate all cables and shall have removable cover at the front for access.

- 4.01.11 Wherever two breaker compartments are provided in the same vertical section, insulating barriers and shrouds shall be provided in the rear cable compartments to avoid accidental touch with the live parts of one circuit while working on the other.
- 4.01.12 A horizontal wire way extending the entire length of the assembly shall be provided at the top for inter –panel wiring.
- 4.01.13 MCCs/DBs shall be supplied with base frames made out of structural steel sections.
- 4.01.14 After isolation of power and control circuit connections, it shall be possible to safely carry out maintenance in a compartment with the busbar and adjacent circuit live. Necessary shrouding arrangement shall be provided for this purpose over the cable terminations located in cable alley.
- 4.01.15 The minimum clearance in air between phases and earth for the entire run of horizontal and vertical bus bars shall be 25mm .For all other components ,the clearance between two live parts , a live part and an earthed part, and an isolating distance shall be at least 10mm throughout .wherever it is not possible to maintain these clearances , insulation shall be provided by barriers .However for horizontal and vertical busbars ,the clearance mentioned above should be maintained even when these are sleeved or insulated .All connections from bus bars upto fuses shall be fully shrouded to minimize the risk to phase of phase and phase to earth shorts.
- 4.01.16 Unless otherwise stated, equipment rating shall be as per Annexure –B.
- 4.02.00 Bus and Bus Taps
- 4.02.01 All MCCs/ACDBs shall be provided with three phase bus bars and neutral bus bar.
- All DCDBs shall be provided with two bus bars.
- All bus bars compartments shall be completely enclosed.
- 4.02.02 Horizontal and vertical bus bars and bus connections shall be of high conductivity copper/Alluminium/Alluminium Alloy. The maximum temperature of bus bars and bus connections at rated current shall be limited to 90 °C i.e. 40°C rise over 50°C ambient. No diversity factor shall be allowed for temperature rise.

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4.02.03 Vertical Bus bars shall be designed for a minimum current rating of 200A or depending on the load of the vertical section with sufficient margin.

4.02.04 All bus connections shall be provided with anti oxide grease with adequate contact pressure and shall be ensured by means of two bolt connection with plane and spring washers and lock nuts.

4.02.05 Bi-metallic connectors shall be provided for connections between dissimilar metals.

4.02.06 Cross-section of the bus-bars shall be uniform throughout the length of the assembly. All bus-bars and bus connections shall be supported and braced to withstand the stresses due to maximum short-circuit current and also to take care of any thermal expansion.

4.03.00 MCC/DB Modules

4.03.01 MCC modules shall have self aligning power/control disconnects. All disconnects shall be silver plated to ensure good contacts. This feature and any other feature described below are to be considered for draw out type design


4.03.02 Modules of same size and type shall be physically and electrically interchangeable.

4.03.03 The design of draw out modules shall be such as to permit easy withdrawal / reinsertion of the unit with guide rails to ensure correct alignment.

4.03.04 Various Module sizes should be multiples of one basic unit to facilitate modifications at site. Suitable provisions for this purpose should also be incorporated in the vertical bus bars.

4.03.05 Draw out modules where specified shall have three distinct positions namely, Service, Test and Isolated. In the service position, both power and control circuits shall be engaged. It shall not be possible to open the module door when the module is in service position. In the test position, the power circuits shall be disengaged but the control circuits shall be engaged. It shall be possible to close the module door when the module is in test position. Racking in of the module from test to service position shall not be possible unless the module door is closed. In the isolated position both power and control circuits shall be disengaged.

4.03.06 Modules shall house the control components for a circuit such as switch, fuse, contactors, relays, push buttons, lamps, meters, etc. Only the push button actuators, lens of indicating lamps and transparent windows for meters shall be mounted on module doors such that when the module is withdrawn, the cubicle door shall provide specified degree of protection when the module door is closed.

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4.03.07 Breaker operated incomers and bus sections shall be provided with one (1) TEST NORMAL -SWGR selector switch. Breaker operated motor feeders shall be provided with TEST NORMAL TRIAL selector switch. These selector switches shall be lockable type and shall be mounted inside the panel.

4.03.08 The equipment layout shall provide sufficient working space in between the components.

4.04.00 Circuit Breaker

4.04.01 Circuit breakers shall be draw out EDO type, 3 pole, single throw, air break type with stored energy, trip free mechanism and shunt trip coil. It shall be suitable for a duty cycle of O3 min -CO-3min-CO.

4.04.02 All incomer breakers and motor feeder breakers shall have motor - wound spring charging mechanism.

4.04.03 Each breaker operated feeder shall be provided with protective devices as specified in ANNEXURE -A.

4.04.04 All breakers with motor wound spring charging mechanism shall have facility of manual spring charging also.

4.04.05 For motor wound mechanism spring charging shall take place automatically, after each breaker closing operation. One open- close-open operation of the circuit breaker shall be possible after the failure of power supply to the motor.


4.04.06 Mechanical safety interlock shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.

4.04.07 Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.

4.04.08 Each breaker shall be provided with an emergency manual trip, mechanical ON/OFF indicator, an operation counter, mechanism charge/ discharge indicator and electrical anti pumping feature.

4.04.09 In addition to the auxiliary contacts required for normal breaker operation and indication, each breaker shall be provided with the following for interlocking purpose:

- a) Position/cell switch with minimum 4 NO + 4 NC contacts.
- b) Auxiliary switch, with minimum 6 NO + 6 NC contacts, mounted on the

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stationary portion of the breaker panel and operated mechanically by a sliding lever from the breaker in SERVICE position.

Alternatively, electrically reset latching relay may be used for the purpose. The exact requirement of contacts of the position/cells switch, limit switch, auxiliary switch and latching relay shall be decided by the Tenderer taking into account the scheme requirement and spares. Limit/auxiliary switches shall be convertible type that is, suitable for changing NO contact to NC and vice-versa.

4.04.10 Spring charge limit switch shall be provided for breakers with motor wound spring charging mechanism. These limit switches shall be provided with minimum 2 NO + 2 NC contacts.

4.04.11 Limit/ Auxiliary switches shall be convertible type, that is, suitable for changing NO contact to NC and vice -versa.

4.14.12 Circuit breaker handling truck shall be provided for each MCC room.

4.05.00 Switches

4.05.01 Switch handle shall have provision for pad-locking in ON and OFF position.

4.05.02 The compartment door shall be interlocked mechanically with the switch such that the door cannot be opened unless the switch is in OFF position. Means shall be provided for releasing this interlock at any time. Interlock defeat feature with switch in ON position.


4.06.00 Fuses

4.06.01 Fuses shall be HRC cartridge type with operation indicator.

4.07.00 A.C Starter

4.07.01 Contactors

- a) Motor starter contactors shall be of air break, electromagnetic type as per IS: 13947 Part-4, Section-1 suitable for DOL starting of motor and shall be of utilization category AC-3 for ordinary and AC-4 for reversing starters.
- b) Contactor starters shall comply with the requirements of IS: 8544 (Part-1) in respect of co-ordination of the characteristics of contactor, overload relay, and fuse. The type of co-ordination shall be Type-2 as per IS-8544.

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4.07.02 Thermal Overload

- a) Thermal overload relays shall be manual reset type and ambient temperature compensated with adjustable settings.
- b) Single phasing preventer shall be provided as an inbuilt feature of the thermal overload relay.
- c) Relays may be direct acting or C.T operated, depending on current rating. C.T's shall be including the scope of supply.
- d) Relays for fan motors having long starting time shall be saturable core C.T operated.

4.08.00 Control and Indication

4.08.01 The general scheme of connections for control, interlock, and protection is shown in the enclosed drawings for guidance for the Bidder. Detailed requirements of individual circuits shall be developed by the Bidder meeting the requirements of this specification.. Following indicating lamps shall be provided for the feeders:


- i) Breaker operated feeders : “ON”, “OFF”, “TRIP”, “SPRING CHARGED” and “TRIP CKT. HEALTHY”.
- ii) Contactor operated motor feeders : “ON”, “OFF” and “TRIP”.
- iii) Reversible feeders:- :- Forward ON, Rev ON, Trip , Off iv) All other feeders : “ON”, “OFF”.

4.08.02 All indicating lamps shall be of high intensity cluster LED type with low voltage glow protection as inbuilt feature.


4.08.03 For control supply, 2x100% adequately-rated 415/240V control transformers (fed from different buses) with provision of momentary paralleling during change-over and with necessary taps shall be provided. Auxiliary bus bars shall be used to distribute 240V AC control supply. The control supply of different modules shall be tapped individually from the auxiliary bus-bars. Transformer ratings shall have adequate spare capacity.

4.08.04 DCDB shall be provided with indication lamps, volt meter and ammeter to monitor the healthiness of the incoming DC supply.

4.09.00 Meter and Meter Selector Switch

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- 4.09.01 All indicating instruments (96x96 mm) shall be digital type, flush mounted on front panel and accuracy class of $\pm 2\%$ full scale. Each meter shall have zero adjuster on the front.
- 4.09.02 Motor ammeters shall indicate starting current (6-8 times the motor full load current).
- 4.09.03 Watt-hour meters shall be provided in draw out cases. Either built-in test facilities or test blocks shall be provided for testing of meters without disturbing C.T and V.T secondary connections. Energy meters shall be three phase multifunction digital type with communication port for DCS interface.
- 4.09.04 All motors of 30KW and above shall have an ammeter in addition to remote metering facility through current transducers.
- 4.10.00 Current and Voltage transformer
- 4.10.01 All current and voltage Transformers as required for metering and specified protection shall be completely encapsulated, cast resin insulated type. The accuracy class shall be as below:
- | | CT | VT |
|------------|-------------|-----|
| Protection | 5P20 | 3P |
| Metering | 1.0 (ISF<5) | 1.0 |
- 4.10.02 Feeders requiring remote metering and/or current monitoring shall be provided with current transducers with calibration for full scale reading.
- 4.11.00 Relays
- 4.11.01 Relays shall be of draw out design with built –in testing facilities and flush mounted at the front of panel .Small auxiliary relays may be in non-draw out execution and mounted within the cubicle.
- 4.11.02 Relays shall be rated for operation on 110V secondary voltage and 1A secondary current as shown on drawings .Number and rating of relay contacts shall suit job requirements.
- 4.11.03 Unless mentioned otherwise in the specification, protective relays shall be multifunction type numerical relays.

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- 4.11.04 Multifunction numerical relays shall be selected to provide an integrated protection, continuous measurement and monitoring functions. Features such as self-diagnosis and external testing, disturbance recording, sequence of event recording, time stampings shall be available with the relay. Relevant data shall be possible to be stored in non-volatile memory backed up by battery .The relay shall have multiple setting

groups, optically isolated input /output, front LCD display and menus, fixed function and, programmable LED's, keypad and password protection .All function including protection, automation, communication, LED's, input /output shall be programmable and can be modified, if required, using the front panel user interface. Communication port (RS-485) for local and remote (with MODBUS protocol) communication shall be located in the front and rear part of the relay .A laptop loaded with support software (complete version)shall be supplied for local off line programming, measurements, extracting and viewing of events ,disturbance etc. The relays shall be housed in dust tight enclosure, suitable for IP 52 degree of protection.

- 4.11.05 The contractor shall furnish, install & co-ordinate all relays to suit the requirements of protection, interlock and bus transfer schemes as broadly indicated in the annexure and drawings.

- 4.11.06 All protective relays, auxiliary relays, and timers shall be provided with hand reset operation indicator (flag) or LEDs with push button resetting.

- 4.12.00 Secondary Wiring

- 4.12.01 Wiring shall be done with flexible, 650V grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 mm² for control and current circuits and 1.5 mm² for voltage circuits.


- 4.13.00 Terminal Blocks

- 4.13.01 Terminal Blocks shall be 660V grade box-clamp type with marking strips, similar to ELMEX 10 mm² or equal. Terminals for C.T secondary leads shall have provision for shorting. Terminal blocks used to interface with DCS via termination cabinet shall be suitably sized to facilitate proper termination of interconnecting cables.

- 4.14.00 Cable Termination

- 4.14.01 Generally, all assemblies shall be designed for cable entry from the bottom

- 4.14.02 Gland plates shall be minimum 4 mm thick. The gland plate and supporting arrangement for I/C power cables shall be of non-magnetic material.

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4.15.00 Ground Bus

4.15.01 A ground bus, rated to carry maximum fault current, shall be provided which shall extend the full length of the assembly.

4.15.02 All stationary units shall be directly connected to the ground bus for effective grounding. The frames of all circuit breakers and draw-out V.T modules shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

4.15.03 All hinged doors shall be earthed by flexible copper braid.

4.16.00 Nameplates

4.16.01 Nameplates of approved design shall be provided on each cubicle, at the top of the assembly and on each instrument & device mounted on or inside the cubicle.

4.17.00 Space Heaters and Plug Sockets

4.17.01 Each vertical section shall be provided with thermostat controlled space heater and 5A, 3 pin plug socket.

4.17.02 In addition, feeders for motors with space heater(for motors rated 30KW and above) shall be wired up for feeding the motor space heater automatically through suitably rated auxiliary NC contact of breaker or power contactor of starter module.


4.18.00 A.C/D.C Power Supplies

4.18.01 Necessary AC and DC power supplies as required for control and service shall be arranged by the Contractor.


4.19.00 Tropical Protection

4.19.01 All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus and insects.

4.19.02 In view of the plant consists of extensive material handling and chemical processing; special anti-corrosion measures in painting shall be taken as necessary.

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- 4.20.00 Local Pushbutton Station & Isolator
- 4.20.01 Local push button station (LPBS) shall be used for emergency stopping/ controlling of drives from local.
- 4.20.02 LPBS shall have die cast aluminium enclosure. 'Stop' push button shall be of latch type with mushroom knob. Pushbutton Stations shall have hinged guard in front to prevent inadvertent operation.
- 4.02.03 Local Load Break Isolators shall be provided for all LT drives. Isolators shall be lockable in "OPEN" position.
- 5.00.00 TEST
- 5.01.00 The switchgear shall be completely assembled, wired, adjusted and tested at the factory as per relevant standards.
- 5.02.00 Routine tests shall be carried out as per relevant standards.
- 5.03.00 Type tests shall be carried out as per Sub section E-0.

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ANNEXURE – A


PROTECTION

All equipment shall have necessary protections. However, following minimum protections shall be provided. There shall be no additional thermal overload relays for the protection of the motors.

- A. Motor feeders: Motors of rating upto 200 KW Realized through digital or numerical motor protection relay.
- i) Instantaneous short circuit protection on all three phases. For contactor starters, it shall be through HRC cartridge type fuses rated for 80 KA rms.
 - ii) Thermal Overload protection.
 - iii) Unbalance (negative sequence) protection iv) Locked motor protection
 - v) Earth fault protection
- B. Motor feeders: Motors of rating above 200KW to be covered under HT Switchgear. Realized through digital or numerical motor protection relay.

NOTE: 1. For contactor starter, the protection mentioned against serial no. (iii) will be replaced by single phasing protection which may be built in with thermal overload relay.

- 2. Protection mentioned against serial nos. A (iii) to A (v) are not applicable for contactor starter.
- 3. Protection mentioned against serial nos. A (i) to A (v) shall be provided in a composite motor protection relay (99) for ACB operated drives along with undervoltage tripping from bus undervoltage relay.
- 4. Apart from protection relays mentioned above, electrically operated breakers shall be provided with anti-pumping (94), trip annunciation (3), lockout (86) and trip circuit supervision (74) relays. Lockout relay shall be of hand-reset type.


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ANNEXURE – B
COMPONENT/MODULE SELECTION TABLE

- NOTE:
1. Fuse and thermal overload relay are to be coordinated with motor rating by the Contractor.
 2. “U” stands for unidirectional and “R” for reversible drives.
 3. Cable sizes are indicative. Sizes shall be subject to validation by design calculation as per stipulation of specification. Components selected shall be 1 size higher than required in Type-2 coordination of all boards.

MOTOR FEEDER

TYPE	MOTOR RATING (KW)	SWITCH RATING	FUSE RATING	CONTACTOR	CABLE SIZE (sq.mm)	MODULE SIZE (min) in mm
AU/AR	0 – 5.5	25A	*	25A	3C-2.5 – CU OR 3C-6 AL	400
BU	5.6 – 11	63A	*	32A	3C – 10/16 – AL	600
CU	11.1 – 22	63A	*	63A	3C – 25/35 – AL	600
DU	22.1 – 45	160A	*	125A	3C – 50/70 – AL	900
EU	45.1 – 55	200A	*	160A	3C – 95/120 – AL	900
FU	55.1 – 75	250A	*	250A	3C – 150 – AL	900
GU	75.1 – 110	400A	*	300A	2X3C – 240 – AL	1200


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OUTGOING FEEDER – AC

TYPE	SWITCH RATING	FUSE RATING	CABLE SIZE (sq.mm)	MODULE SIZE (min) in mm. .
AF	63A	32A	4C – 16 – AL	300
BF	63A	63A	4C – 35 – AL	300
CF	100A	100A	3.5C – 95– AL	600
DF	200A	200A	3.5C – 300 – AL	600
EF	400A	400A	4X1C – 630 – AL or 2X3.5C – 300 – AL	900
FF	630A	630A	7X1C – 630 – AL or 3X3.5C – 300 – AL	900

OUTGOING FEEDER – DC

<u>TYPE</u>	<u>SWITCH RATING</u>	<u>FUSE RATING</u>	<u>CABLE SIZE (Min.)</u>
DAU	16A	16A	2/C – 2.5 Sq. mm CU
DAF	32A	32A	2/C – 2.5 Sq. mm CU
DBF	63A	63A	2 X 2/C – 16 Sq. mm AL
DCF	100A	100A	4/C – 35 Sq. mm AL
DDF	200A	200A	2 X 4/C – 35 Sq. mm AL


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ANNEXURE-A


RATINGS & REQUIREMENTS
(POWER & CONTROL CABLES)

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CABLES

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1.00.00 CODES AND STANDARDS

Major standards which are to be followed are IS : 1554 , IS : 6380, IS : 7098, IS: 9918 and IEC: 502.

2.00.00 SERVICE CONDITION

All cables shall be suitable for a hot, humid and tropical atmosphere with dust and corrosive chemical fumes. All cables shall be designed to withstand the mechanical, electrical and thermal stresses under the steady state and transient/fault conditions, and shall be suitable for the proposed method of installation.

3.00.00 DESIGN CRITERIA

3.01.00 For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard and/or this specification.

3.02.00 Armouring shall be single round wire of galvanized steel for multi core cables and aluminium for single core cable.

3.03.00 Core identification for multi core cable shall be provided by colour coding.

4.00.00 SPECIFIC REQUIREMENTS


4.01.00 General Description

All cables shall be furnished in strict compliance with ratings and requirements and sizes as given in Annexure to this Specification.

4.02.00 Selection Criteria


4.02.01 In cable sizing the following are to be taken into consideration:

- Short circuit current and duration.
- Continuous current.
- Installation conditions.
- Voltage drop under normal running and starting condition.

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- 4.02.02 Apart from above, consideration shall also be given to limit the cable to some standard sizes instead of using too many sizes.
- 4.02.03 The standard cable sizes ampere capacities and derating factor as given in IS will be generally followed.
- 4.02.04 a) For breaker protected circuits minimum size will be determined by short circuit rating. For the purpose of calculating the minimum cable size, the following fault levels and duration shall be considered:
- i) 11000 V System - 40 KA, 0.2 second for outgoing and 0.5 sec for incoming feeder.
 - ii) 415 V System- 50 kA, 0.12 second for incoming feeder as specified in General Electrical specification E-0
- b) For motor circuit the selection of size will be made ensuring that the cable shall withstand a short circuit fault directly following a second hot start.
- 4.02.05 For all feeders the conductor size will depend on full load current subject to voltage drop not exceeding 3% under full load conditions and 10% during motor starting conditions at equipment terminal. For practical purposes, the minimum size shall be 6 Sq.mm for aluminium and 2.5 Sq.mm. for copper.
- 4.02.06 All control cables shall be of 2.5 Sq.mm copper.
- 4.02.07 Multi core control cables will generally have spare conductor(s) in accordance with the following chart:

<u>Conductors Required</u>	<u>Cables</u>
1 or 2	1-3/C
3 or 4	1-5/C
5 or 6	1-7/C
7 or 8	1-10/C
9, 10, 11 or 12	1-14/C
13, 14, 15 or 16	1-19/C

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Above 16

Two (2) or more of
above cables

4.02.08 Separate cables for each type of following services/functions as applicable shall be used for each feeder. Same multi core cable using different services shall not be acceptable.

- a) Power.
- b) Control, interlock and indication.
- c) Metering and measuring.
- d) Alarm and annunciation.
- e) C.T. Cables.
- f) P.T. Cables.


4.02.09 Separate cables shall be used for A.C. and D.C. circuits.

4.03.00 Cable Identification

Cable identification shall be provided by embossing on the outer sheath the following:

- a) Manufacturers name or trademark.
- b) Voltage grade.
- c) Year of manufacture.
- d) Type of insulation e.g. "HR85" for "HR PVC" etc.
- e) Type of outer sheath e.g. "FRLS" etc.
- f) ISI marks.
- g) Nominal cross-sectional area of the conductor & no. of cores.

5.00.00 TESTS

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5.01.00 Shop Tests


The Cables shall be subject to following shop tests in accordance with relevant standards to prove the design and general qualities of the cables.

5.01.01 Routine tests on each drum of cables.

5.01.02 Acceptance tests on drums chosen at random for acceptance of the lot.

5.01.03 Type tests on each type of cable, inclusive of measurement of amount D.C. resistance of power cables as per requirements of General Electrical specification sub-section E-0.

5.01.04 For instrumentation cable, in addition to above, the insulation resistance test and high voltage test at 2 KV shall be conducted.

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ANNEXURE-A


RATINGS & REQUIREMENTS (POWER & CONTROL CABLES)

HV POWER CABLES

- 1.0 11000V /11000V grade 90°C rating heavy duty XLPE power cable suitable for use in 11000V non-effectively earthed system conforming to following requirements and in line with IS-7098, IS-8130, IS-5831 and IS-3975.
- 1.1 Conductor Stranded and compacted aluminium conductor of grade H2 and Class 2 for all sizes, generally conforming to IS: 8130.
- 1.2 Conductor Screen Extruded semi-conducting compound.
- 1.3 Insulation Extruded cross-linked polyethylene (XLPE).
- 1.4 Insulation Screen Extruded semi-conducting compound with a layer of non-magnetic metallic tape. For single core armored cables, the armouring shall constitute the metallic part of screening. The semi-conducting tape shall be easily strippable.
- 1.5 Core Identification By coloured strips applied on (For three core cables) cores or by numerals.
- 1.6 Inner Sheath Extruded PVC compound conforming to type ST2 of IS: 5831 for three core cables. Single core cables shall have no inner sheath.
- 1.7 Armour Galvanized single round steel wire armour for twin and multi core cables. Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables.
- 1.8 Overall Sheath Extruded PVC compound conforming to type ST2 of IS-5831 with FRLS characteristics.

L. V. POWER CABLES

- 1.0 1100 V grade, 85° C rating, heavy duty, HR (Heat Resistant) PVC power cable conforming to following requirements and in line with IS-1554, IS-5831, IS-8130 & IS-3975.
- 1.1 Conductor Stranded and compacted plain aluminium of grade H2 and

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class 2/stranded, high conductivity annealed plain copper as per Annexure generally conforming to IS: 8130.

1.2 Insulation Extruded HR. PVC compound conforming to type C of IS: 5831.

1.3 Inner Sheath Extruded PVC compound conforming to type ST2 of IS: 5831 for multi core cable. Single core cables shall have no inner sheath.

1.4 Armour Galvanizing single round steel wire armour for twin and multi core cables. Non-magnetic hard drawn aluminium single round wire conforming to H4 grade for single core cables.

1.5 Overall Sheath Extruded PVC compound conforming to type ST2 of IS: 5831 with FRLS characteristics.

CONTROL CABLES

1.0 1100 V grade 70°C rating PVC control cable conforming to following requirement and in line with IS:1554, IS:8130, IS:5831 and IS:3975.

1.1 Conductor Stranded non-compacted and circular, high conductivity annealed plain copper, generally conforming to IS: 8130.


1.2 Insulation Extruded PVC compound conforming to type-A of IS: 5831.

1.3 Inner Sheath Extruded PVC compound conforming to type ST1 of IS: 5831 for multi core cables.

1.4 Armour Galvanized single round steel wire for twin and multi core cables.

1.5 Overall Sheath Extruded PVC compound conforming to type ST1 of IS: 5831 with FRLS characteristics.

NOTE: All Control cables shall be twisted pair, individual & overall screened.


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TRANSFORMER


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4.00.00	SPECIFIC REQUIREMENT
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6.00.00	DRAWING, DATA & MANUAL

ATTACHMENTS

ANNEXURE-A	RATINGS AND REQUIREMENTS
ANNEXURE-B	FITTINGS AND ACCESSORIES

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1.00.00 SCOPE OF SUPPLY

1.01.00 The scope of supply shall include dry type transformers of rating to be decided by the Bidder based on selection criteria given in General Electrical Specification: E0.

1.01.01 Each transformer shall be furnished complete with :

- a) Fittings and accessories
- b) Auxiliary equipment

1.01.02 All relevant drawings, data and instruction manuals.

2.00.00 GENERAL REQUIREMENT

2.01.00 Codes and Standards

2.01.01 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

2.01.02 Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.


2.01.03 The electrical installation shall meet the requirements of Indian Electricity Rules as amended up to date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

3.00.00 DESIGN CRITERIA

3.01.00 The transformer will be installed in hot, humid and tropical atmosphere. All equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

3.02.00 The transformer shall be capable of continuous operation at specified rating under the following condition :

- a) Voltage variation : $\pm 10\%$

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b) Frequency variation : $\pm 5\%$

c) Combined voltage and frequency variation

(absolute sum) : 10%

3.03.00 The transformer shall be capable of withstanding the short circuit stresses due to a terminal fault on one winding with full voltage maintained on the other winding for minimum period of three (3) seconds.

3.04.00 The transformer shall be free from annoying hum or vibration. The design shall be such as not to cause any undesirable interference with radio or communication circuits.

3.05.00 The noise level shall be limited to the value specified by NEMA Standard Publication No. TR-1-1993 when measured in accordance with conditions outlines in ANSI/IEEE C57.12.90-1999/IS13964/CBIP publication.

3.06.00 The dry type transformer shall be resin encapsulated and shall be naturally cooled (AN) and moisture proof. Insulating materials used in construction shall be of low smoke emitting type, less flammability and free from toxic gas emission.

3.07.00 Transformers shall be suitable for indoor use.


4.00.00 SPECIFIC REQUIREMENT

4.01.00 Enclosure for Dry Type Transformer


4.01.01 The transformers shall be housed in enclosure fabricated from sheet steel of minimum 2mm thick. Degree of protection of the enclosure shall be at least IP23. Screens shall be perforated sheet steel type. Mesh size shall be such that lizard, rats etc. cannot enter inside the enclosure.

4.01.02 The enclosure shall be adequately reinforced to ensure rigidity so as to permit transportation of transformer within enclosure. Base frame for mounting the transformer shall be minimum 4 mm thick and shall be provided with bi-directional rollers/mounting skid.

4.01.03 Double leaf access, both at front and at rear end, shall be provided with concealed hinge and neoprene gaskets for easy access and also for withdrawal of core and coil assembly if required. Enclosure door shall have provision of padlocking in door-closed position.

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- 4.01.04 Enclosure shall be provided with lifting eyes and pulling lugs Heavy removal parts shall be provided with eyebolt for ease of handling.
- 4.01.05 Each transformer shall be provided with one set of bi-directional rollers for rolling the transformer parallel to either center line.
- 4.02.00 Core & Coils
- 4.02.01 The transformer may be of core or shell type. The core shall be built up with high grade, non-aging, low loss, and high permeability grain oriented cold-rolled silicon steel laminations especially suitable for core material. Adequate cooling to be ensured.
- 4.02.02 The coils shall be manufactured from electrolytic copper conductor and fully insulated for rated voltage. For dry type transformer of encapsulated design, HV & LV coils shall be separately encapsulated under vacuum in cast resin compound.
- 4.02.03 Insulating material shall be of proven design, Coils shall be so insulated that impulse and power frequency voltage stresses are minimum. For dry type transformer the insulating material shall be glass fiber reinforced conforming to class 'F'. Coils shall be so insulated that impulse and power frequency voltage stresses are minimum and are suitable to withstand even the severest of temperature fluctuation.
- 4.02.04 All leads from the windings to the terminal board and bushings shall be rigidly supported to prevent injury from vibration or short circuit stresses. Guide tube shall be used where practicable.
- 4.02.05 The core and coil assembly shall be securely fixed in position so that no shifting or deformation occurs during movement of transformer or under short circuit stresses.
- 4.03.00 Tapings
- 4.03.01 Off-circuit taps as specified shall be provided on the high voltage winding.
- 4.03.02 The transformer shall be capable of operation at its rated KVA on any tap provided the voltage does not vary by more than $\pm 10\%$ of the rated voltage corresponding to the tap.
- 4.03.03 The winding including the tapping arrangement shall be designed to maintain electromagnetic balance between HV and LV windings at all voltage ratios.
- 4.03.04 The tap changing shall be affected manually by change of copper link at the terminal board inside the enclosure. The design of tap changing link shall be such to ensure that same tap is set on all the three phases at a time.

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4.04.00 Safety Interlock

For all dry type transformers following safety interlocks shall be provided :

- a) A safety interlock shall be provided to ensure that the enclosure door can be opened only when transformer is de-energised.
- b) Safety limit switches operated by door-handle shall be provided for tripping HV & LV side breaker.
- c) Local emergency push button station is required for tripping of 11KV breaker.

4.05.00 Bushing

4.05.01 Bushings for transformers shall be resin moulded type of appropriate voltage class.

4.05.02 Bushings shall be provided with terminal connectors of approved type and size.

4.05.03 Bushing location shall provide adequate phase and ground clearances.

4.05.04 The bushings shall be suitable for a heavily polluted atmosphere.

4.06.00 Terminal Arrangements

4.06.01 The physical position of terminals and markings shall be as per the relevant standards.


4.06.02 Terminals for bus duct connection shall be brought through top cover mounted bushings with matching flange.

4.06.03 Bushing terminals and flange shall be coordinated with bus duct.

4.06.04 Terminals for cable connection shall be brought out through top cover/side wall mounted bushings to a detachable cable-end box with disconnect link.

4.06.05 Cable-end box shall be self-supporting, weatherproof, air filled type with sufficient space inside for termination and connection of cables as detailed in the Annexures.

4.06.06 Cable-end box shall be furnished complete with removable gland plate, double compression brass glands, tinned copper lugs, armour clamps and necessary hardware.

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4.06.07 In general, the arrangement shall be such as to permit removal of the transformer and core/coil assembly without dismantling the bus duct/cable installation.

4.06.08 Additional low voltage winding neutral shall be brought out thru' top cover mounted bushing. Two ground conductors 75x10 G.I. flats shall run from neutral bushing to the bottom of the tank over pin insulators for connection to station ground.

4.07.00 Marshalling Box

4.07.01 A sheet steel, weatherproof, IP55, marshalling box shall be provided for the transformer. The box shall be located directly on the outside face of the enclosure at suitable height. The box shall contain all auxiliary devices.

4.07.02 All terminal blocks shall be located in this box.

4.07.03 The marshalling box shall be provided with cubicle lamp with door switch, space heater with thermostat and removable cable gland plate.

4.08.00 Wiring

4.08.01 All control, alarm and indication devices provided with the transformer shall be wired upto the terminal blocks.

4.08.02 Wiring shall be done with 650V PVC wires in conduit or PVC armoured cable. Minimum wire size shall be 2.5 sq.mm stranded copper. Not more than two wires shall be connected to a terminal. 10% spare terminals shall be provided.


4.08.03 Multi-way terminal block complete with mounting channel, binding screws and washers for wire connections and marking strip for circuit identification shall be provided for terminating the panel wiring. Terminals shall be stud type, suitable for terminating 2 nos. 2.5 mm² stranded copper conductor and provided with acrylic insulating cover.

4.08.04 All devices and terminal blocks shall be identified by symbols corresponding to those used in applicable schematic or wiring diagram. Each wire shall be identified, at both ends, with interlocking type permanent markers bearing wire numbers as per Contractor's Wiring Diagrams. AC/DC wiring shall have separate color-coding.

4.08.05 Wire termination shall be made with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

4.09.00 Grounding

4.09.01 For dry type transformers a ground bus rated to carry the maximum fault current shall extend full length of the enclosure.

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4.09.02 The ground bus shall be provided with two bolt drilling with GI bolts and nuts at each end to receive 75 x 10 mm GS flats.

4.09.03 The core coil assembly shall be directly connected to this ground bus by removable bolted link for effective grounding.

4.09.04 Ground terminals shall be also provided on marshalling box to ensure its effective earthing.

4.09.05 For continuity of earth connection, all gasketed joints shall be provided with braided copper wire jumpers.

4.10.00 Painting

4.10.01 All steel surfaces shall be thoroughly cleaned by sand blasting and/or chemical agents, as required, to produce a smooth surface free of scales, grease and rust.

4.10.02 The external surfaces, after cleaning, shall be given a coat of high quality red-oxide or yellow chromate primer followed by filler coats.

4.10.03 The interior and exterior surfaces shall be finished with specified color shades as per IS5.

4.10.04 Sufficient quantity of touch up paint shall be furnished for application after installation at site.

4.10.05 The paints shall be carefully selected to withstand tropical heat, rain etc. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.

4.10.06 If it is considered necessary, the transformer may be given a further coating at site by the Owner/Purchaser. The Bidder shall therefore indicate the type and quality of the paint with full specification for this purpose.


4.10.07 All supporting structures and hardware shall be hot dip galvanized.

5.00.00 TESTS

5.01.00 Routine Tests

During manufacture and on completion, all transformers shall be subjected to the routine tests in accordance with latest IS/IEC and its different parts.

In addition, the following tests shall be performed on each transformer:

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5.01.01 After assembly, each core shall be pressure tested for one minute at 2KV (r.m.s.) A.C. between all bolts, side plates, structural steel works and the core.

5.01.02 The wiring for auxiliary power and control circuitry shall be subjected to withstand one minute power frequency test with 2.0KV (r.m.s.) to earth.

5.01.03 Partial discharge measurement (acceptable value is as specified in IEC).

5.01.04 Measurement of acoustic sound level

5.01.05 Short Circuit test

5.01.06 Environmental test

5.02.00 Type Tests

Following type tests shall be performed on one of each rating of transformer, even if type test certificates of these tests are submitted by the Bidder for Purchaser's approval:

a) Impulse withstand test

b) Temperature rise test

5.03.00 Miscellaneous

All component parts and auxiliary equipment such as bushings, etc. shall be routine tested as per relevant Indian Standards.


5.04.00 Type test certificate on any equipment, if so desired by the Owner, shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

6.00.00 DRAWINGS, DATA & MANUALS

6.01.00 To be Submitted with the Bid

6.01.01 Typical general arrangement drawings showing enclosure, core coil assembly and terminal arrangement etc. for dry type transformers.

6.01.02 Transport/shipping dimensions and weights, space required for handling parts for maintenance.

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6.01.03 Technical leaflets on major components and fittings.

6.01.04 Type test certificate on similar transformer.

6.01.05 Write-up on insulating material used and process of application/method of construction followed for dry type transformer.

6.01.06 Backup calculation for selection of sizes and quantity of transformers

6.02.00 To be Submitted after Award of Contract

6.02.01 Dimensioned general arrangement drawing showing enclosure, core coil assembly, terminal arrangement and various fittings.

6.02.02 Transport/shipping dimensions with weights, wheel base detail etc.

6.02.03 Foundation plan & loading.

6.02.04 Bus duct/cable termination arrangement.

6.02.05 Control schematics and wiring diagrams.


6.02.06 Test reports

6.02.07 Any other relevant drawing or data necessary for satisfactory installation, operation and maintenance.

6.02.08 Instruction manuals on Transformer and its various fittings

The manual shall clearly indicate method of installation, checkups and tests to be carried out before commissioning of the equipment.


6.03.00 The Bidder may note that the drawings, data and manuals listed are minimum requirement only. The Bidder shall ensure that all other necessary write-ups, curves and information required to fully describe the equipment offered are submitted with his bid.

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ANNEXURE-A

RATINGS AND REQUIREMENTS


1.0	Application	:	POWER TRANSFORMER
2.0	Service	:	Indoor, step-down
3.0	Type	:	Dry type
4.0	Reference standard	:	IS 11171, IS 2026 & IEC60076
5.0	Rated power	:	2500KVA
6.0	Rated voltage ratio (line to line)	:	11 /.433 KV
7.0	Number of phases of each unit	:	3
8.0	No. of phases	:	3
9.0	Rated frequency	:	50 Hz 10.0
	Type of cooling	:	AN (AN or AN/AF)
11.0	Insulation Class	:	Class F.
12.0	Temperature rise		
12.1	Design ambient temperature	:	50 degree Centigrade
12.2	Temperature rise above design ambient temperature.		
a)	in winding by resistance	:	90°C
13.0	Insulation level (LI : Lightning Impulse Voltage, AC: Short duration induced & separate source voltage withstand)		
	HV- (LI/AC)	:	75KVp/K28Vrms

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	LV- (LI/AC)	:	-KVp/3KVrms
	LV Neutral-(LI/AC)	:	-KVp/3 KVrms
14.0	partial discharge level	;	<10pc
15.0	Vector group	:	Dyn11
16.0	Short-circuit impedance at 75°C	:	10 % on 2.5MVA
	at principal tap		
17.0	Parallel operation of transformer	:	Momentarily
18.0	Type of taps provided	:	OCTC, full capacity
18.1	Taps provided on	:	H.V. winding
18.2	Range of taps	:	±2 x2.5%
18.3	Method of Tap charge control-		
a)	Manual local	:	Yes
b)	Electrical local	:	No
c)	Electrical remote	:	No
d)	Automatic	:	No
19.0	Enclosure protection class	:	IP23
20.0	System earthing -		
	H.V.	:	Non-effectively earthed
	L.V.	:	Effectively earthed
21.0	Terminal arrangement -		

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	H.V.	:	Cable		
	L.V.	:	Non-segregated phase busduct		
	L.V. Neutral for earthing	:	75x10 mm GS flat		
22.0	Transformer bushing	:	HV	LV	LV-N
22.1	Voltage class KV(r.m.s.)	:	12	1.1	1.1
22.2	Material	:	Resin moulded		
22.3	Creepage distance mm	:			
22.4	Min. Ph-Ph clearance mm	:	HV	LV	
			280	25	
22.5	Min. Ph-Gr clearance mm	:	140	25	
23.0	System fault Level				
	HV Side	:	40 KA (r.m.s.)		
	LV Side	:	50KA (r.m.s.)		
24.0	Max. Flux density in any part of core & Yoke at 110% rated voltage	:	1.0 Tesla		
25.0	Max. Noise level in accordance with Conditions specified in NEMA Std. TR-1	:	As per NEMA std.		
26.0	Auxiliary supply	:	415V(±10%)3 ph. 50 Hz (±5%)		
		:	220V +10%, -15% 2 wire DC		
27.0	Painting Specification: E-0	:	As per Electrical General		

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ANNEXURE-B


FITTINGS AND ACCESSORIES

Each transformer shall be equipped with fittings and accessories, as listed below :

1. Digital type winding temperature scanner with electrically separate contacts for alarm and trip.
2. Handling & lifting lugs for both enclosure and core-coil assembly.
3. Jacking pad for core-coil assembly.
4. Flat type bi-directional rollers with locking arrangement for core-coil assembly.
5. Inspection cover for cable end box.
6. Door handle operated safety limit switch with 1 NO + 1 NC contact.
7. Ground bus.
8. IP-55 marshalling box.
9. Rating and terminal marking plate.

Note

All indication, alarm, trip contacts provided shall be rated for 1A at 110 V DC and 5A at 240 V AC.


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SECTION: 5

SUB SECTION: E-7

415 V NON- SEGREGATED PHASE BUSDUCT

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ANNEXTURE-A
IV

RATINGS & REQUIREMENTS **VOLUME:**


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1.00.00 GENERAL

- 1.01.00 The bus duct will serve as interconnection between L.V. terminals of L.T. Transformers to 415V Switchgear.
- 1.02.00 The bus duct shall be non-segregated type self-cooled .The cooling medium inside the duct shall be air.
- 1.03.00 The bus duct will be installed in a hot, humid and tropical atmosphere.
- 1.04.00 For continuous operation at specified rating , maximum temperature of the bus duct shall be limited to the following considering 50 Deg. C as ambient temperature:
- Conductor /Bus Connection : 85 Deg. C
- Enclosure/Supports : 70 Deg. C
- 1.05.00 It shall be capable of withstanding the mechanical forces and thermal stresses of the specified short circuit currents without any damage or deterioration of material.
- 1.06.00 Wherever expansion joints are required, neoprene rubber bellows shall be provided for enclosure and flexible connectors for conductor.
- 1.07.00 Same phase disposition shall be maintained throughout the run of the busduct. If required, Phase cross-over units to match Switchgear bus configuration shall be provided.

2.00.00 ENCLOSURE

- 2.01.00 All the three phases shall be enclosed in weatherproof dust tight enclosure. Outdoor section of the bus duct shall be completely rain proof .For bus rating including and above 3000 A, enclosure shall be of aluminum and for bus rating below 3000 A enclosure shall be of sheet steel fabricated type(Minimum Degree of protection of bus duct shall be IP-54 for indoor and IPW-55 with canopy for outdoor section of the bus duct).
- 2.02.00 Weather resistant type circumferential gaskets shall be provided for making the joints (with adjacent enclosure), dust proof and impervious to moisture.

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2.03.00 The connection flanges shall be sufficiently stiffened so as not to bend while tightening the bolts.

2.04.00 Suitable inspection openings with gaskets shall be provided for access to support insulator /bus joints etc.

3.00.00 BUS CONDUCTOR

3.01.00 The conductor shall be of high conductivity copper / aluminum /aluminum alloy sized for the same rating as associated Switchgear bus. Conductor material for bus bars of Switchgear and bus duct shall be same.

3.02.00 Joints made at the factory shall be welded type and the joints to be made at site shall be bolted type.

3.03.00 For bolted rigid /expansion joints necessary bolts, nuts (cadmium plated) washers and other hard wares shall be supplied.

3.04.00 Bus bars shall be colour coded at regular intervals for easy identification. The markings on the bars shall be Red for R phase, Yellow for Y phase and Blue for B phase.

3.05.00 For each shipping section, the bus conductor shall be supported at minimum two position.

4.00.00 BUS BAR SUPPORT


4.01.00 All buses and connections shall be supported and braced to withstand stresses due to maximum short circuit current.

4.02.00 The bus conductor supporting insulator shall be flame retardant, non hygroscopic. high strength track resistant type with high creepage surface.


4.03.00 The insulators shall be so located that they can be easily removed and replaced without dismantling the bus duct installation.

4.04.00 Space heater shall be provided near each insulator to avoid moisture condensation within bus duct. The number and wattage of space heater shall be decided by the tenderer.

5.00.00 SUPPORTING STRUCTURES

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- 5.01.00 All supporting structures required for hanging and/or supporting the complete bus duct shall be furnished. These shall include all members, indoor/outdoor posts, bolts, shims, base plates, beams, hangers, brackets, bracings and hard wares.
- 5.02.00 All buses shall be adequately supported and braced to successfully withstand normal operation, vibration, thermal expansion, short circuit forces and all specified design loads.
- 5.03.00 All steel members shall be hot dip galvanized after fabrication. All hardware shall be of high strength steel with weather resistant finish.
- 5.04.00 For each shipping section, the enclosure shall be supported at minimum two positions.
- 5.05.00 The enclosure supporting arrangement shall be such that the busduct weight is not transmitted onto the terminations.
- 6.00.00 CONNECTIONS AND TERMINATIONS
- 6.01.00 All matching flanges, seal off bushings, gaskets, fittings hardware and supports required for termination of the bus duct at 415V Switchgear, transformer shall be supplied .All hardware used at conductor points shall be of non-magnetic high tensile material.
- 6.02.00 Expansion joints for both conductor and enclosure shall be provided as follows:
- At all equipment terminations.
 - On either side of seal -off bushings.
- 6.03.00 Expansion joints shall be provided on bus conductor and enclosure to take care of thermal expansion.
- 6.04.00 Seal-off bushings with wall frame assembly shall be provided wherever the busduct penetrates the building wall from outdoor to indoor.
- 6.05.00 Equipment terminal connection shall be readily accessible and shall provide sufficient air gap for isolation of equipment during testing.
- 6.06.00 If the material of bus conductor and that of the equipment terminal connectors are different, suitable bi-metallic connectors shall be provided.
- 7.00.00 GROUND BUS

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7.01.00 A ground bus rated to carry maximum fault current shall be provided running the entire length of the bus duct , grounding all parts of the supporting structure and each enclosure section.

7.02.00 The ground bus shall be provided with two bolt drilling with G.I bolts and nuts at each end to receive 50 X 6 mm G.S flat.

8.00.00 FINISH

8.01.00 Except for supporting steel structures which shall be galvanized all other materials shall be finished with undercoat of high quality primer followed by two coats of epoxy based paint.

9.00.00 TEST

9.01.00 The bus duct shall be completely assembled and checked at the factory for correctness of alignment.

9.02.00 Routine Tests


Bus duct shall be subjected to the following tests:

- a) Visual inspection and verification of dimensions.
- b) Dry power frequency voltage withstand test for 1- minute.
- c) Insulation resistance measurement.
- d) Milli volt drop test.
- e) Water tightness test.
- f) Air tightness test.

9.03.00 Type Tests


The following test certificates shall be furnished for identical rating and type of each bus duct :

- a) Heat run test.
- b) Short circuit test.

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9.04.00 Miscellaneous Components

9.04.01 Tests on insulators etc. shall be carried out as specified in relevant standards.

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ANNEXURE -A

RATINGS & REQUIREMENTS

FOR 415 V NON-SEGREGATED PHASE BUSDUCT

1.0 General

Type	Non Segregated
Service	Indoor/outdoor
Material: enclosure	Sheet Steel/aluminum
Conductor	Aluminum/Aluminum Alloy
Thickness of enclosure (minimum)	2mm for sheet steel, 3mm for aluminum

2.0 System

Voltage	415V AC \pm 10%
Phase	3 phase and neutral
Frequency	50 Hz. \pm 5%
Combined Voltage and Frequency variation	10%(absolute sum).


3.0 Service voltage 240V AC \pm 10% 1 phase (for space heater)

4.0 Rated current at 50 Deg. C Ambient 4000A

5.0 Short time current Rating for One (1) second 50KA

6.0 One(1) minute power frequency voltage(minimum) 2.5KV(rms) withstand


7.0 Temperature Rise (maximum) (over 50 Deg. C ambient)

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a) Bus Conductor 35° C

b) Bus enclosure and Structure 20° C

8.0 Shipping Section(Maximum) 3M


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VOLUME: IV

SECTION: 5

SUB SECTION: E-8

BATTERY & BATTERY CHARGER


 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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1.00.00 INTENT OF SPECIFICATION

1.01.00 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply and delivery, properly packed for transport F.O.R. site of Battery and Battery Charger complete with all accessories for efficient and trouble-free operation

2.00.00 SCOPE OF WORK

2.01.00 Scope of Supply

2.01.01 110V DC BATTERY BANK (Min 150AH) : 2 sets

2.01.02 Battery charger, each comprising one (1) float charger
and one (1) float cum boost charger : 2 sets

2.01.03 One (1) set of special tools and tackles.

2.01.04 All relevant drawings, data and instruction manuals.

3.00.00 DESIGN CRITERIA

3.01.00 Design Basis & Sizing Criteria


3.01.01 D.C. system shall provide reliable sources of D.C. power for control, indication, protection and annunciation of H.T. and L.T. switchgear equipment. In addition, it shall cater to the emergency lighting loads on failure of A.C. supply inside the substation buildings.

3.01.02 The D.C. system comprises of one (1) set of storage battery for each of the substation buildings which means a total of two sets of batteries.


3.01.03 All two sets of batteries mentioned above shall be maintenance-free VLRA type and complete with associated float charger and float-cum-boost charger.

3.01.04 The batteries and chargers will be installed indoor.

3.01.05 The battery and charger combinations shall be such as to ensure continuity of D.C. supply at load terminals without even momentary interruption.

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- 3.01.06 For continuous operation at specified ratings, temperature rise of the various components of battery and charger shall be limited to the permissible values as stipulated in relevant standards.
- 3.01.07 The procedure for estimating battery capacities shall be as per guidelines stipulated in IEEE-485.
- 3.01.08 The batteries shall be so sized as to meet emergency load duty cycle requirements for one (1) hour.
- 3.01.09 While estimating battery capacities, a design margin of 15% shall be kept. For tubular batteries, an ageing compensation factor of 1.25 shall be applied.
- 3.01.10 For the purpose of estimating battery capacities, the maximum and minimum temperatures shall be considered as 50°C and 5°C respectively.
- 3.01.11 All momentary loads shall be treated as one-minute loads.
- 3.01.12 The battery will be sized such that the voltage at any time during the duty cycle shall not be less than 1.8 volt per cell.
- 3.01.13 Each of the 110V battery charger set shall comprise of one (1) float charger and one (1) float-cum-boost charger.
- 3.01.14 The float charger shall be sized to carry the total load and the trickle charging current of the battery plus 25% margin. The output voltage of the float charger shall be adjustable between 115V-120V. The charger shall also be capable of delivering the rated load even under the specified voltage and frequency variations.
- 3.01.15 The float-cum-boost charger shall be sized to restore the fully discharged battery to full charge condition in ten (10) hours with 25% margin over maximum charging rate or to operate as a float charger with duty requirement as indicated against cl.no.1.01.14, whichever is greater.
- 3.01.16 The batteries & chargers shall be so designed that the maximum fault level on DCDB is limited to 25kA (indicative only; the actual value will be decided by the Tenderer after substantiating the same by calculation.)
- 3.02.00 System Concept
- 3.02.01 The float charger will be normally ON, supplying the D.C. load and at the same time trickle charging the battery.

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3.02.02 The characteristics shall be such that if load is high and exceeds the charger capacity, the battery will supply the excess load.

3.02.03 The float-cum-boost charger will be normally in stand-by (auto float/charge) mode and will cut into the circuit automatically

- (a) To provide occasional equalizing charge as required.
- (b) To take over the functions of float charger in case of its failure.
- (c) To boost charge the battery up to 2.75 volts per cell.

3.02.04 The float-cum-boost charger shall also have provision for float, equalizing, and boost charging the battery through manual selection.

3.02.05 On failure of A.C. supply, both float and float-cum-boost chargers will go out of service and battery will take over to supply emergency loads without any time delay.

3.02.06 Interlock shall be provided to ensure that the battery can be taken to boost mode only if the float charger is healthy and running. Interlock defeat arrangement shall also be provided for initial charging of battery.

4.00.00 SPECIFIC REQUIREMENTS

4.01.00 Layout

4.01.01 The battery and battery charger will be located indoor.


4.01.02 Battery room ventilation shall be under the scope of the Contractor.

4.01.03 Sufficient clear space shall be provided for attending individual cells.

4.02.00 Battery

4.02.01 Construction

- a) Each cell shall be assembled in scaled type, heat resistant, shock absorbing, robust clear view SAN/high grade polypropylene container.
- b) Vent plugs for scaled in type cells shall be anti-splash type.

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- c) The cells shall be supported on porcelain insulator fixed on to the rack with adequate clearance between adjacent cells.
- d) The cell terminals posts shall be provided with connector bolts and nuts, effectively coated with lead to prevent corrosion.
- e) Lead or lead coated copper connectors shall be furnished to connect up cell of batter set.
- f) Positive, negative, and 84th tap terminal posts shall be clearly and indelibly marked for easy identification.
- g) Lead coated bent copper plate, tubular copper lugs, teak wood clamp, bolt, nuts washers, etc. shall be furnished for connection of outgoing aluminium conductor cables.


4.02.02 Racks

- a) The racks for supporting battery cell shall be constructed of best quality teakwood and shall be painted with at least three(3) coat of anti-acid paint ,the shade of which shall be subject to approval of the Purchaser.
- b) Racks shall be free standing type, mounted on porcelain insulators.
- c) Numbering tags for each cell shall be attached on to the racks.

4.03.00 Battery Charger

4.03.01 General


- a) The charger shall be natural air cooled solid state type with full wave fully controlled bridge configurations.
- b) The charger shall be provided with automatic voltage regulation current limiting circuitry, smoothing filter circuit and soft start feature.
- c) Voltage control shall be step less, smooth continuous. Voltage control shall be possible either in "Auto" mode or in "Manual" mode An Auto- Manual selector switch shall be provided for this purpose.
- d) The charger shall be –self –protecting against all A.C and D.C transients and steady state abnormal currents and voltage.

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- e) Charger A.C input and D.C output shall be electrically isolated from each other and also from panel ground.
- f) Each battery charger shall be provided with one (1) no. voltage transducer one (1) current transducer for monitoring the D.C output. These transducers shall have twin-channel output of 4-20mA and will be used for analog inputs to Purchaser's PLC system.

4.03.02 Construction

- a) The charger shall comprise a continuous line up of free standing floor mounted sheet steel panels, with access from both front rears.
- b) In between the float and float –cum-boots charger panels, a central panel shall be provided. This panel shall house the battery terminals, load terminals battery blocking diodes and a few meters, annunciators and indicating lamps.
- c) Minimum thickness of sheet metal used shall be 2 mm.
- d) Access doors shall be with concealed hinges and neoprene gaskets. Ventilating louvers shall be covered with fine wire mesh. Doors over 600 mm. width shall be of double-leaf design.
- e) All equipment within the panels shall be arranged in modular units and laid out with sufficient space for easy maintenance.
- f) Switches, meters, relays, etc. shall be flush mounted on the front of the panels. Adequately sized name plates shall be provided for all circuits and devices.
- g) All bus bars and bus connections shall be of high conductivity aluminium / aluminium alloy and adequately sized to limit the maximum temperature rise to 40°C under rated load condition. The maximum allowable temperature rise shall be 50°C at joints. The ambient temperature in either case shall be 50°C.
- h) All bus connections shall be silver plated. Adequate contact pressure shall be ensured by means of two bolt connection with plain and spring washes and locknuts.
- i) Heat-shrinkable Insulating sleeves shall be provided for bus bars. All bus connections shall be shrouded.
- k) Bus bars shall be color coded for easy identification. Bus bars shall be supported and braced to withstand the stresses due to maximum short circuit current and also to take care of any thermal expansion.

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4.03.03 Charger Equipment


- a) All power diodes and control rectifiers shall be silicon type. Rectifier transformers shall be dry type, double wound, with copper conductor and class-B insulation.

The maximum temperature of the class-B insulation shall be limited to that of class-A insulation.

- b) Blocking diodes shall be fully rated and redundant so that failure of a single diode shall not incapacitate the system in any way.
- c) Isolating switches shall be heavy duty, load break type, operated by an external handle with provision for padlocking in ON and OFF position.
- d) Changeover switch shall be 3 position, 4 pole, load break type with minimum 2 NO + 2 NC auxiliary contacts. The switch shall be installed in such a manner that the operating handle shall be accessible only after opening the front door.
- e) Contactors shall be air-break type. Thermal overload relays shall have in built single phasing preventer.
- f) Fuses shall be HRC type and arranged for easy replacement. Semi conducting device fuses shall be fast-acting.
- g) Indicating lamps shall be low-watt filament type with series resistor. Both lamp and lens shall be replaceable from front.
- h) Meters shall be 96x96 mm switchboard type, 90° scale, antiglare glass, $\pm 1\%$ accuracy with zero adjuster on the front.
- i) Rectifier transformer for float-cum-boost charger shall be provided with $\pm 2 \times 2.5\%$ taps on the primary side.

4.03.04 Alarms

- a) Solid-state, audio-visual annunciation system shall be provided for battery chargers. Annunciation system shall operate on 110 V D.C.
- b) One (1) ten-point alarm facia shall be provided on each float charger and floatcum-boost charger panel, complete with proper actuating devices, circuitry, legend, push-buttons (Accept, Reset and Test), and hooter.

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- c) Each central panel shall be provided with one (1) eight-point alarm facia, complete with proper actuating devices, circuitry, legend, push buttons, (Accept, Reset and Test) and hooter.
- d) The arrangement shall be such that on occurrence of a fault, the corresponding window will light up and stay lighted until the fault is cleared and the reset button is pressed.
- e) Each time a window lights up, a master relay will get energized to provide group alarm signals to PLC-panel.
- f) The requirements of indications/alarms are given in Annexure-B


4.03.05 Meters

- a) Each float charger panel shall be provided with the following meters:
 - i) One (1) D.C. ammeter (for charger output).
 - ii) One (1) D.C. voltmeter with selector switch (for charger output/battery voltage).
- b) Each float-cum-boost charger panel shall be provided with the following meters:
 - i) One (1) D.C. ammeter (for charger output).
 - ii) One (1) D.C. voltmeter with selector switch (for charger output/battery voltage).
- c) Each central panel shall be provided with the following meters:
 - i) One (1) D.C. ammeter (for load circuit).
 - ii) One (1) A.C. voltmeter with selector switch (for main A. C. supply).

4.03.06 Controls

The following manual controls shall be provided on the front of each charger panel:

- a) Selection of float, equalizing, or boost charge.
- b) Voltage setters for setting the output of float/equalizing/ boost charge. Setting shall be independent of each other so that setting of one voltage will not require resetting of the others.

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- c) Current limit setter.
- d) Acknowledge-Reset-Test push buttons for annunciation system. The color of reset buttons shall be BLACK.

4.03.07 Lamp/Space heaters/receptacles:

- a) The charger panels shall be provided with:
 - i) Internal illumination lamp with door switch.
 - ii) Space heater with thermostat control.
 - iii) 3 pin 5A receptacle with plug.
- b) Lamp, heater and receptacle circuits shall have individual switch fuse units.

4.03.08 Wiring/Cabling


- a) The panels shall be completely wired-up. All wiring shall be routed through wiring troughs. Wires shall be ferruled at both ends for identification.
- b) Internal wiring of the panels shall be done with 1100V grade PVC insulated cables with stranded copper conductor of minimum size 2.5 Sq.mm.
- c) Panels shall have removable gland plates at the bottom for cable entry. All incoming/outgoing cables shall be terminated in suitable terminal blocks.
- d) Control terminal blocks shall be box-damp type ELMEX 10 Sq.mm or approved equal 20% spare terminals shall be provided.

4.03.09 Grounding

- a) The charger panels shall have fully rated ground bus with two ground terminals, one at each end.
- b) Each terminal shall comprise two-bolt drilling with M 10 G.I bolts and nuts and shall be suitable for connecting to 50x6 mm G .S. flat.

4.03.10 Tropical protection

- a) All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.
- b) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

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4.03.11 Painting

The panels shall be finished in light grey shade (shade 631 of IS-5) with two coats of synthetic enamel paint. The panels shall have a matt finish to prevent any flare from surface due to illumination.


4.03.12 Name Plate

- a) Nameplates shall be provided for each panel and for each equipment/device mounted on it.
- b) The material shall be anodized aluminium/lamicoid, 3 mm thick, with white letters on black background.
- c) Nameplates shall be held by self-tapping screws. The size of nameplates shall be approximately 20 mm x 75 mm for equipment and 40mmx150 mm for panels.
- d) Nameplates for panels shall be provided both on the front and rear.
- e) Control and meter selection switches shall have integral nameplates. Nameplates for all other devices shall be located below the respective devices.
- f) Instruments and devices mounted on the face of the panels shall also be identified on the rear with the instrument/device number. The number may be painted on or adjacent to the instrument or device case.
- g) Caution notice on suitable metal plate shall be affixed at the back of each panel.

5.00.00 TESTS

5.01.00 Tests On Battery Charger:


- a) Dielectric tests.
- b) Voltage regulation check from 0 to 100% loads with + 10% input voltage variation.
- c) Ripple content measurement.
- d) Functional tests.
- e) Heat run test on current limiting value.

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5.02.00 Routine Test On Component Parts

- a) Burning test on PCBs- assembled PCBs shall be tested at 70°C for 72 hours in loaded condition.
- b) Rapid temperature cycling test at 70°C and 0°C for 30 minutes at each temperature – 5 such cycles.

5.03.00 Type test certificates of any equipment shall be furnished, if so desired by the Purchaser. Otherwise, the equipment shall have to be type tested, free of charge, to prove the design.

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ANNEXURE-A

RATINGS AND REQUIREMENTS

1.0 BATTERY

1.1 Application : Stand-by power.

1.2 Ambient temperature

a) Maximum : 50°C.

b) Minimum : 5°C.

1.3 Type : Maintenance free VLRA type..

1.4 Nos. of cells per battery : 55 (to be decided by tenderer considering allowable voltage variation of DC system.

1.5 Battery nominal voltage : 110V.

1.6 Proposed Method of working


a) Float charging (normal) : As recommended by battery manufacturer depending on battery type.

b) Equalizing Charge (occasional) : As above.

c) Boost charging (after complete Discharge) : As above.

1.7 Intermediate tapping : Bidder to indicate.

1.8 Mounting : Wooden racks.

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2.0 BATTERY CHARGER

2.1 Charger : One (1) float & one (1) float-cum boost.

2.2 Type : Solid-state, full wave, fully controlled, 3phase Bridge.

2.3 Enclosure : Sheet steel.

2.4 A.C. Input

a) Supply : 415V, 3phase, 50Hz, 4wire.

b) Voltage variation : $\pm 10\%$.

c) Frequency : $\pm 5\%$.

d) Combined voltage and variation : $\pm 10\%$ (absolute sum). Frequency


e) Short-circuit level : 50kA r.m.s. symmetrical.

f) System earthing : Solidly earthed.

2.5 Performance Requirements

a) The output voltage of the charge shall be regulated within $\pm 1\%$ of the set value for any load variations from 0 to 100% and A.C. input voltage and frequency variations as indicated above in 2.4.

b) The ripple content in charger D.C. output shall be limited to $\pm 1\%$ of the D.C. output voltage, at nominal A.C. voltage.

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ANNEXURE-B

FITTINGS AND ACCESSORIES

1.0 BATTERY


Each battery shall be furnished complete with the followings:

- 1.1 Six(6) extra cell with all accessories.
- 1.2 Teakwood racks with three coats of anti-acid paint.
- 1.3 Stand insulator plus 5% extra.
- 1.4 Cell insulator plus 5% extra.
- 1.5 Cell inter connectors and take-off.
- 1.6 Lead-coated connection hardware plus 5% extra.
- 1.7 Cell numbering tags with fixing arrangements.
- 1.8 Teakwood cable clamps with hardware.
- 1.9 One (1) inter connector bolt wrench.
- 1.10 One (1) cell testing voltmeter with leads.

2.0 LIST OF ALARMS

2.1 Each float charger and float-cum boost charger panel shall be provided with one (1) tenpoint annunciation facia. Alarm points shall include:

- a) A.C. supply failure.
- b) D.C. voltage low.
- c) D.C. voltage high.

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d) D.C. system ground.

e) Charger overload.

f) SCR fuse blown.

g) Filter fuse blown.

h) D.C. output fuse blown.

2.2 The central panel shall be provided with one (1) eight-point annunciation facia alarm points shall include:

a) Battery on boost charge.

b) Float charger fail.

c) Float-cum bust charger in float mode.

d) Battery earth fault.

e) Main A.C. fail.

2.3 Initiating contacts, wired to two terminals, shall be provided for group annunciation of "Battery Charger Trouble" in remote control room.

2.4 Initiating contacts for all alarm points shall also have electrically separate spare set of contacts wired to the terminal block for future use.


2.5 All alarm contacts shall be rated 0.5A at 110V D.C. and 5 Amp. At 240V A C.

2.6 In addition to the alarm points mentioned above, any other alarm point, if required for battery and charger, shall be provided.

In addition to above requirement, each section of battery charger shall have at least two (2) nos. spare annunciation channels and window facia.

3.0 LIST OF INDICATIONS

The indications to be provided on each float charger and float-cum-boost charger panel shall include but shall not be limited to:

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a) Charger power supply ON.

b) Charger D.C. output healthy.

c) Control supply ON.


3.2 The indications to be provided on the central panel of each charger set shall include but shall not be limited to:

a) Annunciation D.C. healthy.

b) Float cum boost charger in equalizing mode.

c) Float cum boost charger in boost mode


d) Float cum boost charger in float mode.

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ANNEXURE- C

BATTERY CHARGER SCHEME

For Battery charger scheme please refer to Vol-VI, ANNEXURE-II having drawing number: 2011107/EE-BC-SCH-03.


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VOLUME: IV

SECTION: 5

SUB-SECTION: E-9

ILLUMINATION SYSTEM


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1.00.0 CODES AND STANDARDS

Major standards, which shall be followed, are listed below. Other applicable Indian Standards even if not covered in the listed standard shall be followed.

- | | | |
|-----------------------|------------|-----------------------|
| a) IS- 1913 | h) IS-9224 | o) IS-2026 |
| b) IS-1977 | i) IS-2959 | p) IS-2099 |
| c) IS-10322
694 | j) IS-1248 | q) IS- |
| d) IS-8623 | k) IS-2705 | r) IS-1554 |
| e) IS-6064 | l) IS-4160 | s) IS-9537 |
| f) IS-8828 | m) IS-2713 | t) IS-5133 |
| g) IEC-598 | n) IS-800 | u) IS- 16107 (Q3-Cat) |
| V) IS- 16103 (Latest) | | |

2.00.00 DESIGN CRITERIA

2.01.00 Design Basis


2.01.01 All illumination to be LED type only in compliance with IS standards. The system provides lighting to all plant areas under scope of these package in addition it also provides lighting to selected areas during plant emergency conditions.

2.01.02 The system will be installed in an advanced industrial environment Equipment in some areas will be subjected to vibration, corrosive chemicals, oil/water vapour as prevalent in coal handling plants and in co-generation plants.

2.01.03 The design shall be such as to provide minimum lighting levels as specified for different areas.

2.01.04 The systems shall be suitable for operation on available power supply.

2.02.00 System Concept

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The lighting system shall comprise the following sub systems:-

2.02.01 Normal A.C. Lighting

This will be provided by A.C lighting fixtures distributed throughout the plant. These lights will be ON as long as the plant A.C supply is available. The normal lighting fixtures will be fed from respective area lighting panels, which in turn will be connected to main lighting distribution board. The main lighting distribution boards will be fed through respective 1:1 ratio dry type lighting transformer, which forms a part of MLDB. Normal A.C supply thus made available by the MLDB is 415V, 3 phase, 4 wire, 50 Hz, effectively grounded. The exact location and distribution of fixtures shall however be finalized during detailed engineering stage.

2.02.02 Portable Emergency D.C Lighting (2x10W)

This will be provided in isolated building and areas where D.C supply is not available by self contained battery/automatic charger/inverter/flood lighting units. These portable emergency light units will be energized automatically on loss of normal A.C supply. It shall be provided with maintainace free Ni-Cd battery with 4 hours duration capacity.

2.02.03 Street/Area Lighting

Synchronous timers and photo cells shall be used for controlling street lighting or yard areas lighting with provision of manual overrides.


2.03.00 Ratings & requirements

2.03.01 All equipments and accessories shall be designed for continuous operation under site conditions without exceeding permissible temperature rise as stipulated in relevant standards.

2.03.02 Switch, fuses, Miniature circuit breakers (MCB), Bus-bars shall be fully rated for short circuit level at the point of application. MCB shall have backup HRC fuse, if its rating is less available short circuit currents.

2.03.03 All equipments and accessories shall have proper enclosure to suit the site conditions. Hazardous areas shall have flame proof enclosure.

2.03.04 All wiring from lighting panels to fixtures and receptacles shall be carried out by PVC insulated, inner and outer sheaths, armoured copper conductor cables and in special cases such as for concealed wiring by PVC wires in GI conduit.

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2.03.05 Heavy duty AYWY FRLS cables will be used only for connections:

- a) For main lighting board to area lighting panels
- b) From street/area lighting panel to street lighting poles/ towers.

2.04.00 Method of Calculations


2.04.01 Standard Lumen method shall be adopted for interior and exterior lighting in order to determine the number of lighting fixtures for obtaining the desired average level of Illumination.

2.04.02 The coefficient of utilization shall be considered to take care of Lumen loss due to:


- a) Effect of room dimensions
- b) Absorption of light in luminaries
- c) Adoption of light at various room surfaces i.e. ceiling wall etc.
- d) Floor cavity, ceiling cavity.
- e) Mounting Height.

2.04.03.1 A maintenance factor shall also be considered to account for the fall of illumination due to ageing, pollution like dust deposit etc. Maintenance factor to be considered for various areas shall be as follows :


2.04.04	<u>Area</u>	<u>Maintenance Factor</u>
	Control room	0.65
	Cable Gallery	0.55
	Switchgear/MCC Room	0.60
	General Indoor Area	0.55
	General Outdoor Area	0.50

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- 2.04.04 Lux level to be considered for various areas are given in Annexure-B
- 2.04.05 Voltage drop at the fixture from the MLDB bus shall not exceed 3%.
- 2.04.06 Circuit loading of each lighting panel shall be done in such a way that almost balanced loading in all the three phases is achieved.
- 2.04.07 At least to sub circuits shall be used for illumination of particular area.
- 3.00.0 SPECIFIC REQUIREMENTS
- 3.01.00 Lighting Fixtures
- 3.02.01 Lighting fixtures shall be designed for minimum glare. The surface finish shall be smooth, unobtrusive and scratch resistant.
- 3.02.02 Reflector shall be of sheet steel or aluminium, minimum 20 SWG thick, securely fixed by fastening device of captive type.
- 3.02.03 Fixture shall be suitable for 20mm conduit entry and 16SWG GI earth wire connections.
- 3.02.04 High Bay fixtures shall have provision for vibration damper to ensure rated lamp life. Cost of each damper shall be separately indicated.
- 3.02.05 Fixture shall be furnished completely with lamps and integrally/non integrally or separately mounted control gear and accessories as applicable for different types of fixtures. These shall include holders, ballast, capacitors, starters, ignitors etc.
- 3.02.06 Fixtures shall be fully wired up to respective terminal blocks suitable for loop in and loop out connections of PVC wires of following sizes :
- | | | | |
|----|---------------------|---|--------------------|
| a) | Lighting Fixture | : | 2.5mm ² |
| b) | Flood Light fixture | : | |
| | 2x2.5 mm | | |
- 3.03.0 Lamps
- 3.03.01 General Lighting Service (GLS) lamps shall be with clear glass and screwed caps.

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- 3.03.02 All fluorescent lamp shall be bi-pin rotary type and either cool daylight or white as per annexure. Lamp holder shall be spring loaded, low contact resistance type and shall have resistance to wear.
- 3.03.03 Mercury/Sodium vapour lamp shall be colour corrected type with screwed cap.
- 3.03.04 Lamps shall be suitable for use in position and capable of withstanding small vibrations. Restrictions and special features, if any, shall be clearly indicated in the bid.
- 3.03.05 Inside shed/ building, HPMV lamp to be provided and outside the building sodium vapour lamp may be considered.
- 3.04.00 Ballast
- 3.04.01 Ballasts shall be heavy duty, low loss, polyester-filled type with copper winding.
- 3.04.02 Ballast for mercury/Sodium vapour lamp shall be provided with suitable tapings to set the voltage within range specified,
- 3.04.03 Ballasts shall be free from hum. Ballasts, which produce humming sound, shall be replaced free of cost by the contractor.
- 3.04.04 In multi lamp, fixture, each lamp shall be provided with individual ballast.
- 3.04.05 Ballast windings shall have maximum operating temperature of 120°C without rated temperature rise marking.
- 3.05.00 Lighting panel/Distribution boards
- 3.05.01 Lighting distribution boards/panels shall be metal enclosed, cabinet type, fabricated from CRCA sheet steel minimum 2 mm thick, suitable for either wall/column mounting on brackets or floor mounting on channel sills.
- 3.05.02 Lighting distribution boards shall have provision of cable entry from bottom and, panels shall have free access to the terminal connections and easy replacement of parts. Front access doors shall have padlocking arrangements.
- 3.05.03 Two ground terminals shall be provided on opposite sides of each Lighting Distribution Board and lighting panel for connection to ground conductor.

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3.05.04 Each MLDB and Lighting panel shall be complete with designation and caution notice plates fixed on front cover and a directory plate fixed on inside of the front cover. This directory plate on the MLDB shall contain details of the Lighting Panels being fed from it including their designation, location, loading etc. The directory plate on the Lighting panel shall contain details of the points to be controlled by each circuit including the location of the point controlled, rating of the protective units and loading of each circuit.

The plates shall be of anodized aluminium with inscriptions indelibly attached on it.

3.05.05 Bus bar shall be electrolytic grade hard drawn Aluminium, colour coded for easy identification and design for a maximum temperature of 85°C. Minimum size shall be 25x6 mm.

3.05.06 Board/panel shall be fitted with phase barriers such that it is not readily possible for personal to touch the phase bus bars. Insulation barriers shall be preferably

be fitted around the circuit breakers such that only the surface and the toggle of the circuit breakers is available on the front.

3.05.07 Incoming and outgoing circuits shall be terminated in suitable terminal blocks.

3.06.00 Board/Panel Equipment


3.06.01 Each Mail Lighting Distribution Board shall consists of two dry type transformer housed via incoming triple pole switch. Outgoing feeder from the lighting distribution board shall have switch fuse units. Proper discrimination between outgoing fuse of lighting distribution board and downstream MCB of lighting panel should be ensured.

3.06.02 Each panel shall have an incoming triple pole switch fuse with neutral link and a number of outgoing miniature circuit breaker(MCB) as per annexure.

3.06.03 Board/panel access door shall be inter locked with incoming switch such that the door can be open only when the switch is in off position. Means shall be provided to defeat this inter lock.

3.06.04 All switches shall be heavy duty, quick make, quick break type. Fuses shall be HRC link type. Contactors shall be air break electromagnetic type. Push button shall be pushed to individual plug and switch as details in the annexure.

3.06.05 MCB shall be suitable for manual closing and opening and also automatic trip on overload and short circuit.

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3.06.06 Time switch in street light panel shall be clock switch type with on-off time setting facility which shall ensure respective on-off operation in every 24 hrs cycle. Voltmeter/Ammeter shall be of accuracy class 2.0 or better as per IS: 1248. Voltmeter/Ammeter selector switch shall be of reputed make.

3.07.00 Receptacles

3.07.01 Receptacles shall be heavy duty, complete with individual plug and switch.

3.07.02 The conduit box of the receptacle shall be provided with earthing screws with washer and nuts welded on the surface for grounding with 16SWG GI wire. Arrangement shall be provided inside the conduit box for grounding of third pin.

3.07.03 Shrouded type plug shall be provided with corresponding matching arrangement at sockets to prevent accidental contact with finger during plug insertion.

3.07.04 415V, 63A, TPN Welding sockets with switch shall be provided in the following areas:


- a) One(1) no. on each floor of Junction Houses.
- b) At 50Mtrs. Interval in conveyor galleries & yard conveyor (Receptacle shall be outdoor type).
- c) One (1) no in Room.

3.07.05 15/5A, 240V AC industrial type receptacles shall be provided in the following areas shall be provided in the following areas:


- a) Two(2) Nos. in each Switchgear/Control Room.
- b) At 30Mtrs. Interval in conveyor galleries.
- c) One(1) no. in each floor of the Junction House.

3.08.00 Switch & switch Board.

3.08.01 All switch board/boxes shall be of bent steel construction, fabricated of 14 SWG M.S. sheet with 6 mm thick bakelite cover with brass fixing screws.

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- 3.08.02 Switch boards/boxes located in control room and office areas shall be flush mounted type on brick wall with only the switch knob projecting outside.
- 3.08.03 Switch board/boxes shall have conduit knock outs on the sides. Adequate provision shall be made for ventilation of boxes.
- 3.08.04 Flush type receptacles where provided shall be so located that only the plug projects outside.
- 3.08.05 Switches shall have quick-make and quick-break mechanism operated by a suitable external handle complete with indicator.
- 3.09.00 Lighting Poles / Towers
- 3.09.01 Street Light Poles
- Street light poles shall be swaged and welded steel poles complete with facing brackets, weather-proof junction box and all other accessories.
 - The pole shall be coated with bituminous preservative paint on inside as well as embedded outside surface. Exposed surface shall be coated with two coats of metals primer (comprising red oxide and zinc chromate synthetic medium).
- 3.09.02 Flood Light Tower
- Flood light tower shall be a lattice structure with maintenance platform and approach ladder. All structural members and hardware shall be hot-dip galvanized.
 - Structure shall be designed for an additional load of 1500kg for maintenance crew. Deflection under maximum wind pressure shall not exceed 1 in 360. Structural design shall be as per IS-800 and subject to Purchaser's approval.
- 3.10.00 Maintenance Equipment
- 3.10.01 For the maintenance of lighting fixtures within the plant building, the contractor shall also supply two (2) nos. free standing adjustable aluminium ladder, adjustable from 5m to 10 m.
- 3.11.00 Special Requirement
- 3.11.01 All outdoor illumination fixtures, unless fed from photo cell/time switch controlled lighting panel, have to be provided with outdoor type local switches.

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3.11.02 In all the air filtration on units and air handling units one marine type lamp (of 100 Watt approx) shall be supplied and the wiring & fixing of the same has to be done by the contractor.

3.12.00 Lighting Cable & Wires

3.12.01 Lighting Cable shall be heavy duty 650/1100 Volt grade, multi core stranded aluminium conductor, HR PVC insulated, extruded PVC inner sheath single round G.I wire armoured and overall PVC sheathed to IS 1554.

3.12.02 Lighting wires shall be 650/1100 Volt grade PVC insulated stranded conductor, single core cable conforming to IS 694, colour coded as below:

RED	for	R-phase	BLACK	for	Neutral
YELLOW	for	Y- phase	WHITE	for	+ve D.C
BLUE	for	B- phase	GREY	for	-ve D.C


3.12.03 Wire size shall be as follows:

For point wiring beyond lighting panel i.e. from lighting panel to junction box (main run)	:	3core 6sq.mm Copper stranded conductor
For point wiring beyond lighting panel i.e. from lighting panel to junction box (main run)(for special cases such as for concealed wiring)	:	10 sq.mm Aluminium Copper stranded
From junction box to lighting fixture :		2.5 sq.mm Copper stranded conductor

3.13.00 Junction Boxes, conduits and Accessories

3.13.01 Junction box shall be of 16 SWG sheet steel, hot-dip galvanized, dust and damp proof, generally conforming to IP 55

3.13.02 Junction box shall be complete with gasketed inspection cover, conduit knock out (for conduit wires)/threaded hub and terminal blocks.

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3.13.03 Junction box for outdoor use shall be weather-proof IP55 and those for hazardous location shall be flame-proof type.

3.13.04 Junction box shall have the following indelible markings:

- Circuit Nos. On top
- Circuit Nos. with ferrules (inside) as per drawing.
- 'DANGER' SIGN IN case of 415 circuits.

3.13.05 Where conduit is used, conduits shall be rigid steel hot-dip galvanized, furnished in standard length of 3 meters threaded at both ends.

3.13.06 Where conduit is used , conduits up to and including 25mm shall be of 16 SWG and conduits above 25mm shall be of 14 SWG .Minimum size of conduits shall be 20mm.

3.14.00 Nameplate

Nameplate shall be furnished for identification of devices and circuits .All switches controls and indications shall be permanently and legibly marked in English as to clearly indicate their functions.

All light fixtures, receptacles, junction boxes etc. shall be properly marked up indelibly with corresponding circuit numbers.

3.15.00 Samples


Purchaser reserves the right to call for samples if considered necessary and the same shall be submitted by the Bidder free and without any obligation.

3.16.00 Testing Equipment

3.16.01 The Contractor will provide such checking and testing equipment as test lamp, buzzer, 500 volt megger, earth megger, lux meter etc.

3.16.02 Other testing equipment as required will be arranged by the purchaser. Alternatively, the Contractor may be asked to provide the same a mutually agreed rate.

3.17.00 Installation –General

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3.17.01 Installation work shall be carried out in accordance with good engineering practices and also manufacture's instructions /recommendation where the same are available.

3.17.02 Equipment shall be installed in a neat workmanlike manner so that it is level, plumb, square and properly aligned and oriented.

3.18.00 Lighting Fixtures

3.18.01 Continuous rows of fluorescent tubes shall be mounted on a continuous M.S angle for each row of lights.

3.18.02 Fixtures shall be mounted to maintain sufficient clearance from the overhead traveling crane trolley, if there is one.

3.18.03 Bracket for fixture mounting shall be fabricated at site from 40mm conduits with a reducing socket to suit the fixtures and clamped on to the handrails. The fixing shall be strong enough to withstand vibration and high wind velocity.

If a roof over platform is available, the fixture can be pendant mounted.

3.18.04 Flood lights shall be mounted on steel base facing the tentative direction shown on approved drawings. Fixing holes shall be provided with slot to turn the fixture about 5 Deg on both sides. Bolts shall be finally tightened with spring washer.

Terminal connection to the flood light shall be made through PVC coated flexible conduits.


3.18.05 The fixtures after erection shall be marked up indelibly with corresponding circuit number for easy identification of lamp circuit.

3.19.00 Street Lighting poles

Erection of Street Lighting poles where included in the scope of the contractor shall mean complete erection together with all its accessories including civil foundation work ,installing lighting fixtures ,wiring and cabling work.

3.20.00 Flood Lighting Tower

3.20.01 Erection of Flood Lighting Tower where included in the scope shall mean civil foundation work also.

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3.20.02 Contractor shall also mount assembled fixtures outdoor & lockable type isolating switch cubicle, install necessary cabling and wiring and make connections.

3.21.00 Cable /Conduit System

3.21.01 All armoured cables and in case of unarmoured cable, all conduits shall originate from the respective lighting panel and terminate in lighting fixtures, receptacles via junction boxes as required etc.

3.21.02 All armoured cables and exposed conduits shall be run in straight lines parallel to building columns, beams and walls as far as practicable. Unnecessary bends and crossings shall be avoided to present a neat appearance.

3.21.03 Cable /conduit supports shall be provided at an interval of 1000mm for horizontal runs and 750mm for vertical runs.

3.21.04 Cable /Conduit shall be clamped on to approved type spacer plates or brackets by saddles or U-bolts. The spacer plates or brackets in turn shall be fixed to the building steel by welding steel by welding and to concrete or brick by grouting as shown on drawings. Wooden plug inserted in the masonry or concrete for conduit support is not acceptable.

3.21.05 Embedded Conduit shall be securely fixed in position to preclude any movement. In fixing embedded Conduit, if welding or brazing is used, extreme care should be taken to avoid any injury to the inner surface of the conduit.


3.21.06 Spacing of embedded conduits shall be such as to permit flow of concrete between them and in no case shall be less than 40mm

3.21.07 Where conduits are run on cable trays they shall be clamped to supporting steel at an interval of 600mm .Cables on trays shall be clamped at interval of 750mm

3.21.08 For directly embedding in soil, the conduits shall be coated with an asphalt-base compound. Concrete pier or anchor shall be provided where necessary to support the conduit rigidly and to hold it in place

3.21.09 Conduits shall be installed in such a way as to ensure against trouble from trapped condensation.

3.21.10 Running threads shall be avoided as far as practicable .Where it is unavoidable, check nuts shall be used.

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3.21.11 Cables /conduits shall be kept, wherever possible, at least 300 mm away from hot pipes heating device etc .when it is evident that such proximity may impair the service life of cables .

3.21.12 Slip joints shall be provided when conduits cross structural expansion joints or where long run of exposed conduits are installed ,so that temperature change will cause no distortion due to expansion or contraction of conduit run.

3.21.13 For long run junction /pull boxes shall be provided at suitable intervals to facilitate wiring.

3.21.14 Conduits shall be securely fastened to junction box or cabinets, each with a locknut and insulated bushing inside the box and locknut outside. For cable, proper glanding shall be done.

3.21.15 Conduit joints and connections shall be made thoroughly water-tight and rust – proof by application of a thread compound which will not insulate the joints.

White lead is suitable for application on embedded conduit and red lead for exposed conduit.

No cable joint is permissible outside junction box.

3.21.16 The Battery Room installation shall be made with acid fume proof conduits, if conduit wiring is adopted.


3.21.17 Field bends shall have a minimum radius of four (4) times the conduit diameter. All bends shall be free of kinds, indentations or flattened surfaces. Heat shall not applied in making any conduit bend .For cables, the bending radius shall be minimum twelve (12) times the cable diameter.

3.21.18 The entire metallic conduit system, whether embedded or exposed shall be electrically continuous and thoroughly grounded.

3.21.19 Lighting fixture shall not be suspended directly from junction box in the main cable/conduit run.

3.21.20 Cable/Conduit and fittings shall be properly protected during construction period against mechanical injury. Conduits ends shall be plugged or capped to prevent entry of foreign material.

3.21.21 After installation conduits shall be thoroughly cleaned by compressed air before pulling in the wire.

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3.21.22 In control rooms and office areas provided with false ceiling conduit run shall be concealed type, embedded in the walls.

3.21.23 Lighting system cable routing shall be done in such way to give neat appearance and shall not cause any interference. Where too many cables are used in same route, appropriately secured perforated trays may be used for lightings cable only.

3.21.24 Wiring through cables shall be provided in outdoor areas, conveyor galleries, transfer points & Crusher House areas, whereas wiring through conduits shall be provided in indoor areas viz. Sub stations, MCC buildings etc.

3.21.25 Conduits shall be rigid steel, hot dip galvanized, furnished in standard length of 3 meters, threaded at both ends confirming to IS: 9537.

3.21.26 Conduits upto and including 25mm shall be of 16SWG and conduit above 25mm shall be 14SWG. Minimum size of conduit shall be 20mm.

3.21.27 Each piece of conduit shall be straight, free from blister and other defect and covered with capped bushing at both ends.

3.21.28 Flexible conduit shall be made with bright cold rolled annealed and electro galvanized mild steel strip and coated with PVC.

3.21.29 In corrosive area conduit shall have additional epoxy coating.


3.22.00 Wiring

3.22.01 Generally cable shall be used for lighting system wiring .In special cases such as for concealed wiring, wiring, shall be generally carried out by PVC wires in conduits. All wires in a conduit shall be drawn simultaneously. No subsequent drawing is permissible.

3.22.02 Wire shall not be pulled through more then two equivalent 90 bends in a single conduit run.

3.22.03 Wiring shall be spliced only at junction boxes with approved type connections or terminal strip. Maximum two wires can be connected to each way of the terminal block. Splicing of only one phase shall be done in a junction box.

3.22.04 For lighting fixtures, connection shall be teed off through suitable round conduit or junction box so that the connection can be attended without taking down the fixture.

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3.22.05 For vertical run of wires in conduits wires shall be suitable supported by means of wooden /hard rubber plugs at each pull / junction box.

3.22.06 A.C and D.C circuits shall not be run in the same conduit and junction boxes. Circuits fed from different transformers shall be run through different conduits and junction box.

3.22.07 Receptacle circuit shall be kept separate and distinct from lighting and fan circuits.

3.22.08 Separate nature wire shall be provided for each circuit .Wiring throughout the installation shall be such that there is no break in the neutral wire in form of switch or fuse.

3.23.00 Cabling

3.23.01 In outdoor areas ,main run lighting panels shall be means of AYWY cables, directly buried in ground or laid in trenches for the underground portion and through conduit for the over ground portion .

3.23.02 Buried cable shall be laid and covered with sand /riddle earth, and protected from damage by bricks at sides and pre-cast concrete slab at top.

Buried cable shall have cable markers at 50M interval and projecting 150 mm above ground .At cable bends and joints markers shall be provided.

3. 23. 03 When buried cables cross road / railway track, additional protection to be provided in form of hume / G.I. pipe.


3.24.00 GROUNDING

3.24.01 All lighting panels, junction boxes, receptacles, fixtures, conduit etc, shall be grounded in compliance with the provision of I.E. Rules.

3.24.02 Ground connections shall be made from nearest available station ground grid. All connections to ground grid shall be done by arc welding.

3.24.03 Panels / Boards shall be directly connected to ground grid by two nos. 35 x 6 mm G.I. flats (for panels) / two nos. 50x6 mm G.I. flats (for distribution boards).

3.24.04 All junction boxes, receptacles, lighting fixtures etc. shall be grounded with 16 SWG G.I. wire.

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3.24.05 Each street lighting Pole shall be grounded at two points by two nos. 50x6 mm G.I. flat risers from two (2) nos. earthing spike 40 mm dia & 3m long directly driven into ground at a depth of 1m from ground level. The junction box at each lighting pole is grounded at two (2) points from two (2) no's earthing terminals by 16 SWG GI wire. One 16 SWG G. I wire shall be taken up to the junction box from lighting fixtures and connected to grounding point.

3.24.06 Two (2) nos earthing spike 3m long & 40 mm dia directly driven into ground at a depth of 1m from ground level shall be provided for each flood lighting tower. The sheet steel cubicle housing the power supply Isolator at base of flood lighting tower shall be connected at two (2) points from these earthing risers by 16 SWG G. I. wire - The flood lighting fixtures shall be grounded by one (1) 16 SWG G. I wire running through the lighting conduit up to the distribution box.

Two (2) nos separate spike of 3m long & 40 mm dia directly driven into ground at a depth of one (1) m from ground level shall be provided for connection of the lightning mast on top of flood lighting tower through two (2) nos 50x6 mm G. I. flat down conductor.

3.24.07 A continuous ground conductor of 16 SWG G. I. wire shall be run all along each conduit run and bonded to it every 600 mm by not less than two turns of the same size of wire. This conductor shall be connected to each panel ground bus.

All junction boxes, receptacles, fixtures etc. shall be connected to this 16 SWG ground conductor.

3.25.00 FOUNDATION & CIVIL WORKS


3.25.01 Equipment foundations panel foundations and all other civil work will be provided by the Contractor.

3.26.00 Excavation and Back Filling

3.26.01 The Contractor shall perform all excavation and backfilling as required for buried cable and ground connections.

3.26.02 Excavation shall be performed up to the required depth. Such sheeting and shoring shall be done as may be necessary for protection of the work.

3.26.03 The Contractor shall make use of his own arrangements for pumping out any water that may be accumulated in the excavation.

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3.26.04 All excavation shall be backfilled to the original level with good consolidation.

3.27.00 Steel Fabrication

3.27.01 All supports, hangers & brackets shall be fabricated by the Contractor. Necessary steel shall be supplied by the Contractor.

3.27.02 Steel for fabrication shall be straightened and cleaned of rust and grease. All fabrication shall be free of sharp edge.

3.28.00 Painting at site

3.28.01 Street light poles shall be given two coats of aluminium paints after installation.

3.28.02 All steel fabrication shall be given two coats of red oxide primer followed by two coats of battleship grey shade 632 of IS-5.

3.28.03 All equipment shall be given touch-up paint as required after installation.

4.00.00 TESTS

4.01.00 Shop Tests


4.01.01 All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant Indian Standards at manufacturer's works.

4.02.00 Site Tests

4.02.01 Contractor shall thoroughly test and meggar all cables, wires and equipment to prove that the same are free from ground and short circuit.

4.02.02 If any ground or short circuit is found, the fault shall be rectified or the cable and/or equipment replaced.

4.02.03 It should be established to the satisfaction of the Purchaser that illumination in different areas are as per designed Lux level.


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ANNEXURE-A


1.0 **TYPES OF LIGHTING FIXTURES** (Only LED type will be applicable)

SL NO.	Type	Wattage/Voltage	Description
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- | | | | |
|-----|----|---|---|
| 1.1 | A | 1x100WGLS | Bulk head fixture: Die cast aluminium body, stove enamel finish, with prismatic glass neoprene gasket and galvanized wire guard, for protection to glass cover. The housing should have 20 mm conduit threaded entry & fixing lugs for ceiling / wall mounting. |
| 1.2 | B | 1x100W COMPTALUX | Recessed fixture: Spun aluminium body, painted black inside with primer coated outside, internal mirror reflector for flood light effect, with mounting bracket. |
| 1.3 | CA | 1x100W GLS &rainproof, stove enamel sheet aluminium, resistant well glassfitted gasket, galvanised wire | Well glass fixture:Dust-tight die cast aluminium body finish, canopy made of screw neck, heat with neopr enc guard, pendant mounting. |
| 1.4 | | CB | 1x100GLS Well glass fixture: Similar to CA but suitable for platform mounting. |
| 1.5 | DA | 2x36W FLUORESCENT | Industrial fixtures: Sheet steel body, open end trough reflector, vitreous enamel finish, pendant mounting The CRCA sheet steel mounting channel with knockouts suitable for 20 mm conduits should be provided with all accessories like ballast, lamp holder, starter holder & starters. |
| 1.6 | DB | 2x36 FLUORESCENT mounting. | Industrial fixtures: Similar to DA but suitable for cantilever type bracket |

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- 1.7 EA 2x36 FLUORESCENT Totally enclosed fixtures: Dust and drip proof sheet steel housing, stove enamel finish with clear acrylic cover , pendant mounting by 20 mm conduits. Gear made of sheet steel accommodates all electrical accessories such as ballasts, clickfix lamp holders, capacitor duly wired up to the connector block. Gear tray is the housing with screw & self-retaining washer.
- 1.8 EB 2x36 FLUORESCENT Totally enclosed fixtures similar to EA but suitable for cantilever type bracket mounting.
- 1.9 F 2x36 FLUORESCENT Corrosion proof fixtures: Fibre glass reinforced polyester(FRP)canopy with gasket, CRCA sheet steel stoveenameled gear tray with all electrical like ballasts, starters, starter holders, insert contact rotor lamp holders, power factor improvement capacitor and clear acrylic cover ceiling/wall mounting.
- 1.10 G 2x36 FLUORESCENT Decorative fixtures: CRCA stove enameled housing which accommodates all electrical accessories like ballasts, clickfix lamp holders, starter holder, starters, power factor improvement capacitor etc provided up to a terminal block, electro – chemically brightened anodised aluminium mirror assembly as reflector, anodised aluminium lamellae louver, pendant or ceiling mounting .
- 1.11 H 2x36 FLUORESCENT Recessed fitting: Decorative fixture with CRCA sheet steel housing, stove enamel finish & housing all electrical accessories pre-wired up to a terminal block, parabolic mirror assembly made of high purity aluminium sheet duly anodized and electro-chemically brightened and fitted with aluminium lamellae painted white .

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1.12 J 1x125W HPMV Flame-proof fixture: Integral flameproof well glass fixture in cast aluminium housing made of corrosion resistant LM-6 alloy finished with epoxide stove enamel, heat resistant and toughened well glass suitable

for use in hazardous areas, ceiling/wall mounting.

1.13 LA 1x70W HPSV Industrial well glass fixture: Dust and jet proof die cast aluminium body, stove enamel finish, canopy made of sheet aluminium, screw neck, heat resistant well glass fitted with neoprene gasket, galvanized, wire guard pendant mounting with control gear box.


1.14 LB 1x70W HPSV Industrial Well glass fixture: Similar to LA but suitable for platform mounting.

1.15 MA 1x250W HPSV Highbay fixture: Industrial open version high-bay luminal re, die-cast aluminium housing accommodating vibration proof lamp holder, die-cast aluminium mounting tray accommodating ballast capacitor and igniter all pre-wired up to the terminal block, electro-chemically brightened and anodised reflector, pendant mounting.

1.16 MB 1x250W HPSV Highbay fixture: Similar to MA except it is a closed version.

1.17 MC 1x250/1x150W HPSV Closed Industrial Medium Bay Luminaire: with anodised aluminium Wide beam reflector and vibration Proof . Holder, die cast aluminium housing and mounting tray accommodating ballast capacitor and igniter, brightened and anodized aluminium reflector, flat toughened glass cover, pendant mounting.

1.18 N 1x250W HPSV Street light fixture: Weather proof, die cast aluminium preferably A6 grade housing stove enamel finish, anodized and electrochemically brightened high purity aluminium


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reflector, single piece clear molded & gasketted cover, control gear box compartment accommodating ballast power factor improvement capacitor, ignitor etc all pre-wired to the terminal block..


- 1.19 PA 2x250W HPSV Flood light fixture : Weather proof, cast aluminium housing and control gearbox, anodised and electrochemically brightened high purity aluminium reflector, heat resistant toughened glass with EPR gasketing, complete with hot dip galvanised mounting bracket, a graduated disc for proper aiming of the luminaire.
- 1.20 PB 2x400W HPSV Flood light fixture: Similar to PA type described above with 2x400 W HPSV Lamps.
- 1.21 PC 1x400WHPMV Flood light fixture: Weather-proof, cast aluminium, sheet aluminium reflector anodised & polished inside, heat resistant glass with gasketing complete with hot dip galvanized mounting bracket, graduated disc to facilitate aiming of the luminaire after mounting.

2.0 LIGHTING BOARD/PANEL

- 2.1 MLDB 415V A. C. Indoor type Lighting distribution board with transformer (details in Annexure-C), 415V, 250A. 3 ph, 4 wire bus, one 250A triple pole switch as incomer, 8 Nos. 100A, TP & N switch and fuse as outgoing feeders.
- 2.2 DCLP 110V D.C Lighting distribution board, with 110V,32A,2 wire bus, one 32A double pole switch as incomer, 8 Nos. 10A, DP switch and fuse as outgoing feeders.

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- 2.3 LP-1 415V A.C. Indoor type Lighting Panel with 415V, 100A, 3 ph, 4 wire bus, one (I) no. 100A TP & N switch as incomer, 18 nos. 20A, 240V, 1 pole MCBs / SFUs as outgoing feeders.
- 2.4 LP-2 415V A.C. Indoor Lighting panel with 415V, 3ph, 4W bus & one 63A TP & N switch as incomer and 12 no's 20A 240V 1 pole MCBs / SFUs as outgoing feeder.
- 2.5 LP-3 415V A. C. Indoor type Lighting Panel , with 415V, 63 A, 3 ph, 4 wire bus, one (1) no. 32 A TP & N switch as incomer, 6 nos. 20A, 240V, 1 pole MCB's as outgoing feeders.
- 2.6 SLP 415V A. C. Outdoor type Panel with 415V, 100A, 3 ph, 4 wire bus, one 100A TP & N switch as incomer, 18 nos. 20A, 240V, 1 pole MCB's as outgoing feeders. The lighting panel shall be provided with 63A contactor, frequency compensated timer Switch, photo-cell switch push buttons for automatic control of street area lighting, with provision for manual override.
- 2.7 FLP Outdoor, lockable type Isolating switch of 415V, 32A. 3 ph, 4 wire TP & N with 2mm sheet steel cast iron cubicle.

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ANNEXURE-B

ILLUMINATION LEVELS

SL.NO	LOCATION	LUX LEVEL _____ (LUX) .
1.	Switchgear /MCC Room	200
2.	Control Room	300
3.	Battery Room	100
4.	Maintenance Room	200
5.	Pump House	150
6.	Conveyor Gallery	70
7.	Cable Celler	100
8.	Junction/Transfer/Crusher house	100
9.	Toilet/Passage	70
10.	Indoor/Outdoor Stairs	70
11.	Transformer Yard	20
12.	Street Light	20

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ANNEXURE-C

LIGHTING TRANSFORMER

RATINGS AND REQUIREMENTS


Type	:	NOMEX TYPE
KVA rating	:	100KVA depending on load
Voltage rating	:	415 V/415 V
Cooling	:	AN
P.U. Impedance	:	0.04 ± 10%
Voltage control	:	Off load tap switch /link with change of ± 5% in step of 2.5% tapping full capacity.
Vector Group	:	Dyn 11
Class of insulation	:	B (70Deg.C)
Maximum Temperature rise over 50Deg.C ambient in winding by resistance	:	70 Deg.C

Neutral : Solidly grounded

The secondary neutral of the transformer shall be brought out for getting a grounded 4 wire supply. Each transformer shall be routine tested and one transformer shall be type tested in accordance with relevant standard.

The transformer shall be liable for rejection if the tolerance on the quoted values of losses impedance, temperature rise, etc .exceeds the specified values of relevant standard.

The transformer shall be mounted inside sheet steel enclosure, which shall be an integral part of Lighting Distribution Board.

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ANNEXURE-D


LIGHTING TRANSFORMER

FITTINGS AND ACCESSORIES

Each transformer shall be equipped with fittings and accessories as listed below

1. 150mm dia, winding temperature indicator with maximum reading pointer and electrically separate sets of contact for trip and alarm.
2. Handling and lifting lugs both for enclosure and core-coil assembly.
3. Jacking pad for core-coil assembly.
4. Inspection covers for cable and box.
5. Door handle operated safety limit switch with 1NO +1NC contacts .
6. Ground bus.
7. IP-54 junction box.
8. Rating and terminal marking plates.


Note: All indication, alarm, trip contacts provided shall be rated for 0.5A at 220V D.C and 5A at 240V A.C.

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ANNEXURE- E

ILLUMINATION NOTES AND DETAILS

For Illumination Notes and Details please refer Vol: VI, ANNEXURE – II, having drawing number: 2011107/EE/ILLU-N&D/01.


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VOLUME: IV

SECTION: 5

SUB SECTION: E-10

**ERECTION, CABLING, GROUNDING AND
LIGHTNING PROTECTION SYSTEM**

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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NOTES AND DETAILS OF
CABLING, GROUNDING AND
LIGHTNING PROTECTION
SYSTEM

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1.00.00 CODES AND STANDARDS

Motor standards which shall be followed are IS:3043 ,IS:2309,IEEE:80,IS :2629,IS:9537 ,IS:3480 ,IS: 1239 and IS :4985.

2.00.00 DESIGN CRITERIA

2.01.00 Grounding System.

2.01.01 The main objectives of grounding system are:

- To provide safety to personnel from contact of dangerous potential caused by ground fault.
- To ensure sufficient grounding current for effective relaying
- To stabilize circuit potential with respect ground


2.01.02 The major aspects to be considered for grounding system design are given below:

2.01.03 Ground Grid Conductor

- Ground grid conductor of mild steel rod shall be used.
- The minimum conductor section is determined on the basis of ground fault current .The section is then increased by an allowance to account for the soil corrosion loss of 0.3 mm per year over the design life of 30 years
- The ground grid shall be designed to keep the touch and step voltage within safe limits as per recommendation of IEEE-80.
- The ground grid conductors will be buried in each at a minimum depth of 1000mm .The length of ground conductors below earth will be sufficient to ensure a ground resistance less then one (1) ohm
- All ground grid conductor connections will be welded type

2.01.04 Above Ground Connections

- Galvanized steel flats shall be used for all risers from ground grid conductor and all connections above earth.

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- b) Inside building starting from the risers ground conductors will be run for each floor supported on building steel and/or cable trays .Risers from ground grid conductor shall be connected to the nearest building column/structure.
- c) Two separate and distinct ground connections will provided for each electrical equipment in compliance with I.E Rules
- d) All connections above ground will be welded type except connection to equipment/structures which shall be bolted type

2.01.05 Equipment Ground Lead

Equipment ground connections will be sized to carry the available ground fault current .Considerations shall also be given to mechanical ruggedness of the connections and to limit the number of sizes


2.01.06 The minimum ground conductor sizes for various equipment and structures shall be as given below:

<u>NAME</u>	<u>SIZE</u>		
a) Ground grid conductor : 40mm dia .MS rod			
b) Main risers from ground grid conductor	: 50x6 mm GS flat		
c) Structures, MCC, Distribution Boards : 50x6 mm GS flat above 75 KW.		MLDBs,	Motors
d) Local Panels, Lightning Panels, Rotor Starters : 35x6 mm GS flat Motors above 30 KW up to 75KW.			
e) Control desk , small distribution Boards : 25x3 mm GS flat Motors above 5 KW up to 30KW.			
f) Push Button Stations ,Junction Boxes, : 8SWG GS wire above 5 KW up to 30KW.			Motors

2.02.00 Lightning protection System:

2.02.01 The main purpose of lightning protection system. are:

- a) To provide protection to structure from lightning strokes

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b) To provide low resistance conducting path to lightning discharge.

2.02.02 Lightning protection .will also be provided for building/structures where the calculated risk index exceeds 40

2.02.03 For metal structures which are electrically continuous down to the ground level, no lightning protection is required except adequate grounding connections.

2.02.04 The system design for lightning protection shall be based on the following:

- a) Air termination network with down conductors and earthing electrodes will be provided on the basis of IS Code of Practice.
- b) Horizontal air termination shall be so laid out that no part of the roof will be more then 9 meters from the nearest conductor.
- c) Shielding angle for one vertical air termination shall be 45 degrees .For more then one, shielding angle between the rods shall be taken as 60 Degrees.
- d) Down conductor will run along the outer surfaces of the building and shall have a test joint about 1meter above ground.
- e) An earth electrode will be provided at the connection point of the down conductor with the station ground
- f) Galvanized steel rods and strip will be generally used for air termination and connections. All connections will be welded type.


2.03.00 Cabling system

2.03.01 Cables will generally be laid on cable trays either in concrete trenches or overhead supported from building steel/structures .Cable shall be run in concrete trenches in the electrical rooms at ground level housing switchgear/MCC .

2.03.02 For inter plant connections, the cable shall be routed through an overhead cable bridge/ pipe cable bridge

2.03.03 For underground crossing of railways. road etc additional protection shall be provided in form of hume pipe or concrete rigid steel conduits (duct bank.)

2.03.04 Suitable embedded steel inserts shall be provided on wall/ floor/ ceiling surfaces for welding of cable tray bracket in order to make the cable tray system withstand

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horizontal/ vertical accelerations due to seismic forces for indoor trays and also wind load for outdoor trays in addition to normal tray cable loading.

2.04.00 All election work to be carried out under this specification shall conform to the notes and details given in Annexure –A to this specification.

3.00.00 SPECIFIC REQUIREMENT SUPPLY

3.01.00 Site-fabricated Cable Trays

3.01.01 Cable trays shall be ladder type made of GI sections.

3.01.02 Cable trays shall be of standard width of 600 mm and 300 mm .Other details shall be as per attached drawings.

3.02.00 Conduits and Accessories

3.02.01 Conduits diameters up to and including 25mm size shall be of 16 SWG and conduits above 25mm diameter shall be of 14 SWG .Minimum diameter of conduits shall be 20mm.

3.02.02 Steel conduit with interior coating of silicon epoxy ester for ease of wire/cable pulling shall be seamed by welding and flo-coat metal conduit/hot-dip galvanized. These shall be supplied in standard length of 5meters with minimum wall thickness as specified in IS: 9537. In chemical handling areas, battery room etc, and the exterior surface shall be further coated with chromate and polymer for better resistant to corrosion. Conduits, fitting and accessories shall have ISI mark.


3.02.03 For sizes above 63mm mild steel pipes of heavy duty class as per IS: 1239 with necessary fittings & accessories all having ISI mark shall be provided and installed by the contractor. Pipes fittings and accessories shall be not dip galvanized both on inside and outside.

3.02.04 Flexible conduit shall be in accordance with IS: 3480. They shall be made with bright, cold-rolled, annealed and electro-galvanized mild steel strips.

3.02.05 Rigid PVC conduits shall comply with IS: 4985.

3.03.00 Junction Boxes

3.03.01 Junction boxes shall be of 16 SWG sheet hot-dip galvanized, out-door type, dust vermin and damp proof, generally conforming to IP 55.

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3.03.02 Junction boxes shall be complete with neoprene gasketed inspection cover, conduit knockout, terminal blocks and painted with one coat of red oxide primer and two finishing coats of light gray(shade 631 of IS: 5) synthetic enamel paint.

3.03.03 Junction boxes for outdoor use shall be of weather proof design and those for hazardous location shall be flame proof type. Outdoor junction boxes shall be epoxy painted.

3.03.04 Junction boxes shall be of two types viz. one suitable for control wiring and the other with terminals for power cable termination. Junction boxes for power cable termination shall have minimum nine (9) nos. of terminals. Terminals shall be suitable for the cable size involved.

3.03.05 The junction box shall be marked with:

- a) Circuit nos. on top by white stenciled paint at site.
- b) Circuit nos. with ferrules (inside) as per approved drawing.
- c) Danger sign in case of 415V circuit.

3.03.06 Junction boxes shall be provided with two nos.(2) earthing terminals .

3.04.00 Cable Termination & Jointing Kits

3.04.01 Straight-through joints of H.T and L.T cable shall be of Tapex /Paracast /Parawrap type .The end termination kits for H.T cable shall be of Raychem /3M / Elastimold type .Cable joint or end-terminations on Electrical equipment shall be suitable for indoor & outdoor use as the case may be.


3.05.00 Cable Glands

3.05.01 Cable glands shall be tinned brass gland, double compression type complete with necessary armour clamp and tapered washer etc.

3.06.00 Cable Lugs

3.06.01 Cable lugs shall be of following types :

- i) Aluminium tubular terminal end for solderless crimping to aluminium conductors.
- ii) Copper tubular terminal end for solderless crimping to copper conductors.

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Solderless crimping of terminals shall be done by using corrosion inhibiting compound .Lugs for control/ instrumentation cable shall be PVC insulated /sleeved type.

- iii) Cable lugs for control cable termination shall be pin type/ flat type /ring type /U type to suit the terminals provided in the panels.

4.00.00 INSTALLATION

4.01.00 Cable Trays

4.01.01 The Cable trays shall be supported in general at a span of exceeding 1.25 meter horizontally and 1.0 meter vertically.

4.01.02 Sufficient spacing not less then 250mm shall be provided between trays and maintained to permit adequate access, for installing and maintaining the cables.

4.01.03 Cable trays /conduit system shall be electrically continuous and grounded.

4.01.04 Different voltage grade cables will be laid in separate trays when trays are run in tier formation .Power cable will normally be on top trays and control /instrumentation cable on bottom trays.

4.02.00 Cable and Conduits

4.02.01 Approved drawings shall be strictly followed except where obvious interference occurs. In such cases the routing shall be changed as directed and /or approved by the Engineer-in charge.


4.02.02 The contractor shall also maintain and submit when requested, a record of cable insulation value when drawn from store, after laying, before and after termination /jointing.

4.02.03 Where direct heat radiation exists, heat isolating barriers, shall be adopted for cabling system.

4.02.04 Cabling /wiring in offices ,control rooms etc shall be taken through concealed G.I or rigid PVC pipes as directed by the purchaser's Engineer .

402.05 At certain place where hazardous fumes /gasses may cause fire to the cable, cable trenches after installation of cables shall be sand filled.

4.03.00 Conduit and Accessories

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4.03.01 Conduit /pipes shall be used only in short lengths in certain areas where required and /or directed by the Engineer-in charge.

4.03.02 Conduits shall be flexible type in general for connection from embedded conduit /pipes to motor terminal and also to any equipment with high vibration level or which requires regular removal .However, rigid type steel conduit if required shall also be supplied by the Contractor.

4.03.03 Except for inside an enclosure wherever the cable enters or leaves the conduit. The conduit end shall be sealed by suitable sealing compound. having fire withstand capability .

4.03.04 The entire metallic conduit system, when embedded or exposed shall be electrically continuous and grounded.

4.03.05 Where it is possible for water or other liquids to enter conduits, sloping of conduit runs and drainage of flow points shall be considered.

4.03.06 Pull boxes will be installed between termination points where required to facilitate cable pulling, but at a maximum interval of 30 meters.

4.03.07 Conduits shall be firmly fastened within 900 mm of each junction box/pull box /cabinet /fitting etc .Conduits shall be supported at least every 2000 mm (2 meters).


4.03.08 Rigid PVC conduits conforming to IS: 4985 shall generally be used for control and instrumentation cable in some areas where cable trays do not exist and where the runs are straight ones generally the PVC pipes with special Bell Mounting shall be of 110mm ,160mm ,&200 mm outside diameter and shall be suitable for working pressure of 6 kg /sq.cm .The length of each pipe shall be 5 to 6 meters .Necessary fittings and accessories as may be required for the installation shall also be provided .

4.04.00 Cable Laying

4.04.01 Cable laid on trays and risers shall be neatly dressed and clamped with self-locking type fire resistant nylon interval of 750 mm for horizontal and vertical runs ,in case of both power ,control and instrumentation cables .

4.04.02 All single core power cable for 3ph .A.C circuit shall be laid in trefoil formation and suitably clamped with self-locking type fire resistant nylon ties at an interval of 750 mm.

4.04.03 All H.T multicore power cables and L.T multicore power cable with cross-sectional area including & above 95 sq.mm shall be clamped individually by self locking type fire resistant nylon ties.

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4.04..04 L.T power cable of cross-sectional area less then 95 sq.mm and all control and Instrumentation cable shall be clamped in bunches with self-locking type fire resistant nylon ties .The number of cable in one bunch shall not exceed eight(8).

4.04.05 Prior to laying of cables inside the indoor and outdoor trenches, the contractor shall properly clean the trenches.

4.04.06 In outdoor areas, buried cables shall be laid and covered with sand /riddled earth and protected from damage by bricks at sides and precast slab at top

4.04.07 When buried cables cross road /railway track, adequate protection shall be provided in the form of hume/ galvanized iron pipes laid at a minimum depth of 1 meter below ground.

4.04.08 After completion on installation and prior to connection, all power cable shall be subjected to a high potential test.

4.05.00 Cable Tags & Markers

4.05.01 Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedules. Cable and conduit shall be tagged at their entrance, bends, every 30 meters and exit from any equipment, junction box .When a cable / conduit passes through a wall, tags shall be fitted on both sides of the wall.

4.05.02 The tags shall be of aluminium with the number punched on it and securely attached to the cable by not less then two turns of 16 SWG G.I wire .For single core cable the wire shall be of non magnetic material.


4.05.03 The location of cable joints, if any shall be clearly indicated with cable market with an additional inscription cable-joint.

4.05.04 For buried cable the marker shall be clearly indicated with cable marker with an additional inscription cable-joint.

4.06.00 Cable Termination and Connection

4.06.01 Control /instrumentation cable cores entering a panel enclosure shall be neatly bunched and served with PVC perforated type to keep it in position at the terminal block.

4.06.02 The Control shall put ferrules on all control cable cores in all junction boxes and at all terminations. The ferrules shall carry terminal number as per drawings .All ferrules shall be coloured plastic & interlocked type.

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4.06.03 Spare cores shall be similarly ferruled, crimped with lug and taped on the ends, spare cores shall be ferruled with individual cable number.

4.06.04 All cable entry points shall be properly sealed and made vermin and dust proof. Unusual opening if any, shall be effectively closed .Sealing work shall be carried out with approved sealing compound having fire withstand capability for at least three hours.

4.07.00 Grounding

4.07.01 For cable trays, a separate ground conductor (50x6 mm G.S flat) shall run along the entire length of each route of cable tray being suitably clamped on the cable tray. Individual cable trays of each section shall be connected to above ground conductor through 50x6 mm G.S flat to maintain continuity of ground path.

4.07.02 All ground conductor connection shall be made by electric arc welding /brazing unless otherwise specified .Ground connections shall be made from nearest available ground grid risers.


4.07.03 All ground conductors shall be painted black for easy identification.

4.07.04 Equipment ground connection after being checked and tested by the Engineer shall be coated with anti-corrosive paint.

4.07.05 Whether specifically shown or not ,all conduits ,trays ,cable armour cable end box, electrical equipment such as motors ,switchboards ,panels ,cabinets ,junction boxes, lockout switches ,fitting ,fixtures etc, shall be effectively grounded .

4.07.07 Risers shall be 50x6 mm GS flat brought above ground level from the 40 mm MS rod ground conductor below grade .The riser shall be properly clamped or supported along the outer edge or the concrete foundation and connected to the face of the concrete /steel column following the arrangement shown in enclosed drawings. The 50x6 mm GS flat including the welded joints at both ends shall be painted with anti-corrosive paints.

4.07.08 All columns are required to be grounded by 1 no. of 50x6 mm GS flat ground grid.

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ANNEXURE-A

NOTES AND DETAILS FOR CABLING SYSTEM GROUNDING

AND LIGHTNING PROTECTION SYSTEM

1.0.00 NOTES AND DETAILS FOR CABLING SYSTEM

1.01.00 General

1.01.01 These notes and details shall be read and construed in conjunction with Specification and the drawings meant for cable tray details and supporting arrangements in Trench, Racks etc. enclosed elsewhere. In case of conflict between these notes and drawings, the letter shall prevail.

1.01.02 The cable system installation work shall conform to the requirements of the latest revisions of the following standards /codes

- a) Indian Electricity Rules, 1956 with up to date amendment
- b) I.S code of practice

2.00.00 CABLE ROUTING/LAYING


2.01.01 Cable shall be generally be laid on ladder type cable trays either in trenches or overhead supported from building steel /structures except in some cases cable may have to be laid underground and for short runs in conduits for protection or crossing.

2.01.02 For interplant connections, the cable will be routed through overhead cable racks.

2.01.03 For underground crossing of railways, roads etc. hume pipes shall be used and shall be laid at a depth of minimum 1000 mm such that cable shall not be damaged.

2.01.04 In boiler area ,trench will be avoided as far as practicable .The cable racks shall be supported fro Boiler structure in vertical configuration with suitable cover to avoid deposition of coal dust as far as practicable .

2.01.05 Different voltage grade cables shall be laid in separate trays when trays are arranged in tiers .Power cable shall be on top trays and Control/Instrumentation cable

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on bottom trays and it is recommended that trays for cable of different voltage levels be stacked in descending order with high voltage level above .

2.01.06 Cable for redundant equipment /system shall be run in separate trays in separate route.

2.01.07 Low level signal cable and other special Instrumentation and Control cable shall run in separate trays .In general ,a minimum of 15000 mm clearance shall be maintained between these cables and noise generating equipment (large motors ,generators ,transformers etc .)

2.02.00 Cable Trays /Supports

2.02.01 Cable trays and covers shall be ladder type constructed from MS angle and flats as per drawings.

2.02.02 Cable tray supports shall be cantilever type for each installation.

2.02.03 Standards cable tray width shall be 600 mm .However trays with 800, 450 and 300 mm width may be used in some place considering the requirement and space restrictions.

2.02.04 Cable trays shall be ladder type with 250mm rung spacing.

2.02.05 All weld for cable tray supports shall have a minimum throat thickness of 6 mm

2.02.06 Cable trays in areas subjected to excessive coal dust or mechanical damage will have hot-dip galvanized sheer metal tray cover installed on front tray in vertical run and inverted V type on upper tray in horizontal run.


Where covers are used on trays containing power cables, consideration should be given to ventilation requirements .Areas where corrosive chemicals are likely to be handling, cable tray and covers shall be epoxy painted.

2.03.00 Conduits

2.03.01 Conduit runs shall be supported at an interval of 750 mm for vertical run and 1000 mm for horizontal run.

2.03.02 Conduit shall be sized so that conduit fill (ratio of total cable area to conduit area) shall not exceed the following:


One Cable : 53%

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Two Cable : 31%

Three Cables & up : 40%

- 2.03.03 Conduit runs shall be provided with necessary bends as required.
- 2.04.00 Installation
- 2.04.01 The Contractor shall install, terminate and connect up all cable and conduits with supporting arrangements as per drawings, cable schedules and interconnection chart /drawings.
- 2.04.02 The HV power cable shall be laid in trays or racks as follows:
- In single layer only.
 - 3 core cable to be laid giving one diameter gap of the largest diameter adjacent cable.
 - Single core cables to be laid in trefoil formation with spacing equal to diameter of the trefoils.
- 2.04.03 1100V grade power cable shall be laid in single layer in trays.
- 2.04.04 1100V grade power cable shall be laid giving one diameter gap of the largest diameter adjacent cable.
- 2.04.05 Control and instrumentation cable can be laid up to a maximum of three layers in each tray.
- 2.04.06 The trays shall be run with a vertical spacing of 300 mm for overhead cable trays as well as inside cable trenches .A minimum of 225 mm clearance shall be provided between the top of tray and beams, cold piping 500mm clearance for hot piping /object to facilitate installation of cable in tray .Minimum spacing between consecutive tiers of horizontal cable trays (both overhead as well as in trenches) shall be 400 mm for 45 KV grade cable.
- 2.04.07 Adequate pull boxes shall be provided in conduit run to facilitate cable pulling in long runs and also to ensure that there will be no more then 270 Deg .bends between pull points.

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2.04.08 Cable trays/conduit system shall be installed to accommodate cable manufacturer's recommended maximum pulling tension and minimum bending radius.

2.04.09 All openings in the floor and wall for cable access shall be sealed after installation of the cable system with non-inflammable materials, as follows:

- i) Fire stop /Penetration seal shall be installed in the cable spreaders and cable raceways.
- ii) Similarly in the trenches fire stop /penetration seals shall be provided at suitable interval to avoid spread of fire.
- iii) For all H.T, L.T Relay and Control panels, Control desk, instrumentation panels, fire-stop should be provided below base plate.

2.04.10 All floor/wall openings for cable entry to the electrical equipment and accessories shall be sealed with non-inflammable materials, after completion of cable installation .Thickness of such materials, after completion of cable installation .Thickness of such materials shall be equal to the thickness of floor/wall unless specified otherwise.

2.04.11 The portion of galvanized steel, which if required undergoes any welding at site shall be coated with two (2) coats of cold galvanizing anti-corrosive paint after welding.

2.04.12 The cable shall be coated with fire protection coating as specified elsewhere.


2.05.00 Identification

2.05.01 The complete cabling system shall be properly identified .Methods for identification of cabling system shall be furnished to the successful tenderer and the Contractor shall strictly adhere to the said methods.

2.05.02 Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.

2.05.03 Location of cable laid directly underground shall be clearly indicated with cable marker made of galvanized iron plate, projected above ground level .

2.05.04 Cable tags shall be provided on all cable at each end (just before entering the equipment enclosure),on both sides of a wall or floor crossing ,on each duct/conduit entry ,at each bend and at every thirty(30) meters in cable tray/trench runs . Cable tags shall also be provided inside the switchgear,

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MCC, control & relay panels etc. Wherever required for cable identification, such as where a number of cable enter together a gland plate.

3.00.00 NOTES AND DETAILS OF GROUNDING & LIGHTNING PROTECTION

3.01.00 General

3.01.01 These notes and details shall be read and construed in conjunction with grounding and lightning protection drawings and specification .In case of conflict between these notes and drawings the letter shall prevail .

3.01.02 The grounding and lightning protection system installation work shall conform to the requirements of the latest editions of the following standards /codes :

- a) Indian Electricity Rules, 1956
- b) National Electrical Code, 1985
- c) Code of Practice for Earthing (IS: 3043)
- d) Protection of Buildings and Allied Structures against Lightning (IS: 2309)
- e) IEEE 80

4.00.00 GROUNDING SYSTEM


4.01.00 Main Grounding Grid

4.01.01 The main ground grid shall be buried in earth at a minimum depth of 1000 mm below finished grade level unless stated otherwise .The size of ground grid conductor shall be bare 40 mm dia .mild steel rod.

4.01.02 A minimum earth coverage of 300 mm shall be provided between the ground grid conductor and the bottom of trenches, tunnels, underground pipes, foundations railway tracks etc .The ground grid conductor shall be re-routed in case it fouls with equipment foundations.

4.01.03 Grounding conductor .crossing the road may have to be laid at greater depth to suit the site conditions.

4.01.04 Grounding conductor around the building shall be buried in earth at a minimum distance of 1200 mm from the outer boundary of the building

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4.02.00 Grounding Electrodes

4.02.01 The grounding electrodes shall be 40 mm dia ,3000 mm long mild steel rod .These shall be fabricated and driven the ground by the side of grounding mat conductors and connected to the ground mat conductors .

4.03.00 Earthing conductor

4.03.01 50x6 mm galvanized steel flats shall be run as main earthing conductors above ground along building columns ,walls ,steel structure ,etc. for equipment and other structures earthing .

4.03.02 These earthing conductors shall be interconnected between them and to the main ground grid through risers /pigtail .The connection between earthing conductor and riser shall be made above ground.

4.03.03 Earthing conductors along their run on column, wall etc will be supported by suitable welding/ clamping at intervals set exceeding 750 mm

4.03.04 Earthing conductors shall be embedded in concrete floor of building without having direct contact with the reinforcement rods.

4.03.05 At the crossing of building wall floor etc the earthing conductor shall be passed through galvanized conduit sleeves .Both ends of the sleeve shall be sealed to prevent the passage of water through the sleeves.


4.04.00 Grounding of Equipment and Structures

4.04.01 All indoor and outdoor electrical equipment and associated non-current carrying metal works supporting structures ,building /boiler columns ,fence ,system neutrals ,lightning masts /arresters shall be connected to the plant ground system .

4.04.02 Two separate and distinct ground connections shall be provided for grounding electrical equipment frameworks in compliance with I.E rules.

4.04.03 All Electrical equipment will be furnished with two (2) separate ground pads with tapped holes, bolts and spring washers .The connection between these ground pads and the grounding grid shall be made by short and direct earthing conductors free from kinks and splices.

4.04.04 Miscellaneous devices such as junction boxes ,pull boxes ,pushbutton stations ,lockout switches ,cable end boxes ,lightning fixtures ,receptacles ,switches etc. shall be effectively grounded whether specifically shown or not .

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4.04.05 Metallic conduits and pipes shall not be used as earth continuity conductor .These shall be grounded at both ends.

4.04.06 a) The cable trays inside the cable trenches shall be grounded thru one (1) no.40 mm dia M.S Rod at an interval of ten (10) meters .One end of this rod is connected with riser from grounding mat and the other end which is projected inside the cable trench shall be connected with one(1) 50x6 mm G.S flat which runs horizontally along the cable trench .This earthing conductor shall be securely attached to earth tray section of cable tray /trays forming a solidly grounded tray system through 50x6 mm G.S flats .

b) A continuous 50x6 mm G.S flats earthing conductor shall run along the supporting structure of overhead cable trays /cable shafts .This earthing conductor shall be attached to each section of cable tray /trays through 50x6 mm G.S flats.

4.04.07 Fence within the ground grid shall be bonded to the plant ground system at regular interval not exceeding ten (10) meters .Fence gate shall be separately grounded with fixable connection to permit movement.

4.04.08 The street lightning poles, junction boxes mounted on the poles, flood light supporting structures etc. shall be connected to ground grid at minimum two points.

4.04.09 The steel columns, metallic stairs, hand-rail etc. to the building where electrical equipment are located shall be connected to the nearby ground mat by earthing conductor. Electrical continuity shall be ensured by bonding the different sections of handrails and metallic stairs.

4.04.10 The railway tracks within plant are shall be bonded across fish plates the rail tracks shall be connected to ground grid at different locations. The rail tracks leaving the plant boundary shall be made electrically discontinuous from the rail tracks inside the plant area by providing suitable arrangements at fish plate joints.


4.04.011 The overhead crane rail shall be grounded at both ends .In addition all joints shall be bonded to provide electrical continuity.

4.04.12 The flexible earthing connection of jumpering wire shall be provided where flexible conduits are connected to rigid conduits to ensure continuity.

4.05.00 Earthing of Cable

4.05.01 The metallic, sheaths, screens are armour of cables shall be earthed at both switchgear/MCC/DB and equipment ends.

4.06.00 Jointing and Connection

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4.06.01 All ground conductor connection bellow ground label shall be done by electric area welding with low hydrogen content electrode. The contact surfaces shall be thoroughly cleaned to provide good electrical continuity.

4.06.02 The bending of the large diameter ground conductor where necessary shall be done by gas heating.

4.06.03 The projected portion of riser/pigtail above ground shall be coated with two (2) coats of bitumen paints (anti-corrosive paints) with a minimum thickness of 1mm. after connection.

4.06.04 The connection between the riser/ pigtail and earthing conductor (galvanized steel flats) and between the earthing conductors above ground level shall be made by electric arc welding.

4.06.05 The portion of galvanized steel flats, with undergoes welding at site, shall be coated with two (2) coated of cold galvanizing anti-corrosive paint after welding.

4.06.06 The earthing connections to equipment grounding pads/ terminals and some removal structures shall be bolted type with G1 bolts and nuts. The contact surfaces shall be thoroughly cleaned (to free from scale, paint, enamel, grease, rust) before connection to ensure good electrical contact.

4.06.07 Equipment/ structure ground connections after properly checked and tested shall be coated with weather resistant paints/ cold galvanized paints.

5.00.00 LIGHTNING PROTECTION SYSTEM


5.01.00 Air Terminations

5.01.01 The vertical air terminal rods shall be installed at the roof of buildings protect those objects from lightning strokes.

5.01.02 The vertical air terminal shall be made of 200mm dia galvanized steel rod. The projected length of the rod shall be as required to protect object (on which the rod is fixed) from lightning strokes.

5.01.03 The air terminal rod shall be properly fixed on the top of the building/ structure to withstand very high wind pressure. In case the air terminal rod is embedded at the top of roof of building. The portion embedded inside the concrete shall not touch the reinforcement bars and shall be duly insulated from them.

5.01.04 All the vertical air terminal rod shall be electrically connected tighter by means of conductors of size 50×6mm galvanized steel flats.

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5.01.05 The shielding angle for one vertical air terminal shall be 45 degrees .For mores then one rod, shielding angle between the rod shall be taken as 60 degrees.

5.01.06 Horizontal air termination (i.e. .G.S Flat conductor) shall be so laid that no part of the rood will be more then nine (9) meters from the nearest roof conductor.

5.02.00 Down Conductors

5.02.01 The down conductor shall be 50×6mm galvanized steel flats. The size of down conductor and horizontal conductor provided for lightning protection of conveyer gallery shall be 25×3 mm galvanized steel flats. One end of this shall be connected with air terminal rod/horizontal conductor at the top of roof/structure and other end connected to the nearest 40 mm dia .mild steel rod riser from ground electrode.

5.02.02 Each down conductor shall have an independent earth termination .In no case conductors of the lightning protection system shall be connected with the conductor of grounding system above ground level .

5.02.03 The connection between each down conductor and rod electrode (by means of 40 mm mild steel rod riser shall be made via test link located at approximately 15000 mm above ground level .

5.02.04 The down conductor shall be laid straight and sharp bends shall be avoided as far as practicable .These shall be cleared on outside of the building wall and column/structure at about 750mm interval unless stated otherwise in the drawing .

5.02.05 At the supports for down conductor along the column /wall of the buildings; chimney etc. the portion embedded inside the building concrete should not touch the reinforcement bars.


5.02.06 All exposed metallic parts of the building shall be bonded to the down conductors. Such parts shall include ladders, balconies, conduits etc.

5.02.07 The down conductors shall be protected at the ground level against mechanical injury by means of non-metallic pipes, viz. PVC pipes filled with bituminous compound.

5.03.00 Electrodes (for lightning protection)

5.03.01 The electrodes shall be 40mm dia 3000mm long mild steel rod. Those shall be driven into the ground.

5.03.02 All the electrodes shall be inter connected by means of one (1) 40mm dia mild steel rod which will be laid under ground at a minimum depth 1000mm bellow finished grade

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level unless stated otherwise. This ground mats/electrode in turn shall be connected to main grounding grid.

5.04.00 Riser (for lightning protection)

5.04.01 All riser connected to grounding mat shall be 50×6mm GS flat

5.05.00 Jointing & Connection

5.05.01 All ground conductor connections bellow ground level shall be done by electric arc welding with low hydrogen content electrode.

5.05.02 The projected portion of riser above ground shall be coated with two (2) coats of bitumen paints (anti-corrosive paints) with a minimum thickness of 1mm after connection.

5.05.03 The joints in the lightning conductors shall be kept to a minimum and there shall be no joint in the underground portion of conductors.

5.05.04 All the joints shall be done by arc welding process overlapping of the conductors at straight joints shall not be less than 150mm. The contact surfaces shall be cleaned properly before jointing.


5.05.05 The portion of galvanized steel flats, which undergoes welding at site, shall be coated with two (2) coats of cold galvanized anti-corrosive paints after welding.

5.05.06 The bolted joints of the test link shall be covered with thick coating of bitumen paints after successful testing.

5.05.07 The air terminal rods and shielding mast shall be coated with weather resistant anticorrosive paints (zinc chromate followed by two coats of aluminium paints).

5.05.08 The steel to copper connection shall be brazed type.


Note: For Lightning protection system, Grounding system and Cabling system notes and details please refer Volume: VI, ANNEXURE – II, with drawing numbers CHP/NIT/ELECT/12, CHP/NIT/ELECT/10, CHP/NIT/ELECT/07 respectively.

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VOLUME IV

SECTION – 6

CONTROL AND INSTRUMENTATION SYSTEM

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I. GENERAL

1.1.0 INTRODUCTION


This part of the document includes detail specification for development and implementation of a suitable PLC based control system to accommodate the new and upgraded systems for the stacking circuit (conveyors, crushers etc.) in the existing CHP in order to ensure the smooth up-gradation and transition of the system capacity from 600 TPH to 900 TPH for stacking circuit. This includes supply, erection and commissioning of all new equipment, up-gradation of existing PLC and all necessary hardware and software modification of the existing PLC system in order to integrate the new, upgraded and existing systems.

1.2.0 SYSTEM DESCRIPTION

The control system of the stacking circuit mainly comprises of two parts:

- a. Wagon Tippler Control System – The new wagon tippler and all its associated drives shall be controlled and monitored from a PLC based system located in the new wagon tippler control building. For this purpose two (2) new HMI shall be located in the new wagon tippler control building. One of these HMI shall function as operator's station and the other as engineering station respectively. Wagon tippler control system, (*provision for controlling WT shall be available either from HMI or PUSH BUTTON TYPE control desk*) HMI and all other associated hardware and software shall be supplied by wagon tippler package vendor. All necessary co-ordination with wagon tippler vendor shall be in scope of bidder.
- b. Stacking System – The stacking circuit drives which are not part of the new wagon tippler system shall be controlled and monitored from existing PLC system located in existing CHP control room. A remote I/O rack shall be located in the new MCC building and shall take care of the I/Os for the new MCC and other new field instruments etc. if any. VFD panel for vibrating feeders shall be located in the new MCC building and shall be connected with the I/O rack through hardwired link. Fire alarm panel shall be located in new wagon tippler control room and shall be connected to the I/O rack via soft link. One engineering station shall be considered in the remote I/O rack panel and is to be located at new MCC building. All necessary changes in hardware and software required in order to seamlessly integrate the new stacking circuit with the existing system shall be in scope of the bidder.

The Control System Architecture drawing, Dwg no. CHP/NIT/C&I/01 shows the configuration described above.

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1.3.0 CONTROL PHILOSOPHY

Control and monitoring for stacking circuit drives shall be from existing CHP Control Room located in existing MCC building. Independent control system related to any equipment i.e. New Wagon Tippler system shall be provided by respective package vendor and shall be located near the respective equipment.

For Vibrating feeders the system should operate in both VFD mode and DOL mode.

The existing PLC system located in the CHP control room comprises of the following:

1. The existing control system is a Rockwell PLC system (Model no. 1756-L72 Ser-B) in the CHP Control room. The model no. for the existing I/O cards is as follows:
 - a. DI- Flex I/O -1794-IB32 (32 Channel)
 - b. DO- Flex I/O -1794-OB32P (32 Channel)
 - c. AI – Flex I/O -1794-IE8 (8 Channel)

2. Two (2) Operator's workstation/ HMI

The PLC processor of the existing system shall be upgraded in order to accommodate the new I/Os of the stacking circuit. All necessary changes in hardware and software required for the integration of the new system in the existing system shall be in scope of bidder.


The following drive shall be upgraded:

1. Conveyors 3A/3B

For the upgraded drive, existing cables between field safety switches, local push button station, local panels etc. to existing I/O rack shall be used.

A remote I/O rack shall be placed in the new MCC building and the following drives but not limited to the list below (which are not part of the wagon tippler system) shall be connected to this I/O rack. The I/O rack shall communicate with the existing PLC system through optical fiber cable.

1. Conveyor 1B
2. Conveyor 1C
3. Conveyor 2C/ 2D
4. Belt Weigher BW-1B on Conveyor 1B

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5. Flap Gate 15
6. Flap Gate 2C/ 2D
7. Flap Gate 15/16
8. Vibrating Feeders -12/13/14 with variable speed drive
9. Dry Fog Dust Suppression system
10. Water Pumps

I/O racks of PLC shall have 20% spare slots for installing I/O modules of each type in future. These racks shall be part of the offer. Each installed I/O card shall be such that it can take care of 25% I/O additional input to the existing one. Further there shall be 10% spare I/O cards in the I/O panel as installed spare prewired to TBs. Wherever relays are used to interface process input/outputs with PLC, 20% additional relays shall be provided. In addition 20% spare space shall be provided in cabinets to install 20% additional relays in future. Power supply module shall be capable to take the load of the above mentioned spares. 2 nos each of DI,DO,AI and AO cards shall be supplied as loose spare along with panel. The I/O rack shall also have the provision to enable third party panels such as fire alarm panel to be connected to it.


The following equipment shall be controlled from Local control panels. All the local control panels shall be accessible and located near their respective equipment and shall be complete with all the required controls, interlocks, annunciation's etc. However, it shall be possible to monitor the health of the equipment from the control room as well from HMI.

1. Dry fog dust suppression (DFDS) system
2. Water pumps

Hooters with flashing beacon along with one pushbutton shall be provided in new transfer points in order to ensure safety. Conveyors and other drives shall start after and only after the hooters have been sounded and the respective pushbutton actuated in acknowledgement. If the pushbutton has not been actuated after a certain preset time then the entire process shall be repeated. These hooters shall be operated remotely from the existing CHP HMI.

Fire alarm, linear heat sensing system shall be considered along the conveyor gallery. Heat and smoke detector shall be considered in other places. The fire alarm panel shall be located in the control room of the new wagon tippler building for this purpose. The fire alarm panel shall be connected to the remote I/O rack through soft link. It shall be possible to control and monitor the fire-fighting system from the existing CHP HMI. All necessary changes in hardware and software required in order to integrate the fire alarm system in the existing system shall be in scope of bidder.

Bidder shall make a site visit to obtain complete information about the existing system, facilities and availability of space etc to assess the bill of materials to be considered before submission of his offer.

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Only ROCKWELL make 1756 series controllogix remote I/O panel shall be considered. Compatibility of the new hardwires and protocols with the existing ones shall be checked and confirmed by the bidder. Any hardware/software not mentioned in this document but required to complete the integration job shall be in bidder's scope. It is bidder's responsibility to co-ordinate with the existing PLC vendor (Rockwell) if required, and properly integrate the upgraded and new equipment with the existing PLC system for complete availability of information at operators' desk and proper functioning of the plant.

1.4.0 OPERATION PHILOSOPHY

The following modes of operation of the system have been envisaged:

- Remote Operation Mode
- Local Operation Mode

There shall be a three position soft selector switch incorporated in the existing CHP HMI for each drive in the system, i.e. REMOTE/LOCAL/OFF. The selection of the mode shall be done from existing CHP control room.


- Remote Operation Mode: In Remote operation mode the operator will carry out the entire operation from the CHP control room through 22" MONITOR and keyboard in HMI. In this mode the operator shall use either of the following options:
 - a. Group start – In this option a single command shall start all the drives of the stacking circuit automatically after taking into account all necessary interlocks and safety measures.
 - b. Manual Start – The operator shall start each individual drive separately through the 22" MONITOR and keyboard.
- Local Operation Mode: In this mode the system shall be operated from the local control panels/ LPBS located in the field.

Normally the system shall run in Remote Operation Mode.

The operation philosophy for proper functioning of independent system ex. wagon tippler system shall be decided by the respective package vendor. However, it shall be possible to monitor the health of the system from the CHP HMI.

The following equipment shall be controlled from their respective local control stations:

1. Dry fog dust suppression (DFDS) system

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2. Water Pumps

However, it shall be possible to monitor the health of the above equipment from the HMI of the existing CHP control room as well.


No remote mode operation has been envisaged for switchgear and MCC. However, it shall be possible to monitor status and requisite alarm annunciations from the CHP HMI.

A belt weigher BW-1B shall be located on Conveyor-1B in order of evaluate the quantity of coal being handled by new conveyors and upgraded conveyors 3A and 3B.

1.5.0 CONTROL CONCEPTS

The concepts mentioned below are bare minimum. Any other control loop necessary for proper and safe functioning of the system shall be provided by the Bidder.

1. Equipment Interlocking: The following equipment shall come under equipment interlocking:
 - All conveyors
 - All flap gates
 - All Hooters
2. Ventilation system shall not come under interlock of conveyor scheme unless otherwise specified. However in case tunnel ventilation has malfunctioned then requisite alarm shall be generated in the existing CHP HMI.
3. All new conveyors and equipment shall have a local push button station (LPBS) comprising :
 - Local Start (It shall be possible to start an equipment in Local mode if and only if 'Local Operation Mode' has been enabled in the control room)
 - Emergency Stop (Lockable type) – Emergency stop button shall have two contacts of which one shall be hardwired to the MCC and the other shall be connected to the PLC.
4. The DFDS systems shall be energized as soon as the conveyor is energized and the belt deflection switch is actuated. This is to ensure that the system is running only when the conveyor is loaded.
5. The following are the various safety interlocks for the conveyors and other equipment. This list is indicative only and Bidder shall develop a comprehensive interlocking scheme during detailed engineering.

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a. Conveyor interlocking:

- Pull - Chord switch - not operated
- Belt sway switch - not operated
- Zero speed switch - closed at 85% speed of the conveyor within designed accelerating time.
- Motor protection - not tripped ➤ Emergency stop PB – not operated
- Chute Block switch - not operated.
- System Ready to start
- Preceding conveyor/ equipment running

b. Flap Gates interlocking

- End of travel (proximity switch only).
- Emergency stop PB – not operated.

6. Adequate status indications/ annunciations/ alarms shall be displayed on the HMI indicating the health and position of equipments enabling the operator to control and monitor the system effectively. A list of alarms/ annunciations shall be prepared by the bidder for NALCO/ Consultant approval.
7. Before starting the plant the hooter along with the flashing beacon shall be energized. The plant shall start only after the respective pushbutton accompanying the hooter has been actuated in acknowledgement. If the acknowledgement does not come within a specified preset time interval then the entire process shall be repeated again. At the time of starting the equipment shall be energized only if the succeeding/ downstream equipment is running and all other safety interlocks have been taken care of. At the time of a fault, the faulty conveyor/ equipment, as well as the preceding conveyors/ equipment in the interlock sequence, will stop. When equipment/ drive shall be run in 'test' mode then all safety interlocks (except PCS, BSS) shall be bypassed. Usually the 'local start' shall be used to run the equipment/ drive in 'test' mode.
8. Interposing Relays (separate plug-in relay with base) with suitable contact rating shall be supplied for all digital outputs. All digital outputs shall be Potential free contacts.
9. Following functions shall be available on the HMI as a minimum in order to ensure smooth operation of the system. Any other functions not categorically mentioned but required for smooth operation shall be provided by the bidder.

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a. Coal handling plant

- Remote/ Local/ Off selection
- Group Start/ Individual drive Start/ Stop selection
- Fixed color with slow blinking indication for all conveyor and equipment selected path.
- Steady indication for gates in selected path.
- Steady indication after the conveyor / equipment is started.
- Yellow light will flicker fast in case of fault/ trip of motor / equipment.
- Normal stop
- Emergency stop for immediate shutdown of the complete plant.
- Annunciation

b. Electric Power Distribution system

- Open & close indication of Starter / Isolator.
- Display of Frequency, KW, voltage and current.

1.6.0 TELEPHONE & PA SYSTEM


A. TELEPHONE SYSTEM

There are existing plant EPABX telephone exchanges already operating which are of following models:

- Model - Siemens -
 - High Com-300(old)
 - High path -4000(new)

Four (4) numbers of new automatic dial type telephone sets shall be provided and connected with the above existing exchange. These shall be located as follows:

- One no. indoor wall mounted type shall be located in the new MCC building near new wagon tippler building.

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- One indoor wall mounted type in the I/O rack room in the new MCC building.
- One no. indoor desk mounted type shall be located in new Wagon Tippler control room
- One no. outdoor wall mounted type in new wagon tippler operating floor

The telephone sets shall have all standard features like call hold, voice mail messages, access redial etc.

Cables for connecting the telephone sets shall be 0.5 sq mm. paired cables, screened and armored. Bidder shall also supply telephone JB's with outlet sockets (RJ connectors) at each building.

All other necessary changes in hardware and software not categorically mentioned but necessary for the integration of the new system in the existing system shall be in scope of bidder.

B. PA SYSTEM

There is an existing plant PA system with following model:


- Model – BOSH (BNA technology)

Four (4) no.s of new loudspeakers shall be provided in the plant which shall be connected to the above existing PA system. These loudspeakers shall be located at different areas as follows:

- One no. shall be located in I/O rack room located in new MCC building.
- One no. shall be located in Control room of new wagon tippler building.
- One no. shall be located in new MCC building near new wagon tippler building.
- One no. shall be located in new wagon tippler operating floor.

Necessary cables, connectors, fittings etc for connection of the new speakers with the existing PA system shall be supplied by bidder.

All other necessary changes in hardware and software not categorically mentioned but necessary for the integration of the new system in the existing system shall be in scope of bidder.

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1. 7.0 FIRE DETECTION AND PROTECTION SYSTEM

Fire sensed by the field equipments shall be monitored by fire alarm panel. The panel shall be located in the new wagon tippler control room. It shall communicate with the existing CHP PLC through the remote IO panel. The panel shall be connected with the remote I/O panel using soft link. The fire alarm panel shall collect signals from various detectors/ manual call points connected to its loops and shall monitor the status of detectors, cable faults. It shall have provision to annunciate the fire / fault signal(s) received from the detectors / manual call points connected to its loop(s). LEDs shall be provided for the visual indication and electronic hooters for audible alarm.

Linear heat sensing system shall be considered along the conveyor along with required number of monitors. Optical type/photo-electric type of smoke detectors shall be considered in the new wagon tippler control room, I/O rack room and MCC room.

Manual call points with breakable glass cover shall be located in suitable, easily accessible locations throughout the transfer points, control room, I/O rack room and MCC room. The manual call point shall be break glass type push button and shall have a push button actuator/element kept in pressed condition by the glass sheets fitted on the front of the box. This push button shall be actuated by breaking glass (by means of a wooden hammer provided along with the push button and chained with the push button station) and shall then give an addressable alarm in the alarm panel.

Also, hooters with flashing beacons shall be located in adequate locations throughout the stacking circuit, control room and MCC room, to be energized in case of any fire hazard.

Any other item not categorically mentioned but required for the proper functioning of the system and safe running of the plant shall be in scope of the Bidder.


1. 8.0 SCOPE OF WORK


Bidder shall supply necessary equipments/ instruments/ accessories etc. as per technical specification/ guidelines stipulated in the tender. Any deviation/ exclusion from the tender specification shall be clearly indicated in the deviation list/ exclusion list. (refer section 10.3.13 & 10.3.14, Vol – V)

1. 9. 0 SCOPE OF SERVICE


Erection and Installation: Installation of all equipments, local panels etc under scope of supply, cable laying and interconnection etc.

Calibration and Commissioning: Individual Calibration of all erected equipments, control loop, commissioning and complete system testing under the scope of supply and services.

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TECHNICAL SPECIFICATION
FOR
INSTRUMENTATION

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II. TECHNICAL SPECIFICATION

2.1.0 GENERAL

Technical specification for instrumentation system shall be as follows:


- i) All PID control loops shall be performed in the PLC system.
- ii) Interposing relays and solenoids shall be used and voltage level shall be 24 VDC wherever required.
- iii) Design and engineering should be such that it takes into consideration for less inventories and modern maintenance practices.
- iv) All field instruments shall be IP66 or better class. Instruments mounted in open atmosphere shall be provided with a cabinet type enclosure. The junction boxes shall be flameproof type and shall have IP65 or better protection class. Cable entry shall be from bottom side.
- v) All field instruments, junction boxes shall be complete with mounting accessories, two/ three valve manifold, isolating valves, terminal units, cable glands etc as required.
- vi) For all critical alarm conditions audio visual annunciation shall be provided. vii)

Consumables, commissioning spares shall be provided by bidder.

TECHNICAL SPECIFICATION –

2.2.0 CONTROLLER (PLC)

- a) Purpose To provide Process with continuous control to
analog input, sequencing, timing, integration,
logical operations, digital inputs, pulse inputs,
digital outputs, self tuning, limitation, rationing etc.
- b) Loading of processor The % loading of the processor should be such that the scan time mentioned against point no "J" remains unchanged. Preferably loading should not exceed 60%.
- c) Selection guideline for Processor shall be Dual Redundant. processor
- d) No. of analog inputs per Manufacturer Std


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control module

- e) No. of analog outputs per control module Manufacturer Std
- f) No. of digital inputs per control module Manufacturer Std
- g) No. of digital outputs per control module Manufacturer Std
- h) No. of pulse inputs per control module Manufacturer Std
- i) Processor Capacity 32 bit or better
- j) Scan time for closed loop/open a) 250 M Sec for closed loops & Interlock loop on full load b) 2 Sec for Temperature signal related to monitoring only
c) 1 Sec for all other Analog & Digital Open Loop
- k) Temperature limits operating/storing Manufacturer Std.
- l) Power supply 220V 50Hz \pm 10% voltage/UPS supply
- m) Accuracy output \pm 0.5% or better
- n) Output load R/L/C Manufacturer Std
- o) Redundancy is available through Two system on hot standby mode to each other.

Backup system taking over any of failed primary system automatically within 100 Milli Sec.

The redundancy is realized through hardware & not software.
- p) Functions Filtering, linearization including extraction for

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orifice type flow meter trending alarm, limits checking switch, integrating from average flow transmitter, inputs, ratio systems, special systems, PID action and values settable by key board auto manual bump less transfer output reversal block self tuning.


Calibration of field mounted smart transmitter shall be done from PLC terminal.

- q) **Alarm** The time stamping for Alarm Registration shall be done in CPU level & not in HMI level.
Resolution of time stamping to be indicated.
- r) **Processor Intelligence** Confirm if controller can act independently with its own processor fully when console fails (display may not be possible) or controller is dependent on console with intelligence and process at console.
- s) **Alarm and diagnostics** Diagnostics alarm shall be available at controller. Lists all functional mode of display.

Facility to have diagnostic alarm in console.
- t) **Localized highway** Confirm communications within controller is through main highway within system.

Give details where used and with what standard.

Shall have interfaces also redundant.
- u) **A/D & D/A conversion** Please give details No. of bits, time resolution, clock resolution, error detection, etc.
- v) **Digital I/O for interlock** It is proposed to use this system for all interlock purposes. Hence, Tenderer to confirm availability of redundancy for digital I/O rack memory protection. Tenderer to advice duration & type of memory protection.
- w) **Special features** Procedure less hot swapping of the card.

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2.2.3 ETHERNET SWITCH

- a) Type Industrial Grade
- b) Power supply Dual supply in redundant mode.
- c) Connectivity All switches shall be able to accept Ethernet/fiber optical cable connection directly.
- d) Operating temperature 45° C

2.2.4 DATA HIGHWAY & COMMUNICATION

- 1 Purpose To link all sub-system and nodes data base management
- 2 Type of cable Dual low loss Optical Fiber cable redundant type
- 3 Max length Please inform and plan to take sufficient length to suit layout
- 4 Type of Network Switched Network/ Ring
- 5 Standards Ring topology/ IEEE 802.3
- 6 Communication Switched Ethernet TCP/IP without MODBUS protocol
- 7 Max no. of subsystem per Manufacturer Std. highway
- 8 Redundancy Dual even if one disconnected other should take over with diagnostic alarm
- 9 Speed 100 mbps/ 10 mbps
- 10 LAN connectivity There shall be at least five nos. of LAN port for the systems like PSM, XRF Analyzer.

2.3.0 VARIABLE SPEED CONTROL DRIVE

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2.3.1 SCOPE

This specification covers design, manufacture, testing & supply of :

Variable frequency converters which are to be used with standard A.C. cage induction motors, up to 650 volts to provide variable speed control of A.C. cage motors.

The specification does not cover the detailed requirements for cage induction motors. However special aspects which need to be considered because of their use on inverters are included in this specification. If scope includes supply of motors also, then the detailed requirements for motor will be indicated in specific requirements and separate data sheets.

2.3.2 BASIS OF DESIGN

All equipments and components shall comply with the relevant Indian Standards / current editions of IEC specifications and in particular to following standards:

- IS1248: Direct acting indicating analogue electrical measuring instruments & their accessories.
- S 8623 (IEC 439): Low Voltage Switchgear and control gear assemblies.
- IS 694: PVC insulated cables for working voltages upto & including 1100V.

Any other relevant standards which are internationally recognized are also acceptable.

Any equipment which is required to be installed in a defined hazardous area shall be certified by CMRS, Dhanbad or an equivalent certifying authority approved by the purchaser.


2.3.3 SERVICE CONDITIONS

The inverter cubicle shall be suitable for service conditions (Ambient Temperature / Humidity, Environment etc.) as specified in data sheets. Unless otherwise stated the inverter cubicle shall be suitable for mounting without further protection inside a dry ventilated room.

Where remote control items are to be provided by vendor, the types of enclosures etc. shall be suitable for area classified in data sheets.

2.3.4 ELECTRICAL SUPPLY SYSTEM

The equipment shall be designed for continuous operation from AC supply source, including variations in supply voltage, frequency as specified in data sheets. Any

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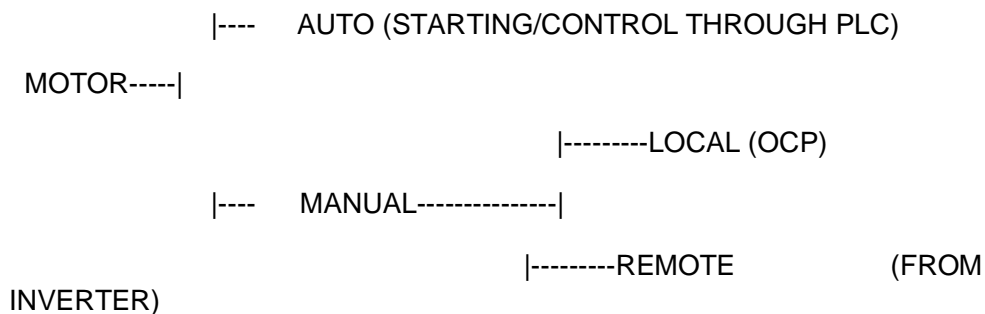
additional transformers necessary to meet these requirements shall be provided by vendor.

The inverter unit shall have inherent self protection against transient over voltages introduced by input power supply and against short circuits, open circuits, earth faults at output terminals.

Vendor shall provide information on level of harmonics presented to the supply system by inverter as called for in data sheets.

2.3.5 OPERATIONAL CONTROL

The operational control for motor fed through inverter shall generally be as follows, unless otherwise specified:




2.3.6 MOTOR & DRIVE COORDINATION

Unless specified elsewhere, the main drive electric motor shall be capable of operating continuously at any of the load/speed conditions within the range. Vendor shall state derating factor, if any, for the motor, based on information given in data sheets.

The coordination of motor and inverter design with the load/speed requirements will be the responsibility of the bidder. Bidder shall be responsible for this drive coordination, in particular to following:

- To ensure that main drive motor and inverter are both adequately rated and sized for the drive requirements stated and to recommend alternative configurations where appropriate (like separate cooling fan, choice of frequency range etc.)

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- To arrange where necessary for testing of motor with inverter unit to confirm compliance with requirements of load, noise, vibration, temperature rise etc.
- VFD rating shall be considered as heavy duty rating

Drive Data enclosed with data sheets, will generally give following information:

- T/ N characteristics of driven equipment
- Driven equipment BkW
- Maximum locked rotor torque required at motor shaft
- Speed range required
- GD² value of driven equipment

2.3.7 POWER SUPPLY ARRANGEMENT

Unless stated otherwise, the inverter will be fed from a remote load break, fault-make manual isolator complete with fuses, which will be provided by others.

A separate inverter "Bypass" system shall be provided to run the motor at fixed speed direct from the mains supply.

The detailed power supply arrangement for a frequency converter fitted with a "Bypass" shall be agreed between the purchaser and inverter supplier.


2.3.8 DRIVE SYSTEM CONTROLS

The variable speed AC drive shall be designed with the controls detailed in subsequent sections

Changeover switches shall be provided on inverter cubicle (Local / remote, or / and auto / manual) to ensure that only one speed control, start control is operative while stop control shall be operative all the time (see also 3.0 above operational control).

The local operator control; when called for, shall be provided with (but not limited to) following:

- Push buttons - 1 no. each
 - Start


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- Stop
- Speed indicating meter (Analogue)
- Speed inc / dec P.B. OR potentiometer

Any other specific requirements shall be as indicated in the data sheets.

The variable speed AC drive cubicle shall be provided (but definitely not limited to) with following:

- Incoming fuse / switch unit
- Start/stop P.B. stations (front of panel - FOP)
- Audio visual alarms as described elsewhere (FOP)
- Power on indicating lamps (FOP)
- Output KW meter / ammeter (FOP)
- Input voltmeter / ammeter (FOP)
- Output speed frequency indicating meter (FOP)
- Ready-on-a trip indicating lamps (FOP) ▪ Alarm acknowledge / reset P.B.
- Terminals for remote control / indication
- Standard options (to be stated by bidder)
- Provision for wiring external sequential / process interlocks / signals for starting / running / tripping
- Facilities for site adjustments for current limit, trip time in current limit maximum frequency (speed), minimum frequency (speed) start compensation (volt boost), slip (IR) compensation, Accuracy rate, deceleration rate others (if any).
- Selector switches: Local / Remote, Auto/Manual.

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- Slip (IR) Compensation: can provide frequency compensation to maintain speed under varying load conditions (more significant for smaller motors with higher natural slip at full load).
- Start compensation (voltage boost)

Compensates for increased effect of stator resistance at very low frequencies improving starting torque.

The above list indicates the minimum requirements. All other features necessary for converters shall be included by the manufacturer.


2.3.9 DESIGN

The salient basic design, functional and performance features of converter shall be, but definitely not limited to, as follows:

- i) Voltage/current source DC link pulse width modulated (PWM) converter to operate at automatically produced fixed ratio of V/F throughout the complete speed range of motor.
- ii) Independently adjustable volts boost at low end of frequency. iii) Separately adjustable ramp up & ramp down time.
- iv) Close loop control to keep output voltage unaffected by system voltage and load changes. Regulation of output voltage shall not be more than $\pm 2\%$ under steady state (zero to full load) and 8% under transient conditions.
- v) Maximum drift in set frequency shall be $\pm 1\%$.
- vi) Comprehensive protection and fault display circuit including under/over-voltage (supply), over current / short circuit / earth fault due to inverter and / or motor fault, internal / external fault provisions for tripping unit.

All the above faults shall also be paralleled and connected to terminal block for remote indication.

- vii) Any additional requirement for remote output signals shall be as detailed out in enquiry / PDS.
- viii) Where tacho generator feedback is required to achieve accurate speed control, same will be indicated in data sheets

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- ix) Where a "Bypass" motor starter is provided, a separate over current protection relay of manual reset type shall be provided.

Each main line contactor and bypass motor starter shall be provided with relevant control terminals for having "Drive Controls" as described elsewhere.

2.3.10 CUBICLE DESIGN AND CONSTRUCTION

i) ENCLOSURE

The enclosure shall be suitable for specified environment and climatic conditions. The cubicle shall be fully assembled, factory wired, floor / wall mounting, cubicle protection for minimum IP41 if not specified otherwise in the data sheets.

It shall be suitable for installation in reasonably clean room without any special conditioning of ambience.

ii) SAFETY FEATURES

All power feed busbars, any live terminals, shall be properly shrouded against accidental contact while carrying out any maintenance work.


All terminals which remain live when main isolator is off shall be properly shrouded and labelled with danger warning.

Where a bypass motor starter is provided, it shall be installed in a separate compartment. Additional isolators shall be provided to enable safe access to all parts of frequency converter cubicle -(including all power semiconductors) whilst the bypass starter is in operation.

ii) COMPONENT LAYOUT

The layout of components inside the cubicle shall be done with specific attention to following aspects

- Layout : Neat & clean
- Easy accessibility to components while carrying out any replacement / maintenance work. Access for components shall be from front of cubicle.
- Safety while carrying out any maintenance work

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- Shrouds/barriers for live parts
- Neat wiring preferably using plastic trunking

2.3.11 GENERAL

- All power / control wiring inside cubicle shall be carried out in 650V grade PVC insulated copper wires unless otherwise stated.
- Cabling terminating facilities and terminals shall be suitable for the specified cable type, gland, conductor size etc.
- Manufacturer shall provide an undrilled gland plate at bottom of sufficient dimensions to terminate specified cables.
- Positioning of cable terminations shall avoid obstructions and removable covers etc.
- All wiring for external connections shall be brought out to individual terminals on a readily accessible terminal block. All terminals shall be shrouded.
- All non current carrying metal work shall be bonded together and connected to an adequately sized earth bus provided inside the panel. Facility for external earth connection shall be provided at two points of earth bus.
- The unit shall be provided with all necessary labels having black letters on white background. Warning labels shall have white letters on red background.
- Cubicles and components shall be identified by labels. Cubicle designation labels shall be as per design data sheets.
- The color and finish of cubicle shall be as per manufacturers standards, unless otherwise stated.
- Indicating instruments shall be flush mounting type, size shall be as per manufacturers standards.
- Where fan cooling is used, it shall be connected to mains. In case of fan failure cubicle shall operate satisfactorily at full load without damage or duration to internal components for specified time.

2.3.12 MAINTENANCE EQUIPMENT

- A complete set of any special tools for breakdown or routine maintenance shall be provided by vendor along with the equipment.

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- ii) Bidder shall also provide list of additional maintenance and test equipment (such as inbuilt diagnostic test module) individually priced along with his quotation.

2.3.13 SPARES

Bidder shall provide, with his quotation separate price list of two years O&M spares which will be evaluated separately and NOT mandatory by NALCO to procure.

Commissioning spares required for successful commissioning and hand over the system to NALCO shall be supplied along with the equipment.

2.3.14 DRAWINGS & DATA


Bidder shall provide drawings and data sheets for the offered models. This shall include operating and maintenance manuals also.

2.3.15 QUALITY ASSURANCE

- i) Quality assurance shall follow the requirements of manufacturer's standard QA documents.
- ii) QA involvement will commence at enquiry stage and follow through the completion and acceptance thus conforming total conformity to purchaser's requirements.

2.3.16 WORKS INSPECTION & TESTING

- i) Manufacturer shall provide test certificates for type and routing check tests on equipment which shall include in particular following tests plus other tests as specified in design data sheets / relevant standards.
- ii) Physical inspection for dimensions, bill of materials, layout / accessibility of components, cabling space, shrouds, barriers for live parts etc.
- iii) With the unit energized, following tests shall be done at least at three different (low, middle, high) frequencies from no load to full load:
- Inverter output voltage & output wave form
 - Simulation of faults and faults annunciation scheme (ref. 5.6 above).
 - Ramp up acceleration time observing voltage and current.
 - Oscillogram records of inverter output for 100% load rejection and 100% load application. Verify dynamic response time.

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- Vary A.C. mains input voltage and frequency to extremity of limitations and provide oscillogram records of inverter output. Verify output voltage and frequency.
- Verify overload capacity for the unit
- Full load test of complete equipment for 4 hours after thermal stability.

- iv) All routing tests like continuity test for wiring, operation/functional tests, checking of interlocks, IR/HV test on power/control circuit, etc.
- v) Purchaser reserves right to witness all above tests.
- vi) Manufacturer shall give two weeks notice of tests prior to commencement.
- vii) All apparatus, instruments etc. required for tests shall be provided by the manufacturer and shall have been checked and tested for accuracy during 12 months prior to the tests.


2.3.17 SITE TESTING & COMMISSIONING

- i) Bidder shall include site testing and commissioning of frequency converter panel at site.
- ii) Site testing and commissioning shall include at least (but not limited to) the following tests:
- iii) Operation of motor / converter panel over complete speed range (with load if available using local and remote control facilities.
- iv) Setting up and recording all on site adjustments.
- v) Checking up operation of all front of panel indicators / alarms / lamps.
- vi) Recording any test point voltages (where fault diagnostic facilities are provided).
- vii) Checking operation of bypass system (if provided)

2.3.18 DEVIATIONS

- i) Deviations from specifications must be stated in writing at the quotation stage.
- ii) In the absence of such statement, it will be assumed that the requirements are met without exception / deviations.


2.3.19 Technical Data Sheet for VFD Panel:

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Application: Vibrating Feeders VF-12/VF-13/VF-14

Driven Motor Data: 2.3 KW, 5.1 Amps, 6 pole AC Motor


SL No.	Required Technical Particulars	Vendor's Data
1	Manufacturer's Reference / model : Model / Cat No of VFD module including options need to be specified.	
2	Minimum Rating Requirement : Heavy duty, Continuous rated * Current Rating of offered VFD module after necessary de-rating due to ambient conditions need to be specified.	
3	Applicable code/standards: Compliance to latest EMC/NEMA directives for Industries.	
4	Speed range : 1:1000 with Closed loop Flux Vector mode	
5	Speed Control: Panel Mode: Speed Control from Operator keypad. Speed reference selection shall be possible from the control room through a Panel/PLC selector switch mounted in this panel. PLC mode: Speed Control through Raise/Lower push buttons from LPB station (Local Selection from DCS/PLC) or through 4 to 20 ma from DCS (Remote selection from DCS), L/R selector switch at DCS; Potential free contact for "Local Selected" shall be extended to VFD panel from PLC/DCS.	
6	Input Power supply ratings :Voltage 3ph, 415V \pm 10% , Frequency - 50Hz, \pm 5 %	

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SL No.	Required Technical Particulars	Vendor's Data
7	Output Rating: Voltage - 3ph, 0 to 415V variable. Frequency - 0 to 100 Hz variable with Constant torque. Freq. resolution - 0.1Hz at max.	
8	Overload capability: 150 % for 1 minute.	
9	Low Harmonic content & high power factor: Commensurate to IEEE 519 guidelines i.e Voltage/Current THD shall NOT exceed 5% at PCC(Point of common coupling). # Bidders scope shall include measurement of harmonics at site to establish compliance to IEEE 519 & IEC 61800-3 standards. # VFD shall be equipped with measures to protect the feeding network against excessive harmonics and electromagnetic interference. Details of additional hardware provided in the offered system/panel for harmonics containment shall be indicated. # Harmonic data (with and without specific hardware as per point above) shall be furnished in the offer. # PF at Load shall remain > 0.9 at all load conditions.	
10	Panel Controls :# START/STOP, Speed Raise /Lower, Fault Reset : Push buttons shall be provided on the panel door for these controls, in addition to possibility from soft touch LCD operator key pad mounted on panel door. #Panel/PLC selections switch for selection of control location. # Start/Stop contact from DCS/PLC shall also be interfaced with the VFD panel.	

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SL No.	Required Technical Particulars	Vendor's Data
11	MCC : Input Supply MCCB Input line choke of Class H insulation shall be provided. DC Choke Power Contactor (3 Nos x 16Amps ; I/P, O/P, bypass line) Power fuses and control fuses as required. DIN rail mounted MCBs shall be used for control ckt. Auxiliary contactors (11 Nos) DIN rail mounted are envisaged.	
12	Metering on Panel: In addition to LCD based Operator panel display, following metering shall be provided. # RPM Meter # Multifunction Power Meter with suitable CT/transducer, both at I/P and O/P to indicate 3 phase Voltage / current, harmonics/THD etc. # In case power meter connectivity at O/P is NOT possible, 3 phase O/P current (with suitable hall effect transducers as sensors) and 3 phase O/P voltage measurement with necessary ammeter /voltmeter through individual selector switch shall be provided. # Provision shall also be kept for connecting output ammeter and speed indicator at local PB station and at Remote DCS through 4 to 20ma Analog O/P. # 2 Nos Repeaters(I/p=4 to 20 ma, O/P=4 to 20 ma) shall be provided in the VFD panel for connection of RPM/Ammeters at Local and DCS. (Local meters/LCS etc in NALCO scope)	

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SL No.	Required Technical Particulars	Vendor's Data
13	<p>Indications: through Clustered LED lamps.</p> <p>R, Y, B Power input Indications</p> <p>System Healthy/Ready to start.</p> <p>System Tripped (Illuminated PB for Resetting fault)</p> <p>System Running.</p> <p>Control ON</p>	
14	<p>Interfacing I/Os DI- 8, DO - 4 Relay contacts.</p> <p>AI -2, AO - 2. Both AI and AO shall be configured for 4 to 20 ma.</p> <p>RUN/FAULT/Ready/ALARM contact and multi function programmable output contact shall be provided within the 4 DO contacts.</p> <p># Separate potential free contacts shall be provided for RUN/Ready/TRIP indications at PLC/DCS.</p> <p># 4 to 20 ma Current outputs shall be provided for Current and RPM indication at PLC/DCS and at Local Control station. Repeaters shall be made use of for isolation purpose.</p>	
15	<p>Protections :</p> <p>Mains fault / I/P phase failure.</p> <p>O/P Phase failure</p> <p>O/P over voltage</p> <p>Torque Current TRIP Instantaneous Over current</p> <p>Motor O/L- Thermal-Electronic.</p> <p>Stalling protection</p>	

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SL No.	Required Technical Particulars	Vendor's Data
	Current limit Output Short circuit Output ground fault Inverter fault	
16	<p>Fault diagnostics and other displays: Direct display of faults through messages on operator key pad display (mounted on panel door) in plain English text in 5 lines alpha numeric LCD display.</p> <p>Display of Power drawn, load torque, Motor Current; magnetization and load components, Panel heat sink temp.</p> <p>Trip history / fault trace records for last 4 faults.</p> <p>Diagnostics for controller hardware components.</p>	
17	<p>Electronics Controls :</p> <p># Digital sensor less Flux Vector control with State of the art technology.</p> <p># All modes like V/F control, Vector control with or without sensor shall be available.</p> <p># Voltage source inverter with IGBT based Inverter and PWM .</p> <p># Software setting control for all parameters with password protection.</p> <p># Programmable alarm/trip parameters with ride thru and interchangeability.</p> <p># Masking of functions / parameters i.e start/stop/jog/dirn/alarm word/fault word/ trip word shall be possible.</p>	

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SL No.	Required Technical Particulars	Vendor's Data
	<p># ON /OFF Time delay programming possible thru software.</p> <p># Complete electronics module in IP20 configuration shall be mounted in the panel.</p> <p># Drive control through soft touch keypad mounted on the panel door with diagnostic display window.</p> <p># Automatic optimization feature or self parameterization in software control.</p> <p># Short time(<2 secs) power dips at Input shall NOT TRIP the VFD panel in any way. Fault Reset shall NOT be required in case of short time power dips.</p> <p># Flying Restart CKT shall be made available in the VFD panel schematics.</p> <p># Selected masking of system TRIP due to I/P U/V and DC O/V shall be available.</p>	
18	<p>Connectivity to Supervisory control :Standard protocol to interface with customer's PLC or DCS or SCADA system :</p> <p>Modbus / profibus through RS-422/485 connectivity shall be possible. Necessary communication module shall be inclusive.</p>	
19	<p>Bypass Arrangement – All Required Control, Switchgears & protection scheme not limited to the following shall be provided for continuous running of the drive in bypass mode.</p> <p># Power contactor arrangement (3 Nos), SF unit, Electronic Motor protection relay (with display), drive/bypass selector switch shall be provided for the same.</p> <p># Arrangement for Current monitoring in bypass mode in all the three locations i.e Panel door ammeter, Local</p>	

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SL No.	Required Technical Particulars	Vendor's Data
	Control station, DCS. Hence transducer for current conversion to 4 to 20ma need be used.	
20	<p>Extra provisions: # Provision for connection of Output Ammeter and speed indicator at customer's remote control desk.</p> <p># Provision for connecting external interlocks (Minm 3 Nos Customer contacts) in control Circuit.</p> <p># 1 no of spare auxiliary contactor and some spare TBs shall be mounted extra in the panel.</p> <p># Potential free contacts from RUN/Fault/Ready contactors shall be available for connection to Remote PLC/DCS.</p> <p># Provision for Motor Space heater shall be available.</p>	
21	<p>Noise level of controllers: Below audible level or <70DB.</p> <p>DB level of VFD panel (with cooling fan) to be specified.</p>	
22	<p>Motor is located at a distance of 250 mtrs from VFD Panel :</p> <p>Controller panel shall be suitable for this application and Output chokes shall be included if required. side and the panel body and all other metallic parts / components shall be connected to this earth bus using green 2.5/4 sq mm Cu wire. There shall be earthing bolts on both sides of the panel.</p> <p># Two modules shall be mounted in a single cubicle in order to save floor space.</p>	
23	Environmental /Ambient conditions: Temp. 47 degree, 95% humidity, Altitude = 1300 mtrs.	

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GENERAL REQUIREMENTS:

- 1) Drawing/Documents: 6 sets of all drawings/documents including the factory test reports, instruction manual, Replacement parts manual, schematics, card component level drawing, Soft copy shall be furnished along with the document.

The Schematic drawings for the VFD Panel, BOM with component ratings, interface with LCS and PLC indicated in separate sheets, shall be subject to approval of NALCO before manufacturing of Panel.
- 2) Bought-out items :Vendor list of all major brought out items shall need the prior approval of NALCO along with drawing approval.
- 3) Commissioning : shall be in the scope of vendor.
- 4) Vendors to fill the relevant data in the vendor data column against each point specifically with marking deviations if any from our requirement. Any extra provision other than specified above may be tabulated separately.

2.4.0 INSTRUMENT SIGNAL CABLE

2.4.1	Type	Twisted Pair
2.4.2	Conductor	0.5 mm ² multi-stranded annealed tinned copper, individually and overall sheathed.
2.4.3	Inner sheath	Extruded PVC
2.4.4	Lays per meter	25 to 30
2.4.5	Mode of wrapping layers	Mylar tape and filler chord
2.4.6	Mode of overall shielding	Aluminized Mylar tape wrapped with 25% overlapping
2.4.7	Overall sheath of cable	FRLS PVC
2.4.8	Continuous operating temperature	70oC


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2.4.9	Voltage grade	1100 Volt
2.4.10	Signal drain wire	Continuous tinned copper under the aluminum side of the screen
2.4.11	Core identification	By standard colors as well as numbering at frequent intervals.
2.4.12	Standard pairs	1 pair, 2 pairs, 4 pairs, 8 pairs, 12 pairs - as applicable.

2.4.13	Armoring	Rounded GI wire/strip with overlapping.
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2.5.0 CONTROL CABLE

2.5.1	Type	Twisted pair
2.5.2	Conductor	2.5 mm ² multi-stranded annealed tinned copper, individually and overall sheathed
2.5.3	Inner sheath	Extruded PVC
2.5.4	Continuous operating temperature	70° C
2.5.5	Voltage grade	1100 V
2.5.6	Armoring	Rounded GI wire/strip with overlapping
2.5.7	Overall sheathing	FRLS PVC/Fluoropolymer insulation
2.5.8	Identification	By standard colors as well as numbering at frequent intervals
2.5.9	Standard Pairs	1 pair, 2 pair, 4 pair, 8 pair, 12 pair – as applicable
2.5.10	Accessories	i) Flexible & rigid conduit with fittings

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ii) Cable trays with mounting accessories iii) Lockable-unlockable type PVC/ nylon cable straps iv) Fork-type termination lugs for all termination points.

2.6.0 UNINTERRUPTED POWER SUPPLY

2.6.1 GENERAL

The scope of specification includes but not limited to the following:

Design, Fabrication, Testing, Supply, Erection, Commissioning of system Inspection at shop / site, offering post commissioning assistance for the Uninterrupted Power Supply.

Bidder shall quote for spares and consumable for commissioning and spares and consumable for trouble free operation for two years along with their offers.

Bidder to furnish list of deviation from Bidder spec. along with offer. Failure to furnish the details of deviation shall mean 100% conformity. Bidder to give a clear confirmation and these confirmations to be technically complete and will form the basis for evaluation. Backup catalogues showing specifications should be sent but this will be only for references. Bidder's specifications and catalogues will not be considered as complete answers in themselves when point comments and confirmations are not furnished.


2.6.2 GUARANTEE

Bidder shall guarantee all the equipments in his supply against improper design, defective material, poor workmanship, poor finish or failure in normal usages for the guarantee period of 12 running months of the system after successful performance guarantee test and handing over of the system to NALCO. Bidder to make sure that their service engineer will be available at site within 24 hours of raise of requisition from Tenderer's side. Bidder shall provide the address & contact no of nearest service center.

2.6.3 CODES AND STANDARDS

UPS will be in accordance with the latest applicable standards of the following:

- All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) except where modified and / or supplemented by the specification.
- Equipment and materials conforming to any other standard which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

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2.6.4 METERING BASES AND CHART UNITS

The following system of units shall be followed throughout the specifications unless otherwise mentioned.

Amps	➤ Current -
Volts/ Kilo Volts	➤ Voltage -
Kilo Watt	➤ Active Power -
- K VAR	➤ Reactive Power
	➤ Phase -

2.6.5 PLANT UTILITIES A.

Power Supply:

Purchaser shall arrange 1 phase, 230V AC supply from emergency power distribution board terminated at a convenient point. Any conversion/ stabilization for voltage ranges for the use by the Purchaser shall be carried out by the Bidder.

2.6.6 SCOPE OF WORK

A. Scope of Supply


The true on line double conversation Uninterruptible Power Supply (UPS) system is envisaged.

There shall be one (1) no. Redundant UPS's located in new wagon tippler control room

The rating of the UPS and the CVT shall be decided by the Bidder as per the UPS load and shall be subject to NALCO/ Consultant approval.

The components of each UPS shall be as follows:

1. 100% Static inverters
2. 100% Static switches

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3. Manual bypass switch/breaker
4. 100% UPS battery
5. 100% Float-cum-boost charger
6. Rectifier
7. Constant Voltage Stabilizer
8. CT/PT/ Ammeter/ Voltmeter as required
9. A.C Power distribution Board


Additionally, one set of tools and tackle and requisite spares shall also be supplied.

2.6.7 DESIGN CRITERIA AND SYSTEM PHILOSOPHY

A. Design Basis

A.1 General

- UPS system provides a regulated and uninterrupted single phase A.C power, within specified tolerances to critical station loads during normal and emergency operation.
- The system shall be installed indoors in a clean atmosphere.
- UPS system shall be compatible for satisfactory and well-coordinated operation with other related equipment as well as with input and output systems.
- Energizing or de-energizing any portion of the system serviced by the UPS shall not cause output changes, which will affect the operation or integrity of the remaining portions of the system in any way.
- The equipment shall be self protecting against all A.C and D.C transients, voltage surges, and steady state abnormal voltages and currents.
- The circuit protection shall be coordinated with UPS short circuit capacity and protective device characteristics so that a fault on circuit shall result in minimum loss of function.
- All non interrupting components of the UPS system shall be capable of withstanding the available short circuit currents without damage.


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- All circuit interrupting components shall be capable of withstanding the available short circuit currents without damage.
- For continuous operation at specified ratings, temperature rise of the various components of the UPS system shall be limited to the permissible values stipulated in the relevant standards and / or this specification.
- Normally Power should be fed to UPS through Constant Voltage Transformer. There should be provision to bypass the UPS (in case of failure of the UPS) under such condition load will get power from CVT only. There shall be provision to by pass CVT also.

A.2 Static Inverter


- The static inverters shall be solid state type employing IGBT(Insulated Gate Bipolar Transistor) based PWM with Instantaneous Sine wave Microprocessor Control/Silicon Controlled Rectifier to convert Direct Current / Power to essentially Sinusoidal Alternating Current/Power.
- The inverter equipment shall include all necessary circuitry and devices to conform requirements like voltage regulation, soft start, transient recovery, protection automatic synchronization, wave shaping etc. as specified herein.
- Upon transfer of full load, the inverter output voltage shall not drop below 80% of nominal voltage during the first half cycle after transfer and 90% of nominal voltage in the next half cycle. The recovery to within $\pm 2\%$ of voltage shall be less than 50 milli-seconds.
- On occurrence of a fault in branch circuit, the inverter shall be capable of cleaning the highest rated branch circuit fuse in 4 milli-seconds or less.
- The inverter shall be protected against overload, short circuit, 100% loss of load, as well as excursion, loss or restoration of D.C input voltage and synchronizing voltage.
- The D.C input current shall never exceed twice the full load current except for a short circuit within the inverter.
- For any value of the load power factor drawn by the equipment served, the inverter shall not impose on D.C source any voltage oscillations in excess of 5 volts (RMS total all frequencies) or any current oscillations in excess of 3 percent (RMS total all frequencies) of the D.C current at full load.

A.3 Static Transfer Switch

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- The static transfer switch shall be solid state type using SCR for automatic / manual transfer of load from “inverter” to “stand-by” source and vice versa.
- Stand-by source can be either of the inverter or A.C. source depending on whether both the inverters are supplying 50% load each or one of the inverter is carrying 100% load within 3 Milli Second.
- The transfer time including sensing shall not be more than one fourth cycle. Further the transition shall be make-before-make in both directions.
- The capacity of static transfer switch shall be equal to continuous full load capacity of the inverter. The switch shall be provided with protective devices in both normal and alternate power source.
- Static transfer switch shall be furnished with contact to alarm failure of the alternate or opening of any fuse protecting the static switch.
- Static transfer switch shall include all necessary circuitry and devices to meet the functional requirements of transfer initiation, transfer inhibit or retransfer back to normal as detailed below.
- The transfer of static switch from normal ‘Inverter’ position to ‘Stand-by’ position shall be initiated by one of the following causes:
 - a. Inverter failure and UPS system trouble
 - b. Inverter output voltage failure
 - c. Manual push button operation
- The static switch shall automatic transfer the load from inverter to stand-by source when the maximum i^2t capability of the inverter is reached and when the inverter output drops below 90%.
- Transfer inhibit - Automatic or manual transfer from inverter to stand-by A.C source vice versa shall be inhibited when the inverter frequency is not synchronized to the alternate source.
- Retransfer to Normal - The return to inverter mode shall be manual in all cases. Manual transfers shall be initiated by push button actuation.

A.4 Manual Bypass switch

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- Manual by-pass switch is used to isolate any static transfer switch for maintenance or repair without interruption to the UPS load.
- The switch has also the facility of by-passing both the static transfer switches during the start-up at the option of the operator.
- Switch contact shall have current rating equal to full load inverter current and necessary short time load carrying and interrupting capacity to meet the requirement of UPS system.
- The switch shall have current rating equal to the full load inverter current and necessary short time load time carrying and interrupting capacity to meet the requirement of the UPS system
- Breakers may be used instead of By-pass switch maintaining the same philosophy of operation.


A.5 Battery

- The battery shall be Sealed Maintenance Free VRLA type having a capacity of 2 hours back-up in case of failure of Main Power.

A.6 Float-cum-Boost charger

- The charger shall be solid-state type with full wave fully controlled, bridge configurations.
- The charger shall be provided with automatic voltage regulation, current limiting, smooth filter circuit and soft-start feature.
- The charger shall have the provision of float, equalizing and boost charging. Further the charger shall be suitable for single and parallel operation.
- Suitable circuitry shall be provided to ensure that charging current is voltage regulated and current limited.
- Each charger shall be rated to meet 100% UPS load plus recharge the fully discharged UPS battery within 8 hours.
- Voltage control shall be step less smooth and continuous. Float & equalizing control shall have an adjustable range of $\pm 5\%$.

A.7 Constant Voltage Transformer

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- A single phase to single phase transformer along with associated voltage stabilizer shall be furnished with the UPS system.
- The transformer and stabilizer shall be sized for 100 percent UPS load and shall coordinate with the largest circuit protection device for feeder short circuit current without sacrificing voltage regulation.
- The voltage stabilizer shall employ silicon solid state circuitry and shall maintain the specified output voltage for 0 to 100% load with maximum input voltage variation as indicated in the annexure. The make and rating shall be subjected to Tenderer's approval.
- There will be equal number of CVT of adequate rating in each & every location.

A.8 Distribution Boards

- The distribution boards shall be fixed type, of modular design in free standing gasketed sheet steel enclosure conforming to IP-54. Sheet steel thickness shall be 2mm minimum.
- Each module shall be housed in a separate compartment complete with individual front access door. Working height shall be limited to 1800 mm from the floor level.
- A full height vertical cable alley shall be provided in each panel to facilitate module wiring. The alley shall be liberally sized and shall have removable cover at the front.
- Switches shall be double pole, air break, heavy duty type, capable of safely making and breaking the full load current of associate circuit.
- Switch handle shall have the position indicator and provision of padlocking in ON & OFF positions. Further it shall be interlocked with access door for safety.
- MCB of suitable rating shall be provided..

A.9 UPS cabinets/ enclosures

- The UPS system components shall be housed in a sheet steel free standing IP42 enclosure with all access from the front. Sheet steel thickness shall be 2mm minimum.
- The enclosure shall consist of vertical cabinets housing modules in rack type sub-assemblies, connected mechanically and electrically to form a rigid, self supporting, metal enclosed structure

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- The modular units shall be mounted in pull out and/or swing trays. Each module shall be capable of being easily removed to provide for the ready inspection of major solid devices.
- Vertical wiring trough shall be provided for the entire height of the UPS cabinet. Cable entry shall be from top & bottom.
- Adequate ventilating louvers and screen shall be provided. The top of the panel shall be protected by a suitable drip cover to prevent entrance of falling liquid and foreign material.
- If the equipment supplied requires forced air cooling , the cooling system furnished shall meet the following requirement:
 - a. Two(2) Nos. 100% cooling fans shall be provided for each vertical panel
 - b. Each cooling fan shall be equipped with an air flow switch having a alarm contact that closes upon failure of air flow

A.10 Alarms

- Alarm fascia shall be provided on each charger and inverter panel complete with proper actuating devices, circuitry and legends.
- The arrangement shall be such that on occurrence of a fault the corresponding window will light up and stays lighted until the fault is cleared and reset button pressed.
- Each time a window lights up a master relay will get energized to provide group alarm signals for Purchaser's remote panel.
- Alarm contacts shall be rated 0.5A at 220 V DC and 5A at 230 V A.C.

A.11 Lamp / Space Heaters / Receptacle

- The panels shall be provided with :
 - a. Internal illumination lamp with door switch
 - b. Space heater with thermostat control
 - c. 3-pin 5A receptacle with plug
- Lamp, heater and receptacle circuits shall have individual switch fuse units.

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A.12 Wiring/ Cabling

- The panels shall be completely wired up. All wiring shall be done with flexible 650 V grade. PVC insulated wires with stranded 2.5 Sq. mm copper conductors and routed through wiring troughs. Wires shall be ferruled at both ends for identification.
- Panels shall have removable gland plate for cable entry. All incoming / outgoing cables shall be terminated in suitable terminal block.
- Control terminal blocks shall be box-clamp type ELMEX 10sq. mm or approved equal. 20% spare terminals shall be furnished.

A.13 Grounding

- Normal A.C power supply will be grounded at the source. For grounding other than this, isolation transformer shall be furnished with the UPS.
- The inverter input and output shall be electrically isolated from each other and from cabinet ground.
- Panels shall have fully rated ground bus with two ground terminals, one at each end.
- Each terminal shall comprise two-bolt drilling M10 G.I. bolts and nuts to receive Purchaser's ground connection of 50 x 6 mm G.S. flat.

A.14 Tropical protection


- All equipments accessories and wiring shall have fungus protection involving special treatment for insulation and metal against fungus, insects and corrosion.
- Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

B. System Philosophy

A.D.C power supply source and an A.C power source are available to each UPS system. The system is so designed that its load shall be served without interruption as long as one of the above power sources is available within specified limit of voltage and / or frequency.

In normal mode UPS will get power through CVT and load will be connected to UPS


In case of failure of UPS, the Static by Pass Switch will feed the load through Constant Voltage Transformer with requisite alarm.

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2.6.8 TECHNICAL SPECIFICATION

i) STATIC INVERTER

- a. Application UPS system
- b. Type Solid State SCR / IGBT based PWM
- c. Duty Continuous
- d. Enclosure Sheet steel, IP-31
- e. Cooling Natural convection or forced cooling
using redundant fans
- f. Ambient Temperature 40 Deg.C maximum
- g. Inverter capacity To be decided at 0.8 power factor
- h. Overload capacity 125% for 5 minutes
- i. Voltage:
 - i) Inverter input. Battery 200 V to 360 V
output
 - ii) Nominal output 230 VAC, 50 Hz. 1-phase
- j. Voltage Regulation:
 - i) Steady state (0 – 100 % \pm 2%
load at all input voltages
and all power factors)
 - ii) Transient voltage(on application or removal of \pm 20%
100% load) iii) Time to recover from
50 ms
transient to normal voltage
- k. Wave Form:
 - i) Nominal frequency 50 Hz
 - ii) Frequency range for all conditions of input 0.5 Hz

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supplies, loads and temperature occurring

simultaneously or in any combination(automatically controlled)

- iii) Synchronization limits (for maintenance of 47 Hz to 53 Hz(factory set) synchronization between inverter and standby A.C source)
- iv) Field adjustment range for 50 ± 0.5 Hz to 50 ± 2 Hz (c) above
- v) Total Harmonic Distortion 2% Max.(For 100% Linear Load) / 5% Max. (For 100% Non Linear load)
- vi) Harmonic content for any single harmonic 3% maximum
- I. Rated output current at rated

output

voltage with current limit not

operating:

200%

- i) Current

100 milliseconds ii)


Duration

- m. Efficiency at full load (Watt output/ watt input) 85% or better

- n. SCR derating from peak voltage and peak rating 50%

ii) STATIC SWITCH

- a. Type Solid-state, SCR

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- b. Duty Continuous
- c. Enclosure Sheet Steel IP-31
- d. Cooling Natural convection or forced cooling using redundant fans
- e. Ambient Temperature 50 Deg.C
- f. Capacity
 - i) Continuous Equal to full load capacity of the Inverter
 - ii) Overload 125%
 - iii) Peak 100% of continuous rating for 5 cycles
- g. Normal Voltage 230V, 50 Hz, 1-phase
- h. Transient Voltage Tolerance 340V peak above the nominal line voltage
- i. Transfer time ¼ th cycle maximum

iii) **MANUAL BYPASS SWITCH/ BREAKER**


- a. Type Maintained, make before break.
- b. Voltage 600V
- c. Rated Current As required

iv) **BATTERY**

- a. Application UPS Battery
- b. Ambient Temperature
 - i) Maximum 40 Deg.C
 - ii) Minimum 10 Deg.C
- c. Type Sealed Pack Maintenance Free VRLA
- d. Nos. of Cells per Battery Manufacturer Standard

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- e. Battery Capacity Bidder to compute considering 100% load for 2 hours
- f. Method of working
 - i) Float charge (Normal) 2.15 Volt/Cell
 - ii) Equalizing charge(Occasional) 2.33 Volts/Cell iii)
 - Boost charge(after complete 2.75 Volts/Cell discharge)
- g. Mounting Battery Cubicle
- h. Connection Cables
- i. Battery Size(AH Capacity) Battery sizing calculation shall be done in line with IEE standard 485-1983 considering temperature correction factor, design margin and compensation for age
- j. Design Margin Min. to be considered 15%
- k. Aging Factor Min. to be considered 20%
- v) BATTERY CHARGER**
 - a. Charger Float + Boost
 - b. Type Solid-state, full wave fully controlled SMPS based (N+1 configuration)
 - c. Duty Continuous
 - d. Enclosure Sheet steel IP-42
 - e. Cooling Natural convection of forced cooling using redundant fans.
 - f. Ambient Temperature 50 Deg.C
 - g. A.C.input

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i) Supply 415V, 3-phase, 50Hz , 4 wire ii) Voltage variation 15%

iii) Frequency variation 5%

iv) Combined volt frequency variation 20%(absolute sum)

v) Short-circuit level 50KA vi) System earthing Solidly earthed

h. D.C output 100% UPS load plus restoring fully discharged battery to full charge condition in 8 hours.

i. Blocking Diode, Peak inverse voltage 800V(minimum)

j. Performance Requirement i) The output voltage of the charger shall be regulated within $\pm 1\%$ of the set value for any load variation from 0 to 100% and A.C input voltage and frequency variation as indicated above in 8.05.07.

ii) The ripple content in charger D.C. output shall be limited to $\pm 2\%$.

vi) DISTRIBUTION BOARDS

a. Type Double Door Industrial type

b. Enclosure Sheet Steel IP-31

c. Mounting Wall Mounting

vii) CONSTANT VOLTAGE TRANSFORMER


a. Input 230V AC, 50Hz 1 Phase

b. Output 230V AC, 50Hz 1Phase

c. Regulation 1% or better

2.6.9 ERECTION PRACTICES

Each cabinet, console and other equipment supplied as a part of UPS system shall be provided with an earthing lug. All these lugs shall be properly secured to the AC mains earthing bus.

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All circuit grounds, shields and drain wires of control cables shall be connected to the system ground bus which is electrically isolated from AC mains earthing bus. This bus shall be typically of 25 mm wide and 6 mm thick of copper.

2.6.10 TESTING AND INSPECTION

A. GENERAL

On the basis of guidelines specified in these specifications, Vendor shall submit their own testing and acceptance procedure. For hardware the procedures shall include purpose of test, test definition of input, procedure, results expected and acceptance criteria.

The testing and acceptance of the system shall be carried out on the mutually agreed procedures and criteria based on these guidelines and Vendor standard procedures.

B. FACTORY ACCEPTANCE TEST (FAT) & ACCEPTANCE

Vendor shall demonstrate functional integrity of the system. No material or equipment shall be transported until all required tests are successfully completed and certified 'Ready for Shipment' by owner / consultant.

Owner / consultant reserve the right to involve and satisfy him at each and every stage of testing. They shall be free to request any specific test on equipment considered necessary by him, although not listed in this specification. The cost of performing all tests shall be borne by the Vendor.


Vendor to note that acceptance of any equipment or the exemption of inspection / testing shall be in no way absolving the Vendor of the responsibility for delivering the equipment meeting all the requirements specified.

It shall be the Vendor's responsibility to modify and / or replace any hardware if the specified functions are not completely achieved satisfactorily during FAT.

Schedule of FAT shall be included by the Vendor in the proposal.

If a malfunction of module / component in a sub-system repeats, the test shall be terminated and the vendor shall replace the faulty components / module. Thereafter the test shall start all over again. If a subsystem fails during FAT and is not repaired and made successfully operated within 4 hours of active repair time after the failure, the test shall be suspended and restarted all over again only after the vendor has replaced the device into acceptable operational condition.

Vendor shall conduct SAT (Site Acceptance Test) at site after commissioning.

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2.6.11 INSTALLATION AND COMMISSIONING

The Vendor shall produce detailed installation, test and commissioning procedures and operating instructions 4 weeks prior to the FAT for review and comment by purchaser.

A. INSTALLATION

The Vendor shall:

- Unpack and check the system hardware and supervise the transportation from site stores and installation of UPS hardware at its intended locations.
- Carry out the laying of system communication network cables and fabricate and install all splices, connections and accessories necessary to provide a complete interconnection between all equipment.
- Terminate all interconnecting cables, communication network, power and earth cables inside the system cabinets and consoles.
- Test the hardware, power supplies, cabling and connection.

B. COMMISSIONING


The vendor shall:

- Test all functions of the system
- Simulate, test and commission all input functions from the incoming terminals at the marshalling cabinets through to the operator interface.
- Test and commission all output and control functions from the operator interface through to the outgoing terminals at the marshalling cabinets.
- Test and commission the complete database.
- Test and commission all maintenance and diagnostic facilities

C. FINAL COMMISSIONING

The Vendor shall assist in commissioning all field input and output devices to the system including:

- Commissioning from field device to operate interface.
- Reconfiguration and rewriting of the system where necessary.

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- Start-up and Shut-down of the system
- As the system is to be hooked up to DCS, the Vendor shall fully co-operate with DCS Vendor and shall provide assistance in all respect

2.6.12 DRAWING, DATA & MANUAL


- A. Vendor shall submit following documents during Offer Stage: ➤

Single Line Diagram

- Panel GA.
- Heat Load, Power Requirement.
- Detail Technical Catalogue for the offered model.

- B. Vendor shall submit following documents during detail engineering Stage:

- Architecture Drawing
- Manuals for installation, configuration, termination.
- Bill of materials of all hardware's supplied.
- Grounding Details
- Panels and cabinets details, termination details to facilitate, engineering of field loops, etc.
- Power supply drawing showing distribution of various power supplies to field instruments.
- Procedure for customer acceptance tests Preliminary Engineering Stage with offer.
- Test certificates, Customers acceptance certificates etc.
- Panel Layout, Control Room Area(Considering 200% additional I/O)
- Heat Load, Power Requirement (Considering 200% additional I/O)
- Operation & Maintenance Manuals


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2.6.13 SPARE LIST FOR UPS

- Electronic cards used in the UPS - 01 Set (consisting of all type)
- Cooling fan -- 1 number of each type
- SCR, IGBT and semi conducting fuse – 3 sets each

2.7.0 DIAL TYPE HANDSET TELEPHONE WITH HOTLINE FACILITY

2.7.1	Mounting	:	i) Indoor Desk mounted type-2 nos ii) Outdoor wall mounted type -1 no
2.7.2	Dimension	:	80 mm x 160 mm x 220 mm (HxWxD)
2.7.3	Weight	:	800 g (approx.)
2.7.4	Operating Temperature	:	4°C - 50°C
2.7.5	Humidity	:	95%
2.7.6	Material of construction	:	FRP
2.7.8			Protection class : i) IP 52 – Indoor desk mounted type ii) IP 65 –Outdoor wall mounted type
2.7.9	RFI Compliance	:	FCC 15, CISPR 22, VDE 0878
2.7.10	EMC	:	CISPR 24
2.7.11	Buttons	:	16 buttons & keys
2.7.12			Features : All standard features, like call hold, voice mail messages, access redial etc.
2.7.13	Cables	:	Paired, 0.5 mm dia screened and armored copper cables
2.7.14	Connector		RJ-11, Standard Telephone Outlet


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2.8.0 LOUDSPEAKER FOR PA (BOX TYPE)

2.8.1	Peak Power Output	:	5W rms (6W Peak)
2.8.2	Impedence	:	8 ohms
2.8.3	Sensitivity	:	92 dB/1W/1M
2.8.4	Frequency Response	:	150/100 – 10000 Hz
2.8.5	Coupling	:	Direct (Without Driver Unit)
2.8.6	Material	:	Sheet Metal (Weather-proof type IP-65)

2.9.0 OPTICAL FIBER CABLE

2.9.1	Type of Cable	:	Multimode Glass Fiber Optic Cable
2.9.2	Number of Elements	:	6
2.9.3	Fiber Color Code	:	Vendor to provide color code chart
2.9.4	Tube Identification	:	Single Tube
2.9.5	Fiber Protection (Tube)	:	PBT
2.9.6	Water Blocking	:	Thixtropic Gel (Tube) & Petroleum Jelly (Interstices)
2.9.7	Core Wrapping	:	Polyethylene Terephthalate
2.9.8	Armoring	:	Corrugated Steel Tape of thickness > 0.125 mm
2.9.9	Peripheral Strength Meter	:	Two Steel Wires
2.9.10	Outer Sheath	:	UV Stabilised Polyethylene
2.9.11	Optical Performance	:	
a.	Attenuation at 850 nm	:	3.2 dB/km (approx)

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b. Attenuation at 1310 nm : 1 dB/km (approx)

2.9.12 Minimum Bandwidth

a. At 850 nm : 550 MHz (approx)

b. At 1310 nm 600 MHz (approx) xxx

2.10.0 JUNCTION BOX

2.10.1 Type of Enclosure : Dust tight, Weatherproof and Waterproof , generally conforming to IP 65 .

2.10.2 Material : 16 SWG sheet steel hot-dip galvanized / Cast aluminum LM6.

2.10.3 Type of Cover : Solid unhinged with retention chain

2.10.4 Number of Paint : One base + two finish coatings of anti-corrosive epoxy

2.10.5 Cable Entry : Conduit Knockout/Threaded Hub

2.10.6 Accessories : a) Rail mounted Terminal blocks with makers
b) Cable gland

2.11.0 OPTICAL SMOKE DETECTORS


2.11.1 Type of Detector : Photoelectric

2.11.2 Detector Housing Material : Plastic Housing Material

2.11.3 Electrical Connection : Easy wiring via removable terminal block

2.11.4 Life time of Sensor : 10 years


2.11.5 EMC immunity : 20 V/m

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- 2.11.6 Dimensions : To be furnished by Vendor
- 2.11.7 Weight : To be furnished by Vendor
- 2.11.8 Output Signal : Potential free contacts
- 2.11.9 Supply Volatage : 15-32 V DC
- 2.11.10 Operating Temperature : (-) 40 deg. C to (+) 70 deg. C
- 2.11.11 Mounting : Indoor, Ceiling mounted

2.12.0 MANUAL CALL POINTS

- 2.12.1 Type of MAC : Break glass Type
- 2.12.2 Electrical Connection : 2XM Bottom entry of Conduit
- 2.12.3 Switch : Double Pole Change over
- 2.12.4 Housing Material : SS 316
- 2.12.5 Dimensions : To be furnished by Vendor
- 2.12.6 Weight : To be furnished by Vendor
- 2.12.7 Output Signal : Potential free contacts
- 2.12.8 Power Supply : 24V DC from F &G Panel
- 2.12.9 Temperature Range : (-) 40 deg. C to (+) 70 deg. C
- 2.12.10 : Shade shall be provided, as applicable for Weather protection outdoor MCPs.
- 2.12.11 Ingress Protection : IP-66(Outdoor) / IP-45(indoor)
- 2.12.12 Electrical Protection : Explosion proof to EE x de for outdoor location


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2.13.0 FLASHING BEACON

2.13.1	Sensor Type	:	Xenon Beacon
2.13.2	Flash Rate	:	60 Flash/ minute
2.13.3	Electrical Connection	:	3/4 inch NPT
2.13.4	Lens Colour	:	Red/Blue
2.13.5	Housing Material	:	GRP UV Stable
2.13.6	Dimensions	:	To be furnished by Vendor
2.13.7	Weight	:	To be furnished by Vendor
2.13.8	Output Signal	:	Potential free contacts
2.13.9	Power Supply	:	24V DC
2.13.10	Power Consumption	:	44.4 Watt
2.13.11	Temperature Range	:	(-) 40 deg. C to (+) 70 deg. C
2.13.12	Ingress Protection	:	IP-42 (indoor)/ IP-66(outdoor)
2.13.13	Electrical Protection	:	Explosion proof to EE x de for outdoor location

2.14.0 AUDIBLE ALARM/ HOOTER

2.14.1	Electrical Connection	:	3/4 inch NPT
2.14.2	Device Colour	:	Black
2.14.3	Housing Material	:	Body and horn in antistatic ,UV stable glass reinforced polyester
2.14.4	Dimensions	:	To be furnished by Vendor

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- 2.14.5 Weight : To be furnished by Vendor
- 2.14.6 Output Signal : Potential free contacts
- 2.14.7 Power Supply 12V DC to 48V DC
- 2.14.8 Sound output 115 Decibel at 1m distance
- 2.14.9 Temperature Range (-) 40 deg. C to (+) 70 deg. C
- 2.14.10 Weather Protection Shall be provided as applicable
- 2.14.11 Ingress Protection : IP-42 (indoor)/ IP-66(outdoor)
- 2.14.12 : Explosion proof to EE x de for outdoor
Electrical Protection location

2.15.0 LINEAR HEAT SENSING CABLE

- 2.15.1 Detector Cable : It shall consist of four copper conductors, each covered with a color code, negative temperature co-efficient material. The cores shall be twisted together and protected by an outer sheath of high temperature, flame retardant PVC insulation.
- 2.15.2 Enclosure : IP 55
- 2.15.3 Control Unit/ Interface Units : Vendor to specify




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ABBREVIATIONS

Abbreviations mentioned below are only a sampling of common and specific usages. Other abbreviations, if used, it is expected that its full description is understood.

EHV	- Extra High Voltage	FRLS	- Fire Retardant Low Smoke
HV	- High Voltage	IDMT	- Inverse Definite Minimum Time
LV	- Low Voltage	TEFC	- Totally Enclosed Fan Cooled
FLC	- Full Load Current	TETV	- Totally Enclosed Tube Ventilated
I/C	- Incomer	CACA	- Closed Air Circuit Air Cooled
CT	- Current Transformer	MCB	- Miniature Circuit Breaker
PT	- Potential Transformer	MCCB	- Moulded Case Circuit Breaker
CB	- Circuit Breaker	MPCB	- Motor Protection Circuit Breaker
ACB	- Air Circuit Breaker	SFU	- Switch Fuse Unit
VCB	- Vacuum Circuit Breaker	ELCB	- Earth Leakage Circuit Breaker
ONAN	- Oil Natural Air Natural	REF	- Restricted Earth Fault
ONAF	- Oil Natural Air Forced	ASB	- Auxiliary Service Board
AN	- Air Natural	SPDB	- Small Power distribution Board
NGR	- Neutral Grounding Resistor	OCTC	- Off Circuit Tap Changer
PCC	- Power Control Center	OLTC	- On Load Tap Changer
MCC	- Motor Control Center	DOL	- Direct On-Line
GIS	- Gas Insulated Switchgear	SWBD	- Switchboard
UPS	- Un-interruptible Power Supply	FRP	- Fiber Reinforced Plastic
VRLA	- Valve Regulated Lead Acid	TPN	- Three Phase Neutral
VFD	- Variable Frequency Drive	SPN	- Single Phase Neutral
RTD	- Resistance Temperature Detector	ACDB	- AC Distribution Board
BTD	- Bearing Temperature Detector	DCDB	- DC Distribution Board
SCVS	- Servo Control Voltage Stabilizer	AC	- Alternating Current
ICAO	- International Civil Aviation Organisation	DC	- Direct Current

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EMLDB - Emergency Main Lighting Distribution Board MLDB - Main Lighting Distribution Board
ESLDB - Emergency Sub Lighting Distribution Board SLDB - Sub Lighting Distribution Board

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CBCT - Core balance / Zero Balance

Current Transformer

FLC - Full Load Current

SCVS - Servo Control Voltage Stabilizer


DCS - Distributed Control System

JB - Junction Box

S/S - Substation

rms - Root Mean Square

Ph. - Phase

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1) GENERAL INFORMATION

This document provides the minimum and generally followed norms, basis, guidelines for the electrical equipment/ systems in the project.


This document contains all the major electrical equipment/ systems. The applicable ones shall be referred to.

Design ambient temperature

50°C for Electrical equipment.


2) SUBSTATIONS

	Cable routing options.	With cable cellar (cables routed on cable trays).
	Ventilation:	
	a) Switchgear room.	Naturally ventilated with exhaust fans (with wire mesh)
	b) Office-room, Operation & Maintenance room, Control room.	Air conditioned.
	c) Cable Cellar.	Naturally ventilated with exhaust fans. (with wire mesh)
	d) Battery room.	Not Applicable.
	e) UPS/VFD/Rack room SCADA panels, Battery charger & Battery	Air conditioned
	Transformer bay	Enclosed bay with roof and grided rolling shutter in front.
	Doors.	Steel doors of 2 Hour fire rating.
	Exit doors.	At every 30 m.
	Walls.	Blast proof if it is within 15 m from hazardous plant. Transformer bay walls of 4 Hour fire rating.
	Window	Windows shall be provided in substation with fixed transparent pane.
	Additional rooms inside Substation building.	Toilet block. Ground Floor: Storage of emergency spares. First Floor: Electrical shift room, General shift maintenance group room, Documentation Room. Second Floor: Storage space for VFD spares/ modules.

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	Additional requirement.	Industrial duty passenger lifts of minimum 2 ton capacity. Applicable for substation with ground floor (Cable Cellar room) + two floors (switchgear room and other rooms). Monorail shall be provided for switchgear room at first floor level at loading platform.
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3) TRANSFORMERS


	Design Data	Main Power Transformer	Distribution Transformer			Lighting Transformer	
	No-load Voltage ratio	220/11.5 kV	11/6.9 kV	11/0.72 kV	11/0.433 kV	11/0.380 KV	0.415/0.380 KV
	Vector group	YN0yn0	Dyn11		Dyn11	Dyn11	
	Cooling	ONAN/ONAF	ONAN		ONAN	AN	
	Tap changer	OLTC	OCTC		OCTC	OCTC	
	Spare capacity (on calculated operating load)	min. 20 %	min. 20 %		min. 20 %	min. 50 %	
	HV side termination	OH conductor	Cable		Cable	Cable	
 4	LV side termination	Cable	Cable	Busduct	Busduct/ Cable(for trafo ratings ≤ 800 KVA)	Cable	
	Neutral earthing	Resistance Grounded	Resistance Grounded	Solidly Grounded	Solidly Grounded	Solidly Grounded	

4) POWER SUPPLY UTILIZATION DETAILS


	AC POWER FOR NORMAL POWER DISTRIBUTION				
	Voltage Level	Voltage & Variation	Frequency & Variation	System (No. of ph. & wires)	Application
	EHV- 220 kV	220kV ±10%	50 Hz + 3% / -5%	3Ph, 3W	Switchyard
	650V<High Voltage ≤ 11kV	11kV ± 10%	50 Hz + 3% / -5%	3Ph, 3W	Distribution/ HV Loads
		6.6 kV ± 10%	50 Hz + 3% / -5%	3Ph, 3W	HV Loads
		690 V ± 10%	50 Hz + 3% / -5%	3Ph, 3W	VFD Motor Loads
	Low Voltage ≤ 650V	415 V ± 10%	50 Hz + 3% / -5%	3Ph, 4W	LV Loads
		220 V ± 10%	50 Hz + 3% / -5%	1Ph, 2W	Lighting Loads

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AC POWER FOR EMERGENCY POWER DISTRIBUTION														
	Voltage Level	Voltage & Variation	Frequency & Variation	System (No. of ph. & wires)	Application									
	Low Voltage	415 V ± 10%	50 + 3% / -5%	3Ph, 4W	Emergency Loads									
CONTROL POWER SUPPLY														
	AC/ DC	Voltage & Variation	Frequency & Variation	System (No. of ph. & wires)	Application									
	AC	240 V ± 10%	50 Hz + 3% / -5%	1Ph, 2W	Panel space heater supply & other auxiliary loads. Control ckts. of motor feeders (from Control Bus fed from 2 nos. of control Transformer with auto-manual facility, per bus section).									
	AC	230 V ± 1%	50 Hz ± 0.5%	1Ph, 2W	Instrumentation loads, Telephone commu. system, Wireless commu. system, PA, FA, SCADA system, Transducer Panel and other critical systems									
	DC	110V + 10% - 15%	-	-	Indication & control supply of all feeders of EHV, HV & ACB feeders of LV switchgear and DC critical lighting.									
5) NGR														
	Earth fault current shall be limited to		11 kV: 900 A or FLC of transformer whichever is lower. 6.6 kV: 200 A or FLC of transformer whichever is lower.											
	NGR rated current & time		Earth fault current for 10 seconds											
	Material of NGR		Stainless steel											
6) METERING														
Parameters to be monitored	Feeder Type	I/C + LINE PT (also refer Note vii)			Bus Coupler HV/ LV	Bus PT HV/ LV	Capacitor HV/ LV	Trafo. Sec. voltage ≥ 433V	INDUCTION MOTOR (Also refer Notes i, ii, iii, vi, vii)			Diesel Gen. I/C		Distribution (Also refer Notes viii)
		HV	LV PCC	LV MCC					HV	LV		LV/ HV		
										≥ 30kW & ≤ 55 kW	≥ 75 kW	≤ 1000 kVA	> 1000 kVA	
	I	Y(C) (vii)	Y(C) (vii)	Y(C) (vii)	Y (C) + (D/A)	N	Y (D/A)	Y (C/D)	Y(C)+ A	Y(iii)	Y(C) (vi, iii)	Y(C) (vii)	Y(C) (vii)	Y(C/D) (iv) + A

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Parameters to be monitored	Feeder Type	I/C + LINE PT (also refer Note vii)			Bus Coupler HV/LV	Bus PT HV/LV	Capacitor HV/LV	Trafo. Sec. voltage ≥ 433V	INDUCTION MOTOR (Also refer Notes i, ii, iii, vi, vii)			Diesel Gen. I/C		Distribution (Also refer Notes viii)
		HV	LV PCC	LV MCC					HV	LV		LV/ HV		
										≥ 30kW & ≤ 55 kW	≥ 75 kW	≤ 1000 kVA	> 1000 kVA	HV/ LV (> 250 A)
	V	Y(C) (vii)	Y(C) (vii)	Y(C) (vii)	Y (C)	Y (D/A)	N	N	N	N	N	Y(C) (vii)	Y(C) (vii)	N
	Hz	Y(C)	Y(C)	Y(C)	Y (C)	N	N	N	N	N	N	Y(C) + AA	Y(C) + AA	N
	PF	Y(C)	Y(C)	Y(C)	Y (C)	N	N	Y(C)	N	N	N	Y(C)	Y(C)	Y(C) (viii)
	MW	Y(C)	Y(C)	Y(C)	N	N	N	Y(C)	Y(C)	N	Y(C) (vi)	Y(C)	Y(C)	Y(C) (viii)
	MWh	Y(C)	Y(C)	Y	N	N	N	N	N	N	N	Y(C)	Y(C)	Y(C) (viii)
	Hour run	N	N	N	N	N	N	N	Y	N	Y	Y	N	N
	MVA _r	Y(C)	N	N	N	N	Y (D/A)	N	N	N	N	N	Y(C)	N
	MVA _h	Y(C)	N	N	N	N	N	N	N	N	N	N	Y(C)	N
	MVA	Y(C)	N	N	N	N	N	N	N	N	N	Y(C)	Y(C)	N
NOTES :														
(C) : Composite meter, (D) : Digital meter, Y : YES, N : NO, (A) : Analog Meter with Selector Switch, (AA) : Analog meter														
i)	Motor Current display for all motors ≥ 15 kW (11kV, 6.6kV, 415V) shall be provided at Plant DCS & also at Operator terminal for each substation.													
ii)	Current measurement shall be provided at PCC/ Switchgear for all motors ≥ 30 kW, all agitators & critical drives.													
iii)	Field ammeters are required for all motors rated ≥ 5.5 kW													
iv)	Need not be provided if distribution board is in same substation.													
v)	Composite/ Digital Meters shall be provided with communication Port for SCADA connectivity.													
vi)	Multi-function meter (communicable type) shall be provided for all HV, LV (PCC/ MCC) incomers, bus couplers & DOL motors ≥ 30 kW (11 kV, 6.6 kV, 690V & 415 V) .													
vii)	For HV and LV incomers separate analogue ammeter and voltmeter with selector switches shall be provided in addition to composite meters.													
viii)	All lighting feeder incomers (MLDB & EMLDB) shall have separate metering (I, MWh) .													


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7) PROTECTION


RELAY NUMBERS & DESCRIPTION			
2	Timer	51N	IDMT Earth Fault Relay (Residual connection)
25	Synchro-check Relay	59	Over Voltage Relay
27	Under Voltage Relay	60	Voltage or Current Balance Relay
32	Directional Power Relay	64R	Restricted Earth Fault Relay
46	Negative Phase Sequence Relay	67	Directional Over Current Relay
49	Thermal Overload Relay	67N	Directional Earth Fault Relay
50	Instantaneous Overcurrent Relay	86	Tripping Relay
50G	Instantaneous Earth Fault Relay	87	Differential Protection Relay
50L/R	Locked Rotor Protection Relay	95	Trip Circuit Supervision (Separate Relay)
50N	Instantaneous Earth Fault Relay	96	Transformer Auxiliary Relay
51	IDMT Overcurrent Relay	80	DC Supervision Relay
51G	IDMT Earth Fault Relay		

PROTECTION (For HV Switchboards, LV PCC/ MCC panels)


	Feeder Type Relay No. & Type Descr.	I/C + LINE PT HV/ LV	Bus Coupler HV/ LV	Bus PT HV/ LV	Capacitor		Transformer Feeder		Induction Motor Feeder		Diesel Gen I/C		Distri-bution with CB/ fuse
					HV	LV (ACB Feeder)	Sec. voltage > 433 V	Sec. voltage ≤ 433 V	HV	LV	LV		
											≤ 1000 kVA	> 1000 kVA	
	51	Y	Y	N	Y	Y	Y	Y	N	N	Y(xiv)		Y
	51N	Y	Y	N	Y	Y	Y (viii)	Y (viii)	N	N			Y
	51G (sec. neutral)	Y (i)	N	N	N	N	(i)	(i)	N	N	Y(xv)		N
	50	N	N	N	Y	Y	Y	Y	N	(xiii)	N	N	Y
	50N	N	N	N	Y	Y	Y (ix)	Y (ix)	N	(xiii)	N	N	Y
	50G	N	N	N	N	N	N	N	N	Y (xiii)	N	N	N
	49, 50, 50N, 46, 50L/R, 50G	N	N	N	N	N	N	N	Y (xi)	Y (xi)	N	N	N
	49	N (xviii)	N	N	N	N	N	N	N	N	Y (xvi)		N

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	Feeder Type Relay No. & Descr.	I/C + LINE PT HV/ LV	Bus Coupler HV/ LV	Bus PT HV/ LV	Capacitor		Transformer Feeder		Induction Motor Feeder		Diesel Gen I/C		Distri-bution with CB/ fuse
					HV	LV (ACB Feeder)	Sec. voltage > 433 V	Sec. voltage ≤ 433 V	HV	LV	LV		HV/ LV (see note xxi)
											≤ 1000 kVA	> 1000 kVA	
	64R	Y (i & x)	N	N	N	N	Y (i & x)	Y (i & x)	N	N	Y (xv)		N
	87	N	N	N	N	N	Y (ii)	N	Y (xii)	N	N	Y (xvii)	Y (xviii)
	86 (Sep. relay)	Y	Y	N	Y	Y	Y	Y	Y	N	Y		Y
	95 (Sep. relay)	Y	Y	N	Y	Y	Y	Y	Y	N	Y		Y
	96	N	N	N	N	N	Y	Y	N	N	N		N
	27 (80%) + 2	Y	N	Y	(vi)	N	N	(vi)	(vi)	(vi)	N	N	N
	27 (20%)	N	N	Y	N	N	N	N	N	N	N	N	N
	59	N	N	Y (v)	Y (v)	N	N	N	N	N	N	Y	N
	25	N	Y (iv)	N	N	N	N	N	N	N	N	N	N
	60	N	N	N	Y (vii)	N	N	N	N	N	N	N	N
	46	N	N	N	N	N	N	N	N	N	Y	Y	N
	32	Y(iii)	N	N	N	N	N	N	N	N	N	Y (iii)	N
	67	Y (iii)	N	N	N	N	N	N	N	N	N	Y (iii)	N
	67N	Y (iii)	N	N	N	N	Y (viii)	N	N	N	N	Y (iii)	N
	80	N	Y	N	N	N	N	N	N	N	N	N	N
	NOTES :												
i)	51G & 64R are transformer protection relays located in the Incomer panel, for incomers fed from transformers, shall trip upstream breaker.												
ii)	For transformers rated 5 MVA and above.												


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iii)	32, 67, 67N shall be provided where paralleling of feeders is envisaged.	
iv)	For switchgear having bus transfer scheme, where continuous or momentary paralleling is envisaged.	
v)	Time delayed over voltage (59) protection to be provided if there are capacitor feeders on the Bus.	
vi)	The following feeders shall be tripped on sustained under voltage, by under voltage relay on Bus PT: a) HV capacitor feeders. b) HV & LV ACB controlled motor feeders or contactor feeders with DC control supply. c) Rectifier feeders.	
vii)	In case of HV Capacitor bank feeders, 60 (Neutral displacement) relay shall be Current operated for Double star connection and Voltage operated for Single Star connection with RVT.	
viii)	51N for delta primary/ directional IDMTL 67N for star primary.	
ix)	50N (with stabilizing resistance) shall be provided only for transformers with delta primary	
x)	64R shall be provided for transformers rated 1 MVA & above.	
xi)	• Overload Relay Type:	
	Electronics overload relay	* 7.5 kW
	Digital Motor protection Relay with display & fault record (46, 49, 50, 50N, 50G, 50 L/R)	7.5 kW ≤ Motor kW < 75 kW
	Digital Motor protection Relay with display & fault record (46, 49, 50, 50N, 50G, 50 L/R)	≤ 55 kW for agitator motors
	Comprehensive numerical Motor Protection Relay (46, 49, 50, 50N, 50G, 50 L/R)	Motor kW ≥ 75 kW
	Comprehensive numerical Motor Protection Relay (46, 49, 50, 50N, 50G, 50 L/R)	> 55kW for agitator motors
	• Bimetallic relay shall not be used.	
xii)	For motors rated 1000 kW and above.	
xiii)	Instantaneous O/C protection shall be achieved with fuse for motor rating ≤ 200kW. Earth leakage relay connected to CBCT shall be provided for motor rating 5.5 kW & above.	
xiv)	Voltage restrained overcurrent relay shall be provided for Diesel Generator feeders.	
xv)	51G shall be provided for Generators, 500 kVA and above. 64R shall be provided for generators rated 1000 kVA and above.	
xvi)	49, Temperature protection (through RTD) shall be provided for generators 1000 kVA and above.	
xvii)	For generators rated 1600 kVA and above.	
xviii)	In general differential protection shall be provided for critical/ long cable feeders where distance is >1 km. However differential protection shall be provided for all outgoing feeders from new 11kV switchgear building to Plant substations of 5 th Stream Alumina Refinery.	
xix)	Thermistor Relay shall be considered for Motors provided with thermistors.	
xx)	Each bus section shall be provided with Bus Differential Relays (87B) and BUS wire supervision Relay (95B) for HV Switchboards connected directly to generation buses or critical buses.	
xxi)	51N shall be provided for LV fuse/ MCCB distribution feeders above 250 A. 50G shall be provided for non-motoring loads rated above 5 kVA.	
xxii)	LV Air Circuit breakers shall be provided with external numerical protection with CT's. These shall not have any breaker mounted CT with releases.	
xxiii)	50N shall be provided with stabilizing resistance.	
8) SWITCHYARD EQUIPMENT BASIC SPECIFICATION (220 kV)		
	Rated short time withstand current	40 kA for 3 seconds
	Creepage distance	7595 mm (Minimum).
	Lightning Impulse withstand voltage	+/-1050 kVP
	Power frequency withstand voltage	460 kV (rms)
	Minimum clearance	As per CBIP
	Type of busbar	ACSR Single, Zebra
	Main Bus configuration	Single Busbar

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a	Circuit Breaker			
	Rated current	630 A Minimum		
	Short circuit capacity, kA	Short time withstand	Breaking	Peak/ Making
		40/ 3 s	40	100
	Type	SF ₆		
	Operating mechanism	Spring assisted, motorized		
b	Isolator			
	Type	Double break, Gang operated, Center post Rotating		
	Operating mechanism	Motorised & Manual		
	Earth switch	Yes, Interlocked with Isolator (E/M)		
c	Potential Transformer			
	Type	Oil filled dead tank type		
	Secondary Voltage	110V/ √3		
	Accuracy class	0.2 for Tariff Metering, 3P for Protection		
	Continuous/Short time Overvoltage factor	1.2 / 1.5 for 30 s		
d	Current Transformer	Metering	Prot.	Differential/ REF
	Secondary current	1 A	5 A	1 A
	Accuracy class	CL 0.2	5P20	CL PS
	Type of Construction	Oil filled live tank type		
e	Metering			
	Parameters to be monitored	EHV-220 kV		
	I	Applicable, Composite meter and refer note 1.		
	V	Applicable, Composite meter and refer note 1.		
	Hz	Applicable, Composite meter.		
	PF	Applicable, Composite meter.		
	MW	Applicable, Composite meter.		
	MWH	Applicable, Composite meter.		
	Hour run	Not Applicable.		
	MVAR	Applicable.		
	MVAH	Applicable.		
	MVA	Applicable.		
	Harmonic analyzer (up to 25th harmonic)	Applicable.		
	Note:			
	1. Separate Digital ammeter and voltmeter shall be provided in addition to composite meters.			
f	Protection			
	Relay No. & Descr.	EHV-220 kV		
	51	Applicable.		
	51N	Applicable.		
	51G (sec.neutral)	Applicable, refer note 1.		
	50	Applicable.		
	50N	Applicable.		
	64R	Applicable, refer note 1.		
	87T	Applicable		

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	86 (Sep.relay)	Applicable.
	95 (Sep.relay)	Applicable.
	67, 67N, 87B	Applicable.
	4 27 (80%)+2, 27 (20%)	Not Applicable.
	Note:	
	1. 51G & 64R are transformer protection relays located in the Control Relay panel.	
g	Insulators	Porcelain
h	Lightning Arrester	Station Class Heavy Duty ZnO, Gapless
i	Switchyard equipment supporting structure material	MS hot dip galvanized
j	Earthing material	MS hot dip galvanized
9) HIGH VOLTAGE BUSDUCT		
10) HIGH VOLTAGE SWITCHGEAR (11 kV, 6.6kV, 690V)		
	Type of Switchgear	Metal enclosed (air insulated)
	Degree of enclosure protection	min. IP4X
	Type of circuit breaker	For 11kV & 6.6kV, VCB, motorized For 690V, ACB, motorized
	Motor switching device	For 11kV, VCB for ≥ 1000 kW , For 6.6kV, Vacuum Contactor with HT fuse for < 1000 kW, For 690V, MCCB with shunt realises.
	Short time rating of switchgear	40 kA for 3 second (11kV, 6.6kV) Minimum 50 kA for 1 second (690V).
	Type of Main Protection Relay	Numerical (IEC 61850 compliant)
	Internal Arc testing	40 kA for 1 second (11kV, 6.6kV)
	Material and arrangement of Busbars	Aluminum, Double bus: For Main 11kV panel located in new 11 kV switchgear building Single bus: For 11kV Panel at down stream substation.
	Sleeve requirement of Busbar	Heat shrinkable Sleeves with shrouds over busbar joint.
	Surge suppressors to be provided for motor feeder	In case of Vacuum CB/ Vacuum contactor feeders
	Supply changeover system	Auto/ manual with momentary paralleling
	Control voltage for Circuit breaker & relays	110 V (DC)
a	Short circuit capacity of circuit breakers	
	Symmetrical breaking	40 kA (rms) (11kV,6.6kV)
	DC component	Approx. 30 %

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	Making capacity	100 kA (peak) (2.5 times Breaking capacity) (11kV,6.6kV)		
b	Spare feeders	Min. 1 of each outgoing type		
c	Potential Transformer			
	Type of construction	Epoxy resin Cast		
	Mounting of bus PT	Drawout, separate panel		
	Mounting of Line PT	Drawout, with I/C CB		
	Continuous over voltage factor	1.2		
	Short time over voltage factor	1.9 for 30 s for non-Effectively grounded		
		1.5 for 30 s for Effectively grounded		
	Accuracy Class : Class 1 for metering and Class 3P for Protection			
d	Current Transformer	Metering	Prot.	Differential/ REF
	Secondary current	1 A	5 A	1 A
	Accuracy class	CL 1	5P15	CL PS
	Type of Construction	Epoxy resin Cast		
11) LOW VOLTAGE SWITCHGEAR				
	Type of construction	Floor mounted, Drawout type (For PCC, MCC)		
	Front	Single front		
	Cable Entry	Bottom		
	Degree of enclosure protection	IP 42 for MCC panels, IP 4X for ACB panels		
	Supply changeover system	Auto/ Manual (with momentary paralleling)		
	Type of Protection Relay for ACB feeders	Numerical		
	Spare feeders	20% with min. 1 of each rating		
	Control supply for ACB Feeder	110 V DC		
	Control supply for Contactor	240 V AC (through control transformer)		
	Space heater supply	240 V AC		
	Motor switching	i) Air Break Contactor - Below 75 kW (Contactor rating shall be one size higher than that recommended by the Type 2 Coordination of switchgear vendor). ii) Vacuum Contactor - 75 kW to 200 kW & Agitator motor.		
a	Type of isolating device			
	a) Incomer feeder	ACB, 4P (PCC, MCC > 400 A) SFU (MCC ≤ 400 A)		
	b) Bus coupler	ACB, 4P (PCC, MCC > 400 A) SFU (MCC ≤ 400 A)		
	c) Outgoing feeder			
	1) Motor feeder	SFU ≤ 200 kW		
	2) Distribution feeder	ACB > 400 A; SFU ≤ 400 A		
b	Method of motor starting			
	DOL	Upto & including 200 KW.		
	Star delta/ DOL/ Soft starter	NA.		
	Any other type	VFD- to be selected based on process requirement. Soft Starter- NA		
c	Material of busbars	Aluminum		
d	Sleeve arrangement of Busbar	Heat shrinkable Sleeves		

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e	Short time rating of switchgear		Rated switchboard fault level for 1sec	
f	Short circuit breaking capacity of circuit breakers			
	Symmetrical	As required kA (rms)		
	DC component	30% Approx.		
	Making capacity	2.1/ 2.2 times breaking capacity		
g	Current Transformer	Metering	Prot.	Differential/ REF
	Secondary current	1 A	5 A	1 A
	Accuracy class	CL 1	5P15	CL PS
	Type of Construction	Epoxy resin Cast		
12) LOW VOLTAGE BUSDUCT				
	Type	Less than 4000 A: Air Insulated, Non Phase segregated, Interleaved >2500 A. 4000 A and above: Sandwich type		
	Degree of protection	Outdoor IP55 & Indoor IP52		
	Short time rating	As required kA for 1 second		
	Material of Busbars	Aluminum		
	Material, type of flexible	Copper, Fusion bonded		
	Sleeve requirement of Busbar	Heat shrinkable Sleeves for Air insulated		
	Material of enclosure	CRCA Sheet Steel		
13) UN-INTERRUPTIBLE POWER SUPPLY				
	Configuration	Parallel redundant with SCVS		
	Output voltage	230 V AC, 50 Hz, 1 phase, Neutral earthed		
	Input isolation transformer	To be provided		
	Batteries	Double Bank with common battery sharing feature.		
	Battery backup duration	60mins (for the combined set of batteries).		
	Spare capacity to be considered for UPS sizing	Min. 50 %		
	Type of batteries	VRLA		
	Construction of ACDB	Sheet metal enclosed, modular, compartmentalised		
	Spare outgoing feeders for ACDB	Min 20 % with 1 of each rating.		
	Connectivity with computer / SCADA to be provided	Yes		
14) SQUIRREL CAGE INDUCTION MOTOR (LV & HV)				
a	Power supply for motor rating (DOL)			
	Below 0.37 kW	Single Phase, 230 V AC		
	0.37 kW to 200 kW	Three Phase, 415 V AC		
	Above 200 kW & below 1000 kW	Three Phase, 6.6 kV AC		
	1000 kW & above	Three Phase, 11 kV AC		
b	Power supply for motor rating (with VFD)			
	Upto 200 kW	Three Phase, 415 V AC		

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	Above <u>200</u> kW to <u>630</u> kW	Three Phase, <u>690</u> V AC	
	Above <u>630</u> kW & below 1000 kW	Three Phase, <u>6.6</u> kV AC	
	<u>1000</u> kW & above	Three Phase, <u>11</u> kV AC	
c	Starting duty cycle	Up to 200 kW	Above 200 kW
	Equally spaced starts per hour from cold condition	4 nos.	3 nos.
	Successive starts from cold condition	3 nos.	2 nos.
	Successive starts from hot condition	2 nos.	1 no.
d	Winding insulation/ Temperature Rise		
	Insulation Class	F	
	Temperature rise limited to limits of class	B	
	Over voltage withstand capacity for stresses	<u>150</u> % rated voltage due to Bus Transfer	
e	Minimum permissible voltage in percent of rated voltage for:		
	Starting at Full Load	80%	
	5 minute running without overheating	75%	
f	Requirement of separate Canopy & material	FRP, for outdoor motors open to sky.	
g	Separate terminal box for space heater thermister,RTD/BTDs	Yes	
h	LV Squirrel Cage Induction Motor (Specific requirement in addition to a, b, c, d, e, f & g above)		
	Cooling & Degree of protection	TEFC, IP56	
	Energy efficiency type	Min. IE2 as per IS:12615	
	Provision of space heater	30 kW and above	
	Thermistor to be provided for	≥ 75 kW and VFD operated Motors	
	Noise level	To be limited to <u>85</u> dB max.at 1 meter distance*	
	Starting current (Inclusive of IS/ IEC tolerance)	8.4 times Full Load Current (Max.)	
	If required, starting current shall be restricted to lower values based on voltage dip calculations.		
f	HV Squirrel Cage Induction Motor (Specific requirement in addition to a, b, c, d, e, f & g above) (690V, 6.6kV, 11kV)		
	Cooling & Degree of protection	TEFC/ TETV/ CACA & IP56	
	Starting current (Inclusive of IS/ IEC tolerance)	6.6 times Full Load Current (Max.)	
	If required, starting current shall be restricted to lower values based on voltage dip calculations.		
	Main / Neutral terminal box type	Phase segregated/ Non Phase segregated resp.	
	Winding Protection	<u>2</u> nos. RTDs per Phase (Duplex)	
	Bearing protection	RTDs 1 each for DE & NDE bearing (Simplex)	
	Vibration monitoring for motor rating	<u>1000</u> kW and above	
	Noise level	To be limited to <u>85</u> dB max.at 1 meter distance*	
	*Special measures to be implemented (in coordination with Rotating Machinery group) in case noise level cannot be limited to 85 dB at 1m.		


15) LOCAL CONTROL STATION AND LOAD BREAK SWITCH


	A) LOAD BREAK SWITCH	
	1. For flameproof type (Ex-d)	Die cast Aluminium (Applicable for Flame proof Area "Fuel/ Oil handling").

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	2. For Industrial type	Stainless steel (SS-304)
	Enclosure protection	IP 65
	Additional canopy	Yes, same as Enclosure Material
	B) LOCAL CONTROL STATION	
	1. For flameproof type (Ex-d)	Die cast Aluminium (Applicable for Flame proof Area "Fuel / Oil handling").
	2. For Industrial type	Stainless steel (SS-304)
	Enclosure protection	IP 65
	Additional canopy	Yes, same as Enclosure Material
	Type of stop Push Button	Stay put type with Mushroom head pad with locking facility
	Ammeter shall be provided for motor rating	5.5 kW and Above. And also for all agitator drive.
	Note: Glass, Cover & Dial shall be replaceable on damage	
	Type of indicating lamps	Clustered chip LED type
	Control device for breaker operation	TNC Switch
	Hardware material	Stainless steel
	Enclosure protection	IP 65
	Local-Off-Remote-Switch	NA
	Note: Load break switch with pad lock facility shall be provided near each LT motor & Load break switch to motor connection shall be through flexible copper (EPR) cable.	

16) CABLES

a	High voltage power cables (Above 1100V grade)	
	Voltage grade for Solidly grounded system	Earthed Grade
	Voltage grade for Resistance Grounded System	Unearthed Grade
	Conductor material	Aluminum
	Conductor screen/ Insulation screen	Required
	Insulation	XLPE
	Inner sheath	Extruded PVC
	Armouring & type	Round/ Flat, Galv. steel for multi core, Al for 1 core
	Outer sheath	Extruded PVC, FRLS
4	Max. conductor size for 1C/ 3C cables	For 11kV & 33kV - 1000 mm ² for 1C / 300mm ² for 3C For 6.6kV - 630 mm ² for 1C For 690 & 415 V - 300 mm ² for 3C
	Type of termination kit	Heat shrinkable
b	Low Voltage Power cables	
	Voltage grade	1.1 kV
	Conductor material & Type	Al for 6 sq. mm and above / Cu below 6 sq. mm, Stranded
	Minimum conductor size	2.5 sq. mm for Cu, 6 sq. mm. for Al
	Insulation	XLPE
	Inner sheath	Extruded PVC
	Armouring & type	As per IS, Galv. steel for multi core, Al for 1 core
	Outer sheath	Extruded PVC, FRLS
	Max. conductor size for 1C/3C cables	Up to 630 mm ² for 1C & up to 300 mm ² for 3C
c	Control cables	
	Voltage grade	1.1kV

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	Conductor material/ type/ size	Cu/ stranded/ Min. 2.5 mm ²
	Insulation	PVC
	Inner sheath	Extruded PVC
	Armouring & type	Round
	Outer sheath	Extruded PVC, FRLS
	Spare core	20% with minimum 2 core
d	Lighting sub-circuit cables	
	Voltage grade	1.1kV
	Type, Conductor material & type	XLPE insulated, Cu - Solid conductor
	Conductor size	2.5 sq. mm
e	Cable laying Philosophy	
	Hazardous Plants	Not Applicable
	Non-hazardous Plants	Cable trays on Racks
	a) Major part on cable trays in air on pipe racks	Yes
	b) Cable trays in Built-up(RCC/ Brick) trenches to suit layout	Yes, Only if overhead routing not possible.
	c) Cable buried direct underground, with earth soil & sand	For street lighting, High mast lighting.
	d) Cable rack/ trays(ladder type) in built up (with RCC/ Brick) trenches & filled with sand	Yes, Only if overhead routing not possible.
f	Short circuit withstand capacity to be considered for Cables:	
	HV incoming cables to Switchboard	40 kA for 1 s
	HV CB distribution feeders	
	i) Capacitor feeder	40 kA for 0.25 s
	ii) Motor feeder	40 kA for 0.25 s
	iii) Transformer feeder	40 kA for 0.6 s
	HV contactor feeder with fuse backup	Let through energy of fuse
	690 & 415V Incomer to SWBD (Transformer Incomer)	Rated switchboard fault level for 1sec
	690 & 415V ACB Motor/ distribution feeders	Rated switchboard fault level for 0.25sec
	690 & 415V fuse backed feeder	Let through energy of fuse
	690 & 415V MCCB/ MPCB feeder (Current limiting type)	Let through energy of MCCB/ MPCB
g	Maximum voltage drop for running condition for Cables between:	
	Transformer & switchboard Busbars	0.5%
	PCC & MCC/ Auxiliary switchboard located in same substation	1%
	PCC & MCC/ Auxiliary switchboard located in different substation	3%
	HV Switchboard and HV motor	3%
	HV switchboards situated in same S/S	1%
	HV switchboards situated in different S/S	3%
	HV switchboard & Transformer/ Capacitor	2%

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	PCC and motor	5%
	MCC located in same substation as feeding PCC and motor	5%
	MCC located remote from feeding PCC and motor	3%
	Auxiliary Services board/ MLDB and SLDB	2%
	Lighting panel to last light fitting	5%
	DC supply Circuit	5%
	UPS outgoing circuit	5%
	Control cables	3%
h	Maximum voltage drop in cable during motor starting	15%

17) EMERGENCY DG SET


	Application	Plant Emergency Loads and Emergency lighting
	Auto mains failure panel to be provided	Yes
	Time for voltage built-up after start command	10 seconds (max.)
	Preferred speed of DG set	1500 rpm
	Type of cooling for engine	Radiators
	Type of fuel	High speed diesel
	Type of Excitation system	Brushless, self excited
	Max. noise level	As per PCB norms with latest regulation
	To be paralleled with grid / other generator	No
	Exhaust arrangement	As per PCB norms with latest regulation
	Method of starting	Battery
	Sound proofing requirement	Acoustic enclosure
	Installation	Indoor on skid with shed
	Spare capacity to be considered	min. 20 %

18) DC SYSTEM


a	Station Batteries for Protection, Metering & Control	
	Nominal output voltage	110 V
	Type	VRLA
	Back up duration	60 minutes for charger. (4 hours for Switchyard S/S).
	Individual cell voltage (nominal)	2 V
	End cell voltage	1.85 V for 2 V cell
	Spare capacity to be considered	Min. 25%
b	Battery Charger	
	Configuration	Dual Float cum Boost Charger with common battery
	Normal loading of each float charger	50%
	Spare capacity	Min. 25%
	Operating Philosophy	
	i) Normal	Both chargers sharing the load & float charging the battery
	ii) One charger failure	Healthy charger supplying the load & float charging the battery
	iii) One charger failure and battery	Healthy charger supplying the load & float charging the

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	discharged	battery	
c	DCDB	Sheet metal, separate DCDB panel	
19) CAPACITOR BANK (HV & LV) FOR POWER FACTOR IMPROVEMENT & HARMONIC FILTER			
		HV	LV
	Overall power factor to be achieved at 11kV	0.95 lag	-
	Voltage level, Power factor to be obtained	6.6 kV, 0.95 to 0.98	415 V, 0.95 to 0.98
	Connection	Star-Star/Delta	Delta / Star
	Die-electric for capacitors	Poly-propylene	Poly-propylene
	Series Reactor	Yes	Only for Harmonic Filters
	Reactor construction	Air cooled	Air cooled
20) LIGHTING			
a	Lighting transformer to be provided	Yes	
b	Max. Allowable fault level in lighting circuit	9 kA	
c	Construction of		
	MLDB/ EMLDB	Sheet metal enclosed, Fixed type, floor mounted, Compartmentalized, bottom cable entry.	
	SLDB/ ESLDB	Sheet metal enclosed, Fixed type, Column/wall mounted, non-compartmentalized, bottom cable entry.	
d	Switching device for MLDB/ EMLDB		
	Incomer	SFU/ ACB	
	Outgoing	SFU	
e	Switching device for SLDB/ ESLDB		
	Incomer	SFU	
	Outgoing	10 A MCB	
f	Earth Leakage protection	One ELCB common for each Phase & Neutral	
g	Max. load on each Single phase circuit	1 kW	
h	Lighting cables for		
	SLDB to JB or lighting fixture	3C x 2.5 sq. mm (YWY) min.	
	JB to JB	3C x 2.5 sq. mm (YWY) min.	
	JB to light fitting	3C x 2.5 sq. mm (YWY) min.	
	Street lighting	4C x 16 sq. mm (A2XWY) min.	
i	Philosophy of cable laying		
	Lighting in plant areas	Cleated on structure or laid in Perforated cable tray 50/ 100/ 150 mm wide	
	Buildings with false ceiling	Conduit/ Cable tray	
	Substation	Conduit/ Cable tray	
j	Emergency Lighting (Plant, Substation & Control Room)	Min. 20% of normal lighting (It will be energised by DG set).	
k	DC critical lighting		
	Sources, Voltage rating	110 Volts DC	
	Type of Critical lighting	LED.	

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	Type of Exit/ Panic Lights	Battery backed up LED.		
	Areas to be considered for DC Critical Lighting	Control rooms, Substations, DG room, Fire station, Fire pump house, First aid room, and staircase of closed building (i.e. substation & control room).		
I	Type of Luminaires			
	AREA	TYPE OF FIXTURE	TYPE OF LAMP	WATTS
	Indoor lighting for control room with false ceiling, Lab	Decorative recess mounting, mirror optic	LED	20/36/45/60/80 W
	Indoor lighting for office with false ceiling	Decorative recess mounting, mirror optic	LED	20/36/45/60/80 W
	Indoor lgt. for substation/ office without false ceiling	Industrial mirror optic tube light	LED	20/36/45/60/80 W
	Open process	Well Glass	LED	35/80/100/150 W
	Closed process plant with high ceiling below 10 m height	Medium Bay Well glass for local lighting	LED	50/80 W
	Closed process plant with ceiling above 10 m height	Medium Bay Well glass for local lighting	LED	80/100/150 W
	Ware houses	Medium Bay / High Bay	LED	20/36/45/50/60/80 W
	Open vast areas	Flood Light / High mast	LED	10/30/60/80/120/ 160W
	Conveyor Gallery	Well glass	LED	20/36/45/60/80 W
	Battery Room	Corrosion resistant	LED	20/36/45/60/80 W
	Transformer cell	Industrial Tube	LED	20/36/45/60/80 W
	Substation/ MCC room periphery	Street light Fittings	LED	35/45/60/72/90/120/134/ 150/170/210 W
	Switchyard	Flood light / High mast	LED	10/30/60/80/120/160 W
	Tank farm/ Area lighting	Flood light	LED	10/30/60/80/120/160 W
	Notes: 1) Enclosures shall be as per "Equipment Selection for Hazardous Area".			
	2) Illumination system for Flame proof area "Fuel / Oil handling".			
m	Street Lighting			
	ROAD SIZE	POLE HEIGHT / TYPE OF LAMP		
	Upto 6 m wide	8 m high/ Solar-LED		
	10 - 12 m wide	10 m high/ Solar-LED		
n	Maintenance Factor for Lighting Design (Indoor / Outdoor) : 0.8/ 0.7			
o	Aviation Lighting : As per ICAO			
p	Illumination Levels			
	AREA	LUX LEVEL (AVG.)		WORKING PLANE (in metres)
	Process areas, attended	50-100		0.7
	Unattended areas in process plant	50		0.7

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	General Open areas in Process Plant	20	FFL
	Compressor house	150	0.7
	Unattended Platforms in plant areas	50	0.7
	Attended / Process operation platforms	50 - 100	0.7
	Piperack	50	0.7
	Pump house	50 - 100	0.7
	Cell house	150	0.7
	Ware house	100 - 150	0.7
	Street Lighting	10 / 20	FFL
	Sub station in front / back of panels	150 - 200 / 50	0.5
	Control Room, Laboratory	300	1.2
	Sub station cable cellar	50	0.7
	Transformer Bay	100	0.5
	Battery room	100	0.7
	Switchyard - lighting	50 (operating areas) / 20 (Non operating areas)	0.5
	Rectifier room	150 - 200	0.5
	DG room	150	0.5
	Workshop	150	0.5
	Offices	300	1.2
	Machine shop	300	1.2

21) AUXILIARY SERVICE BOARD (ASB)


	Construction	Fixed, Floor mounted, Compartmentalised, Sheet metal enclosure.
	Cable entry	Bottom
	Enclosure protection	IP55
	Incoming feeder type	SFU
	Outgoing feeder type for	
	i) Exhaust fan, minor power sockets	SFU
	ii) Welding Sockets / Machines	SFU
	Short time rating of busbar	20 kA for 1 second
	Spare feeders	20 % (with min. one of each rating)

22) PREFABRICATED CABLE TRAYS


22) PREFABRICATED CABLE TRAYS		Perforated	Ladder
	Thickness of cable tray	2 mm	2.5/ 3 mm
	Side flange height of the cable tray	65 mm	75/ 100 mm
	Standard sizes	50/ 100/ 150 mm	300/ 600/ 750/ 900 mm
	Material	Hot-dip galvanised mild steel(Sheet steel)/ FRP (Acid areas)/ MS epoxy painted (Areas with heavy Caustic seepage)	
	Material for hardware accessories for trays	Stainless steel (SS304)	
	Maximum Support span for cable tray:	<u>Galvanized steel/ SS304</u>	<u>FRP</u>
	Horizontal Run	3 m	2 m
	Vertical Run	2 m	1 m
	Requirement of Cable tray covers	Only for top tray in slurry area	
	Electrical continuity between tray sections	Coupler plate & Earthing jumper	

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	Minimum Bending radius for Cable Trays	300 mm
	Margin in tray size for future cables	Minimum 20%
	Cable to be secured to trays by	UV resistant heavy duty nylon cable ties at least every 1500 mm on horizontal runs and 900 mm on vertical runs.
	Cable laying philosophy on Cable Trays	
	HV Cables, > 1 kV	Single layer
	LV Power/ Control Cables > 50 V	2 layers with side flange height of 100 mm
	LV Signal Cables upto 50 V	3 layers with side flange of 100 mm
	Cable tray spacing - HV to LV or LV to LV or LV to Signal Cable Tray	300 mm
	HV Power to Low Power / signal	600 mm
23) CABLE GLANDS (3 Core cables)		
	Material	Nickel plated Brass
	Type of glands for indoor installation	Single compression for unarmoured cables and double compression for armoured cables.
	Type of glands for outdoor installation	Double compression
24) EARTHING & LIGHTNING PROTECTION SYSTEM		
a	Material of earthing grid conductor	MS hot dip galvanized Strip
b	Fault current withstand duration of conductor	1 second
c	Earth Electrodes	MS hot dip galvanized Pipe (Hardware/termination of Stainless steel)
d	Maximum resistance of earthing system for	
	Switchyard & Main substation	1 ohm
	Plant area	5 ohms
	Neutral earthing	5 ohms
	Instrumentation earthing	1 ohm
	Lightning Protection	5 ohms
25) PUBLIC ADDRESS SYSTEM (Loudspeaker interconnection system)		
	Paging System shall consist of:	
	Central exchange along with Power Supply System (through UPS)	
	Master station along with Loudspeaker, microphone etc.	
	Desk type and outdoor pole/ wall mounted type call stations along with microphone and external loudspeaker for installation in Building. It shall be dust proof, pilfer proof & weather proof protection cover suitable for outdoor installation.	
	Wall/ column mounting type call stations for hazardous/ safe area with external loud speaker as per operational requirement	
	Spare capacity in Central Exchange for future : min 10 %	
	Acoustic Hoods shall be considered for high noise level areas : Yes	
	System Communication	Paging and Private modes.
	Architecture	Zone wise- common bus architecture, while communication with Central unit shall be of "Star topology"
	Amplifier	Distributed type

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	Loud Speakers	To be provided
	Loud Speakers Talk back	To be provided
26) TELEPHONE SYSTEM		
	Intercom system type	Microprocessor based Programmable type with Digital PCM/TDM technology
	Capacity of EPABX	P&T lines, internal lines
	Telephone system shall consist of	
	a) Telephone handsets	
	b) Main junction box	
	c) Telephone cables	
27) WIRELESS COMMUNICATION SYSTEM		
	Wireless system	VHF/ UHF band with necessary frequency license from WPC
	Wireless system with rechargeable batteries, antennas, battery chargers and other accessories	
	a) Repeaters	Covering distance between 2nos. of repeaters shall be 5 km
	b) Stationary Radio	Covering distance between 2nos. stationary radio shall be of 5 km
	c) Handheld Radio	Covering distance between 10nos. handheld radio shall be of 2 km
28) FIRE ALARM SYSTEM		
	Fire alarm system type	Addressable (Microprocessor based).
	Main components of fire alarm (FA) system shall be:	
	Main/ Master control panel for entire plant	Yes - In the control room.
	Repeater panel(s)	Yes - In Fire station.
	Manual call points	Located at strategic locations with access of 60 m along all exit routes and roads.
	Sirens	Yes.
	Detectors	Yes - In closed rooms.
	Fault isolator	Yes .
	Provision for future expansion	Minimum 10% - 1 No. spare loop.
	Auto-dialer	Yes.
29) SCADA		
	The new SCADA shall monitor and control 11kV switchgear in the new 11kV building and in downstream substations of CHP	
	System configuration	Centralized server with RTU's located in individual Plant substations.
	Server	Redundant - In new 11 kV switchgear building.
	EWS	Yes - In Existing Control room in the CDS substation.
	Operating stations	Yes - In Existing Control room in the CDS substation and One in each substation of Alumina refinery.
	Topology	Distributed RTU's in various Plant substations with redundant connection to centralized server.
	Numerical relay	Shall communicate on IEC 61850 protocol.
	Meters	Shall be connected on Modbus.

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		constraint			
	Minimum clear space in front / back	1500 mm/ 800 mm			
	Minimum clear space between two rows	2000 mm front to front			
	All round clearance for transformer	1000 mm			
c	UPS, VFDs, Inverter panels, Battery chargers, ACDB, MLDB, APDB etc.				
	Minimum clear space in front	1200 mm			
	Minimum clear space at the back	800 mm			
	Minimum clear space between two rows	2000 mm			
	Minimum space between two ends	800 mm (after considering space for future panels)			
d	Battery room requirement	No separate battery room, VRLA batteries to be installed on racks adjacent to Charger/ UPS.			
33) MISCELLANEOUS					
	Coverage radius for Welding Socket	50 m			
	Coverage Radius for Single Phase Sockets	25 m			
	Max. Number of Welding Sockets allowed in Outgoing circuit	3 Nos.			
	Max. Number of Single phase Sockets allowed in Outgoing circuit	4 Nos.			
	Rating of Welding Socket	415 V, 60 A, TPN			
	Rating of Single Phase Socket	240 V, 20 A, SPN			
	Hand lamps and portable tools	240/ 24 V Transformer 100 VA			
34) EQUIPMENT SELECTION FOR HAZARDOUS AREA					
	The electrical equipment for hazardous areas shall be selected as per IS-5571 and petroleum rules. The minimum requirement is summarized as below.				
		Zone 1		Zone 2	
	Equipment	Gas Group IIA, IIB	Gas Group IIC	Gas Group IIA, IIB	Gas Group IIC
	LV Motors	Ex-d	Ex-d	Ex-d/ Ex-de/ Ex-e	Ex-d/ Ex-de/ Ex-e
	HV Motors	Ex-d/ Ex-p	Ex-d/ Ex-p	Ex-d/ Ex-p/ Ex-e*	Ex-d/ Ex-p/ Ex-e*
	Push Button Station	Ex-d	Ex-d	Ex-d	Ex-d
	Motor Starters	Ex-d	Ex-d	Ex-d	Ex-d
	Plug & Socket	Ex-d	Ex-d	Ex-d	Ex-d
	Welding Receptacle	Ex-d	Ex-d	Ex-d	Ex-d
	Lighting Fixtures				
	a) Integral	Ex-d	Ex-d	Ex-d	Ex-d
	b) Non Integral				
	Control gear	Ex-d	Ex-d	Ex-d	Ex-d


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	Luminaire	Ex-d	Ex-d	Ex-d	Ex-d
	Junction Boxes	Ex-d	Ex-d	Ex-e	Ex-e
		Zone 1		Zone 1	
	Equipment	Gas Group IIA, IIB	Gas Group IIC	Equipment	Gas Group IIA, IIB
	Hand Lamps				
	i. Light fitting	Ex-d	Ex-d	Ex-d/ Ex-e	Ex-d/ Ex-e
	ii. Transformer Unit	Ex-d	Ex-d	Ex-d	Ex-d
	iii. Plug & Socket	Ex-d	Ex-d	Ex-d	Ex-d
	Break Glass Unit (Fire Alarm System)	Ex-d	Ex-d	Ex-d	Ex-d
	Lighting Panel/ Power Panel	Ex-d	Ex-d	Ex-d	Ex-d
	Transformers	Hermetically sealed with surface temperature not exceeding 200° C			
NOTES:					
1	The increased safety motors (Ex-e) fed by VFDs shall be certified as combination for the Specified location by Independent test house and shall be certified by authorities.				
2	In case of Flameproof Motors, the Motor and VFD combination need not be certified together if Direct temperature control by embedded temperature sensors are provided, which will disconnect the Motor.				
3	* Ex-e motor can also be provided if the motors are tested as per latest IS/ IEC. Pre-start purging arrangement shall be made based on risk analysis. Auto start requirement shall be checked in case of Pre-start purge requirement.				
4	Electrical equipment in fired heater area shall be Ex-d irrespective of zone classification. Gas group shall be appropriately selected.				


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Annexure-I (Earthing Schedule)

Srno.	Type of Equipment	Earth Conductor Size	Number of Earthing Connections
1.	Main Earthing Grid - Burried in Ground / Finished Floor, including Earthing Stub-ups	75 x 12 mm, HDGI Strip (65kA,1Sec) 75 x 10 mm, HDGI Strip (50kA,1Sec)	As per the relevant Earthing Layouts.
2.	Main Earthing Grid - Above Ground, including Earthing Risers	75 x 12 mm, HDGI Strip (65kA,1Sec) 75 x 10 mm, HDGI Strip (50kA,1Sec)	As per the relevant Earthing Layouts.
3.	Main Earthing Conductor on Cable Trays	75 x 12 mm, HDGI Strip (65kA,1Sec) 75 x 10 mm, HDGI Strip (50kA,1Sec)	As per the relevant Earthing Layouts.
4.	Transformer Tank ,HV & LV cable box & Rail: Power & Distribution Trafo.	75 x 12 mm, HDGI Strip (65kA,1Sec) 75 x 10 mm, HDGI Strip (50kA,1Sec)	As per Installation standards-Earthing.
5.	HV Switchgears (HT), LV (PCC, EPCC, MCC) Switchgears, LV Busduct , HV PFIC, HV VFD (6.6kV, 11kV) and Neutral Grounding Resistor	75 x 12 mm, HDGI Strip (65kA,1Sec) 75 x 10 mm, HDGI Strip (50kA,1Sec)	2 nos. each.
6.	DG SET: Alternator, LV terminal box, AMF Panel (with isolating breaker).	75 x 12 mm, HDGI Strip (65kA,1Sec) 75 x 10 mm, HDGI Strip (50kA,1Sec)	As per Installation standards-Earthing.
7.	<ul style="list-style-type: none"> Transformer: Marshaling Box, OLTC Panel, Fan Control Panel.Control Panels: RTCC, Fire Alarm, Public Address, Package units (HVAC & Others) & other Communication systems. Small Power Distribution Boards in Substation: ASB, PDB, MLDB, UPS, ACDB, Battery rack, Battery Charger, DCDB, Heat tracing Distribution Boards & LV PFIC. 	40 x 5 mm G.I. Strip	2 nos. each.

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Srno.	Type of Equipment	Earth Conductor Size	Number of Earthing Connections	
8.	Motors upto 37 kW & Corresponding Load Break Switches	10 mm (3/8") Dia. G.I. Wire Rope	2 nos. each.	
9.	Motors above 37 kW & upto 200 kW & Corresponding Load Break Switches	16 mm (5/8") Dia. G.I. Wire Rope	2 nos. each.	
10.	Motors above 200 kW HV Motors Main terminal box & Neutral terminal box.	16 mm (5/8") Dia. G.I. Wire Rope	2 nos. each.	
11.	Storage Tanks, Vessels & Heat Exchangers	40 x 5 mm G.I. Strip	Equipment Dimension (D or H)	No. of Connection
			* 20 Mtrs.	2 nos. at 180 deg
			≥ 20 < 30 Mtrs.	3 nos. at 120 deg
			≥ 30 Mtrs.	4 nos. at 90 deg
12.	Small Power Distribution Boards in Plant (PDB), Field Lighting (SLDB) & Instrument Panels.	10 mm (3/8") Dia. G.I. Wire Rope	2 nos.	
13.	LCS	8 SWG Solid G.I. Wire	1 no.	
14.	Street lighting Poles	8 SWG Solid G.I. Wire	1 no.	
15.	Lighting & Other Dry Type Transformers	40 x 5 mm G.I. Strip	As per Installation standards-Earthing.	
16.	Grounding of piperack & structure column (steel).	40 x 5 mm G.I. Strip	At every 20 Mtrs.	
17.	Welding receptacles	10 mm (3/8") Dia. G.I. Wire Rope	2 nos.	
18.	VFD Panels (< 200 kW, 415V)	10 mm (3/8") Dia. G.I. Wire Rope	2 nos. each.	
19.	VFD Panels (200 kW ≤ 630 kW, 690V)	16 mm (5/8") Dia. G.I. Wire Rope	2 nos. each.	
20.	Power Junction Box	10 mm (3/8") Dia. G.I. Wire Rope	2 nos. each.	
21.	Bonding of Pipes/ Cable tray	10 mm (3/8") Dia. G.I. Wire Rope	As per Installation standards-Earthing	
22.	Loading platforms, Rail (Crane), Hoist, Monorail	16 mm (5/8") Dia. G.I. Wire Rope	1 no.	
23.	Handrail, metallic stairs, 1 phase socket 16/20 A	8 SWG Solid G.I. Wire	1 no.	

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10.0 **SPECIAL INSTRUCTIONS TO BIDDER**

10.1 **CRITERIA'S FOR ACCEPTANCE / REJECTION OF OFFER**

10.1.1 Criteria for Acceptance/ rejection of offer will be as per the criteria/ conditions mentioned in Bidder's Qualifying Criteria of Instructions to Bidders.

10.1.2 Site & meteorological information of plant i.e. location, climate condition, earthquake factor, connectivity of the site with railways, road, ports etc. are furnished in TS. Bidder is requested to consider the same while finalization of offer.

10.1.3 The Successful Bidder shall bear full responsibility for deductions and conclusions as to the nature and conditions under which the work is to be executed, including effect of climate rainfall etc. Failure to do so shall not absolve the Successful Bidder of his responsibilities about the proper execution of the job. Since the execution shall be turnkey in nature, no claims for extra payments due to any special site conditions and ignorance of site conditions shall be considered after the acceptance of his quotation.

During engineering stage, if any item or facility felt necessary to be included for proper functioning of the plant which is not envisaged in the offer of Bidder, the same shall also be provided by the Successful Bidder without any extra claims.

10.1.4 Training of Purchaser is required to ensure smooth operation of various equipment of Plant and speedy attainment of sustained design indices.

Training for O&M practices, Troubleshooting of new Wagon Tippler, Side Arm Charger, DFDS, Hydraulic Breaker shall be given to NALCO personnel as indicated below:-


Operation and Mech. Maintenance:- 06 Engineers and 10 technicians

Elect Maintenance and E&I:- 06 Engineers and 08 technicians

The duration of training will be for 2 days and will be arranged in 3 batches. Training will be conducted at Vendor's site (Supplier of wagon tippler & side arm charger).

10.1.5 The offer shall be complete with technical details, drawings, sketches, design parameters etc. which are necessary for providing clarity of the offered system / items.

General description of process with process flow sheet, layout, plant & sections of each unit.

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Complete list of plant & equipment with equipment parameters including electrics, instrumentation & automation and source of supply.

Complete drive list.

List of drawings and documents to be furnished in various stages of the project.

Measures taken for fulfilling safety requirement & statutory regulations of concerned authorities.


Makes of all bought out items as per preferred makes of GTS.

Estimated operating cost of plant & equipment with break-up.


Duly filled in format of time schedule as submission of drawings, documents, supply, erection, testing & commissioning and PG. Further, the dates of deliverables forming part of contract to match with overall time schedule of the project.

The Bidder may please note that Schedules are to be filled in completely without which the technical offer shall be considered as incomplete.

- 10.1.6 The enclosed bidder drawings are deemed to be sufficient for the Bidder to assess the nature and quantity of work involved and to quote his prices for the above job. No price increase on account of deviation from bidder drawings shall be admissible.
- 10.1.7 Signed un-priced format of the Price Schedule (as asked for in Instruction to bidders of tender documents) shall also be included in the technical offer.
- 10.1.8 All handling and transport charges of plant and equipment, raw materials for site fabricated structures etc. including double handling as required for completion of the work in accordance with time schedule are deemed to be included in the scope of work of the Bidder.
- 10.1.9 1no. soft copy of complete offer shall be submitted along with the Bid with hard copies.
- 10.1.10 All materials / equipment / machinery / fabricated items used in the subject package shall be according to the specification given herein and any deviation should be clearly brought – out in the offer. No mention of deviation will mean that the bidder has accepted the specification given herein.
- 10.1.11 The Bidder shall include in his supply a complete new and unused set of all special tools & tackles required for operation and maintenance of the plant / equipment offered.

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- 10.1.12 The equipment broadly described under the scope of work shall be located generally as per General Layout Drawing enclosed with the bid. The scope of TS as described in Section 1.3, 2.0 & 3.0 – (Volume – 1) of the Bidder. The specification given in different volumes. Vol. I, II, III & IV and enclosed drawings. Bidder should undertake all work as per details given in different sections of TS.
- 10.1.13 The plant and equipment supplied shall be new and best of its kind and of latest technology. All materials and equipment shall comply with latest codes and standards, applicable nationally / internationally. A consolidated list of all codes and standards followed or adopted for design, manufacture and testing shall be submitted. Preferably, all equipment and accessories shall confirm to the latest Indian Standards, International wherever applicable. All electrical equipment supplied shall be designed, manufactured, tested & erected as per the latest revision of Indian Electricity Rules, Statutory requirements of the Govt. of India, Govt. of State. In the event of requirement of the TS exceeding the requirement of corresponding standards, regulations & safety codes, the specification provided in the TS shall govern. In the event of conflict between standard regulation & TS, the most stringent shall be applied.
- 10.1.14 All equipment as may be necessary shall conform to the provision of Statutory and other Regulations in force such as RDSO Guideline, Indian explosives Act, MMR 1961, Indian Factories Act. Indian Boiler Regulation, State Factories Act, Central/State Pollution Control Board, Indian Weights & Measures Act, etc. The Successful Bidder shall take necessary steps to get all the installations within his scope of work approved by the concerned legal authorities.
- 10.1.14.1 The Bidder shall use new, good and tested quality materials. The workmanship shall be of high quality.
- 10.1.14.2 Layout of plant and equipment shall have provision for easy and safe movement of operation / maintenance personnel for operation / inspection of the running plant. Adequate space for dismantling / removal of equipment / parts for repair shall also be built in the layout. All working parts of the equipment shall be easily accessible and maintainable. There should be a proper arrangement for convenience of operation, inspection, maintenance, replacement & repair. Fast wearing parts shall be accessible for replacement / maintenance without necessitating removal of other parts. All like parts of the equipment supplied shall be inter-changeable.
- 10.1.15 After erection, all equipment, pipes, structures, etc. shall be thoroughly cleaned and painted with one coat of primer and two coats of approved colour paints. Paints shall be of good quality and shall be strictly as per instructions and recommendations of the paint manufacturer and to the approval of Employer. Painting in damp or foggy weather shall not be resorted to. Painting specification and procedure shall be subject to the Purchaser approval.

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- 10.1.16 Execution of entire work shall be carried out in such a manner that normal working of the existing plant is not interrupted. Shut downs, for mutually agreed periods shall be arranged by the Purchaser for interconnections / modifications / extensions of existing facilities.
- 10.1.17 Testing shall be done as per relevant latest Indian Standards / International codes or practices and shall include electrical, mechanical and chemical tests including performance tests and test certificates for the same shall be submitted for Purchaser's approval prior to dispatch.
- 10.1.18 The Successful Bidder shall obtain written approval / clearance from the Purchaser / Consultant at each stage or before or before start of the next stage of site work. The Bidder with the approval of the Purchaser shall decide the stages.
- 10.1.19 The Successful Bidder shall ensure deputation of well experienced engineers and technical staff from various disciplines including mechanical, technology, refractory electrical, instrumentation, automation and process control (as per requirement) for erection, testing and commissioning of plant and equipment.
- 10.1.20 All the manufacturing / fabrication works shall be carried out only on the basis of approved drawings and schemes or as directed by the Purchaser / Consultant. It is solely the responsibility of the Successful Bidder to ensure that all working drawings prepared by him bear the stamped of approval of the Purchaser / Consultant by sets prior to start of work. All other drawings shall bear the acceptance stamp of Employer / his consultant for execution of the project.

10.2 **CONTRACT DOCUMENTS, DRAWINGS AND SPECIFICATION**


- 10.2.1 Documents mutually explanatory: The Several documents forming the Contract are to be taken as mutually explanatory of one another and in case of ambiguities or discrepancies the same shall be mutually discussed, explained and resolved by the Purchaser who shall thereupon issue to the Successful Bidder instructions directing in what manner the work is to be carried out.
- 10.2.1.1 The Bidder shall indicate in their offer, the list of drawings, the list of bought-out items, initial feedback data, etc. to be furnished during Basic Engineering.
- 10.2.1.2 The Bidder shall confirm in their offer, the list of drawings, the list of bought-out items, initial feedback data, etc. to be furnished during Basic Engineering.
- 10.2.2 Scope of Contract Drawings and Contract Specification:

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- 10.2.2.1 In as much as the Successful Bidder is required to supply drawings, documents and manuals, he shall furnish the same to the Purchaser / Consultant in requisite number of copies indicated herein below as a part of the Contract. These shall include, but not be restricted to, all necessary calculations, design drawings, details and construction drawings, specifications, bill of materials, manuals etc.
- 10.2.2.2 The Successful Bidder shall be liable for any discrepancies, errors or omissions in the drawings and other information supplied by him, irrespective of whether these have been approved by the Purchaser or not. Successful Bidder shall pay for any extra cost incurred or to be incurred by the Purchaser due to any alterations necessitated by reasons of any discrepancies, errors or omissions in the drawings and particulars supplied by the Successful Bidder.
- 10.2.2.3 “Contract Specifications” and “Contract Drawings” shall be coordinated by the Successful Bidder such a manner that any work shown in the drawings and not specified, or specified and not shown in the drawings, is to be executed in accordance with the Contract without any extra cost.
- 10.2.2.4 Drawings furnished by the Successful Bidder shall be certified as correct for use and shall bear the name and signatures of authorised persons.
- 10.2.2.5 Drawings, documents, manuals, spare parts list, audio visual training tutor in e-form for the benefit of operational & maintenance personal etc. shall be supplied in neat substantially bound volumes. All reproducible polythene films transparencies shall be sent in mailing tubes and rewritable CDs or any other electronic form as mutually agreed upon. The quality of reproducible polythene films / CDs to be used for supply of reproducible prints will have to be approved by the Purchaser. The drawings, documents etc. shall be mailed to the addresses of the Purchaser and Consultant. The Successful Bidder will be informed of these in time by the Purchaser.
- 10.2.2.6 Within a week of issue of Letter of Acceptance, the Successful Bidder shall submit 3 (Three) copies of the draft “Contract specification” giving details of Plant, Machinery and Equipment and Work ordered which shall be based on the Bidder Document, the bidder and all correspondences through letters, fax messages, e-mails and minutes of meetings/notes during negotiations, etc. prior to issue of Letter of Acceptance. After verification by the Purchaser / Consultant the “Contract Specification” shall serve as a working document.

The details furnished shall also include the following:


- a) Information on associated items not forming part of the Successful Bidder supply, but which may be required to be ordered by the Purchaser / Consultant the agencies.

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- b) Details of auxiliaries which, though not a part of the Contract, are essential for safe and efficient working of the Plant and Equipment in terms of the Contract.

10.2.3 Drawing Format:

- 10.2.3.1 All drawings shall be dimensioned in the metric system and titles and written notations shall be in English language. While preparing the drawings, the drafting standards adopted shall be in English language. While preparing the drawings, the drafting standards adopted shall be such that good, clean and legible e-form of the drawings can be obtained. Drawings prepared by the Successful Bidder shall be suitable for transmitting electronically and digitization for preservation.
- 10.2.3.2 All drawings submitted by the Successful Bidder shall be as per the latest revision or IS: 696 or equivalent International Standards. In general, it is desired to keep the same size for all drawings for ease of filing and reference. All layout drawings shall be oriented to match the Plant arrangement drawings and shall have a key plan identifying the Plant area to which they apply and marked with an arrow pointing to the north at the top of the sheet. There shall be sufficient reference notes on the drawings to proper understanding. Drawings and bills of materials shall give broad specifications and quantities of all materials along with the technical notes required for the work and shall be cross-referred for easy identification.
- 10.2.3.3 The Successful Bidder standard drawings catalogue / leaflets used for the Contract shall have information pertaining to other items which may be contained on the same drawings.
- 10.2.3.4 When a drawing is revised by the Successful Bidder, every change made shall be identified on the drawing by circling the changes made and placing the revision number in a small triangle so as to be easily recognizable. When a subsequent revision is made the circles made for the previous revision shall be erased and the current changes circled. However, all revision numbers in the small triangle should be retained. In addition, a record of revisions along with the coordinates showing the location of revisions shall be indicated at the left hand bottom corner of the drawings as per standard practice. In case of revision of a drawing, for which a different number is allotted, the new drawing shall clearly indicate the number of the drawing, which it supersedes.
- 10.2.3.5 The Successful Bidder shall prepare and furnish drawings exclusively against the Contract. Even standard drawings of the Successful Bidder shall bear a reference in the drawings to the present Contract only. References pertaining to other contracts entered into with other parties shall not appear in the drawings submitted to the Purchaser / Consultant.

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10.2.4 Submission of Drawings:

10.2.4.1 Numbering System:

10.2.4.1.1 Identification numbers or symbols that the Successful Bidder selects to use for his own purposes are permissible. Bills of materials must be such that the Purchaser / Consultant will be able to identify and purchase any needed replacement and spares. The method of numbering drawings, specifications and bill of materials used by the Successful Bidder shall be submitted to the Purchaser to enable the Purchaser to plan their archives. The above information shall be submitted along with a drawings submission schedule within two (2) weeks of award of the Contract.

The drawings shall be submitted by the Successful Bidder progressively in phased manner to avoid delay in further approval. This aspect shall be taken into consideration by the Successful Bidder while preparing the Time Schedule for submission of drawings for the Purchaser / Consultant approval.

10.2.4.2 List of Drawings and Schedule:


10.2.4.2.1 Within two (2) weeks of the date of award of the Contract, the Successful Bidder shall supply to the Purchaser / Consultant in three (03) copies of a complete list of all drawings by title, which the Successful Bidder expects to supply against the Contract together with a detailed schedule for submission of the different types of drawings as outlined in Clause No. 10.2.4.3 and shall be in conformity with the overall time schedule established by the Successful Bidder in his proposal with subsequent modifications, if any, which has been made part of the Contract.

10.2.4.3 The Successful Bidder shall submit the various drawings and documents to the designated offices of the Purchaser / Consultant as per the agreed schedule of submission.


*_ In addition to the above the Successful Bidder shall also deliver One (1) soft copy on CD or any

NOTE : The list of drawings and documents under information as well as approval category for General, Basic Engineering, Detail Engineering for plant and equipment, Detail Engineering for Civil and Building Structure, Assignment Drawings and Spare Part list including As Built Drawings & Final documentation is enclosed as Sections 10.2.12


10.2.5 Drawings for Approval:

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- 10.2.5.1 Within three (3) weeks of award of contract, the Successful Bidder shall submit general arrangement and layout drawings including cross sections and sub-assembly drawings for approval prior to commencement of detailing and manufacture. In the layout drawings, the scope of supply of the Successful Bidder shall be indicated in darker outlines or lines of deferent colour to distinguish from those items not in the Successful Bidders scope. The general arrangement and layout drawings referred to herein shall include the following. The bidder drawing can be referred for guide line only. All general Arrangement drawing should indicate IS codes, standard or other standards clearly in drawings.
- 10.2.5.1.1 For Equipment, this category shall include equipment general arrangement with adequate cross sections and sub-assembly drawings, overall dimensions, locations of equipment performance characteristics and graphs and important clearance dimensions, along with sufficient load data for structural and civil designs.
- 10.2.5.1.2 For piping, this category shall include flow diagram of all utilities and process fluids showing flow quantities, temperatures and pressures, all equipment like fans, filters, pumps, valves and instrumentation. The general arrangement and layout drawings for piping and duct work shall include physical location of Equipment and general pipeline / duct routings to avoid equipment and electrical interferences and to make units requiring servicing and maintenance accessible. These drawings shall also include details of insulation material, heat tracing arrangement, etc. if any. Both the flow sheets and pipe/duct routing drawings shall show interconnecting pipelines/ducts, and terminal points of the Successful Bidder piping/ducting. This category shall also include diagrams of hydraulic, pneumatic, lubrication, ventilation and air conditioning systems. Where necessary, the Successful Bidder shall also give diagrams and drawings showing waste disposal systems.
- 10.2.5.1.3 For electrical, this category shall include Single Line Diagram (SLD), layout drawings showing locations of all electrical Equipment including motors, controls, limit switches, solenoid valves etc. motor list, list of electromagnetic valves, single line inter-locking and sequence diagrams for control, signaling and communication systems, location of devices on switch – gear, control panels, desks etc. including sectional views. The details furnished shall include complete cabling drawings giving details of power and control cables, terminal details, layout of trenches and cable racks/tunnels, conduits, cross-sections of cable layouts at all important and necessary locations etc. Bidder drawings are for reference and guideline only. Detail Engineering based on actual load data will be prepared and submitted for Approval.
- 10.2.5.1.4 For Instrumentation, this category shall include the control scheme and instrumentation flow diagram and general arrangement drawings of instrument and control panels, etc.

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- 10.2.5.1.5 Drawings for approval of statutory authorities such as the Indian Boiler Inspectorate, Inspectorate of Explosives, Electrical Inspectorate, Factory Inspectorate, Environmental Clearance, approvals / permission from Odisha Govt. etc. also as required by those statutory authorities.
- 10.2.5.1.6 Preliminary foundation outline drawings including excavation drawings, load data and bolt locations as well as any specific design criteria such as thermal protection, acid/alkali resistance measures etc. that may be required. All civil design will be done as per actual data of Geo-technical investigation and size conditions.
- 10.2.5.2 The details furnished shall include necessary calculations and data required for demonstrating that all parts of the Plant and Equipment to be furnished shall conform to the provisions of the Contract.
- 10.2.5.3 Approval of the Successful Bidder drawings will generally be accorded within two (2) weeks of receipt. Approval of the Successful Bidder drawings means that these will be checked for conformity with applicable specifications and general conformity that approval by the Purchaser / Consultant does not include checking for drafting and other errors, but mainly review of basic concepts and general principles involved, in compliance with Bidder specification.
- 10.2.5.4 The Successful Bidder shall not make any changes in the design, without prior approval of the Purchaser / Consultant. In case such changes are necessary to make the Equipment conform to the provisions and intents of the Contract, the same be without additional cost to the Purchaser / Consultant. Approval of the Successful Bidder drawings or any design changes shall not relieve him, Purchaser / Consultant of his responsibility to comply with the provisions and intents of the Contract. The Successful Bidder may proceed with his works after complying with the comments/observations made in the “Approved as Noted” drawings. Subsequently, the Successful Bidder shall submit the drawings incorporating the comments / observations for “Approval”. However, manufacture / fabrication or procurement of the items prior to “Approval” or “Approval as Noted” drawings, shall be to the Successful Bidder account.
- 10.2.5.5 The Successful Bidder shall submit drawings for approval in Three (3) prints each and one soft copy on CD. If the drawing is approved, one print will be returned to the Successful Bidder. If the drawing is not approved, one marked-up print with appropriate comments or “Approved as Noted”, will be returned, within ten (10) days of receipt of drawings to the Successful Bidder for correction and re-submission. The Successful Bidder shall re-submit the revised drawings incorporating all the comments / changes within one (1) week after receipt of drawings with the Purchaser / Consultant comments. The revised drawings shall be resubmitted in Eight (8) prints along with one soft copy on CD. One print of finally approved drawing will be furnished to the Successful Bidder.

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10.2.5.6 Upon approval by the Successful Bidder the drawings shall become Contract drawings and thereafter the Successful Bidder shall not depart from them in any way whatsoever except with the subsequent approval of the Purchaser / Consultant.

10.2.6 Feed Back Data :

10.2.6.1 On finalisation of designs, the Successful Bidder shall furnish sufficient drawings and data covering the Plant and Equipment in his supply to enable design and construction of necessary civil, structural and building works and to install necessary electrical and utility connections at Site, including necessary electrical cabling, piping, ducting, other lining works. The feed back data shall include the following:

10.2.6.1.1 Certified Civil foundation assignment including locations and dimensions of foundation bolts, sleeves, inserts, supports, etc., load data, (static & dynamic loads, critical speeds, allowable vibrations, movements, etc.) requirement of tunnels and trenches, flue ducts, any specific design criteria such as thermal protection, acid / alkali resistance measures, etc. Specifications for sleeves, foundation bolts and other materials shall also be included.

10.2.6.1.2 Certified dimension drawings showing plan, front, rear sectional views indicating location of each individual equipment including, where necessary, its auxiliaries and control panels being supplied under the Contract, and also space requirement for operation and maintenance position of power and control entries and utilities connecting points and end connection details.


10.2.6.1.3 Assignment / arrangement for underground and over-ground utilities including those to be embedded in the concrete, rate of flow, pressure, temperature of utility services including connecting dimensions with outside pipelines.

10.2.6.1.4 Electrical power, control and instrumentation schematic and erection diagrams giving power load, cable dimensions etc.


10.2.6.2 The above documents shall be furnished in Three (3) sets within 3 weeks of award of Contract.

10.2.6.3 Other drawings, specifications and data including those not described above but required by other agencies to perform their work related with Plant and Equipment being supplied by the Successful Bidder. These shall be furnished in Three (3) sets and one (1) soft copy on CD as and when required by the Purchaser during the execution of the Contract.

10.2.7 Assembly and Erection Instructions and Drawings:


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- 10.2.7.1 The Successful Bidder shall furnish Three (3) copies each and one soft copy on CD of the following:
- 10.2.7.1.1 Descriptive literature and drawings to illustrate the working principles, method of assembly and dismantling.
- 10.2.7.1.2 Instruction books for proper Erection, assembly and dismantling of all Plant and Equipment and necessary instructions for checking and recording.
- 10.2.7.1.3 Instruction sheets for proper balancing, alignment, checking and calibration as may be necessary.
- 10.2.7.1.4 Erection drawings showing all details and particulars, in sequence, required for Erection and installation of the Plant and Equipment. In addition, the Successful Bidder recommended time schedule and a chart showing the sequence of erection of Equipment may be furnished.
- 10.2.8 Final Drawings:
- 10.2.8.1 Along with the supply of Equipment or along with Assembly and Erection Instructions and Drawings covered under section 10.2.7 above, Three (3) sets of prints each and one soft copy on CD shall be furnished for each of original drawings, specifications, bills of materials, calculation sheets etc. made by the Successful Bidder and his sub-Successful Bidders under clause 6.0, incorporating all changes made during manufacturing of the Plant Equipment, including those made at Site during erection, assembly and start-up indicating the authorities who made the changes. This shall include but not be restricted to the following:
- 10.2.8.1.1 General arrangement, assembly, sub-assembly and section drawings as well as detailed drawings showing details of components required for assembly complete with bills of materials and schedule of parts of each complete Equipment giving part numbers with reference to the assembly drawings and the total number of each part. These drawings shall be suitably cross-referred to other drawings as required. The drawings shall be sufficiently detailed such that, if the Purchaser so desires, he can procure spares and replacement from any competent manufacturer in India and abroad.
- 10.2.8.1.2 Performance data including graphs, efficiency and characteristic curves and other pertinent information of the individual / composite items of Plant and Equipment.
- 10.2.8.1.3 Operation manual for the Plant and Equipment. This should include complete operating instructions for each Equipment and work procedure for each work-station giving all


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details necessary to ensure proper sequence of operation and safety of men and machinery.

- 10.2.8.1.4 Maintenance manual covering all phases of both preventive and repair maintenance giving clear instructions regarding expected faults, method of detection and elimination, lubricating charts showing every point requiring lubrication, grade of lubricant, schedule for lubrication, and where required, the correct amount and grade of oil or grease necessary for refill.
- 10.2.8.1.5 Flow diagrams and layouts of instrumentation, hydraulic, pneumatic, lubrication systems and utilities with all necessary dimensions and specifications.
- 10.2.8.1.6 Complete electrical, schematic and erection and inter-connecting wiring diagrams for power distribution, control and instrumentation and logic circuits for the Plant and Equipment. The drawings should give ratings, characteristics, make type and range of items being supplied. Dimensional drawings for control panels, desks, etc. shall also be furnished.
- 10.2.8.1.7 All the Test charts and Test Certificates.
- 10.2.8.1.8 The Successful Bidder shall supply complete list of commissioning spares. In addition, the Successful Bidder shall supply spares list giving complete list of replaceable parts for two years normal operation indicating clearly operational, consumable, maintenance, replacement spares, etc. In the maintenance spares, fast wearing and insurance spares shall be clearly identified. The spare parts lists shall include necessary catalogues and manufacturing drawings and shall be supplied in the form of a table giving item designation and application, name of manufacturer, manufacturer's specification, type and form, reference drawing number, standards used, quantity installed, quantity recommended for two years normal operation, expected useful life, unit cost, and in addition, for electrical Equipment the item designation shall show the entire module to be replaced in case of defect in any component. Detailed instructions both for original installation and future replacements shall be furnished.
- 10.2.8.1.9 Manufacturing drawings for the items in the spare parts lists including fast wearing parts which require replacements due to wear in normal operation. The information furnished shall include complete specifications giving materials of construction, heat treatment, grade of finish, tolerance etc. for mechanical items and coil / cable dimensions, size and section of conductors, type and size of insulation, process of impregnation etc. for electrical items. Further drawings of components of proprietary items of the Successful Bidder and his sub-Successful Bidder which can be manufactured by general engineering practice shall be furnished. If required, the Purchaser will give an undertaking that such items of proprietary nature will not be used for commercial purposes but will be exclusively used only for maintenance of the Plant.

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- 10.2.8.2 Until such time as the supply of drawings, documents and information required as per section 10.2 are completed, the Purchaser will not finally accept the Plant as supplied and erected by the Successful Bidder.
- 10.2.9 The time of submission and approval of drawings shall not have any bearing on the Delivery Schedule mentioned in the Contract.
- 10.2.10 All drawings, specifications, materials and designs furnished by the Employer or his authorized representatives shall be treated as strictly confidential and as property of the Purchaser. All such drawings, specifications, manuals and other materials shall be returned to the Purchaser upon completion of the Work under this Contract or on termination of the Contract. No copies, duplications or photo-stats shall be retained by the Successful Bidder without the consent of the Purchaser. All drawings, specifications and manuals and all specific designs furnished by or through the Successful Bidder shall be fully owned by the Purchaser who is entitled to use them for all purposed.
- 10.2.11 In respect of the drawings issued by the Purchaser for facility of execution of the Contract, the Successful Bidder shall keep safe custody of such drawings. If any additional drawings are required, the Successful Bidder shall give adequate notice in writing to the Purchaser / Consultant any further drawings or specification that can be required for the execution of the Work or otherwise under the Contract. One (1) copy of the drawings furnished to the Successful Bidder as aforesaid shall be kept by the Successful Bidder at the site and the same shall at all reasonable time be available for inspection or use by the Purchaser representative or any other person authorised by Purchaser / Consultant.
- All the drawings and specifications and copies thereof furnished by the Purchaser / Consultant to the Successful Bidder are deemed to be the property of the Purchaser, they shall not be used on other works and with the exception of the signed contract set, these shall be returned by the Successful Bidder to the Purchaser on completion of the works or termination of the Contract.
- 10.2.11.1 Two (2) prints in good condition of each of the approved drawings and documents shall be retained by the Successful Bidder at Site where the Works is being carried out and the same shall be always available for inspection and use by the Purchaser / Consultant or by their authorised representatives.
- 10.2.12 As Built Drawings :
- 10.2.12.1 After completion of performance test and provisional acceptance, the Successful Bidder shall furnish to the Purchaser 3 (Three) each of all “As Built Drawings” along 2 (Two) sets of soft copies on rewritable CDs or any other compatible electronic version as mutually agreed upon. Such “As Built Drawings” shall contain the agreed

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modification, alterations or changes made during execution at site at no extra cost to the Purchaser and stamped 'As-built' with date and signature.

10.2.13 Distribution of Drawings and Documents

The Successful Bidder shall be responsible to deliver to all concerned required number of copies of all "Approval". "Information" and "Final" category of drawings and documents. Failure in complying with above, may result withholding payments against PAC & FAC of performance Guarantee (sec.13, Vol. - V)

10.3 Schedule & Data Sheets

Following schedule & Data Sheets shall be filled up the bidder along with the bidder document. Failure in submission of Data Sheet may result in outright rejection of bidder.

10.3.1 Declaration for site Visit.

10.3.2 List of Exclusion.

10.3.3 List of Deviation.

10.4 DATA SHEET

10.4.1 MECHANICAL

10.4.1.1 Belt Conveyor

10.4.1.2 Wagon Tippler.

10.4.1.3 Side Arm Charger.

10.4.1.4 Vibrating Feeder.


10.4.1.5 Motorised Flap Gates.

10.4.1.6 Electric Hoist.

10.4.1.7 Belt Weigher

10.4.1.8 Hydraulic Breaker.

10.4.1.9 DFDS System.

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10.4.1.10 Air Conditioning & Ventilations System.

10.4.2 ELECTRICAL

10.4.2.1 Electric Motor

10.4.2.2 Electric Motor Actuator

10.4.2.3 L.V Equipment

10.4.2.4 M.C.C, A.C.D.B, D.C.D.B, Push Button Station & Local Isolator

10.4.2.5 Power and Control Cables

10.4.2.6 Transformer

10.4.2.7 Bus Duct

10.4.2.8 Battery and Battery charger

10.4.2.9 Cabling Installation & Support System

10.4.2.10 Illumination System

10.4.2.11 Grounding and Lightning Protection System

10.4.3 INSTRUMENTATION

10.4.3.1 Programmable Logic Controller

10.4.3.2 Variable Frequency Drive

10.4.3.3 Instrument Signal Cable


10.4.3.4 Control Cable

10.4.3.5 Uninterrupted Power Supply

10.4.3.6 Dial Type Handset Telephone With Hotline Facility

10.4.3.7 Loudspeaker for PA (Box Type)

10.4.3.8 Junction Box

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LIST OF EXCLUSIONS
(To be filled up by the Bidder)
Schedule – 10.3.2 (Sht. 1 of 1)


Sl. No.	Reference clause of TS	Details of exclusions	Reasons

Seal of company

Signature of the Bidder:

Name:

Designation:

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DATA SHEET
Belt Conveyor
Schedule No. 10.4.1.1 (sht. 1 of 4)

BELT CONVEYOR

Item	NEW CONVEYORS				MODIFICATION OF EXISTING CONVEYORS				
Capacity (tph)									
Length (c/c in mm)									
Lift (mm)									
Belt speed (m/s)									

Questionnaire (To be filled by Bidder)


The Bidder shall also furnish the following questionnaire and submit with his offer. This data shall form a part of the contract with Successful Bidder.

Seal of company

Signature of the Bidder:

Name:

Designation:

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DATA SHEET

Item: - Wagon Tippler (RDSO G33 latest Revision)
Schedule No. – 10. 4. 1. 2 (sht. 1 of 1)

The Bidder shall furnish following questionnaire and submit the same with his offer. The data shall be part of contract for the successful Bidder.

Type / Make :

Type of wagon to be handled :

Capacity :

No. of tips / hour :

Rail gauge :

Angle of tipping :

Duty :

Type of clamping :

Type of drive :

Vibrators :

Mode of control :

Speed :

Duty :

Power supply :

Travel Drive :


Illustrative Catalogue

Seal of company


Signature of the Bidder:

Name:

Designation:

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The Side Arm Charger shall be suitable to push or pull a full rake load of loaded wagons with gross weight as stipulated in IS:10095 1982, Reaffirmed-2001 (Latest) on straight track and shall be suitable to position all types of wagons at the centre of wagon tippler.

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18. Effort for pushing pulling :
19. Safety features :
20. Type of lubrication arrangement :
21. No of carriage wheels :
22. No of guide roller :
23. Track Gauge :
24. Travel length :
25. Location & size of control deck :
(covered)
26. Driving Torque :
27. Speed of hydraulic motor :
28. Overall dimensions including :
C/C dimension between Tippler
Track & Charger Track
29. Preliminary Installation GA :
drawing
30. Load data for civil / structural :
work

Seal of company

Signature of the Bidder:

Name:

Designation:


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DATA SHEET

Item :- Motorised Flap Gate
Schedule No. 10. 4. 1. 5 (sht. 1 of 2)

The Bidder shall also furnish the following questionnaire and submit with his offer. The data shall form a part of the contract with Successful Bidder.

01. Name and address of the Bidder :
02. Previous experience of the Bidder :
03. List of similar equipment supplied along :
with user's certificate
04. Location / Nos. off :
05. Designation :
06. Capacity through :
07. Material of construction of different parts :
08. Total weight and weight of individuals parts :
09. Type of liner and thickness :
10. Motors
 - a) KW rating :
 - b) RPM :
 - c) Type :
11. Gear Boxes
 - a) Make :
 - b) Type :
 - c) Reduction ratio :
 - d) Torque rating (kg-m) :
 - e) Overall efficiency :

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f) Wt. of Gear box (kg) :

Seal of company

Signature of the Bidder:

Name:

Designation:


 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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DATA SHEET


Item :- Belt Weigher

Schedule No. 10. 4. 1. 7 (sht. 1 of 2)

Type	
Capacity	
Material handled	
Bulk density	
Flow	
Weighing scale range	
Temp. range of operation	
Duty	
Calibration	
Accuracy	
Weight sensor	
Speed measurement	

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Electronic Unit	
Quantity	
Location	
Tag nos.	
Belt width	
Belt speed	
Belt Type	
Material size	
Troughing angle	
Type of weighing	
Type of load cell	
Weighing bridge length	
Weighing range	
Accuracy at full load	

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Operating Voltage/ Power requirement	
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Seal of company

Signature of the Bidder:

Name:

Designation:

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DATA SHEET

Item – Hydraulic Breaker

Schedule No.- 10. 4. 1. 8 (sht. – 1 of 1)

Questionnaire (To be filled up by bidders)


1.	Make of Equipment	
2.	Supplier full name & address	
3.	Collaboration (in any)	
4.	Details of collaboration	
5.	Material to be handled / broken	
6.	Maximum boulder size to be broken	
7.	Horizontal reach of Breaker	
8.	Maximum vertical reach of Breaker	
9.	Swing rotation of Boom	
10.	Machine mounting	
11.	Breaking Arrangement	
12.	Breaking Capacity	
13.	Type of Breaker	
14.	Type of movement of Boom / Link	
15.	Swing and Luffing movements	
16.	HGI of Coal / Sand Stone	
17.	Assembled weight of machine (MT)	
18.	Number of Drives and Drive Ratings in KW	
19.	Preliminary Installation GA drawing	
20.	Load data for civil/structural	

Seal of company

Signature of the Bidder:

Name:

Designation:


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11.0 TIME SCHEDULE & PROJECT COMPLETION

11.1 Project completion from the date of issue of Letter of Intent (LOI)/ Brief Order (BO)/ Purchase Order (PO) is 18 (Eighteen) months.

Successful Bidder shall submit a Bar chart with clear demarcation of different type of activities as listed below. Level II Network to be submitted as activity shall be updated every fortnight (15 days / 2 weeks). Delay status, and delay analysis submitted to Purchaser / Consultant alongwith monthly progress report. Following are segregation of activities.


- 11.1.1 Effective Date of Contact (LOI/ BO/ PO). (Zero date)
- 11.1.2 Basic Engineering and Approval.
- 11.1.3 Detailed design & Engineering.
- 11.1.4 Preparation and issue of T/S (Enquiry) to major Sub-Vendors.
- 11.1.5 Tendering & Ordering on Sub-Vendors.
- 11.1.6 Civil Works.
- 11.1.7 Fabrication Delivery of Structure.
- 11.1.8 Erection of Steel Structure.
- 11.1.9 Delivery of Equipments.
- 11.1.10 Delivery of Electricals.
- 11.1.11 Erection of Equipments.
- 11.1.12 Mechanical completion of Auxiliaries.
- 11.1.13 Cold Test of Wagon Tippler Complex & SCR.
- 11.1.14 Test & Trial Run.
- 11.1.15 Final Acceptance Test.

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12.0 LIST OF O&M SPARES


The vendor has to quote separate itemized prices for recommended O&M Spares and consumables for two years operation. The vendor's list should include the following bare minimum O&M spares. Order for O&M Spares shall be placed separately and these spares are not mandatory to be procured by NALCO.

12.1	Rota-Side Wagon Tippler	
12.1.1	Bearing Housing of Drive Shaft Assembly	Two (2)
12.1.2	Oil Seal of Tippler Support Roller	Two (2)
12.1.3	Bearing Sleeve of Tippler Support Roller	Two (2)
12.1.4	Brake Liners of Tippler Drive Unit Assembly	Two (2) Sets
12.1.5	Pin of rubber bushes for brake coupling of Tippler Drive Unit Assembly	Five (5)
12.1.6	Hydraulic motor and solenoid valve	Two (2) Sets
12.2	Side Arm Charger	(scheme only)
i)	Suction Filter	Six (6) Sets
ii)	Return Line Filter	Six (6) Sets
iii)	Seals for Hydraulic Filter	One (1) set of each type & rating.
iv)	`O' Ring for Hydraulic System	One (1) set
v)	Bearing for Support Rollers	Two (2)
vi)	Bearing for Guide Rollers	Two (2)
vii)	Pipe Fittings for hydraulic system	One (1) set
viii)	Valves for Hydraulic System	One (1) of each type & rating.
ix)	Wire Rope for Arm	1 full length
x)	Sheave for Arm	One (1)
xi)	Arm Resting Pad	Two (2) Sets
xii)	Drive Sprocket	One (1)
xiii)	Idle Sprocket	One (1)
xiv)	Pin with Bush for idle Sprocket	Two (2) Sets
12.3	<i>Vibrating Feeder</i>	

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12.3.1	Drive assembly complete without motor and motor seal	1set
12.3.2	Bearing	8 nos. for each type and size
12.3.3	Seal	2 nos. for each type and size
12.3.4	Liners with Bolts	1set

12.3.5	Roll Body Shaft	1set (32nos.)
12.3.6	Roll Body	2 set (complete for one Screen)
12.3.7	Drive Motor	1no
12.3.8	Local Control Station	1no.
12.4	ELECTRICAL HOIST MANUAL HOIST (CHAIN PULLEY BLOCK)	
	<i>ELECTRICAL HOIST (for each type and rating, hoists)</i>	
12.4.1	Bearings for long travel wheels	Two (2) sets
12.4.2	Bearings for gear boxes for each type of hoist	Two (2) sets
12.4.3	Break liners for all the brakes	100% of total population of each type & size
12.4.4	Oil seals	100% of total population of each type, size rating
12.4.5	Brake springs for all brakes	100% of total population of each type, size rating
12.4.6	Wire ropes for hooks	10% installed on each hoist
12.4.7	Solenoid coils for brakes	Two (2) sets
12.4.8	Overload relay for motors	Two (2)
12.4.9	Limit switches for hoists and travel mechanisms	Two (2) sets
12.4.10	Spare motors for hoists	Two (2)
12.4.11	Long travel machinery (for Electric Hoist)	

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	i. Gear wheel	One (1) set
	ii. Internal clip	Two (2)
	iii. Pinion	One (1)
12.4.12	Chain pulley block (for each type/capacity)	
	i. Load chain wheel	One (1) for each type.
	ii. Load chain stripping fork	Five (5)
	iii. Hand chain wheel	Two (2)
	iv. Ratchet pawl	One (1)
	v. Locking ratchet wheel	Two (2)
	vi. Guide roller	Two (2)
	vii. Brake disc	Two (2)
12.5	<i>Flap gate</i>	
12.5.1	Limit switch	2 nos. of each type & size
12.5.2	Actuator (Complete with motor, gear box etc.)	2 nos. of each size

12.5.3	Oil seals	4 nos. of each size
12.5.4	Flap gate shaft	2 nos. of each type
12.6	<i>Conveyor</i>	
12.6.1	<i>Geared Coupling</i>	
12.6.1.1	Gear Coupling complete	2 no. of each type
12.6.1.2	Bolts for gear coupling	2 sets of each size
12.6.1.3	Seal kit for gear coupling	2 sets of each type
12.6.2	<i>Idlers</i>	
12.6.2.1	Troughing idlers complete with base frame and mounting brackets etc.	10% of Total installed capacity
12.6.2.2	Rolls for above	10% of Total installed capacity
12.6.2.3	. Impact idlers complete with base frame and mounting brackets etc.	10% of Total installed capacity
12.6.2.4	Rolls for above	10% of Total installed capacity


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12.6.2.5	Training idlers complete with base frame and mounting brackets etc (If used).	10% of Total installed capacity
12.6.2.6	Transition idler complete as above	10% of Total installed capacity
12.6.2.7	Flat return idlers complete with mounting brackets etc.	10% of Total installed capacity
12.6.2.8	Flat return trainer complete with mounting brackets etc.	10% of Total installed capacity
12.6.2.9	Belt cleaning spiral rubber disc return idler complete with mounting brackets etc.0	10% of Total installed capacity
12.6.2.10	Two roll 10 deg. Troughing idlers complete with base frame and mounting brackets etc.	10% of Total installed capacity
12.6.2.11	<i>Rolls for above</i>	10% of Total installed capacity
12.6.3	<i>Pulleys</i>	
12.6.3.1	Pulleys complete with shaft excluding bearing and plummer blocks (Complete with lagging, if applicable)	1 no. of each size in pulley and shaft diameter
12.6.3.2	Plummer block complete with bearing and sleeves	2 nos. of each type and size
12.6.3.3	Modular segment for belt cleaners and skirt board	10% of total quantity
12.6.4	<i>Brakes</i>	
12.6.4.1	Brakes	2 nos. of each type & size
12.6.4.2	Brake shoes	2 sets of each size


12.6.5	<i>Conveyor gear boxes (including, belt feeders)</i>	
12.6.5.1	Gear box internal complete with input shafts, output shafts & gears etc.	1 set of each type & rating
12.6.5.2	Oil seals	2 sets of each type & rating
12.6.5.3	Bearings	1 set of each type & rating
12.6.5.4	Hold back device	2 nos. of each type & rating
12.6.5.5	Cooling fan with cover	2 nos. of each type & rating

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12.6.6	<i>Belt cleaners</i>	
12.6.6.1	External belt cleaners set	4 sets
12.6.6.2	Internal belt cleaner set	4 sets
12.6.6.3	Modular segments for belt cleaners (Primary and Secondary)	10% of the total population
12.6.7	<i>Fluid Coupling</i>	
12.6.7.1	Fluid coupling complete	1 no. of each size
12.6.7.2	Multi disc assembly (For fluid coupling)	1 set of each size
12.6.7.3	Resilient drive plate assembly	1 set of each size
	Bearings	1 set of each type of coupling
12.7	DFDS : COMPRESSED AIR SYSTEM	
12.7.1	<i>Compressor and accessories (applicable for each compressor)</i>	
12.7.1.1	Motor Bearing	1 set of each type
12.7.1.2	HP stage Gear & Pinion	1 set of each type
12.7.1.3	LP stage Gear & Pinion	1 set of each type
12.7.1.4	Air Intake Filter Element with Gasket	2 sets of each type
12.7.1.5	Oil filter Element with Gaskets & Seals	2 sets of each type
12.7.1.6	Safety valve springs & gasket for HP stage	1 set of each type
12.7.1.7	Safety valve springs & gasket for LP stage	1 set of each type
12.7.1.8	Gaskets & Seals for Inter Cooler	2 sets
12.7.1.9.	Gaskets & seals for After Cooler	2 sets
12.7.1.10	Gaskets and seals for oil cooler	1 set
12.7.1.11	Moisture trap element / assembly	2 sets of each type / size
12.7.2	<i>Air Drying Plant</i>	
12.7.2.1	Dew point Meter	1 set

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12.7.2.2	Sensor for Dew Point Meter	1 set
12.7.2	PIPING SYSTEM (DFDS System)	
12.7.2.1	<i>Valves including control valves (for each type, size, class, material)</i>	
12.7.2.1.1	Diaphragm Valves	
	a) Pneumatically operated diaphragm valves	5% of total quantity used with minimum one (1)
	b) Diaphragm for valve actuators and valve body for pneumatically operated diaphragm valve	10% of each size with minimum two (2)
	c) Manual diaphragm valves	5% of total quantity used with minimum Two (2)
	d) Spares diaphragm for manual diaphragm valves	10% of total quantity used with minimum Two (2)
12.7.2.2	Gate/ Globe/ Plug/ Ball valves	
	i. Up to 100 mm NB	20% of total quantity used with minimum Four (4)
	ii. Above 100 mm NB	5% of total quantity used with minimum Two (2)
	iii. Gland packing (for each size & type, material)	5% of total quantity used with minimum Four (4) sets
12.7.2.3	a) Non-return valves (NRV)	5% of total quantity used with minimum One (1)
	b) Flaps for above NRV	5% of total quantity used with minimum Two (2)
	c) Hinge pins	5% of total quantity used with minimum Four (4) sets
	d) Seat rings	5% of total quantity used with minimum Four (4) sets
12.7.2.4	Butterfly valves [for each size, rating and material]	5% of total quantity used with minimum One (1).
	a) Gland packing	Ten (10) sets


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	b) Bearings	One (1) set
	c) Valve discs	One (1) set
	d) Rubber seals	One (1) set
12.7.2.5	Air Release Valves	5% of total quantity used with minimum One (1)
12.7.2.6	Solenoid valves	10% or minimum Six (6)
12.7.2.7	Limit Switches	10% for each type & size with minimum Two (2)
12.7.2.8	Control valves (of each type)	5% of total quantity supplied with minimum (2)

12.10 LIST OF O&M SPARES (ELECTRICAL)


The vendor has to quote separate itemized prices for recommended O&M Spares and consumables for two years operation. The vendor's list should include the following bare minimum O&M spares. Order for O&M Spares shall be placed separately and these spares are not mandatory to be procured by NALCO.

12.10.01	<i>Transformers (for each rating)</i>	
i)	Bushings(HT & LT)	1 No
ii)	Winding Temperature Indicator	1 No
iii)	Tap changer contacts	1 No
iv)	Limb of complete LT and HT windings (1 phase) inclusive of temperature sensing devices for dry type transformer	1 Set
12.10.02	Circuit Breaker Components (LT)	
i)	Complete Pole of each rating of breaker	3 No
ii)	Spring charging motor	1 No
iii)	Primary disconnect (power) complete set	1 No
iv)	Auxiliary contact set	2 No
v)	Limit switches	3 No
vi)	Arc chutes	3 No
vii)	Fixed contact	3 No

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viii)	Moving contact	3 No
ix)	Seal of bushing	10% of total
x)	Inter phase barrier	2 No
xi)	Arcing contact	3 No
xiii)	Charging spring	3 No
xiv)	Closing coil.	3 No
xv)	<i>Tripping coil</i>	3 No
xvi)	Bus bar supporting moulded insulator	15% of total
xvii)	Power contactors each rating	1 No
xviii)	Auxilliary contactors	20 No
12.10.03	Load break switches/fuse switch unit (415V)	1 No of each rating

12.10.04	Switches	
i)	Pull cord Switches	10 No
ii)	Belt Sway Switches	5 No
iii)	Zero speed switches	3 No
iv)	Limit Switches	2 No of each type
12.10.05	Control Switch	1 No of each type and rating
12.10.06	Selector Switch	1 No of each type and rating
12.10.07	Push Button	10 Nos
12.10.08	Meters	
i)	MFM	1 No of each type for each feeder as shown in SLD
12.10.09	Relays	
i)	Protective relays (Digital / Numerical)	1 No of each type and range
ii)	Auxiliary Relay	5 Nos.
12.10.09	Instrument Transformers	
i)	<i>Current Transformer</i>	1 no of each ratio

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ii)	Voltage Transformer	1 No of each ratio
iii)	Control Supply Transformer	2 Nos.
12.10.10	Fuses and base	
i)	HRC power fuse base	3 No of each rating
ii)	HRC control fuse base	20 No
iii)	HRC power fuse links	5 No of each rating
iv)	HRC control fuse links	20 No
v)	Neutral links(power)	2 No of each rating
vi)	<i>Neutral links(control)</i>	10 Nos
12.10.11	Timer	1 no of each type and range
12.10.12	Terminal Block	5 No of each
12.10.13	Indicating Lamps with resistor	
i)	AC	100 No
ii)	DC	25 No
12.10.14	Power trailing cable	1 length
12.10.15	Bus duct flexible connector	2 No

13.0 PERFORMANCE GUARANTEE TEST

13.1 GENERAL

13.1.1 Performance Guarantee tests shall be carried out by the Successful Bidder to establish the performance parameters for individual equipment and equipment in combination for different streams in association with the Purchaser / Consultant.

13.1.2 After the equipment are completely erected at site, each item / equipment will be thoroughly inspected for correctness and completeness of the installation. They shall be subjected to final tests for performance guarantee, to be carried out by the Successful Bidder or his authorized representative, in the presence of. These tests shall be carried out to demonstrate that the performance of the equipment conform to relevant standards an specifications and meet the requirements as given in this specification. The tests / checks to be conducted shall be generally as under:


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- 13.1.3 For each equipment, the load test shall be conducted in stages. The equipment shall be run for 72 hours continuously at no load and 100% of the rated capacities for time duration as per mutually agreed upon between Bidder and the Purchaser / Consultant.
- 13.1.4 All the specified speeds of the conveyors shall be measured under full load conditions.
- 13.1.5 Proper operation of all safety switches for conveyors like pull cord switch, belt sway switch and zero speed switch etc. shall be demonstrated by the contractor in the presence of Purchaser / Consultant.
- 13.1.6 During operations of equipment at no load and at full load, performance of all the drive shall be checked in respect of current drawn by the motors, temperatures rise, vibrations, gear box noise and its heating, bearing heating etc. with respective rated values.
- 13.1.7 The Electrical & automation system along with all its auxiliaries installed under the subject package is deemed to have cleared the PG test if performance of the equipment and system and subsystem is found satisfactory.
- 13.1.8 Any other observations / tests felt necessary for judging the performance of the machines and mutually agreed between Bidder and the Employer shall be carried out.
- 13.1.9 If during the test runs, there is interruption exceeding 2 hours due to any cause other than power failure or shortage of input materials, the test run shall be discontinued and fresh date shall be decided mutually by both the parties.

13.2 PERFORMANCE GUARANTEE PARAMETERS

- 13.2.1 The Successful Bidder shall comply with the following operating parameters of major equipments.

Sl. No.	Description	Guaranteed Level (Performance Guarantee Value-Rated)
1.	Wagon Tippler.	20 Wagon / Hr.
2.	Side Arm Charger	Full Rake of 58-60 Wagons.
3.	Vibrating Feeder	500 TPH
4.	New Conv. – 1B, 1C, 2C/2D upgraded Conv. 3A/3B.	900 TPH

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13.2.2 Performance Guarantee parameters at some other equipment is mentioned with equipment specifications the same forms an integral part of the PG. parameter.

13.3 PERFORMANCE GUARANTEE

General

On completion of erection of the plant units along with utilities and auxiliaries by contractors as per approved drawings / documents as well as detailed drawings, the successful bidder shall undertake preliminary Acceptance Test (PAT) i.e. cold test, to prove that the unit has been supplied as per agreement and after erection the unit is fit to be started up and commissioned. The PAT shall be followed by commissioning (hot trials) to demonstrate that the unit is fit for commercial production.


13.4 Preliminary Acceptance Test (PAT)

- 01 Cold tests shall be performed on the individual sub-assemblies of the unit and shall be designed to conduct the systematic check of the components and of the functional operation thereof.
- 02 Cold tests shall comprise idle, no-load tests. Cold tests shall be conducted by the successful bidder under his sole responsibility. The purchaser will provide skilled operating personnel during the cold test.
- 03 A detailed program of cold test shall be drawn up by the successful bidder and shall be subject to the approval of the purchaser / Consultant. Such program may be revised and adjusted as may be required by the purchaser during the test run.
- 04 Results of cold tests shall be recorded jointly by the successful bidder and the purchaser / Consultant.
- 05 On successful completion of preliminary acceptance tests, and liquidation of the defects list, preliminary acceptance certificates shall be issued by the Purchaser / Consultant.

13.4.1 PRELIMINARY ACCEPTANCE AND TAKING OVER

Preliminary Acceptance Test (PAT).

13.4.1.1 As soon as the Erection of the Plant with auxiliary facilities is completed, the Successful Bidder shall notify the Purchaser / Consultant in writing of the proposed date of commencement of preliminary tests. The Purchaser / Consultant then at the earliest jointly with the Successful Bidders representative will prepare a procedural protocol and proceed with the preliminary tests to prove that the plant has been completely delivered, properly erected


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and is fit for Operation. As soon as the tests have been carried out and results are found to the satisfaction of the Purchaser / Consultant, start-up-operation, trial runs, integrated trial runs and thereafter commissioning shall be commenced.

- 13.4.1.2 Rejection of Defective Plant, Materials Workmanship: If the completed Plant, or any portion thereof at any time before it is accepted, be defective or fails to fulfill the requirements of the Successful Bidder, the Engineer shall be at liberty to reject any Work done or Plant supplied or Materials used by the Successful or his sub-Successful Bidders. The Purchaser shall give the Successful Bidder a written notice as soon as the Preliminary test is conducted. setting forth particulars of such defects or failures, and in so far as may be necessary, place the Plant at the disposal. The Successful Bidder shall with all speed and at his own expenses make it comply with the requirements of the Contract. Should the fail to do so within a reasonable time, the Purchaser / CES may reject and replace at the cost of the Successful Bidder the whole or any portion of the Plant, as the case may be, which is defective or fails to fulfill the requirements of the Contract. The Successful Bidder liability under this clause shall be satisfied by (a) payment to the Purchaser of all money paid by the Purchaser to the Successful in respect of such Plant, plus (b) the ascertained difference, if any, between (i) The price of the replaced Equipment including charges for Erection and /or supervision of erection, and (ii) the original Contract price including charges for Erection and / or supervision of erection in respect of such defective Plant.

Should the Purchaser not get the rejected Plant so replaced within a reasonable time, the Successful Bidders liability under this clause will be satisfied by the repayment of all money paid by the Purchaser to him in respect of such plant.

- 13.4.1.3 In the event of such rejection, the Purchaser shall be entitled to remove or retain all Plant in a reasonable and proper manner for a time reasonably sufficient to enable him to obtain other replacement Plant.
- 13.4.1.4 The Successful Bidder shall be entitled to remove or retain all Plant which the Purchaser may have replaced at the Successful Bidders cost.
- 13.4.1.5 On completion of satisfactory start up operation, the Successful Bidder shall notify to the Purchaser / the Consultant in writing of the proposed date of commencement of the trial runs. Trial runs shall be conducted by the Successful Bidder under his sole responsibility and employing his own personnel. During the trial runs, unless otherwise agreed to in the Contract, the Purchaser shall provide inputs like power, utilities, raw materials, etc. as required. The Purchasers supervisory and skilled operating personnel shall however, witness the trial runs. On successful completion of the trial runs by the Successful Bidder and elimination / rectification of the defects and / or deficiencies to be undertaken by the Successful Bidder as indicated / listed by the Purchaser / Consultant in writing to Successful Bidder during trial runs (except minor defects and /or deficiencies which in the

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opinion of Purchaser will not affect the operation, safety & commissioning of the Plant and Equipment), the Successful Bidder shall so notify the Purchaser in writing for conducting integrated trial runs.

During the integrated trial runs, unless otherwise agreed to in the Contract, the Purchaser shall provide inputs like fuel, power, utilities, operating personnel and supplies required for the operations. The Successful Bidder shall provide the required personnel for integrated trial runs. The integrated trial runs shall be for an uninterrupted minimum period of mutually agreed between bidder and purchaser. Unless otherwise agreed in the Contract Specification. During the integrated trial runs, the Successful Bidder shall also associate the Purchaser personnel with a view to provide hands-on-training and / or knowledge of the equipment and to get them acquainted with the safety precautions, method of operation & maintenance and corrective steps to be taken in case of necessities. The presence of Purchaser personnel does not relieve the Successful Bidder of his responsibilities & obligations for proper running of the equipment.

Supervision of all the operations during start-up-operation, trial runs & integrated trial runs is the responsibility of the Successful Bidder. As soon as the integrated trial runs are completed, the plant and Equipment shall be ready for commissioning and the Successful Bidder shall so notify the Purchaser in writing. The Purchaser / Consultant shall notify the Successful Bidder in writing any defects and / or deficiencies during integrated trial runs. If the Purchaser / Consultant is satisfied that the defects and / or deficiencies so notified have been eliminated / rectified by the Successful Bidder at his cost, the Successful Bidder shall commission the Plant and Equipment and a completion protocol would be signed to that effect. The Purchaser shall supply the operating and maintenance personnel an all raw materials, utilities required for commissioning. However, the Successful Bidder shall supply commissioning spares and consumables required for commissioning as stipulated in the Contract.

On commissioning, the Purchaser shall issue Preliminary Acceptance Certificate (PAC) and while issuing PAC the Purchaser shall list out various defects and/or deficiencies during commissioning to be liquidated by Successful Bidder within the specified time as decided by the Purchaser. The Successful Bidder at his cost shall attend to the defects & points with due diligence & speed and get the defects eliminated / rectified to the satisfaction of the Purchaser within the time so specified by the Purchaser while issuing the PAC.

After issue of PAC the Purchaser shall take over the Plant and Equipment. However, taking over by the Purchaser no way relieves the Successful Bidder of the obligations under this Contract. Taking over means taking over physical possession and the Plant shall be operated under the supervision and guidance of the Successful Bidder till Performance Tests are carried out and the Provisional Acceptance Certificate (PAC) is issued as per Section 13.5 herein below.


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In special circumstances and at the Purchaser sole discretion, PAC may be issued for a part of the Plant. However, the Plant is deemed to have taken over only after issue of PAC for all the units of the Plant

13.5 PERFORMANCE TESTS AND PROVISIONAL ACCEPTANCE:

- 13.5.1 After eliminating / rectifying the defects by the Successful Bidder at his cost, which are listed along with the issue of PAC, the Successful Bidder shall notify the Purchaser / Consultant in writing of the proposed date of commencement of Performance Guarantee Tests (PG Test). A detailed procedural protocol shall be prepared by the Successful Bidder to this effect, which will be discussed and agreed upon by the Purchaser / Consultant. Every item of Plant, Machinery and Equipment as well as the Plant as a whole shall undergo PG Test unless otherwise decided by the Purchaser. The duration of the PG Test shall be for a period agreed to in the Contract. The man-power utilization for carrying out the PG Test by the Successful Bidder shall not be more than the strength of normal operation recommended by the Successful Bidder accepted by the Purchaser.
- 13.5.2 During the PG Test, the Plant, Machinery and Equipment as well as the Plant as a whole will be operated / run under the supervision and guidance of the Successful Bidder. The Successful Bidder shall provide adequate labor Purchaser / Consultant and commissioning spares for smooth conducting of PG Test. Unless otherwise agreed to in Contract, The Purchaser will provide power, utilities, operating & maintenance personnel and supplies required for the Operation.
- 13.5.3 Should the continuous operation during the PG Test be interrupted due to either difficulties with the Plant as a whole supplied by the Successful Bidder or inadequacy of his staff or any other reasons, then the PG Test shall be restarted and carryout again continuously for the period as mentioned in the Contract.
- 13.5.4 PG Test shall be carried out by the Successful Bidder in the presence of the Purchaser representative (s) within one (1) month or such time as may be considered reasonable by the Purchaser from the date of issue of PAC. Should the result of these Tests not achieved within the acceptable tolerance limit specified in the Contract Specification, after undertaking required rectifications and modifications, the Tests shall be repeated by the Successful Bidder within the period as may be considered reasonable by the Purchaser. Even after the second test, if the results are not satisfactory, then the third test shall be conducted by the Successful Bidder after necessary rectifications and adjustments within fifteen (15) days or any other period mutually agreed upon with the Purchaser / Consultant from the date of the preceding test.

All tests and re-tests shall be conducted by the Successful Bidder in the presence of the Purchaser representatives / Consultant.

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Maximum three (3) nos. of repeat tests shall be allowed unless otherwise agreed by the Purchaser, if the Successful Bidder fails to achieve the guaranteed performance parameters even after above repeat tests, but the results of the tests as achieved are within the acceptable tolerance limits as specified in the Contract Specification, the Purchaser, under such occurrence, shall accept the Plant as a whole and recover from Successful Bidder Liquidated Damages as per Section 14.10.2 of Vol-V

In case, even all required and possible repairs, adjustments, modifications and replacements by the Successful Bidder, the test results of any of the guaranteed parameters (as stipulated in the Contract Specifications) as achieved fall below the aforesaid specified acceptable tolerance limits of performance guarantee parameters, the Purchaser shall at his discretion may either reject the subject Plant as a whole or may proceed for commercial settlement with the Successful Bidder for acceptance of the Plant as a whole. The Purchasers decision in these regards shall be final and binding on the Successful Bidder.

13.5.5 The Plant shall be deemed to have concluded the PG Test satisfactorily, if during the entire duration of the Test, the Plant, as a whole shall have delivered the guaranteed specified output or operated at guaranteed specified capacity utilising specified quantity and quality of raw materials, utilities, fuel, supplies, etc. as guaranteed by the Successful Bidder.


13.5.6 On satisfactory completion of the PG Test of the complete Plant, the Purchaser will issue a Provisional Acceptance Certificate (PAC), provided that the Successful Bidder undertakes to rectify defects, if any, which do not influence normal operation but which are nevertheless present in the Plant, and which are indicated in writing by the Purchaser and delivery of "As Build Drawings" as stipulated in Section 10.2.12. Such certificate, shall in no way release the Successful Bidder from his liabilities and responsibilities in respect of the Contract as a whole.

13.6 Successful Commissioning (Hot Trials)


13.6.1 Within 30 (thirty) days from the date of issue of preliminary acceptance certificates, the successful bidder shall start-up and commission the unit in and commission the unit in and integrated manner under his sole responsibility.

13.6.2 During the start-up and commissioning, the successful bidder shall perform the required adaptation, adjustment and hot run the Plant & Equipment to demonstrate its production capacity.


13.6.3 The purchaser shall, for the purpose of start-up and commissioning, provide operating personnel as may be available with him for normal operation, who shall work under the instructions and guidance of the successful bidder.

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- 13.6.4 Start-up and commissioning of the unit shall be taken up only when material handling system, electrical power system, inter-plant fluid system and auxiliaries serving the unit as well as the preceding / succeeding plant units are under normal operation and / or feed material is available. The successful Bidder shall rectify the defects observed during commissioning.
- 13.6.5 The quantities of starting material and facilities necessary for conducting the commissioning shall be mutually determined by the successful bidder and purchaser.
- 13.6.6 Results of start-up tests and commissioning shall be recorded jointly by the successful bidder and the purchaser.
- 13.6.7 On successful completion of commissioning of the unit and its commencement of stable normal operation, commissioning certificate shall be issued by the purchaser within 15 days.
- 13.6.8 The unit shall be taken over by the purchaser when:
- Commissioning certificate as per clause 13.6.7 has been issued by the purchaser / Consultant.
 - The successful bidder has submitted all final documents in compliance with the provisions of this specification.
 - The successful bidder has supplied all consumables, change parts, special tools and tackles and commissioning spares.
 - The successful bidder has met, to the satisfaction of the purchaser, all the observation, if any, contained in Preliminary Acceptance certificate.
- 13.7 Performance Guarantee Tests (PG)
- 13.7.1 After successful commissioning of the plant & equipment, the bidder shall offer the plant for conducting performance guarantee tests as mutually agreed upon between the purchaser and bidder.
- 13.7.2 The successful bidder shall supervise and carry out the operation under their instruction and guidance during performance guarantee tests and shall take full responsibility of the operation. The purchaser will make available necessary operating and maintenance as per the agreed manning schedule as well as the raw materials, utilities and services etc. as specified.

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- 13.7.3 The successful bidder shall submit the scope, general preconditions, test procedures, guaranteed values and test evaluation methods which shall be finalised during bidder discussion.
- 13.7.4 The performance tests for all plant equipment shall be carried out to satisfy all operating parameters as per the relevant clauses of the Technical specification for the equipment under consideration.
- 13.7.5 The performance guarantee test shall be performed for each sub section continuously for 10 days. Continuity of operation however, be limited by availability of raw materials for unloading and stacking and availability of storing capacity on delivering end. Wherever equipment in the sub section is of stand by nature, each such equipment shall operate for at least 10 hours on load in the period.
- 13.7.6 The performance guarantee test shall also be performed for the complete system for 5 days on round the clock basis.
- 13.7.7 In case this is disrupted due to equipment or facilities supplied by others, the performance is to be repeated for two more times after rectification of fault of the equipment or facilities supplied by others. Repair / Rectification of fault shall be done by others. If the test is disrupted even after that, the performance test shall be on the basis of total hours of uninterrupted operation of the system, 200 hours for sub section and 100 hours for total system. However, there should not be any failure of the equipment supplied by Successful bidder between starts and finish of this time counting. If the operation stops due to failure of any item supplied by Successful Bidder, the operating hours prior to such failure will not be counted.
- 13.7.8 In case some equipment can not be tested within the period of testing because of failure of equipment or facility provided by others, the same will be accepted on the basis of load test result for the limited period or no – load test result where load test could not be performed at all.
- The Successful bidder shall prepare and submit a draft performance test procedure for each equipment and system within 12 months of order. The final performance test procedure will be prepared jointly by the purchaser / Consultant and the contractor based on the draft performance test prepared by the contractor and various requirement indicated in the contract specification and the order.
- 13.8 FINAL ACCEPTANCE:
- 13.8.1 Final Acceptance Certificate (FAC) of the Contract as a whole shall be issued by the Engineer subject to the following :

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- a) Proof of satisfactory integrated operation that is to say that the Plant is capable of giving the guaranteed performances, parameters, output, etc. as per the provisions of the Contract.
- b) The supply of remaining drawings, documents and information required as per Section 10.2 (Vol.-V) herein above are completed.
- c) Fulfillment of all the Contractual obligations by the Successful Bidder.

13.9 GUARANTEE AND GUARANTEE PERIOD:

- 13.9.1 The Successful Bidder shall be liable for the total guarantee period i.e 12 running months of the system after successful performance guarantee test and handing over the system to NALCO. During this period vendor has to replace/repair any parts that may fail or show signs of defects whether of his own manufacture or those of his sub-suppliers under the conditions provided for in the Contract and proper use and arising from faulty designs, materials or workmanship or erection or from any act or omission of the Successful Bidder.
- 13.9.2 All such replacements of defective parts mentioned above shall be made free of cost at site by the Successful Bidder and the return of the defective parts to the Successful Bidders works shall be the Successful Bidders responsibility and shall be made at his expenses. All expenses such as freight, insurance, customs duty, handling charges, erection charges, etc. related to replacement incurred by the Purchaser, shall be to the Successful Bidder account. The Purchaser will, however, render such assistance in this matter to expedite the same. In the case of defective parts not repairable at Site but essential in the meantime for the commercial use of the Plant, the Successful Bidder shall replace with good parts at Site free of cost to the Purchaser the said defective parts, before the defective parts are removed from the Site.
- 13.9.3 If it becomes necessary for the Successful Bidder to replace or renew any defective portions of the Plant under this clause, the provisions of this clause shall apply to the portions of the Plant so replaced or renewed until the expiration of twelve (12) months from the date of such replacement or renewal or until the end of the above mentioned period of twelve (12) months whichever may be the later. If any defect be not satisfactorily remedied within a reasonable time, the Purchaser may proceed to do the work at the Successful Bidder risk and cost but without prejudice to any other contractual rights which the Purchaser may have against the Successful Bidder in respect of any such defects.
- 13.9.4 If the replacement or renewals are of such character as may affect the efficiency of the Plant, the Successful Bidder shall, if asked by the Purchaser repeat the tests as required


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by the Purchaser to re-establish the performance of the Plant as per requirement of the Contract. Such Tests should be carried out without any extra cost to the Purchaser.

- 13.9.5 Until the end of the guarantee period, the Successful Bidder shall have the right of entry at his own risk and expenses, by himself or his duly authorised representative, whose name shall previously have been communicated in writing to the Purchaser at all reasonable working hours, upon all necessary parts of the works for the purpose of inspecting the working and the records of the Plant and taking notes therefrom and, if he desires, at his own risk and expenses, making any tests subject to the approval of the Purchaser, which shall not be unreasonably withheld.
- 13.9.6 The issue of the Inspection certificate shall in no way exempt the Successful Bidder from the provisions of this Article.
- 13.9.7 The Successful Bidder shall be responsible for any discrepancies, errors or omissions in the designs, drawings, documents and other particulars supplied by him, irrespective of whether such drawings and particulars have been approved by the Purchaser / Consultant, or not. Successful Bidder liability shall be limited to the execution, free of charge to the Purchaser, of any such engineering services as are required for making good the defects which are due to faulty designs and drawings supplied by the Successful Bidder. The Successful Bidder shall also pay for any extra cost incurred by the Purchaser due to any alteration necessitated by reasons of any discrepancy, error or omissions in the design, drawings and particulars supplied by the Successful Bidder in terms of guaranteed performance.
- 13.9.8 For liabilities arising out of defective supervision services, that is, wrong instructions rendered by the Successful Bidder engineers / experts / technicians, the Successful Bidder shall provide free of charge to the Purchaser any such supervisory services of the Successful Bidder as are required for making good possible defects resulting from defective supervision services.

In addition, the Successful Bidder undertakes to bear the costs for making good all such defects either by carrying out the necessary work free of charge or by paying costs incurred by the Purchaser in eliminating such defects.

This new Wagon Tipper and its associated system will be hooked up with the existing plant of CHP. So the time and duration of various types of tests mentioned above under clause and sub clauses of performance guarantee will depend upon the running of existing plant, availability of coal wagons etc. Hence the time and duration of various tests will be accordingly decided by the owner, consultant and vendor depending upon the plant situation at that time. However PG test will be carried out as per CI no:- 14.6.0(v)

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14.0 **Special Condition of Contract**

14.1 Name of the Work: -

Engineering, Supply, Erection, Commissioning of Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated conveying system, Up-Gradation of existing conveyor and DFDS system in Coal Handling Plant in SPP, NALCO, Damanjodi, Odisha.

14.2 General Scope of work:-

The scope of work shall cover engineering, supply, storage, fabrication, erection and commissioning test of Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated conveying system, Up-Gradation of existing conveyor and DFDS system for CHP as described in Section 3.0 (Volume-I) of all the allied Civil, Structural, Mechanical, Electrical & Instrumentation work. The jobs shall include:

Installation of new equipment and conveying system


- i) 1 No New Wagon Tippler with Side arm charger.
- ii) 1 No. Hydraulic Breaker
- iii) 4 Nos. new conveyors complete with junction house, underground tunnel.
- iv) DFDS system in all discharge points in Wagon Tippler building, junction houses.
- v) Water Sprinkler at Wagon Tippler Hopper grizzly.
- vi) Fire detection at wagon Tippler drive unit, conveyors and mulsifier system in Conveyor no:-1B tunnel and gallery

Up-gradation of existing conveyor 3A/3B

In this step the capacity of existing Conveyor 3A/3B has to be enhanced by increasing Belt width and speed limiting to 2.5M/sec to be accommodated in the same existing gallery. The design/ modifications required to the structural is in the scope of the vendor. The details of this have been covered in section 6.0 Vol. – II.

Suggested Process of execution will be as given below. But Vendor is free to opine and execute as per their own process within the desired time frame and the same to have prior approval of NALCO/Consultant.

- 1) Location of new wagon Tippler (with co-ordinates) and other details have been indicated in General Layout drawing of the package and the system envisaged has been described in Flow Diagram. All the other locations have been described in the pre-engineered

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Tender Specification. However, Vendor will carry out the site survey, finalize the location of various units and accordingly revise the relevant drawings.

- 2) Indicative details of nearby soil bearing capacity are available for the existing plant. However detail Geo - technical investigations are required to be done along with site survey for design and detailing work.
- 3) Initiate action for manufacture/fabrication of items that is required to be supplied by the bidder and simultaneously Design & erect the civil foundation and structural for all new structures and buildings.
- 4) Design and erect complete Dust Suppression system (DF DS) at all feed points of for the new conveyors to comply with pollution control and other statutory norms. The complete system requires construction of a separate Pump & Compressor room.
- 6) Assess the additional power requirement of the existing conveyors 3A/3B in view of enhanced capacity recommended and also undertake strengthening of support structure existing transfer houses galleries where the drives are located after assessing the load bearing capacity of the existing structures.
- 7) Supply and installation of all handling device (electric hoist chain pulley block) at all location as described in Tender specification.
- 8) Supply & installation of all electrical equipment like Transformer, switch gears, MCC and all accessories including cable, junction boxes, VFD etc. for both new and up-grading equipment as described above by taking main supply from Switch Board 5 HA (Panel 5 & 18) as described in Tender Specification.
- 9) Integrate the control system of newly erected system with the existing system and carry out pre commissioning checks and commissioning activities.
- 10) Carryout successful performance guarantee test and hand over the system to NALCO.

14.2.1 MATERIAL / EQUIPMENT QUALITY AND WORKMANSHIP:

All the materials to be used and equipment supplied shall comply with their respective standards. Quality of workmanship shall be in accordance with modern engineering practices and the vendor will be responsible for overall quality and workmanship.

14.2.2 INSPECTIONS AND TESTING:

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NALCO may carry out inspection of supplied materials/items at site or prior to dispatch at Your's/vendor works. Supervision of manufacture/ fabrication at vendor's works shall be the responsibility of Vendor. Necessary fabrication, erection & commissioning shall be done by Vendor's site in-charge at our site during the execution of these jobs. Inspection & Testing procedure for the erected work will be as per mutually agreed terms and standard engineering practices. However the PG test should confirm the achievement.

14.2.3 TRANSPORT & STORAGE:

Vendor will arrange for transportation of all materials to our site. Unloading and storage at site of all equipment/materials will be the Vendor's responsibility. The vendor shall at his own expenses carry and maintain insurance with reputed insurance companies to the satisfaction of owner covering all the activities from dispatch to successful commissioning and handing over the system to NALCO.

14.2.4 SITE FACILITIES:

Electric power and water required for this project job shall be supplied by NALCO at one point each at free of cost. Necessary tapping /extensions/ distribution shall be the responsibility of the Vendor. Such distribution pipe network shall have prior approval of the Engineer at site so as not to interfere with the layout of existing system or other constructional works. All electrical installations for construction power shall conform to Indian Electricity Rules.


All tools, tackles and other erection equipment, consumables, chemicals etc. shall be arranged by Vendor. Site for storage shall be arranged by NALCO within a reasonable distance from the construction site. Construction of temporary shed and transportation from storage to construction site shall be the responsibility of the Vendor.

14.2.5 SAFETY:

Prior to commencement of any work at site, requisite clearance shall be obtained from NALCO. Vendor shall abide by all the safety rules and regulations of the Plant. Safety of equipment & PPE required for workers during site activities shall be the responsibility of Vendor.

14.2.6 Site Manning: -

The vendor must depute adequate work force headed by a Site-in-charge. The Site-in-Charge of the vendor must be a qualified engineer with adequate experience in erection and commissioning of this type of CHP Up-gradation & Modification work. The Site-in-Charge must be assisted by their minimum Four Engineers/supervisors from Civil,

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Mechanical, Electrical and Instrumentation discipline respectively. These four engineers must have adequate experience in their respective field relevant to said job. The appointed site-in-charge shall timely mobilize the job and ensure the job progress as per schedule so as to complete the project within scheduled period. Since time is very essence of this contract, vendor must depute the site in charge along with engineers/supervisors within two weeks of date of brief order and accordingly increase/strengthen the manpower from time to time so as to complete the project within scheduled period.

14.2.7 Training: -

As this up-graded system will consist of New Wagon Tipper with Side Arm Charger, Hydraulic Breaker, DFDS System etc Purchaser's concerned Engineers and technicians shall be trained by the vendor at their works without any additional charges from NALCO. (Please refer cl no:-10.1.4 of Vol-V)

14.3.0 Pre-Bid Visit: -


Since the Job is of turnkey in nature, bidders are strongly advised to visit the site and understand the total job before submitting their offer. During their site visit, they can collect the relevant data regarding the project and physically inspect the area where this new wagon tippler along with associated system are proposed to be installed and the conveyor needs to be upgraded.

Since this turnkey project is to be executed in the existing plant without affecting the functioning of the existing system, prior site visit is highly required to satisfy in all respects with site conditions before submitting the offer. After acceptance of bid, the claim for extra payment on the ground of any special local working or site constraints/conditions will not be evaluated.

During their pre-bid visit, the bidder shall have evaluation of the proposed scheme/ technique prepared by NALCO/Consultant and suggest for any modification/ better scheme if any to achieve the desired objective. The same shall be finalized after discussed with NALCO. The bidder shall submit their tender documents afterwards according to the finalized scheme.

A Pre-bid meeting will be arranged for the eligible bidders by the owner and consultant at Damanjodi after three weeks of publication of tender. Following points are to be noted:-

- a. All prospective bidders should submit a List of clarification required before the pre-Bid meeting if they require any clarification on the tender documents/ drawings etc.


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- b. If the bidder feels that The Tender specification is with sufficient details they can attend the “Pre Bid meeting” without submitting the “List of clarification”.
- c. It may be noted that no clarification will be replied or entertained by the owner and consultant during “Pre bid meeting” if not submitted earlier, except in exceptional cases.
- d. All the bidders should come prepared for site visit to be accompanied by authorized representative of the owner and consultant.

14.4.0 Scope of the Work: -

The Scope of work of the bidder shall broadly cover the followings: -

- a. The bidder shall conduct site survey, soil investigation test and submit lay out plan of the finalized scheme indicating the area earmarked for Wagon Tippler, Transfer points, Conveyor gallery, electrical MCC room, transformer etc. for approval of NALCO/Consultant.
- b. Preparation of detailed engineering, technical specification of each and all items and method of execution of the finalized scheme.
- c. Preparation of technical document indicating the supply and erection & commissioning (E&C) portion separately along with specific time schedule and finalize the same in consultation with NALCO/Consultant.
- d. The bidder shall submit the Technical Manual in ten copies. The technical manual must include the GA/layout drawing of the entire system, engineering drawing of each equipment/sub-system including foundation details, floor plan etc. The manual will also include the detail technical specification of each equipment, O&M practice, troubleshooting etc. including the final as built drawing. All the drawings and documents to be submitted in form of hard copy as well as soft copy.
- e. Initiate the action for manufacture/fabrication of the items needs to be supplied by the vendor at their works. If any items needs to be supplied from other sub-vendors, necessary permission from NALCO to be taken.
- f. Start the Civil foundation job for new Wagon tippler, Transfer points, MCC, control room along with transformers, conveyor gallery etc.
- g. Expedite manufacture/fabrication being carried out at your works/ sub-vendor for early receipt of materials and facilitate for inspection of materials at works or at site.
- h. Start the erection activities.
- i. Detailed supervision/monitoring of the job being carried out and generation of weekly progress report, showing progress of work of each segment. This should contain areas of concern, assistance from NALCO, comparison of schedule vrs actual etc.
- j. Submission of invoice after completion of the activities mentioned in SI no14.9.0 in Terms of payment.
- k. Ensure completion within the time schedule and start the commissioning activities.

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- I. Ensure complete painting of structural, pipeline and other erected equipments/sub-system and air conditioning of process control room.
- m. Carryout performance guarantee test after 30days of stable operation.
- n. Completion of Handing over formalities to NALCO after successful completion of performance guarantee test.

14.5.0 Brief description of existing Coal Handling Plant: -

Brief description of existing Coal Handling Plant (CHP) has been furnished in Tender Specification (ref. Vol-I).


14.6.0 Time Schedule for completion of the Job: -

The work is to be completed as per the following schedule from the effective date as per details given in tender specification.

- i. Site visit, carry out site survey, soil investigation test and submit lay out plan of the finalized scheme indicating the area earmarked for various installation like Wagon tippler, MCC room, Transfer points etc based on the Flow Diagram and Plant Layout drawings and details collected during site visit for approval of NALCO/Consultant. The vendor shall submit the billing schedule for approval of NALCO and the vendor shall raise their invoices accordingly.

Preparation of detailed engineering, technical specification of each and every items and method of execution of the finalized scheme. Preparation of technical document indicating the supply and erection & commissioning (E&C) portion separately along with specific time schedule and finalize the same in consultation with NALCO along with GA drawings. The bidder shall submit the Technical Manual in ten copies. The technical manual must include the GA/layout drawing of the entire system, engineering drawing of each equipment/sub-system including foundation details, floor plan etc including as built drawing. Hard copy and soft copy of all the drawings and documents to be submitted. The manual will also include the detail technical specification of each equipment, O&M practice, trouble shooting etc. **(5 months from the date of brief order)**

- ii. Initiate the action for manufacture/fabrication of the items that is required to be supplied by the vendor at their works. If any items needs to be supplied from other sub-vendors, necessary permission from NALCO to be taken. Expedite for manufacture/fabrication job being carried out at the supplier works/ subvendor for early receipt of materials and facilitate for inspection of materials at supplier's works or at site. Start and complete the Civil foundation job or various equipment, control room etc. By the time of completion of civil jobs, the required materials must have started reaching at NALCO site- **((7 months from - (i) and complete by 12th month.**

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- iii. Start the erection activities as specified in tender document. Detailed supervision/ monitoring of the job being carried out and generation of weekly progress report, showing progress of work of each segment till completion of the work. This should contain areas of concern, assistance from NALCO, comparison of schedule versus actual etc. Ensure completion of job within schedule. Ensure for complete painting of structural, pipeline and other erected equipments/sub-system and air conditioning of control room- **(from 5th month upto 14th month). complete by 14th month**
- iv. Pre commissioning checks and commissioning of the system:- **(1 Month) (from 14th month upto 15th month). complete by 15th month**
- v. Carryout performance guarantee test after 30 days of stable operation after successful commissioning. **(from 16th to 17th month) complete by 17th month**
- vi. Completion of Handing over and taking over formalities(**One month** after stable operation of system after successful PG test) – **complete by 18th month**

*The total period of assignment (Total contract period) remains **18 months**. However the vendor can reorganize the job/time period of individual job components suitably for betterment of the job without changing the total period of assignment/ Total contract period. Early completion will be welcome.*


14.7.0 OBLIGATIONS OF NALCO

NALCO will provide the required technical information in relation to existing CHP along with proposed modification scheme. However, the Bidder is expected to be knowledgeable enough to carry out the work even is certain information sought is not available. This information will be necessary for preparation of detailed engineering and technical specifications and execution of the job. NALCO will also provide necessary information regarding present status of CHP. NALCO will provide necessary accommodation in the township for the vendor subject to availability. NALCO will extend possible facilities like providing a room inside plant to the vendor to carry out their day-to-day official jobs subject to availability. NALCO will not provide any transportation, local conveyance to the personnel of the vendor for any of their visit in connection with the subject work. NALCO will also not extend any facilities regarding communication, secretarial assistance and computer facilities to the personnel of the Vendor.

14.8.0 GUARANTEES & LIABILITIES

14.8.1 GENERAL

The Vendor to stand guarantee for the WORK and services as broadly specified and described in this CONTRACT. The Technical

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Documentation/technical manual to be prepared shall be in accordance with sound and established practices, using applicable standards, Indian codes, analytical tools and regulations, wherever applicable. The vendor to guarantee for supply of standard items required for this project. The vendor also guarantees for detailed supervision of the job executed and carries out performance guarantee test as well as successful completion of handing over and taking over formalities from vendor to NALCO.

14.8.2 COMPENSATION TO BE PAID TO NALCO:-

In case the vendor is unable to achieve desired parameters in performance guarantee test, Vendor shall facilitate for necessary rework/modifications till completion of successful PG test without any additional charge from NALCO. Simultaneously any deviation noticed in performance of newly erected system before handing over from vendor to NALCO, Vendor shall facilitate for necessary rework/modifications without any additional charge from NALCO.

However, if after taking all the measures, the vendor fails to meet the guaranteed performance in terms Capacity enhancement suitable compensation to be paid as specified in tender specification.

Sl. No.	Equipment	Guaranteed parameter	Short fall	LD amount to be imposed
1	Wagon Tippler	20 Tips /Hour	By One tip per hour	5% of order value
			By two tips per Hour	7% of order value
			Beyond two tips per hour	10% of the order value which is scheduled to be paid after successful PG test.
2	Side Arm charger	Full rake of 58-60 wagons	By one wagon	5% of order value
			By two wagons	7% of order value
			By 3 wagons and beyond	10% of the order value which is scheduled to be paid after successful PG test.
3	Vibrating Feeder	500TPH	More than 5% upto 7%	2% of order value
			More than 7% upto 10%	3% of order value
			Beyond 10%	5% of the order value which is scheduled to be

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				paid after successful PG test.
4	Conveyors 1B,1C, 2C,2D,3A,3B	900TPH	More than 5% upto 7%	2% of order value
			More than 7% upto 10%	3% of order value
			Beyond 10%	5% of the order value which is scheduled to be paid after successful PG test.

In case the total LD amount imposed on the vendor increases above the order value which is scheduled to be paid after completion of PG test, then the balance LD amount will be recovered from the bank guarantee submitted by the vendor.

In case of delay in completion of the project or/and any deviation of the parameters from the guaranteed performance/failure of any equipment/sub-system within the warranty period/ before termination of the contract for the reasons solely attributable to vendor, the same to be replaced by the vendor without any additional cost from NALCO Or else the same shall be recovered from the bank guarantee submitted by the vendor.

14.11.0 Deviation: -

In case the proposal has deviations from the specification, the bidder in his proposal shall indicate clearly such deviations item wise. Deviation, if any, shall be listed in the Deviation Chapter. Price implication, of such deviations shall also be indicated item wise in deviation sheet. In case of absence of such deviation sheets in the proposal it will be presumed that the offer is strictly as per the specification. Also in case of absence of any price implication against any item(s) for which the deviation(s) has been taken by the bidder. It will be taken for granted that such deviation(s) will have no reflection in the quoted price

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Annexure - II

SPECIAL INSTRUCTIONS TO BIDDERS - COMMERCIAL

1.0 Scope of Pre - bid meet:

1.1 Bidder is advised to visit and examine the Site, its surrounding and familiarize himself of the existing facilities and environment and collect all other information which he may require for preparing and submitting the bid and entering in to the contract. Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the bid and during implementation.

1.2 The bidder or any of his personnel or agents will be granted permission by the Owner to enter upon his premises and land for the purpose of such inspection but only upon the explicit condition that the bidder, his personnel or agents will release and indemnify the owner and his personnel or agents from and against all liability in respect thereof and will be responsible for personnel injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, cost and expenses incurred as a result thereof.

1.3 Name of Contact Person for Site Visit:


(i) Mr. P K Behera, GGM(CRG)
M&R Complex, NALCO,
Damanjodi
District - Koraput,
Odisha – 763008
Mob: +91 9437004449
E-mail: pramod.behera@nalcoindia.co.in

(ii) Mr. V S S Anand, GM(CRG)
M&R Complex, NALCO,
Damanjodi
District - Koraput,
Odisha – 763008
Mob: +91 9437097035
E-mail: vedula.anand@nalcoindia.co.in


All technical clarifications should be addressed to above persons.

1.4 Bidder shall examine the bidding document thoroughly in all respect and if any conflict, discrepancy, error or omission is observed, bidder may request clarification within the cutoff date and 02 weeks prior to the bid closing date.

1.5 All commercial clarifications request shall be addressed to the following:

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- (i) Ms. Sumita Sahay, GM(Materials)
National Aluminium Company Limited,
Nalco Bhawean, P/1,
Nayapalli, Bhubaneswar,
Odisha - 751 013
Mob: +91 9937307790
E-mail: sumita.sahay@nalcoindia.co.in
- (ii) Mr. Mihir Behera, SM (Matls.),
National Aluminium Company Limited,
Nalco Bhawean, P/1,
Nayapalli, Bhubaneswar,
Odisha - 751 013
Mob: +91 9437111103
E-mail: mihir.behera@nalcoindia.co.in
- 1.6 A Pre-bid meeting will be arranged by the owner and consultant at Damanjodi on technical and commercial issues after three weeks of issuance of tender. Following points are to be noted:-
- All prospective bidders should submit a List of clarification required before the pre-Bid meeting if they require any clarification on the tender documents/ drawings, etc.
 - If the bidder feels that The Tender specification is with sufficient details they can attend the "Pre Bid meeting" without submitting the "List of clarification".
 - It may be noted that no clarification will be replied or entertained by the owner and consultant during "Pre bid meeting" if not submitted earlier, except in exceptional cases.
 - All the bidders should come prepared for site visit and they will be accompanied by authorized representative of the owner and consultant.
- 1.7 Any failure by bidder to comply with the aforesaid requirement shall not excuse the bidder, after subsequent award of contract, from performing the work in accordance with the contract.
- 1.8 Response to queries/ clarifications raised will be sent as expeditiously as possible. The response shall not form part of the tender document unless issued as an addendum/ amendment.
- 1.9 Bidders are expected to resolve all their clarification/ queries to the bidding document and submit their bid in total compliance to bidding document without any deviation/ stipulation/ clarification.

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2.0 Bidder's Qualifying Criteria (BQC):

The bidders intending to participate in the Tender should fulfil the following bidder's qualifying Criteria:

2.1 Technical Eligibility Criteria

2.1.1 Experience of having successfully executed "similar works" during the last seven years ending last day of the month previous to one in which the tender is invited, should be either of the following:

(i) Three "similar works" each costing not less than Rs. 42.04 crore

OR

(ii) Two "similar works" each costing not less than Rs. 52.55 crore

OR

(iii) One "similar work" costing not less than Rs. 84.08 crore

Definition of similar works:

"Design, engineering, manufacture, supply, construction, erection and testing & commissioning of at least one wagon tippler of design capacity 20 tips per hour or more along with side arm charger and associated conveyors as one integrated system in Coal Handling Plant in turnkey basis in India."


The above mentioned wagon tippler system installed by bidder should be in successful operation for at least one year since commissioning.

Cost of completed works by the bidder shall be escalated @ 10% per annum (simple) to bring them at the current price level. (the cost of work completed within one year prior to original date of bid opening shall not be considered for any weightage and no weightage shall be given for part of the year.)

2.1.2 Documentary proof required: The bidder to submit the following documents duly attested by a notary public or Gazetted office.

(i) Work order indicating order value, scope of work and bill of quantity for assessment of experience criteria.

(ii) Satisfactory completion certificate indicating the value of work executed and period of contract obtained from principal owner of the work for whom the work has been executed.

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Note: The experience/ completion certificates shall be considered only when it bears the Name and Designation of issuing authority. This is only applicable for experience/ completion certificates issued after 30.06.2022.

2.2 Financial Eligibility Criteria

2.2.1 The **average Annual Turnover** of the vendor for last three financial should be minimum **Rs.31.50 crore**.

2.2.2 **Net Worth** of the bidder as on last day of the financial year shall be minimum **Rs.35.00 crore** as per audited balance sheet.

2.2.3 **Minimum positive working capital** shall be **Rs.17.50 crore**. Alternatively bidder should make exclusive credit limit available from one or more scheduled commercial banks for the proposed work and submit a line of confirmation from the bank/ banks as documentary evidence

2.2.4 Turnover shall be escalated @ 10 % (Ten Percent) per annum (simple rate) to bring them at current Price level. The turnover of latest previous year shall be not covered for any weightage.

2.2.5 Net worth of the bidder during the last financial year shall be positive. The bidder shall furnish audited Annual Report containing audited balance sheets and profit and loss accounts, statements for preceding 3 financial years.


Net Worth = Equity share capital + Reserves excluding Revaluation reserves (-) Minus Intangible Assets (-) Minus Miscellaneous expenditure to the extent not written off and carried forward loss.

2.2.6 Bidder should not be under liquidation, court receivership or similar proceeding. Bidder has to submit certificate/ undertaking in this respect in their official letterhead duly signed by their authorized signatory with official seal.

Bidders should upload the scanned copy of the declaration with their On - line Part - I - Bid. The original copy of the declaration should be submitted in cover - 1 of the hard copy offer.

2.3 The bidder or its Proprietor/Partner(s)/Director(s) of the firm should not have been convicted by a court of Law for an offence involving moral turpitude in relation to business dealings during the past seven (7) years. The bidder shall give an affidavit to this effect. The affidavit must be affirmed before the competent judicial authority or duly notarized by the Notary. Besides, bidder should furnish litigation history of their firm or group firm. The litigation history shall include:

(i) Arbitration cases pending

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- (ii) Disputed incomplete works
- (iii) Pending civil cases against the firm or its Proprietor/Partner(s)/Director(s) involving moral turpitude in relation to business dealings.
- (iv) Pending criminal cases against the firm or its Proprietor/Partner(s)/Director(s) involving moral turpitude in relation to business dealings.
- (v) Punishments awarded under civil cases or criminal cases involving moral turpitude in relation to business dealings.

Bidders should upload the scanned copy of the affidavit and declaration with their On - line Part - I - Bid. The original copy of the affidavit and declaration should be submitted in cover - 1 of the hard copy offer.

2.4 Even though the bidders meet the above pre - qualification criteria, they are subject to be disqualified if they have:

- Made misleading or false representation in the forms, statements and attachments in proof of the qualification requirement
- Records of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, litigation history or financial failure etc.
- Their business banned by any central/ state government department/ PSUs or enterprises of Central/ State Govt.
- Not submitting all the supporting documents or not furnishing the relevant details as per the prescribed format


A declaration to the above effect in form of affidavit on stamp paper of Rs. 10/- duly attested by Notary/ Magistrate should be submitted. Bidders should upload the scanned copy of the affidavit and declaration with their On - line Part - I - Bid. The original copy of the affidavit and declaration should be submitted in cover - 1 of the hard copy offer.

2.5 Sub - contractor's experience and resources will not be taken into account in determining the bidder's compliances with qualifying criteria.


2.6 NALCO reserves the right to use in house information for assessment of Bidder's capability.

Instructions:

1. Bidders are requested to upload/ submit all the required documents attested by Notary public or a Gazetted officer otherwise bids are liable for rejection.


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2. No further correspondence will be carried out with the bidders unless considered necessary by NALCO.
3. Bids from Joint venture/ MOU/ Consortium shall be accepted subject to fulfilling the criteria as given below:
 - (a) Maximum 3 (three) partners/ members shall be allowed in case of Joint Venture/ MOU/ Consortium. Bid shall be accompanied by a copy of Joint Venture/ MOU/ Consortium duly notarized so as to be legally valid and binding on the Members/ partners.
 - (b) The Lead partner shall be responsible for 100% participation in financing of the Joint Venture/ MOU/ Consortium. The contract-cum-performance-bank guarantee (CPBG) for the total value is required to be submitted by lead partner.
 - (c) The lead partner shall meet financial eligibility criteria singly and all the partners shall meet Technical Eligibility Criteria jointly as stipulated above. The other member of the Joint Venture/ MOU/ Consortium shall have experience such that the combined experience of both the members meets the complete requirement stated in the technical eligibility criteria of the BQC as mentioned above.
 - (d) The orders shall be placed on Lead Partner. However, all the partners of the Joint Venture/ MOU/ Consortium shall be liable jointly and severally for the execution of the contract in accordance with the contract terms and conditions. A statement to this effect shall be included in the authorization through a Power of Attorney in favour of the Lead Member in the Bid as well as in the Agreement (in case of a successful bid).
 - (e) The Joint Venture/ MOU/ Consortium formation date shall be before bid submission date.
 - (f) Bid shall be accompanied by a copy of Joint Venture/ MOU/ Consortium duly notarized so as to be legally valid and binding on the Members/ partners.
 - (g) One of the partners/ members shall be nominated as Lead Partner being in-charge and the authorization shall be evidenced by submitting Power of Attorney in his favour duly signed by legal authorized signatories of all the partners/ members (i.e., Member of the Joint Venture/ MOU/ Consortium shall give Power of Attorney (POA) to the Leader). The overall Project Management shall be performed by the Leader.
 - (h) The Joint Venture/ MOU/ Consortium shall submit a copy of valid collaboration agreement/ MOU identifying the scope division matrix of the complete work in all respects between the leader and member (i.e., clearly describe the scope

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of work of the partners and mention clearly the lead supplier). The Bidder shall also submit the Power of Attorney as mentioned above. The MOU shall be converted into a definitive legally binding agreement within one month from the effective date of contract awarded by NALCO. This agreement should be irrevocable and valid till completion of LSTK package.

- (i) The format for the agreement is attached.
 - (j) Net Worth of the Leader of the Joint Venture/ MOU/ Consortium and the other Member of the Joint venture/ MOU/ Consortium should be individually positive as per the audited financial results of the last financial year. It is clarified that the term "Last Financial Year" means the latest financial year out of the immediately preceding three financial years mentioned above.
 - (k) Separate bid by any of the Joint Venture/ MOU/ consortium members shall not be accepted. A bidder can be a member only in one Joint Venture/ MOU/ consortium. In case he participates in more than one Joint Venture/ MOU/ consortium for this Bidding Document, all the Joint Venture/ MOU/ consortium bids with his participation shall be rejected.
 - (l) NALCO intends to enter into more than one contract for the LSTK package to rationalize tax liability as per legal provision of country and also for operational convenience in case, the offer of the bidder being accepted by NALCO. But, Leader of the Joint Venture/ Consortium shall be ultimately responsible for the project.
 - (m) The fee towards cost of EMD can be submitted by any of the member of the Joint Venture/ Consortium subject to proper authorization from the leader of Joint Venture/ Consortium.
 - (n) In case of dissolution/ failure of Joint Venture/ MOU/ Consortium, the contract shall be voidable at the option of the owner and owner shall have right to execute the balance job at the risk and cost of the Joint Venture /MOU /Consortium.
4. Owner reserve the right not to seek any clarification on documents submitted in support of Pre-qualification requirements and to evaluate the PQ Bids on "As Received Basis" and/or in-house data, survey, or otherwise. However, in case of any ambiguity in the documents submitted by the Bidder or if the Bidder submits incomplete documents, pertaining to the BQC, NALCO may give an opportunity to the Bidder to submit the required documents in support of meeting the stipulated BQC for the jobs mentioned by the Bidder in their original offer, within the time period specified. In case, the Bidder fails to submit any document or submits incomplete/ ambiguous within the time period specified, the bid evaluation will be done as per the evaluated documents. The Bidder shall not be allowed to submit any new document

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pertaining to the BQC beyond the time period specified in this regard by NALCO.

5. The failure to meet the BQC stipulated above will render the bid to be summarily rejected.
6. Submission of authentic documents is the prime responsibility of the Bidder. However, NALCO reserves the right of getting the document cross verified, at their discretion, from the document issuing authority.
7. Canvassing in any other form by the Bidder or by any other agency on their behalf may lead to disqualification of their Bid.
8. Bidders who are on Holiday list/ Banned List of NALCO on the due date of submission of PQ bid/ during the process of evaluation of the PQ bids, the offers of such Bidders shall not be considered for Bid Opening/ Evaluation/ Award. If the PQ document were issued inadvertently/ downloaded from website, offers submitted by such Bidders shall also be not considered for bid opening/ evaluation/ Award.
9. NALCO shall not be responsible for any expenses incurred by bidders in connection with the preparation & delivery of their bids, site visit and all other expenses incurred during bidding process regardless of the conduct or outcome of the bidding process.
10. NALCO reserves the right to disqualify any bidder during the PQ process on account of their non-performance in the earlier jobs executed by them for NALCO.
11. NALCO reserve the right to reject any or all the bids received or annul the Bidding process at any time without assigning any reason whatsoever, without assuming any liability or any obligation. The Owner reserves the right to accept or reject any PQ Bid and/or to annul the pre-qualification process and/or reject any and/or all PQ Bids at any time without thereby incurring any liability to the affected Bidder(s) or any obligation to inform the affected Bidder(s) of the grounds for such action.
12. Bidders must make their own judgment on the adequacy of the documents/ information they provide. In case any information provided by Bidder is found to be incorrect, the bid will be rejected, and the Earnest Money Deposit of such Bidder will be liable for encashment/ forfeited as the case may be.

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CONSORTIUM AGREEMENT

This Consortium Agreement is made on _____ date _____ at _____ place _____
BETWEEN: (1) _____ Bidder-leader _____ (full address) (here in after called the First party -Bidder, which expression shall include its successor, administrators, Executors and permitted assigns, of the one part (2) _____ address of 1st associate _____ (full address) here in after called the 2nd party-Associate, which expression shall include its successor, administrators, Executors and permitted assigns) of the 2nd part, and (3) _____ address of 2nd associate if any _____ (full address) here in after called the 3rd party, which expression shall include its successor, administrators, executors and permitted assigns) of the 3rd party,
WITNESSETH:

WHEREAS, the owner M/s. National Aluminium Company Ltd., is a Government of India Undertaking, having its Office at Nalco Bhavan, P/1, Nayapalli, Bhubaneswar - 751 013, Odisha, (hereinafter referred to as NALCO) has floated Notice inviting tenders bearing No. _____ for execution of work _____ description of work _____, inviting offers from the interested parties; AND


WHEREAS the said Notice Inviting tender, permits submission of bid on consortium basis subject to the stipulations specified in the Notice Inviting tender; AND

WHEREAS M/s _____ name of the leader-bidder _____ the 1st party-bidder will file the tender on consortium basis; taking the 2nd party (and 3rd party) as the associate(s) for the said project as detailed in the bid documents No. _____ in order to meet the BQC criteria; since M/s _____ name of the leader-bidder _____ the 1st party-bidder itself is meeting all the Qualifying requirements except describe the work which the associate(s) is/are required to execute AND;


WHEREAS the 2ND party (and 3rd Party) associate(s) have the required men, materials, and establishment with them and eager to participate and execute the work covered by the NIT and WHEREAS parties to this consortium agreement have mutually agreed to execute the contract covered by the aforesaid bid document in this joint venture; if awarded to the 1st party-bidder;

NOW, therefore, it is agreed between the Parties as under:

1. M/s _____ name of the leader-bidder _____ the 1st Party bidder is the leader, of this consortium Agreement; and is answerable to the owner i.e. NALCO in all respects with regard to execution of such work. However the associate(s) are not absolved from any liability that may arise during the course of execution of such contract work.

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2. M/s name of the leader-bidder the 1st party bidder and leader will participate in the above mentioned Bid with the Owner i.e. NALCO, and is authorized and competent to enter into negotiations and make all correspondence with the owner as he deems fit just and proper and the parties to this agreement shall be bound by the decisions or/and commitments made by the leader in that regard.
3. During the term of this Consortium agreement the parties shall not enter into any teaming arrangements with any other party for any component of the Bid covered under this Consortium Agreement.
4. This consortium agreement shall remain in force until finalization of the bid filed by the owner on consortium basis and in case of award of work, until completion of the awarded work including the defect liability period covered by the Bid documents, as the case may be.
5. The parties to this Consortium Agreement here by mutually agree that both (all) of them shall remain as irrevocable members of the tie-up for the complete execution and completion of this project.
6. The parties to this Consortium Agreement agree that after mutual consultation and technical discussions, they have agreed and decided with regard to preparation of the final bid, authorizing their leader to bid for the work.
7. The Parties to this Consortium Agreement shall be jointly and severally liable for the consequences of non-execution of the Contract work satisfactorily covered by the aforesaid Bid document.
8. The parties to this Consortium Agreement do here by declare that the leader 1st party M/s name of the leader-bidder shall have the authority to conduct all business for and on behalf of any and all the partners of the Consortium during the bidding process and in the event the Consortium is awarded with the Contract, during the entire Contract execution period.
9. It is hereby agreed that the leader M/s name of the leader-bidder shall be entitled to receive all instructions and communications from the owner i.e. NALCO, on behalf of the members of this Consortium Agreement. All such instructions and communications are deemed to have been made on all the parties to this consortium Agreement.
10. The parties do here by agree that all of them shall sign the Contract agreement in case of its award; with the owner i.e. NALCO.
11. The parties do here by agree that the leader (1st party) name of the leader-bidder shall remain in-charge of the entire project if awarded by the owner i.e. NALCO, but however all of them shall make every endeavor to satisfactorily execute the Contract work in its entirety to the satisfaction of the owner i.e. NALCO.


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12. The parties do hereby agree that the leader -1st party- name of the leader-bidder _ shall raise periodical bills with the owner for the works executed and the leader -1st party name of the leader-bidder _ shall only be eligible to receive payments from the owner. The associate(s) does/do hereby declare that he/they does/do not have the authority to raise any bills in respect of the allotted Contract work, basing on this Consortium agreement. The associate(s) to this agreement can only make correspondence through the leader-1st party M/s name of the leader-bidder with the owner i.e. NALCO.
13. The parties do here by declare that so far as NALCO is concerned, the 2nd Party (and 3rd Party) is/are only the agents/partners of the leader-1st party M/s name of the leader-bidder, though they are jointly and severally liable for the consequences those may arose during or after execution of the contract work in question.
14. The parties to this agreement covenant with each other that each of them shall be entitled to share the payments received from Nalco according to work executed by them respectively, without any reference to NALCO.
15. The parties to this Consortium Agreement shall mutually cooperate with each other, and shall not do or cause to be done or indulge in any sort of activity, which would impede or adversely affect the progress of the awarded contract work and in its completion satisfactorily.
16. In the event of the acceptance of the Bid and on award of work on the leader on the basis of this Consortium Agreement, the Contract work shall be executed by all of the parties to this consortium agreement as per the bidding documents and as per the Work Schedule given here under.

WORK SCHEDULE


Sl. No.	Name of Bidder/member of consortium/Joint venture.	Work Particulars	Completion schedule.

17. The leader of Consortium /Joint venture is here by authorized to incur liabilities and receive instructions for and on behalf of any and all the consortium/ Joint Venture members for the entire Contract Work.
18. This Consortium agreement having been exclusively entered in to by the associates with their Leader-Bidder, the leader bidder shall alone is accountable and answerable to the associates concerning the execution of the contract work so awarded and

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NALCO the owner shall in no case be held liable or answerable to the associates, for all or any of the matters covered by this consortium agreement.

19. In the event of any default in the execution of the contract, i.e. execution of work in accordance with specifications and within the scheduled time by any member/ members of consortium/ joint venture member, the rights and obligations of the consortium/ joint venture shall continue to be in full force without being affected by any changes, until the final bill of the contract work of Nalco is settled. The leader shall ensure performance of the contract and if one or more associates fail to perform their respective portions of the contract, the same shall be deemed to be a default by all the members of the Consortium /Joint venture.
20. The parties to this consortium agreement/ joint venture do here by declare that they shall not cancel or amend this agreement unilaterally without the consent of the owner i.e. NALCO, which consent shall be obtained in writing.
21. It is agreed that the responsibility of all partners/ members of the consortium/ joint venture in respect of planning, design, construction equipment, key personnel, work execution and financing of the project has been decided and defined. The leader M/s- the name of the 1st party bidder shall be responsible for 100% participation in financing and execution.
22. The associated parties i.e. M/s NAME OF 1ST ASSOCIATE and M/s NAME OF 2ND ASSOCIATE IF ANY shall provide adequate finances, tools and tackles, transportation equipments, other plant and equipments, measuring and monitoring devices, men and machineries etc for proper and effective execution of the works undertaken by them as per this Consortium agreement.
23. This Consortium agreement shall be construed and Governed by laws of India and the parties here by agree to submit themselves to the exclusive jurisdiction of Koraput Courts with in whose jurisdiction they contract work in question is to be carried out.
24. Any matter which is not stipulated in the consortium agreement shall be settled in good faith by discussion among the parties in the spirit of understanding and cooperation.
25. All disputes or differences what so ever arising among the parties regarding this consortium agreement, shall be settled by arbitration, in accordance with arbitration and conciliation Act, 1996. The Arbitral Tribunal shall consist of a sole arbitrator who shall be nominated and appointed by the CMD of the leader 1st party on the request of either party to this consortium agreement. Since the contract work relates to M & R Complex Nalco, Damanjodi the Venue of arbitration shall also be at the nearby places of Damanjodi in the District of Koraput. With the consent of the parties, the

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arbitrator may hold sittings at any other place other than the venue agreed for, for the convenience of the parties.

In witness where of, the parties here to have executed this Consortium Agreement in duplicate/triplicate, today the _____ day of _____ 2016 at _____.

1st Party (leader)

2nd party (associate)

3rd party (associate)

WITNESSES


1.

2.

Drafted, Computer typed by me, as per the instructions of the parties. Read over and explained the contents of the agreement to the parties in presence of witnesses, to which they admitted the same to be true and correct and as per their instructions and signed the same in my presence and in presence of the witnesses.

Advocate

Note: The agreement should be duly attested by Notary Public. Bidder should upload the scanned copy of the agreement with their On - line Part - I - Bid. The original copy of the declaration should be submitted in cover - 1 of the hard copy offer.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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- 3.0** The bidder has to furnish a declaration to the effect that they have not been banned or de-listed by any Government or Quasi Government agencies or PSUs of India. If they have been banned or de-listed by any Government or Quasi Government agencies or PSUs, then this fact must be clearly stated. The declaration/ undertaking should be in the bidder's official letterhead duly signed by the authorised signatory with official seal. **Offer without this declaration are liable for rejection.**

Bidders should upload the scanned copy of the declaration with their On - line Part - I - Bid. The original copy of the declaration should be submitted in cover - 1 of the hard copy offer.

- 4.0** The bidder shall furnish detailed information regarding the names of other firms/ agencies/ partnership firm/ wholly owned or partly owned/ subsidiary etc. where they are having financial/ professional stakes along with the Part - I - Bid. **The bidder should also give a declaration/ undertaking that any such firm/ agency are not participating in the same tender.** The declaration/ undertaking should be in the bidder's official letterhead duly signed by the authorised signatory with official seal. **Offer without this declaration are liable for rejection.**


Bidders should upload the scanned copy of the declaration/ undertaking with their On - line Part - I - Bid. The original copy of the declaration/ undertaking should be submitted in cover - 1 of the hard copy offer.

5.0 COMPLETION SCHEDULE


The scope of work shall be as per **Annexure - I - Technical Specification** of Tender Documents. The schedule for completion of the system at Site shall be **18 months** from the date of LOI/ Brief Order/ Purchase Order. The offer submitted by the bidder shall be accompanied by a time schedule showing individual time period required for each activity like route survey, submission of drawings, fabrication of steel structure, erection and commissioning etc. Activities shall also include supply and erection of individual items of equipment and accessories.

6.0 VALIDITY OF BIDS

The bid should be kept valid for acceptance for a period of **6 (six) months** from the bid due date/ final due date for bid submission.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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- 7.0 Technical specifications should be strictly as per Annexure - I - Technical Specification of Tender Documents enclosed. In case of any deviation, please furnish the same clause-wise, in the deviation format of Annexure - I - Technical Specification. Any deviation mentioned elsewhere in the offer will not be considered.**
- 8.0** The Questionnaire under the caption “Agreed Terms & Conditions (Import)” / “Agreed Terms & Conditions (Indigenous)” are to be filled in & submitted along with the offer.
- 9.0** Bid should be submitted without any deviation to the bidding documents. In case of any deviation, deviation to bidding documents shall be submitted as per the pro-forma for deviations enclosed with Agreed terms and conditions questionnaire. Deviations , if any appearing anywhere else in the offer shall not be considered for evaluation and ordering.
- 10.0** The bidders are to furnish name and address of the official to whom correspondence should be sent including telephone number/ fax number and e-mail id. If e-mail id is not available, an undertaking is to be given that e-mail id is to be registered within 2 weeks of bid submission.
- 11.0** We are SA 8000 Certified Company. It is expected that our Suppliers/ Service providers confirm to the requirements of this International Standard SA 8000: 2008. The Survey Questionnaire attached at Annexure - XII may please be filled up and sent along with Bid document.
- 12.0 EVALUATION/ LOADING/ REJECTION CRITERIA:**
- 12.1** All evaluation shall be made on landed and erected on destination basis including design and engineering, supply of equipment & Spares (excluding Two Years O&M Spares and Consumables) etc. and all other construction, erection, installation, testing, commissioning supervision charges along with the taxes and duties for the same, as per scope of Tender documents.
- 12.2** Arithmetical errors will be rectified on the following basis:-
- If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price will be corrected. If there is a discrepancy between the total amount and the sum of total prices, the sum of the total prices shall prevail and the total bid amount will be corrected. Further, if there is a discrepancy between the quoted lump sum price, and its separate break-up prices (if any), the quoted lump sum price shall prevail.
- 12.3** Supply prices shall be evaluated as follows:

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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(i) **INDIGENOUS**

- | | | | |
|-----|--------------------------------|---|-----------------------------|
| 1. | FOT Despatch Point | : | As quoted |
| 2. | Freight Charges | : | As quoted |
| 3. | Total Price | : | 1+2 |
| 4. | IGST/ CGST & SGST | : | As per merit rate on 3 |
| 5. | Total Landed Cost | : | 3+4 |
| 6. | Insurance to be borne by Nalco | : | @ 0.02% on (5) |
| 7. | Technical loadings, if any | : | On FOT Despatch point price |
| 8. | Commercial loading, if any | : | On FOT Despatch point price |
| 9. | Total after loading | : | 6+7+8 |
| 10. | Less, Input Tax Credit | : | (-4) |
| 11. | Total Comparable Price | : | 10+11 |

12.4 Price loading on account of payments and other conditions required by various vendors will be based on following: -

(i) Payment terms:


- a) Price loading on account of payment terms at variance with Bidding Document payment terms will be loaded @ 10% per annum for the relevant period.

(ii) Price Variation: -

Terms offered by vendor price loading

- | | | | |
|-----|---|---|---------------------------------------|
| (a) | Firm Price | : | No loading |
| (b) | In case of ceiling on Price Variation Clause | : | Loading by ceiling percentage offered |
| (c) | No ceiling on the formula | : | Offer may be rejected |
| (d) | No formula and no ceiling specified by vendor | : | - do - |

- (iii) Any differential in taxes and duties will be cost loaded on case-to-case basis. If a vendor states that taxes/duties are not applicable at present and will be charged as applicable at the time of delivery then no advantage will be given.
- (iv) All the material is required to be transported by Registered Common Carriers, preferably having an office at the place of concerned unit.
- (v) Cost loading in respect of utilities will be considered where guaranteed consumptions have been asked in Technical Specifications as per methodology defined in the tender documents.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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12.5 All cost loadings will be calculated on F.O.T. despatch point.

12.6 No deviation to terms & conditions of the bid documents is allowed. Further Non acceptance of following commercial clauses shall lead to rejection of bid:

- (i) Bids that do not meet the qualification criteria as specified in the tender documents/ bid documents shall be summarily rejected.
- (ii) A bid with incomplete scope of work and / or which does not meet the technical specifications and requirements as specified in the tender documents shall be considered as non-responsive and rejected.
- (iii) Prices must be furnished in accordance to the price schedule format enclosed and strictly based on the terms specified related to the bid prices in the instructions / conditions. Non compliance to this requirement shall make the bid liable for rejection.
- (iv) Bidders are requested to note that exceptions / modifications taken by them to the following clauses of General Conditions of Contract may result in rejection of their bid :-
 - (a) Proforma of Bank Guarantee for Contract - cum - Performance Bank Guarantee
 - (b) Contract Performance Guarantee clause
 - (c) Completion Schedule
 - (d) Period of validity of bid
 - (e) Guarantee / Warranty
 - (f) Replacement of Defective parts and materials


13.0 ORDER OF PRECEDENCE:

In case of any difference between various sections of tender documents, the order of precedence shall be as follows:

- (i) Technical Specifications
- (ii) Price Schedule Format
- (iii) Special Instructions to Bidders
- (iv) Addendum to Tender Documents Commercial (Indigenous)
- (v) Tender documents commercial (Indigenous).

14.0 REFERENCE LIST:

The bidders are requested to submit a list of buyers to whom the same or similar type of equipment have been supplied by them and which are under operation. The detailed addresses of such buyer's office/works including Telephone, Fax Nos. and Contact Person and Order Reference are to be mentioned.


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15.0 **ENGAGEMENT OF AGENTS/ MIDDLEMEN/ INTERMEDIARY/ CONSULTANTS/ SERVICE PROVIDERS:**

- 15.1** Any bidder, hereinafter referred as "Principal", who engages another entity (individual/ firm/ organization) to function, on their behalf, as Agents/ Middlemen/ Intermediary/ Consultants/ Service Providers, hereinafter referred as "Agent", against any tender (single/ limited / open) must disclose the name and address of such an agent in their offer or in course of tendering process prior to the placement of order by NALCO.
- 15.2** Agent shall file an authenticated Photostat copy duly attested by a Notary Public/ Original certificate of the principal confirming the agency agreement and giving the status, including the extent of authorization and authority given to commit the Principal, being enjoyed by the agent and the commission/remuneration/salary/ retainer-ship fee being paid by the principal to the agent before the placement of order by NALCO. Wherever the Agent is a foreign company, it shall be confirmed whether it is real substantial company and details of the same shall be furnished.
- 15.3** Wherever the Agent have communicated on behalf of their principal, and the principal has stated that they are not paying any commission to the Agent, and the Agent is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the principal before the placement of order by NALCO.
- 15.4** Agent who submits offer, on behalf of their principal, against a tender must submit Letter of Authority of the Principal specifically authorizing the agent to make such an offer.
- 15.5** No entity can be allowed to function as agent on behalf of two principals against any particular tender.
- 15.6** Failure to furnish correct and detailed information as called for in above paragraphs render the concerned offer liable for rejection or in the event of a contract materializing; the same is liable to termination by NALCO. Besides this, there would be a scope for imposing a penalty of banning business dealings with NALCO and/or payment of a named sum as damages.

16.0 **CONTRACT PERFORMANCE GUARANTEE**

- 16.1** As a Contract Security, the successful Bidder, to whom the work is awarded, shall be required to furnish a Contract - cum - Performance Bank Guarantee (CPBG) in the attached Proforma in favor of the Owner within 30 days from the date of Letter of Intent/ Brief Order/ Purchase Order. Failure to submit the CPBG within the above time shall be treated as breach of contract and shall entitle the Owner to place the order on others at the risk and cost of successful bidder, in addition to forfeiture of Earnest money deposit. The guarantee amount shall be equal to 10% (Ten percent) of the total Contract Price (Supply + Transportation + Supervision + Site Work) and

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it shall guarantee the faithful performance of the contract in accordance with the terms & conditions specified in the documents and specifications. The guarantee shall be valid for the entire period of the Contract, namely till the end of Guarantee period. The guarantee amount shall be payable without demur on demand to the Owner as per the currency in which it was submitted in the case of foreign bidders and in Rupees in the case of Indian bidders without any condition whatsoever. In the case of joint bidding by foreign party along with Indian party, the performance bank guarantee shall be submitted by the Party having unit responsibility from an Indian Nationalized Bank.

- 16.2 If the Bank Guarantee as stated above gets reduced / deducted for reasons of non-fulfillment of any contractual obligation before commencement of guarantee period, the Contractor shall immediately take action to increase the value of Bank Guarantee to 10% (ten percent) of the contract price, to cover his warranties.
- 16.3 The Performance Guarantee will be returned to the Contractor without any interest at the end of warranty period subject to fulfillment of all contractual obligations by the Contractor.
- 16.4 On the breach of the contract by the supplier, Contract cum Performance Bank Guarantee shall be forfeited/ encashed whether or not the company has suffered a loss on this account & Purchase Order will be rescinded. Forfeiture/encashment of Contract Cum Performance Bank Guarantee does not prejudice NALCO'S rights to make risk purchase and recover damages on account of such risk purchase. However, credit may be given for the Contract cum Performance Bank Guarantee forfeited/ encashed in appropriate cases.

17.0 CONCURRENT COMMITMENT:

The bidder has to submit complete list of concurrent commitments on all jobs under execution by them, which will be taken into account to assess the spare capacity available with the bidder. If the annualized concurrent commitments of the bidder plus annualized estimated value of the work under consideration exceeds four times the average annual financial turnover during the last three financial years of the bidder, then the bid of such a bidder shall not be considered for further evaluation.

Concurrent Commitment of the bidder shall be evaluated as on the last day of the Month previous to bid due date, based on the confirmation/ declaration of the bidders that they have disclosed all works being executed by them. Bidders shall exclude all stalled project for which there is no progress in last one year giving reason for no progress considering above cutoff date. In case any adverse report/ complaint are received against bidder and on enquiry found correct, offer shall be rejected and bidder shall be liable for appropriate legal action. Four times the average annual financial turnover concurrent commitment limit shall be applicable.

FORMAT**ANNEXURE-XI****DETAILS OF PRESENT COMMITMENTS OF THE TENDERER****AS ON / / ____ (*)****(Last day of Month Previous to Bid Due Date)****NAME OF Work: (*)****Tender Reference No. : (*)**

I/We _____, age _____ years, son of _____ do hereby solemnly affirm and declare as follows for and on behalf of
Firm _____

Sl. No	Full postal Address of client & Name of Officer-in-Charge with telex / Telephone NO.	Description of work	Value of contract	Date of commencement of work	Scheduled Completion period	Completion in % as on date	Expected date of completion	Amount of Balance work during the period of Next 12 Months from the date of declaration	Remarks
1	2	3	4	5	6	7	8	9	10


It is certified that the above particulars furnished are true and correct. If any information given is found to be misleading at a later date NALCO will have the authority to take necessary action per provision of the contract and as per laid down procedure of the Company.

Signature of the bidder _____

Name of Bidder _____

Company Seal

(*) Shall be filled up while floating NIT

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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Annexure - III

GENERAL CONDITIONS OF CONTRACT (GCC)



NATIONAL ALUMINIUM COMPANY LIMITED
(A GOVT. OF INDIA ENTERPRISE)
REGISTERED OFFICE: NALCO BHAVAN,
P/1, NAYAPALLI,
BHUBANESWAR - 751 013



GENERAL CONDITIONS OF CONTRACT

**NATIONAL ALUMINIUM COMPANY LIMITED
NALCO BHAWAN, P-1 NAYAPALLI,
BHUBANESWAR – 751 013**

Web site: www.nalcoindia.com

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SECTION – 1

DEFINITIONS AND INTERPRETATION

1. DEFINITION & INTERPRETATION:

1.1 Definition:

In the contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires.

- 1.1.1 The ‘Owner’ shall mean the National Aluminium Company Limited (NALCO), a Company incorporated under the Companies Act, 1956 having its registered office at IDCO Tower, 8th Floor, Janapath, Bhubaneswar –751007 or any other place as modified subsequently and shall include its Chairman-cum-Managing Director or other Administrative Officers authorised to deal with these presents are concerned on his behalf posted in the any of the Offices of NALCO and shall also include Owner’s successors and assignees.

The Chairman-cum-Managing Director has nominated the following persons as the representative of the ‘Owner’ for the purpose of all contractual matters.

Smelter	-	General Manager (Smelter)	} Projects
CPP	-	General Manager (CPP)	
Mines	-	General Manager (Mines)	
Alumina	-	General Manager (Alumina)	

- 1.1.2 The ‘Tender’ shall mean the tender submitted by the tenderer for acceptance by the Owner.
- 1.1.3. The ‘Chairman-cum-Managing Director’ shall mean the Chairman-cum-Managing Director of National Aluminium Co. Ltd., or his successors in office as designated by the Owner.
- 1.1.4. The ‘Project Head’ shall mean General Manager/ Deputy General Manager of the Project of National Aluminium Company Ltd., or his successor in office or his authorised representative.
- 1.1.5. The ‘Contractor’ shall mean the person or persons, firm or company whose tender has been accepted by owner and includes the contractor’s legal representatives, his successors and permitted assigns.
- 1.1.6. The ‘Sub-contractor’ shall mean any person or firm or company (other than the contractor to whom any part of the work has been entrusted by the contractor, with the written consent of the owner or his representative and the legal representatives, successors and permitted assignee of such person, firm or company.

- 1.1.7. The ‘Engineer-in-Charge’ shall mean the person nominated by the Owner from time to time and shall include those who are expressly authorised by the Owner to act for and on his behalf for all function pertaining to operation of this contract. All functions pertaining to the operation of contract means all acts necessary for execution of the contract coordinating between the different agencies and final closing of the contract.
- 1.1.8. The ‘Works’ shall mean and include all works to be executed in accordance with the contract or part thereof as the case may and shall include all extras, addition, altered or substituted works as required for the purpose of the contract or as may be required to be executed by the owner/ engineer-in-charge.
- 1.1.9. The ‘Contract’ shall mean the agreement between the Owner and the contractor for the execution of the works including therein all documents such as the invitation to tender, instructions to Tenders, General Conditions of Contract, Special Conditions of Contract, Job Specifications, General Requirements, Time Schedule of Completion of Job, Drawings, Letter of Intent awarding the work, Agreed variations, if any etc.
- 1.1.10. The ‘Contract Document’ shall mean collectively the tender documents, designs, drawings specifications, agreed variations, if any and other documents constituting the tender and acceptance thereof.
- 1.1.11. ‘Constitutional Plant’ shall mean all appliances or things of whatsoever nature required in or about the execution, completion or maintenance of the works or temporary works (as hereinafter defined) but does not include materials or other things intended to form or forming part of the permanent work.
- 1.1.12. ‘Temporary Works’ shall mean all temporary works of every kind required in or about the execution, completion or maintenance of the works.
- 1.1.13. ‘Specifications’ shall mean all directions, various technical specification, provisions, and requirements, attached to the contract, which pertain to the method and manner of performing the work or works to the quantities and qualities of the work or works and the materials to be furnished under the contract for the work or works as may be amplified or modified by the Owner or the Engineer-in-charge during the performance of Contract in order to provide the unforeseen conditions or in the best interests of the work or works. It shall also include the latest edition including all addenda/ corrigenda or relevant Indian Standard Specifications and other relevant codes.
- 1.1.14. ‘Plans’ shall mean all maps, sketches, and layouts as are incorporated in the contract in order to define broadly the scope and specifications of the work or works, and all reproductions thereof.

- 1.1.15. 'Drawings' shall include maps, plans and tracings or prints thereof with any modifications approved in writing by the Engineer-in-Charge and such other drawings as may, from time to time, be furnished or approved in writing by the Engineer-in-charge.
- 1.1.16. 'Foreign consultant' shall mean a person, agency or firm including their successors and assigns, who are nonresidents of India and are responsible for supply of process Technology for expansion plant based on review of existing plant including material flow, energy balance, additional facilities and improvement on the basis of the recent experience.
- 1.1.17. 'Indian Consultant' shall mean a person, agency or firm including their successors and assign who are responsible for detailed engineering and construction management of the project.
- 1.1.18. 'Project manager' shall mean the authorised representative of the consultant posted at site. He shall be responsible for supervision of the work by the contractors as well as coordinate with different agencies within the organisation or otherwise.
- 1.1.19. 'Site' shall mean the lands and other places on, under in or through which the permanent works are to be carried out and any other lands or places provided by the owner for the purpose of the contract.
- 1.1.20. 'Notice in writing or written Notice' shall mean a notice in written, typed or printed characters sent (unless delivered personally or other wise proved to have been received) by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received in the ordinary course of post it would have been delivered.
- 1.1.21. The 'Completion Certificate' shall mean the certificate to be issued by the owner or his representative when the works have been completed to his satisfaction.
- 1.1.22. The 'Final Certificate' in relation to the work shall mean the certificate regarding the satisfactory compliance of the various provisions of the contract to be issued by the owner or his representative after the period of liability is over.
- 1.1.23. 'Approved' shall mean approved in writing including subsequent written conformation of previous verbal approval and 'Approval' means approved in writing including as aforesaid.
- 1.1.24. The 'Period of Liability' in relation to a work means the specified period from the date of issue of completion certificate up to the date of issue of final certificate which the contractor stands responsible for rectifying all defects that may appear in the works.

- 1.1.25. The ‘Appointing Authority’ for the purpose of arbitration shall be the Chairman and managing Director or any other person so designated by him.
- 1.1.26. The ‘Alteration Variation Order’ means an order given in writing by the Engineer-in-Charge/ owner to effect additions to or deletions from or alteration in the works.
- 1.1.27. ‘Letter of Intent’ shall mean an intimation by a letter to tenderer that the tender has been accepted in accordance with the provisions contained in the letter.
- 1.1.28. ‘Days’ means a day of 24 hours from mid night irrespective of the number of hours worked in that day.
- 1.1.29. ‘Working Day’ mean any day which is not declared to be holiday or rest day by the Owner.
- 1.1.30. ‘Week’ means a period of any consecutive seven days.
- 1.1.31. ‘Metric System’: All technical documents regarding the construction of works are given in the metric system and all work in the project should be carried out accordingly to the metric system. All documents concerning the work shall also be maintained in the metric system.
- 1.1.32. ‘Value of Contract’ shall mean the sum accepted or the sum calculated in accordance with the prices accepted in tender and / or the contract rates as payable to the contractor for the entire execution and full completion of the work.
- 1.1.33. ‘Headings and Marginal Notes’ in these contract documents are given solely for facility of reference and are not part of the contract documents and are not to be taken into account in the interpretation of the provisions of the contract.
- 1.1.34. ‘Language for Drawings & Instruction’: All the drawings, titles, notes, instruction, dimensions etc. shall be in English Language.
- 1.1.35. ‘Singular and Plural’: The singular shall include the plural and vice versa wherever the context so requires.

SECTION - II

2. FACILITIES TO CONTRACTOR

2.1 Location of Sites and Access by Road:

2.1.1 Locations of Sites:

The general information about Mines Alumina, Aluminium Smelter and Captive power Plants furnished below is of indicative nature only and shall not be considered as binding in any way on the Owner and shall not govern either the scope of work or the nature of the respective rights and the obligations of the parties to such contract.

(a) Alumina Plant and Mines:

Alumina plant is on south-western side of the Panchpatmali hill near Damanjodi village in Koraput District, Orissa State. The site is situated at 12 Km from the national highway No. 43 off Semiliguda village. The Alumina Plant Site has the form of saddle between groups of low hills. The location of Red Mud Pond is in the natural basis of hills situated at a distance of 2 Km from the western side of the plant. The Bauxite mine is located at 14 Km away from the Alumina Plant Site.

(b) Smelter Plant:

Aluminium Smelter is on the Southern side of National Highway No. 42, with its approximate latitude and longitude as 20°51'N and 85°10'E respectively. The area, at a higher elevation in comparison with adjacent land, is not subjected to either normal or flash foods. The prevalent directions of wind are from North-West and West.

(c) Captive Power Plant:

Captive Power Plant is located at Angul, District Angul, Orissa on the south of Talcher Thermal Power Station of Orissa State Electricity Board the main plant site is about 3 Km on the north of the junction of the National Highway Nos. 42 and 23, between the villages Balaram Prasad Patna and Gotamara. The access roads to the main plant site may be taken from either of the highways.

2.1.2. Access by Road:

Contractor, if necessary, shall build other temporary access roads to the actual site of construction for his own work at his own cost. The Contractor shall be required to permit the use of the roads so constructed by him for vehicles of any other parties who may be engaged on the project site. The Contractor shall also facilitate the construction of the permanent roads should the construction thereof start while he is engaged on this work. He shall make due allowance in his tender for any inconvenience he anticipates on such account.

Non-availability of access roads, railway siding and railway wagons for the use of contractor shall in no case condone any delay in the execution of works not be the cause for any claim for compensation against the Owner.

2.2 Water Supply:

2.2.1. Unless other wise provided in the Contract, the Contractor shall be responsible for the arrangements to obtain supply of water necessary for the works, his labour colony, his workshops, his offices etc. All pumping installations, pipe network and distribution system will have to be carried out by the Contractor at his own cost.

2.2.2. The Owner may agree to supply water to the Contractor for use in the Owner's works on specified terms and conditions as shall be determined by the Owner, which shall be binding on the Contractors. The tenderer is however required to exercise his option to receive such water supply from Owner's main at the time of submission of his tender.

2.2.3. When the water is supplied by the Owner, the Owner's main will be within 500 metres form the site of work. The Contractor shall provide at his own cost, all necessary ferrules, pipes, fitting, couplings and tanks and temporary works required and he shall maintain all such works in satisfactory condition. The Contractor shall remove all such works and shall re-instate and make good any work disturbed, to the satisfaction of the Engineer-in-Charge.

2.2.4. In the event of the Contractor's drawing water from the Owner's main/ source, he shall not claim any compensation for interruption or failure of Owner's water supply caused due to any reasons beyond the control of the owner.

2.2.5. The water so supplied by the Owner shall be free of cost for the Constructional work only.

2.3. Power Supply:

2.3.1 Subject to availability, Owner will supply power at 400/440 V at only one point at the nearest substation, from where the contractor will make his own arrangement for temporary distribution. The point of supply will not be more than 500 Metres away from the Contractor's premises. All the works will be done as per IEA regulations and passed by the Engineer-in-Charge. The temporary line will be removed forthwith after the completion of work or if there is any hindrance caused to the other works due to the alignment of these lines, the contractor will re-route or remove the temporary lines at his own cost. The Contractor at his cost will also provide suitable electric metres, fuses, switches, etc. for purposes of payment to the Owner which should be in the custody and control of the Owner. The cost of power supply shall be payable to the owner every month. Rs. 1/- per kWh for power, which will be deducted from the running bills. The owner shall not, however, guarantee the supply of electricity and no compensation for any failure or short supply of electricity will be entertained and this does not relieve the contractor of his

responsibility for timely completion of this works as stipulated in the contract.

- 2.3.2 It shall be the responsibility of the contractor to provide and maintain the complete installation of the load side of the supply with due regard to safety requirement at site. All cabling, equipment, installations etc. shall comply in all respects with the latest statutory requirements and safety provisions i.e. as per and the Central/ State Electricity Acts and Rules etc. The Contractor will ensure that his equipment and Electrical wiring etc. are installed modified, maintained by a licensed Electrician/ Supervisor. A test certificate is to be produced to the Engineer-in-Charge for his approval, before power is made available.
- 2.3.3 At all times, IEA regulations shall be followed failing which the Owner has a right to disconnect the power supply without any reference to the contractor. No claim shall be entertained for such disconnection by the Engineer-in-Charge. Power supply will be reconnected only after production of fresh certificate from authorised electrical supervisors.
- 2.3.4 The Owner is not liable for any loss or damage to the Contractor's equipment as a result of variation in voltage or frequency or interruption in power supply or other loss to the Contractor arising there from.
- 2.3.5 The Contractor shall ensure that the Electrical equipment installed by him are such that average power factor does not fall below 0.90 at his premises. In case power factor falls below 0.90 in any month, he will reimburse to the Owner at the penal rate determined by the Owner for all units consumed during the month.
- 2.3.6 The Power supply required for Contractor's colony near the plant site will be determined by the Owner and shall as per state Electricity Board's Rules and other Statutory provisions applicable for such installations from time to time. In case of power supply to Contractor's colony, the power will be made available at a single point and the Contractor shall make his own arrangement at his own cost for distribution to the occupants of the colony as per Electricity Rules & Acts. The site area and colony shall be sufficiently illuminated to avoid accidents.
- 2.3.7 The Contractor will have to provide and install his own light and power meters, which will be governed as per Central/ State Government Electricity Rules. The meters shall be sealed by the Owner.
- 2.3.8 In case of damage to any of the Owner's equipment on account of fault, intentional or unintentional on the part of the Contractor the Owner reserves the right to recover the cost of such damage from the contractor's bill. Cost of HRC Fuses replaced at the Owner's terminals due to any fault

in the Contractor's installation shall be to contractor's account at the rates decided by the Engineer-in-Charge.

- 2.3.9 Only motors upto 3 HP will be allowed to be started direct on line. For motors above 3 HP and up to 100 HP a suitable starting devices approved by the Engineer-in-Charge shall be provided by the Contractor For Motor s above 100 HP slipping induction motors will suitable starting devices as approved by the Engineer-in-Charge shall be provided by the Contractor.
- 2.3.10 The Contractor shall ensure at his cost that all electric lines and equipment and all installations are approved by the State Electricity Inspector before power can be supplied by the Owner.
- 2.3.11 The total requirement of power shall be indicated by the tenderer along with his tender.

2.4. Land for Contractor's Filed Office, Godown and Workshop :

- 2.4.1. The Owner will at his discretion and convenience and for the duration of the execution of the work may provide the land for construction of Contractor's field office, godown, workshops and assembly yard required for the execution of the contract nearer to the site.

The Contractor shall at his cost construct all these temporary buildings structures and provide suitable water supply and sanitary arrangement as approved by the Engineer-in-Charge and other inspectorates.

- 2.4.2. On completion of the works undertaken by the Contractor, he shall remove all temporary works erected by him and have the site cleared as directed by Engineer-in-Charge. If the Contractor fails to comply with these requirements, the Engineer-in-Charge has the right to remove any structure, such surplus, rubbish materials and depose off the same as he deems fit and get the site cleared and the contractor shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such surplus materials disposed as aforesaid. The Owner reserves the right to ask the Contractor at any time during the pendancy of the contract, to vacate the land by giving 7 (seven) days notice on security reasons or on national interest or otherwise. A token rent of Rs. 100/- (Rupees One hundred only) per hectare or part thereof per annum or part thereof shall be charged for the land so made available.

Land provided shall be solely on licence basis which is terminable by at any time without notice or without assigning any reasons. In the event of any such termination or the termination of the contract/completion thereof, the contractor shall forthwith vacate the premises.

2.5. Land for Residential Accommodation:

Land for residential accommodation for staff and labour may be made available at the discretion of the Engineer-in-Charge and rent for the same will be as decided by the Engineer-in-Charge according to location and the area occupied by the Contractor.

SECTION - III

GENERAL INSTRUCTIONS TO TENDERERS

3. SUBMISSION OF TENDER:

3.1. The documents issued to the tenderers shall be as follows:

- (i) One complete set of tender documents as per index sheet and drawings marked 'ORIGINAL' (To be submitted along-with the quotation).
- (ii) One complete set of tender documents as per index sheet marked 'TENDERER'S COPY' (To be retained by the tenderer for reference).

3.1.1. The tender documents shall be in 2 parts viz. Technical Bid and Price Bid. Technical and Price Bid should be put in separate sealed cover and marked with the tender reference and name of the work. In addition, a note on the Price Bid "Quotation do not open" is to be superscribed. Both the sealed covers are to be put in a single sealed cover. The name of the work the tender reference and date of opening are to be superscribed on this sealed envelope also.

The technical Bid shall be opened in the first instance. Clarifications, confirmations, if any, shall be obtained with regard to technical specifications. After technical specifications are firmed up, if a tenderer revises his price bid, he is required to submit justification in support of the revision made. The price bid shall be opened thereafter.

3.2. If Addenda/ Corrigenda are issued to this tender document, they must be signed, submitted along-with the tender documents. The tenderer should write clearly the revised quantities in schedule of Rates of Tender Document and should price the work based on revised quantities when amendments on quantities are issued in addenda.

3.3. Tenderers are advised to submit quotations based strictly on the terms and conditions and specifications contained in the tender documents and not stipulate any deviations. Should it however become unavoidable, deviations should be stipulated in the prescribed proforma only, contained in the proposal form. Owner reserves the right to evaluate the quotations containing deviations having financial implications, by adding the cost for such deviations are determined by Owner.

3.4. Tenders should be submitted in double sealed envelope with the name of work superscribed thereon and with the note "QUOTATION DO NOT OPEN" written prominently. The full name, postal address and telegraphic address of the tenderer shall be written on the bottom left hand corner of the sealed cover.

4.0. DOCUMENTS:

4.1.1 Bidders shall submit with his bids the particular/ documents as envisaged from Appendix (i) to (x) along with tentative construction net work/ Bar chart for completion of work taking into account various intermediate completion milestones/ component milestones and the overall completion of work under the contract.

4.1.2. Details to be submitted along with tender:

The tenders, as submitted will consist of the following:

The technical Bid and Price Bid shall be submitted as stated in para 3.1.1 Documents to be attached with price bid.

- (i) Complete set of the tender document (marked ORIGINAL) as issued duly filled in by the tenderer as prescribed in different clauses of the tender document, signed and date affixed.

Documents to be attached with Technical Bid.

- (ii) Earnest money in the manner specified in Clause 6 hereof.
- (iii) The following proposal forms in FIVE copies
 - (a) Details of works of similar nature and magnitude carried out during last 5 years as per the Appendix – 1(A)
 - (b) Concurrent commitments of the tenderer as per the Appendix – 1(B).
 - (c) Details of equipments, tools and tackles proposed to be deployed for this work as per the Appendix – (II).
 - (d) Details of manpower proposed to be deployed for this work as per the Appendix – (III), indicating the qualification.
 - (e) Site organisation chart showing number of qualified engineers and supervisors etc. indicating their bio-data as per the Appendix – (IV), indicating the qualification.
 - (f) List of proposed sub-contractors to be deployed as per the Appendix – (V).
 - (g) Progress Billing as per the Appendix – (VI).
 - (h) Information about tenderers as per the Appendix – (VII).
 - (i) List of enclosures as per the Appendix – (VIII).
 - a) Power of attorney
 - b) Income tax & Sales tax clearance certificate.
 - c) Solvency certificate from nationalised Bank
 - d) Documents showing annual turnover.
 - (j) Exception and deviation which tenderer may desire to stipulate as per Appendix – (IX).

4.2 All pages to be initialled:

All signatures in tender documents shall be dated, as well as the pages of all sections of tender documents shall be initialled at the lower right hand corner or signed wherever required in the tender papers by the tenderer or by a person holding power of attorney authorising him to sign on behalf of the tenderer before submission of tender.

4.3. Rates to be in Figures and Words:

The tenderer shall quote in English, in figures and in words for the rates and amount tendered by him in the Schedule of Rates forming part of the documents, in such a way that interpolation is not possible. The amount of each item shall be worked out and entered and requisite total given of all items. The tendered amount for the work shall be entered in the tender and duly signed by the tenderer.

If some discrepancies are found between the rates given in works and figures or the amount shown in the tender, the following procedure shall be followed:-

- a) When there is difference between the rates in figures and words, the rate which corresponds to the amount worked out by the tenderer shall be taken as correct.
- b) When the rate quoted by the tenderer in figures and words tally but the amount is incorrect, the rate quoted by the tenderer shall be taken as correct.
- c) When it is not possible to ascertain the correct rate by either of above methods the rate quoted in words shall be taken as correct.

4.4. Corrections and Erasures:

All corrections and alterations in the entries of tender papers shall be signed in full by the tenderer with date. No erasures or over writings are permissible.

4.5. Signature of Tenderer:

- 4.5.1. The tender shall contain the name, residence and place of business of person or persons making the tender and shall be signed by the tenderer with his usual signature. Partnership firms shall furnish the full names of the partners in the tender. It should be signed in the partnership's name by all the partners or by duly authorised representative followed by the name and designation of the person signing. Tender by a corporation shall be signed by an authorised representative and a power of attorney on the behalf shall accompany the tender. A copy of constitution of the firm with names of all partners shall be furnished.
- 4.5.2. When the tenderer signs a tender in a language other than English, the total amount tendered should in addition be written in the same language. The signature should be attested by at least one witness.

4.6 Witness: Witness and sureties shall be persons of status and property. Their name occupation and address shall be stated below their signature.

5. TRANSFER OF TENDER DOCUMENTS:

Transfer of tender document purchased by one intending tenderer to another is not permissible.

6. EARNEST MONEY:

6.1. The tenderer must pay earnest money as given in the Letter/ Notice Inviting Tenders. Tenders not accompanied with earnest money deposit will be rejected. The earnest money can be paid in cash or by crossed demand draft or fixed deposit or Bank Guarantee from any Nationalised/ Scheduled Bank or Insurance Guarantee in the prescribed proforma as indicated in the tender document in favour of National Aluminium Company Ltd.

6.2. The Bank Guarantee so furnished by the tenderer shall be only in the proforma prescribed by the Owner and valid for six months from the date of opening of the tender. No interest shall be paid by the Owner on the Earnest Money deposited by the tenderer.

7. **VALIDITY:** Tender submitted by tenderers shall remain valid for acceptance for a period of four months from the date of opening of the tender. The tenderers shall not be entitled during the said period of four months, without the consent in writing of the Owner, to revoke or cancel his tender or to vary the tender given or any term thereof. In case of tenderer revoking or canceling his tender or varying any terms in regard thereof without the consent of a Owner in writing, the earnest money paid by him along-with the tender shall be forfeited.

8. ADDENDA/ CORRIGENDA:

8.1. Addenda/ Corrigenda to the tender documents may be issued prior to the date of opening of the tenders to clarify documents or to reflect modification in the design or contract terms.

8.2. The Addenda/ Corrigenda will be issued in duplicate to each person or organisation to whom a set of tender documents has been issued. Each recipient should acknowledge the receipt of the same and attach one copy of the addenda/ corrigenda along-with his offer. All addenda/ corrigenda issued shall become part of Tender Documents.

9. RIGHT OF OWNER TO ACCEPT OR REJECT TENDER:

9.1. The right to accept the tender will rest with the Owner. The Owner further does not bind himself to accept the lowest tender and reserves the authority to reject any or all the tenders received without assigning any reason whatsoever. The whole work may be split up between two or more contractors or accepted in part (not entirely) if considered expedient. The quoted rates would hold good for such eventualities. Tenders in which any of the particulars and prescribed information are missing or incomplete in any respect and / or the prescribed conditions are not

fulfilled are liable to be rejected. The decision for the owner in respect of the above shall be final and binding on the contractor.

9.2. Canvassing in connection with tenders is strictly prohibited. The submitted tenders of the tenderers who resort to canvassing are liable to rejection. Tenders containing uncalled remarks or any additional conditions are liable to be rejected.

10. THE SCHEDULE:

10.1. The work shall be executed strictly as per the Time Schedule given in Appendix –1. The period of construction given in time Schedule includes the time required for mobilisation as well as testing, rectification if any, re-testing and completion in all respects to entire satisfaction of the Engineer-in-Charge.

10.2. A joint programme of execution of the work will be prepared by the Engineer-in-Charge and contractor based on priority requirement of this project. This programme will take into account the time of completion mentioned in 19.1 above and the time allowed for the priority works by the Engineer-in-Charge.

10.3. Monthly/ weekly construction programme will be drawn up by the Engineer-in-Charge jointly with the Contractor, based on availability of work fronts and the joint construction programme as per 10.2 above. The contractor shall scrupulously adhere to these targets/ programs by deploying adequate personnel construction tools and tackles and he shall also supply himself materials of his scope of supply in good time to achieve the targets/ programmes. In all matters concerning the extents of targets set out in the weekly and monthly programmes and the degree of achievement, the decision of the Engineer-in-Charge will be final and binding on the contractor.

10.4. CONSTRUCTION SCHEDULE AND PRESENTATION:

The construction schedule shall be in the form of network of PERT CHART/ CPM or other suitable presentation for the programme of the work indicating therein the different components item of works and time required for completion of each components item wise/ month wise season wise so as to complete the work in all respects within the stipulated period. Before award of the work the contractor is also required to make the presentation to satisfy owner of their proposal for construction schedule in the form of BAR CHART and organizational resources, equipments, machinaries, manpower to be deployed for timely completion of the project.

11. TENDERER'S RESPONSIBILITY:

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

12. RETIRED GOVERNMENT OR COMPANY OFFICERS:

No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering department of the State/ Central Government or of the owner is allowed to work as a contractor for a period of two years after his retirement from Government service or from the employment of the Owner without the previous permission of the Owner. The contract if awarded, is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person, who had not obtained permission of the owner as aforesaid before submission of tender or engagement in the contractor's service as the case may be.

13. SIGNING OF THE CONTRACT:

The successful tenderer shall be required to execute an agreement with the Owner in the proforma attached with tender document within 10 days of the receipt by him of the notification of acceptance of the tender. In the event of failure on the part of the successful tenderer to sign the agreement within the above stipulated period, the earnest money or his initial security deposit will be forfeited and the acceptance of the tender shall be considered as cancelled. No bills shall be payable unless the agreement is executed.

14. FIELD MANAGERMENTS AND CONTROLLING AUTHORITY:

14.1 The field management will be responsibility of the Project Manager posted at site by the consultant and nominated by the owner. The Project manager shall work in accordance with the directions given to him from time to time by the project head.

14.2. The Engineer-in-Charge shall only co-ordinate with the other agencies engaged to work at site, to ensure minimum disruption of work carried out by different agencies. It shall be the responsibility of the contractor to plan and execute the works strictly in accordance with site instructions and avoid hindrance to the works being executed by other agencies. The instructions of the Engineer-in-Charge shall be binding on the contractor.

15. NOTE TO SCHEDULE OF RATES:

15.1. The schedule of rates should be read in conjunction with all the other sections of the tender.

15.2. The tenderer shall be deemed to have studied the drawings, specifications and details of work to be done within time schedule and to have acquainted himself of the conditions prevailing at site.

15.3. Rates must be filled in the original tender document. If quoted in separate typed sheets, no variation in time description or specification shall be accepted. Any exceptions taken by the tenderer to the schedule of rates shall be brought out in the terms and conditions of offer.

15.4. The quantities shown against the various items are only approximate. Any increase or decrease in the quantities shall not form the basis of alternation of the rates quoted and accepted.

15.5. The owner reserves the right to interpolate the rates for such items of work falling between similar items of lower and higher magnitude.

SECTION - IV GENERAL OBLIGATIONS

16. INTERPRETATION OF CONTRACT DOCUMENTS:

- 16.1. Complete documents forming the contract are to be taken as mutually explanatory. Should there be any discrepancy, inconsistency, error or omission in the contracts or any of them the matter may be referred to Engineer-in-Charge who shall give decisions and Issue to the contractor instructions directing in what manner the work is to be carried out. The decision of Engineer-in-Charge shall be final and conclusive and the contractor shall carry out work in accordance with this decision.
- 16.2. Works shown in the drawing but not mentioned in the specification or described in specification but not shown in the drawings shall nevertheless be deemed to be included in the same manner as if they had been specifically shown upon the drawings as well as described in the specifications.
- 16.3. Unless otherwise stated specifically, the 'singular' shall also mean 'plural' and vice versa wherever the context so requires words implying 'persons' shall include relevant 'corporate companies or registered association' or 'body of individuals' or 'firm of partnership' as case may be.

17. SPECIAL CONDITIONS OF CONTRACT:

- 17.1. Special Conditions of Contract shall be read in conjunction with the General Condition of Contract Specifications of work, drawing and any other documents forming part of this contract wherever the context so requires.
- 17.2. Notwithstanding the sub-divisions of the documents into the separate sections and volumes each part shall be deemed to be supplementary to complementary of every other part and shall be read with and into the contract so far as it may be practicable to do so.
- 17.3. In case of any discrepancy between various sections of the contract, the following order of preference shall be observed.
 - (1) Schedule of quantities
 - (2) Technical specifications
 - (3) Special Conditions of Contract
 - (4) General Conditions of Contract
- 17.4. Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities it is understood that the Contractor shall do so at his cost.
- 17.5. The materials, design and workmanship shall satisfy the relevant Indian Standard, the job specifications contained herein and codes referred to.

Where the job specifications stipulate the requirements in addition to those contained in the standard codes and specification, these additional requirements shall also be satisfied.

18. Tenderer to Obtain his Own Information:

- 18.1. The tenderer shall for all purposes and whatsoever reason may be, deemed to have himself independently obtained all necessary information for the purpose of preparing his tender. The correctness of the details given in the Tender Document as guideline information to help the tenderer but to make-up the tender is not guaranteed.
- 18.2. The tenderer shall be deemed to have examined the tender documents, to have obtained his own information in all matters whatsoever that might influence carrying out of the works at the scheduled rates and satisfied himself to the sufficiency of his tender. Any error in description or quantity or omission therefrom shall not vitiate the contract or release the contractor from executing the work comprised in the contract according to drawings and specifications at the scheduled rates. He is deemed to know the scope, nature and magnitude of the works, the requirements of materials and labour involved etc. and as what works he has to complete in accordance with the contract document whatever be the defects, omissions or errors that may be found in the Contract Document. The contractor shall be deemed to have visited site and surroundings areas, to have satisfied himself to the nature of all existing structures, and also as to the nature and the conditions of available facilities like Railways, roadways, bridges culverts, means of transport and communications like by land, water or air and possible interruptions thereto the access to and egress from site and to have made enquiries, examined satisfied himself of the sites for obtaining sand, stones, bricks and other materials, the sites for disposal of surplus materials, the available accommodation like depots, buildings as may be necessary for executing and completing the works, to have made local independent enquiries as to the sub-soil water and variations thereof, storms, prevailing winds and climatic conditions and all other similar matters affecting the works. He is deemed to have acquainted himself his liability for payment of Government Taxes, Customs Duties and other charges.
- 18.3. Any neglect or failure on the part of the tenderer in obtaining necessary and reliable information or issues stated at 18.2 or any other matters affecting the contract shall not relieve him from any risks or liabilities or the entire responsibility for completion of the works at the scheduled rates and time in strict accordance with the contract documents.
- 18.4. Any change in layout due to site conditions or technological requirement shall be binding on the contractor and no extra claim on this account shall be entertained.

- 18.5. No verbal agreement or inference from conversation with any officer or employee of the Owner either before, during or after the execution of the contract agreement shall in any way affect or modify and of the terms or obligations herein contained.

19. Security Deposit:

- 19.1. A sum of 10% of the accepted value of the tender or actual value of the work done whichever is higher for contracts not exceeding Rs. 1 Crore, 7 1/2 % for the value of contracts over Rs. 1 up to Rs. 5 crores and 5% for the value of contracts over Rs. 5 crores shall have to be deposited by the person/ persons (hereinafter called as contractor) as security deposit with the owner until the expiry of defect liability period.
- 19.2. This may be deposited initially at 2 1/2% of the value of the contract (referred as initial Security deposit) within 20 days of receipt by him of the notification of acceptance of tender and the balance will be recovered in installments through the deduction @ 10% of the gross value of the each running account bill for the contract upto Rs. 1 crore, 7 1/2 % for contract between Rs. 1 to Rs.5 crores and 5% for contract over Rs. 5 crores, till total security deposit is collected. No further deduction from the bills will be made on this account subject to clause 19.6 below.
- 19.3. Alternatively the contractor may at his option to deposit the full amount percentage as mentioned 19.1 above towards deposit within 10 days of issue of notification accepting his tender. This amount will have to be suitably enhanced to the tune of above percentage of the executed value.
- 19.4. The earnest money deposited with the tender shall be adjusted towards security deposit.
- 19.5. Contractor can furnish the initial or total security deposit amount (a) in Demand Draft or (b) through a Bank Guarantee from any Scheduled bank in the prescribed proforma.
- 19.6. If contractor /sub-contractor or their employees damages, breaks, deface or destroy the property belonging to the owner or other during the execution of the contract, the same shall be made good by the contractor at his own expense and in default thereof; the Engineer-in-Charge may cause the same to be made good by other agencies and recover expenses from the contractor (for which the certificate of Engineer-in-Charge shall be final).
- 19.7. All compensation or other sums of money payable by the contractor to the Owner or recoveries to be made under terms of this contract may be deducted from or paid by the sale of a sufficient part of his security deposit or from any sums which may be due or may become due to the contractor by the Owner on any account whatsoever. In the event of his security being reduced by reasons of any such deduction or sale, the contractor shall within ten days

thereafter make good in cash, bank drafts, any sum or sums which may have fallen short or Security deposit amount or any part thereof. No interest shall be payable by the Owner for sum deposited as security deposit.

- 19.8. The security deposit will be refunded after the expiry of the period of liability as stipulated in the contract.

20. Forfeiture of Security Deposit:

Whenever any claim against the Contractor for the payment of a sum of money arises out of or under the contract, the Owner shall be entitled to recover such sum by appropriating in part or whole the security deposit of the contractor, and to sell any Government securities, etc. forming whole or part of such security deposit. In the event of security being insufficient or if no security has been taken from the contractor, then the balance or the total sum recoverable as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due to the contractor. The contractor shall pay to the Owner on demand any balance remaining due.

In the event of any breach by the contractor or any loss or damage occasioned to the owner which in the opinion of the owner has arisen, the decision whereof shall be final and binding on the contractor or in the event of the termination of the contract for any such breach, the security deposit is liable to be forfeited. The decision of forfeiture by the Owner shall be final and binding on the contractor.

21. Time of performance:

The work covered by this contract shall be commenced within twenty one days after the issue of the letter of acceptance of tender and be completed in stages on or before the dates as mentioned in the time schedule of completion of works. The contractor should bear in mind that time is the essence of the contract, unless such time be extended pursuant to the provision of clause No.22. Request for Revision of Construction time after tenders are opened will not receive consideration. The above period of twenty one days is included within the overall completion schedule, not over and above the completion time.

22. Extension of Time.

- 22.0. The application for extension of time is to be given to project head through the engineer –in-charge and the project head may authorise extension of time after considering the due merits.

Whenever extension of time is granted by the project head, the same shall be on the existing terms and conditions of the contract and without any additional financial liability to the Owner. The contractor in any case shall have no claim whatsoever for any type of compensation on account of any delay attributable to any one.

23. Force Majeure:

- 23.1 Any delays in or failure of the performance of either parties thereto shall not constitute default hereunder or give rise to any claims for damages, if any, to the extent such delays or failure of performance caused by occurrences such as acts of God or the public enemy, expropriation or confiscation of facilities by Government authority, compliance with any order or request of any Governmental authorities, acts or war rebellion, sabotage, fire, floods, explosions riots or illegal strikes, provided always that such occurrences result in impossibility of performances of the contract.
- 23.2 Only events of Force Majeure which impedes the execution of the contract at the time of its occurrence shall be taken into cognizance.

24. Compensation For Delay:

- 24.1. Time is essence of the contract. In case the contractor fails to complete the work within the stipulated period, he shall be liable to pay to the Owner as compensation, an amount equal to 1% of the value of contract per week of the delay subject to a maximum of 10% of the value of the contract. This is a genuine pre-estimate of the loss/ damage which will be suffered on account of delay /breach on the part of the contractor and he agrees to pay the said amount on demand without going in for any proof of the actual loss or damages caused by such delay/ breach.
- 24.2. To ensure good progress during execution of work, the contractor shall be bound in all case in which the time allowed for any work exceeds by one month to complete one-fifth of the work before one-fourth of the time allowed under the contractor has elapsed, three-eighth of the work before the half of such time has elapsed and three-fourth of the work before three-fourth of such time has elapsed. In the event of the contractor failing to comply with this condition, he shall be liable to pay as compensation for delay an amount as stipulated above. The compensation for delay so paid shall not relieve the contractor from his obligations to complete the work or from any other obligations and liabilities under this contract.

25. Failure by the Contractor to Comply with the Provisions of the Contract:

- 25.1. If the contractor refuses or fails to execute the work or any separate part thereof with such diligence as will ensure its completion within the time specified in the contract or extension thereof or fails to perform any of his obligation under the Contract or in any manner commits a breach of any of the provisions of the contract it shall be open to the Owner at its option by written notice to the Contractor to: -
- (a) Determine the Contract: In which event the Contract shall stand terminated and shall cease to be in force and effect on and from the date appointed by the Owner on that behalf, whereupon the contractor shall stop forth with any of the contractor's work then in progress, except such work as the Owner may, in writing, requires to be done to safeguard any property or work, or

installations from damage, and the owner, for its part, may take over the work remaining unfinished by the Contractor and complete the same through fresh contractor or by other means, at the risk and cost of the Contractor, and any of his sureties if any, shall be liable to the owner for any excess cost occasioned by such work having to be so taken over and completed by the Owner over and above the cost at the rates specified in the schedule of quantities and rates.

- (b) Without determining the Contract: To take over the work of the contractor or any part thereof and complete the same through a fresh contractor or by other means at the risk and cost of the Contractor. The contractor and any of his sureties are liable to the Owner for any excess cost over and above the cost at the rates specified in the schedule of quantities/ rates, occasioned by such works having been taken over and completed by the Owner. Besides, the contractor shall also be liable for any compensation accruing under clause 24.
- (c) In other cases, the decision of the Owner is binding on the contractor.

25.2. In such events of clause 25.1 (a) or (b) above

- (a) The whole or part of the security deposit furnished by the Contractor is liable to be forfeited without prejudice to the right of the Owner to recover from the contractor the excess cost referred to in the sub-clause aforesaid, the Owner shall also have the right of taking possession and utilizing in completing the works or any part thereof, such of materials, equipment and plants available at work site belonging to the contractor as may be necessary and the Contractor shall not be entitled for any compensation for use or damage to such materials, equipment and plant.
- (b) The amount that may have become due to the Contractor on account of work already executed by him shall not be payable to him until after the expiry of six (6) calendar months reckoned from the date of termination of contract or from the taking over of the work or part thereof by the Owner as the case may be, during which period the responsibility for faulty materials or workmanship in respect of such work shall under the contract, rest exclusively with the contractor. This amount shall be subject to deduction of any amounts due from the Contractor to the Owner under the terms of the contract authorised or required to be reserved or retained by the Owner.

25.3. Before determining the contract as per clause 25.1 (a) or (b) provided in the judgement of the Owner, the default or defaults committed by the Contractor is/are curable and can be cured by the Contract if an opportunity given to him, then the Owner may issue notice in writing calling the Contractor to cure the default within such time specified in the notice.

25.4. The Owner shall also have the right to proceed or take action as per 25.1 (a) or Clause 25.1(b) above, in the event that the contractor becomes bankrupt, insolvent, compounds with his creditors, assigns the contract in favour of his

creditors or any other person or persons or being a company or a corporation goes into liquidation, provided that in the said events it shall not be necessary for the Owner to give any prior notice to the contractor.

- 25.5. Termination of the Contract as provided for in sub-Clause 25.1 (a) above shall not prejudice or affect their rights of the Owner which may have accrued upto the date of such termination.

26. Contractor Remains Liable to Pay Compensation if Action Not Taken Under Clause 25.

In any case in which any of the powers conferred upon the owner by clause 25 hereof shall have become exercisable and the same had not been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any further case of default by the contractor for which by any clause or clauses hereof he is declared liable to pay compensation amount to the whole of his security deposit and the liability of the contractor for past and future compensation shall remain unaffected. In the event of the Owner putting in force the powers vested in him under the proceeding clause no. 25 he may if he do so desires, take possession of all or any tools and plants, materials and stores in or upon the works of the site thereof belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof paying or allowing for the same in account at the contract rates or in case of these not being applicable at current market rates to be certified by the Engineer-in-Charge whose certificate thereof shall be final, otherwise the Engineer-in-Charge may give notice in writing to the contractor or his clerk of the works, foremen or other authorised agent, requiring him to remove such tools, plant, materials or stores from the premises (within a time to be specified in such notice), and in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expenses or sell them by auction or private sale on account of the contract and at his risk in all respects without any further notice as to the date, time or place of sale and the certificate of the Engineer-in-Charge as to the expense of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

27. No Compensation For Alteration in or Restriction of Work:

At any time from the commencement of the work if the Owner decides for whatsoever reason, not to carryout the whole work or part thereof as specified in the tender, then owner shall give notice in writing of the fact to the contractor, who shall have no claim to any payment or compensation on whatsoever account (profit or advantage which he might have derived by executing the work in full) neither shall he have any claim for compensation by reason of any alterations having been made from the original specifications, drawings, designs and instructions which may involve any curtailment of the work as originally contemplated.

28. Change in Constitution:

When the contractor is a partnership firm the prior approval in writing from the Owner shall be obtained before any changes are made in the constitution of the firm, where the contractor is an individual or a Hindu undivided family business concern. Such approval as aforesaid shall, like wise be obtained before such contractor enters into any agreement with other parties, where under the reconstituted firm would have the right to carry out the work hereby undertaken by the contractor. In either case if prior approval is not obtained. The contractor shall be deemed to have been allotted in contravention of Clause - 34 hereof and the action and consequence shall ensure as provided in that clause.

29. Termination of Contract For Death:

If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies or if the contractor is a partnership concern and one of the partners dies then, unless the Owner is satisfied that the legal representative of the individual or the proprietary concern or the surviving partners are capable of carrying out and completing contract, he (the Owner) is entitled to cancel the contract for the uncompleted part without being in any way liable for any compensation payment to the estate of the diseased contractor and/or to the surviving partners of the contractor's firm on account of the cancellation of contract. The decision of the Owner in such assessment shall be final and binding on the parties. In the event of such cancellation, the Owner shall not hold the estate of the diseased contractor and / or the surviving partners of the contractor's firm liable for any damages for non-completion of contract.

30. Members of the Owner Not individually Liable:

No Director or official or employee of the Owner shall in any way be personally bound or liable for the acts or obligations of the Owner under the contract or answerable for any default or omission in the observance or performance of the acts, matters or things which are herein contained.

31. Owner Not Bound by Personal Representation:

The Contractor shall not be entitled to any increase on the scheduled rates or any other rights or claims whatsoever by reason of any representation, explanation, statement or alleged understanding promise or guarantees given or to have been given to him by any person.

32. Contractors Office at Site:

The Contractor shall provide and maintain an office at the site for the accommodation of his agent and staff and such office shall be open at all reasonable hours to receive instructions, notices or other communications. The contractor at all time shall maintain a site instruction book and compliance of these shall be communicated to the Engineer –in-Charge from time to time and the whole document to be preserved and handed over after completion of works.

33. Contractor's Sub-ordinate Staff and their conduct :

- 33.1. The contractor on award of the work shall name and depute a qualified engineer having sufficient experience in carrying out work of similar nature to whom the equipment, materials if any, shall be issued and instruction for works given. The contractor shall also provide to the satisfaction of the Engineer-in-charge sufficient and qualified staff to supervise the execution of the works, competent sub-agents, foremen and leading hands including those specially qualified by previous experience to supervise the types works comprised in the contract in such manner as will ensure the best quality and expeditious working. At any time of in the opinion of the Engineer-in-Charge any additional, qualified experienced staff is considered necessary, they shall be employed by the contractor without additional charge. The contractor shall ensure to the satisfaction of the Engineer-in-Charge that sub-contractors, if any, shall provide competent and efficient supervision over the work entrusted to them.
- 33.2. If any of the contractor's sub-contractor's, agents, sub-agents, assistants, foremen or any employee in the opinion of Engineer-in-Charge be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the Owner Engineer-in-Charge, undesirable for administrative or any other reasons, for such or person (s) to be employed on the works, then at the directions of Engineer-in-Charge the Contractor shall at once remove such person (s) from employment with the works without the written permission of the Engineer –in-Charge. Vacancy so created shall be immediately filled at the expenses of the contractor by a qualified and competent substitute. Should the contractor be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection therewith.
- 33.3. The contractor shall be responsible for the proper behaviour of all the staff, foremen, workmen and others, shall exercise proper degree of control over them and in particular without prejudice to the said generality the contractor shall be bound to prohibit/ prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or the properties or the occupiers of land or properties in the neighborhood. In the event of such trespassing, the contractor shall be responsible for all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the Engineer-in-Charge upon any matter arising under this clause shall be final.
- 33.4. If and when required by the Owner, all contractor's personnel entering upon the owner's premises shall be properly identified by badges of a type acceptable to the owner which must be worn at all times on Owner's premises.

33.5. It is made clear that no relationship of employer and employee is created between the owner and the contractor labourer and no claim for employment of any such labourer shall be tenable or entertained.

34. Sub-Letting Work:

34.1. No part of the contract nor any share or interest there in shall in any manner or degree be transferred, assigned or sublet by the contractor directly or indirectly to any person, firm or corporation whatsoever except as provided for in the succeeding sub-clauses without the consent in writing of the Owner.

34.2. Sub – Contracting of Works:

The Engineer-in-Charge may give written consent to sub-contract for the execution of any part of the works at the site, provided the contractor submits each individual sub-contract to the Engineer-in-Charge for approval of mode of operation and agency for the work. The contractor is advised not to enter into contract before the consent of Engineer-in-Charge.

34.3. List of sub-contracted works to be furnished:

At the commencement of each month, the contractor shall furnish to the Engineer-in-charge, a list of sub-contractors, persons or firms engaged by the contractor and worked at the site during the previous month with particulars like general nature of the sub-contract or works done by them.

34.4. Contractor's liability not Limited by Sub-Contractors:

Notwithstanding any sub-letting with such approval as aforesaid and notwithstanding that the Engineer-in-Charge shall have received copies of any sub-contracts, the contractors shall be and shall remain solely responsible for the quality and proper and expeditious execution of the works and the performance of all the conditions of the contract in all respects as if such sub-contract or sub-letting had not taken place, and as if such work had been done directly by the contractor.

34.5. Owner may terminate sub-contracts:

If any sub-contractor engaged upon the works at the site executes any work which in the opinion of the Engineer-in-Charge is not in accordance with the contract documents, the owner may by written notice to the contractor request him to terminate such sub-contract. The contractor upon the receipt of such notice shall terminate and dismiss the sub-contract and the sub-contractor. The owner shall have the right to remove such sub-contractor from the site if contractor fails to vacate the sub-contractor immediately.

34.6. No remedy for action taken under this clause:

For action taken by the owner under the clause shall not relieve the contractor of any of his liabilities under the contract or give rise to any right or compensation, extension of time or otherwise.

35. Power of Entry:

If the contractor shall not commence the work in the manner described in the contract documents or if he at any time in the opinion of the Engineer-in-Charge.

- (i) fail to carry on the works in conformity with the contract documents or
- (ii) fail to carry on the works in accordance with the contract schedule or
- (iii) substantially suspend work or the works for a period of fourteen days without authority from the Engineer-in-Charge or
- (iv) fail to carry on and execute the works to the satisfaction of Engineer-in-Charge or
- (v) fail to supply sufficient or suitable constructional plant, temporary works, labour materials or other things or
- (vi) Commit, suffer or permit any other breach of any of the provisions of the contract on his part to be performed or observed or persist in any of the above mentioned breaches of the contract for fourteen days, after notice in writing shall have been given to the contractor by the Engineer-in-Charge requiring such breach to be remedied or
- (vii) If the contractor abandons the works or
- (viii) If the contractor during the continuance of the contract shall become bankrupt, make any arrangement or composition with his creditors, or permit any execution to be levied or go into liquidation whether compulsory or voluntary not being merely a voluntary liquidation for the purpose of amalgamation or reconstruction then in any such case, the owner shall have the power to enter upon the works and take possession thereof and of the materials, temporary works, constructional plant, and stock thereon, and to revoke the contractor's licence to use the same, and to complete the works by his agents, other contractors, or workmen, or to relate the same upon any terms and to such other person, firm or corporation as the Owner in his absolute discretion may think proper to employ and for the purpose aforesaid to use or authorize the use of any materials, temporary works, constructional plant, and stock as aforesaid, without making payment or allowance to the contractor for the said materials other than such as may be certified in writing by the Engineer-in-Charge to be reasonable, and without making any payment or allowance to the contractor for the use of temporary said works, constructional plant and stock or being liable for any loss or damage thereto and if the Owner shall by reason or his taking possession of the work or of the works being completed by other contractor (due account being taken of any such extra work or works which may be omitted) than the amount of such excess as certified by the Engineer-in-Charge shall be deducted from any money which may be due for work done by the contractor under the contract and not paid for any deficiency shall forthwith be made good and paid to the Owner by the contractor and the Owner shall have power to sell in such manner and for such price as he may think fit all or any of the constructional plan, materials etc. constructed by or belonging to and

to recoup and retain the said deficiency or any part thereof out of the proceeds or the sale.

36. Contractor's Responsibility with other Agencies:

36.1 Without repugnance to any other condition, it shall be the responsibility of the contractor executing the work of civil construction to work in close cooperation and to coordinate in the works with the mechanical, electrical, air-conditioning and intercommunication contractors and other agencies or their authorised representatives, in providing the necessary grooves, recesses, cuts and opening etc. in wall, slabs beams and column etc. and making good the same to the desired finish as per specification, for the placement of electrical and intercommunication cables, conduits, air-conditioning inlets and outlets, grills and other equipment in the false ceiling and other partitions, the contractor before starting up the work shall in consultation, with the electrical, mechanical, inter-communication, air-conditioning contractors and other agencies prepare and put up a joint scheme, showing the necessary opening, grooves, recesses, cuts, the methods of fixing required for the works of the aforesaid, and the finishes therein, to the Engineer-in-Charge and get the approval. The contractor before finally submitting the scheme to the Engineer-in-Charge, shall have the written agreement of the other agencies. The Engineer-in-Charge, before communicating his approval to the scheme, with any required modifications shall get the final agreements of all the agencies, which shall be binding. No claim shall be entertained on account of the above.

36.2 The contractor shall conform in all respect with the provisions any statutory regulation, ordinance or bye-laws of any local or duly constituted authorities or public bodies which may be applicable from time to time to the works or any temporary works. The contractor shall keep the Owner indemnified against all penalties and liabilities of every kind, arising out of non-adherence to such statutes, ordinances, laws, rules, regulations, etc.

37. Other Agencies at Site:

The contractor shall have to execute the work in such place and condition where other agencies will also be engaged for other works such as site grading, filling and leveling, electrical and mechanical engineering works etc. No claim shall be entertained due to work being executed in the above circumstances.

38. Serving of Notices:

38.1. To the Contractor:

Any notice may be served on the contractor or his duly authorised representatives at the job site or by registered mail directly to the address furnished by the contractor. Proof of issue of such notice should be conclusive of the contractor having been duly informed of the contents.

38.2. To the Owner:

Any notice to be given to the Owner under the terms of the contract shall be served by sending the same by Registered mail to or delivering the same at the respective site offices of M/s. National Aluminium Co. Ltd. addressed to the head/ site in-charge.

38.3. Rights of various Interests:

- (i) The Owner reserves the right to distribute the work between more than one contractor. The contractor shall cooperate and afford the other contractors all reasonable opportunity for access to the works for the carriage and storage of materials and execution of their works.
- (ii) Wherever the work being done by any department of the Owner or by the contractor employed by the Owner as per the contingent upon work covered by this contract, the respective rights and various interests involved shall be determined by the Engineer-in-Charge to secure the completion of the various portions of the work in general harmony.

40. Patents, Royalties, Rent and Excavated Material:

- 40.1. The contractor, if licensed under any patent covering equipment, machinery, materials or compositions of matter to be used or supplied or methods and process to be practiced or employed in the performance of this contract, agrees to pay all royalties and licence fees which may be due with respect thereto. If any equipment, machinery, materials composition matters, to be used or supplied or methods and processes to be practiced or employed the performance of this contract, is covered by a patent under which the contractor is not licensed then the contractor before supplying or using the equipment, machinery, materials, composition, method or processes shall obtain such licenses and pay such royalties and license fees as may be necessary for performance of this contract. In the event the contractor fails to pay any royalty or obtain any such license, any suit for infringement of such patents which is brought against the contractor or the Owner as a result of such failure will be defended by the contractor at his Own expense and the contractor will pay damages and costs awarded in such suit. The contractor shall promptly notify the Owner if the contractor has acquired knowledge of any plant under which a suit for infringement could be reasonably brought because of the use by the owner of any equipment, machinery, materials, process, methods, to be supplied hereunder. The contractor agrees to and does hereby grant to Owner, together with the right to extent the same to any of the subsidiaries of the Owner as irrevocable, royalty-free licence to use in country, any invention made by the contractor or his employee in or as a result of the performance of the work under the contract.
- 40.2. All charges on account of royalty, tollage, rent octroi terminal or sales tax and/ or other duties or any other levy on materials obtained for the work or temporary work or part thereof (excluding materials provided by the Owner) shall be borne by the contractor.

- 40.3. The contractor shall not set or otherwise dispose of or remove except for the purpose of this contract, the sand stone, clay, ballast, earth, rock or other substances, or materials obtained from any excavation made for the purpose of the works or any building or produce upon the sited at the time of delivery of the possession thereof, but all such substances, materials buildings and produce shall be the property of the Owner provided that contractor may with the permission of the Engineer-in-Charge, use the same for the purpose of the works by payment of cost of the same at such a rate as may be determined by the Engineer-in-Charge.

The Owner shall indemnify and save harmless the contractor from any loss on account of claims against contractor for the contributory infringement of patent rights arising out and based upon the claim that the use by the Owner of the process included in the design prepared by the Owner and used in the operation of the plant infringes on patent right. With respect of any sub-contract entered into by the contractor pursuant to the provisions on the respect to any sub-contract entered into by the contractor pursuant to the provisions of the relevant clause thereof, the contractor shall obtain from the sub contractor an undertaking to provide the Owner with the same patent protection that contractor is required to provide under the provisions of this clause.

41. Liens:

- 41.1. If at any time there should be evidence or any lien, claim for which the Owner might have become liable, which is chargeable to the contractor, then the Owner may pay and discharge the same and deduct the amount so paid from any amount which may be or may become due and payable to the contractor, if any lien or claim remain unsettled after all payments are made, the contractor shall refund or pay to the Owner the cost such lien or claim including all payment and reasonable expenses. Owner reserves the right to the same.

41.2. Nothing Extra for Adverse Sub-Soil Conditions:

The nature of sub-soil of the work site varies widely horizontally and vertically. The KI and KII values also vary widely from place to place. In addition the water bearing seems are also conspicuous with the water table at a depth of 0.75 to 3.0 metres from ground level. A number of cohesive and non-cohesive strata are available particularly everywhere. The contractor shall have to make cuts and resort to pumping with due care to avoid collapsing of sides and occurrence of 'Piping'. The Contractor shall also be careful to avoid occurrence of excessive 'heaving' by avoiding keeping the excavation proposed to atmosphere for a longer period.

- 41.3. Slips and falls in excavation shall be cleared by the contractor at his own cost.

Excessive heaving shall have to cut and refill with lean concrete by the contractor at his own cost. The contractor shall have to adopt under-water work in case of occurrence of piping/ quick condition without any additional cost to the Owner.

The contractor will be paid for the earthwork as per the drawing. The slopes etc. as required for the safety of the work has to be provided as per the decision of the Engineer-in-Charge at his own cost. All types of dewatering including seepage, rain water entering. The earthwork in excavation or from any other source is to be done by the contractor at his own cost till the completion of foundation upto ground level including back filling.

41.3. No Compensation in case of change of Location of site :

Change of location of site do not invalidate the contract and tenderer have no claim for any compensation for such changes.

SECTION – V

PERFORMANCE OF WORK

42. Execution of Works:

All the work shall be executed in strict conformity with the provisions of the contract documents explanatory detailed drawings, specifications and instructions by the Engineer-in-Charge whether mentioned in the contract or not. The contractor shall be responsible for ensuring that works are executed in the most substantial, proper and workman like manner using the quality materials and labour, through out the job Completion in strict accordance with the specifications and to the entire satisfaction of the Engineer-in-Charge.

43. Coordination and inspection of Works:

The coordination and inspection of the day-to-day work under the contract shall be the responsibility of the Engineer-in-Charge or his authorised representative. A work order book will be maintained by the contractor for each sector in which the aforesaid written instructions will be entered. These will be signed by the contractor or his authorised representative by way of acknowledgement within 12 hours.

44. Works in Monsoon and Dewatering:

44.1 The execution of work may entail working in the monsoon also. The contractor must maintain a minimum labour force as may be required for the job. And plan execute the construction and erection according to the prescribed schedule. No extra will be considered for such work in monsoon.

44.2 During monsoon and other period, it shall be the responsibility of the contractor to keep the construction work site free from water at his own cost.

45. Work on Sundays and Holidays:

For carrying out works on Sundays and holidays, the contractor will to keep Engineer-in-Charge or his representative at least two days in advance and obtain permission in writing. The contractor shall observe all labour laws and other statutory rules and regulations in force. In case of any violation of such laws, rules and regulations, consequence if any, including the cost thereto shall be exclusively borne by the contractor and the Owner shall have no liability whatsoever on his account.

46. General Conditions of Construction and Erection Work:

46.1 The working time at the time of work is 48 hours per week. Overtime work is permitted in case of need and the owner will not compensate the same. Shift-working at 2 or 3 shifts per day will become necessary and the contractor should take this aspect into consideration for formulating his rates for quotation. No extra claims will be entertained by the Owner on this account.

- 46.2 The contractor must arrange for the placement of workers in such a way that the delayed completion of the work or any part thereof or for any reason whatsoever will not affect their proper employment. The Owner will not entertain any claim for old time payment whatsoever.
- 46.3 The contractor shall submit to the Engineer-in-Charge reports at regular intervals regarding the state and progress of work. The contract shall provide display boards showing progress and labour strength at work site, as directed by the Engineer-in-Charge.
- 46.4 The site of work will be released progressively in stages and no claim for any compensation or damages will be tenable for non-release of the entire site at a time.
- 47. Drawings to be supplied by Owner:**
- 47.1 The drawings attached with tender are only for the general guidance to the contractor to enable him to visualise the type of work contemplated. The contractor will be deemed to have studied the drawings and formed an idea about the total work involved.
- 47.2 In the Course the progress of work detailed working drawings on the basis of which actual execution of the work has to proceed, shall be furnished in stages. The contractor shall be deemed to have gone through the drawings supplied to him thoroughly and carefully, in conjunction will all other connected drawings and discrepancies if any, shall be brought to the notice of the Engineer-in-Charge, before actually carrying out the works.
- 47.3 Copies of all detailed working drawings relating to the works shall be kept at the contractor's office on the site and shall be made available to the Engineer-in-Charge at any time during the contract period. The drawings and other documents issued shall be returned to the Owner on completion of the works.
- 48. Drawings to be supplied by the Contractor:**
- 48.1 The drawings/data which are to be furnished by the contractor are enumerated in the special conditions of contract and shall be furnished within the specified time.
- 48.2 Where approval of drawings for manufacture/construction/fabrication has been specified it shall be contractor's responsibility to have these drawings prepared as per the directions of Engineer-in-Charge and get them approved before proceeding with manufacture/construction/fabrication works as the case may be. Any changes that may have become necessary in these drawings during the execution of the work shall have to be carried out by the contractor to the satisfaction of Engineer-in-Charge at no extra cost. All final approved drawings shall bear the certification stamp duly signed by both the contractor and the Engineer-in-Charge as indicated below.

“Certified true for
(Name of work)

Agreement No

Signed
(Contractor) (Engineer-in-Charge)

48.3 A period of 3 weeks from the date of receipt shall be required for approval of drawings by the Engineer-in-Charge.

48.4 As built drawing showing all Corrections, adjustments etc. shall be furnished by the Contractor in five copies and one transparent to record purposes to the owner.

49 Setting Out Works:

49.1 The Engineer-in-Charge shall furnish to the contractor with only the four corners of the work site that is plant boundary limits, and a level bench mark only. The contractor shall set out the works, provide an efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.

49.2 The contractor shall provide, fix and be responsible for the maintenance of all stacks, templates, level marks, profiles and other similar things and shall take all necessary precautions to prevent their removal or disturbance. He shall be responsible for their consequences arising of such removals, disturbances corrections thereon and for their efficient and timely reinstatement. The contractor shall also be responsible for the maintenance of all existing survey marks, boundary marks, distance marks and centre line marks, either existing or supplied and fixed by the contractor. The work shall be set out to the satisfaction of the Engineer-in-Charge. The approval thereon or jointing with the contractor by the Engineer-in-Charge in setting out the work, shall not relieve the contractor of any of his responsibilities.

49.3 Before beginning the work the contractor shall at his own cost, provide all necessary reference and level posts-pegs, bamboos, flags, ranging rods, strings, and other materials for proper layout of the work in accordance with the scheme for bearing marks acceptable to the Engineer-in-Charge. The centre, longitudinal, face and cross lines shall be marked by means of small masonry pillars. Each pillar shall have distinct mark at the centre to enable the theodolite to be set over it. No work shall be started until all these points are checked and approved by Engineer-in-Charge in writing, but such approval shall not relieve the contractor of any of his responsibilities. The contractor shall also provide all labour, materials and other facilities as necessary, for the proper checking or layout and inspection of the points during construction.

49.4 Pillars bearing geodetic marks located at the sites of units of works under construction should be protected and faced by the contractor.

49.5 On completion of work, the contractor must submit the geodetic documents according to which the work was carried out.

50. Responsibility for Level and Alignment:

50.1 The contractor shall be entirely and exclusively responsible for the horizontal and vertical alignment, the level and correctness of every part of the work shall rectify effectually any errors or imperfections therein. Such rectification shall be carried out by the contractor at his own cost, when instructions are issued to that effect by the Engineer-in-Charge.

50.2 Lighting, Watch & Ward:

The contractor shall in connection with works provide and maintain at his own cost all lightings, guards, fencing and watch and ward and the security of the entire work in progress including all the machineries, materials shall be the responsibility of the contractor till taken over by the owner by way of the written taking over certificate.

51. Materials to be Supplied by Contractor :

51.1 The contractor shall procure and provide the whole of the materials required for the construction including M.S. Rods, Cement and other building materials, tools, tackles, construction plant and equipment for the completion and maintenance of the work except the materials which will be issued by the Owner and shall make his own arrangement for procuring such materials and for the transport thereof. The owner may give necessary recommendation to the respective authorities, if so desired by the contractor, but assumes no further responsibility of any nature. The owner will insist on the procurement of materials which has the approval of Indian Standards Institution having ISI stamp and/or which are supplied by reputed suppliers borne on DGS & D list.

51.2 The contractor shall properly store all materials either issued to him or brought by him to the worksite to prevent damages due to rain, wind, direct exposure to sun etc. as also from theft, pilferage, etc. for proper and speedy execution of his works. The contractor shall maintain sufficient stocks of all materials required by him.

51.3 No material shall be despatched from the contractor's stores before obtaining the approval in writing of the Engineer-in-Charge.

51.4 All plants, tools and other materials brought by the contractor to the site must be declared at the time of bringing the same to the site.

52. Stores Supplied by the Owner:

52.1 If the specification of the work provides for the use of any material other than Steel & Cement of special description to be supplied from the Owner's stores or it is required that the contractor shall use certain stores to be provided by

the Engineer-in-Charge, such materials and stores, and price to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the contractor, but no so as in way to control the meaning or effect of the contract, the contract shall be bound to purchase and shall be supplied much materials and stores as are from time to time required to be used by him for the purpose of the contract only. The sums due from the contractor for the value of materials supplied by the Owner will be recovered from the Running Account Bill on the basis of actual consumption of materials (after taking into account any wastage allowance as may be provided for in the contract). The contractor should raise requisite copies of indents in a proforma as prescribed by the Engineer-in-Charge and no claim whatsoever will be entertained by the Engineer-in-Charge on this account. After completion of the works, the contractor is required to account as per relevant clauses in this document, for the full quantity of materials supplied to him.

52.2 The value of the stores/materials as may be supplied to the contractor by the Owner will be debited to the contractor's account at the rates shown in the schedule of materials and if they are not entered in the schedule, they will be debited at cost price, which for the purpose of the contract shall include the cost of carriage and all other expenses whatsoever such as normal storage supervision charges which shall have been incurred in obtaining the same at the Owner's stores. All materials so supplied to the contractor shall remain the absolute property of the Owner and shall not be removed on any account from the site of the work and shall be at all times open for inspection to the Engineer-in-Charge. Any such materials remaining unused at the time of the completion or termination of the contract shall be returned to the Owner's stores or at a place as directed by the Engineer-in-Charge in perfectly good condition at contractor's cost.

52.3 Steel & Cement:

52.3.1 If the specification of the work provides for the use of steel or cement such items of steel and cement to the extent required as per the specification of the works, shall be supplied at Owner's stores by the Owner for utilisation in the work on non-chargable basis from time to time depending upon the progress of the work. The tender rates shall be exclusive of the cost of steel and cement to be supplied as per the specification of the work, However, in case of flats and chequered plates the same have to be procured by the contractor at his own cost.

52.3.2 Such materials of steel and cement shall be issued only for permanent works and not for making other temporary works etc. Contractor shall bear all cost including lifting and loading carting from issue points to work site/contractor stores, custody and handling etc. and return of surplus serviceable/unserviceable materials to owner's store or other places to be designed by owner and no separate payment for such expenditure shall be made.

52.3.3 Items of steel as per specification of the work as mentioned above shall be supplied in the available length only. No claim on account of supply of non-standard length shall be entertained. Steel materials shall be issued on actual weight basis.

52.3.4 Cement as mentioned above will be supplied to the contractor a receive from the manufacturer/stockist. The theoretical weight of each bag of cement supplied will be considered as 50 Kg.

52.3.5 Scraps & Surplus Material:

The Contractor shall return all the surplus/unutilised as well as the scraps and wastages out of the materials supplied to him to the Owner's stores in a perfectly good condition at the contractor's cost. However, the following scraps allowances are permissible.

	<u>Unaccountable</u>	<u>Accountable</u>
(i) Cement	3%	Nil
(ii) Reinforcement Steel	½%	2.5%
(iii) Steel structural (Plates & Sections)	½%	4.5%
(iv) M.S. Plates for fabrication of Pipes	½%	As per cutting diagrams approved by Engineer-in-Charge before cutting and fabrication.

52.3.6 Return of unutilised/surplus materials and scrap/wastage:

In respect of any utilised/surplus quantities of cement and steel supplied by not accounted for and or returned by the contractor shall pay to the Owner amounts at the penal rate of twice the SAIL, Bhubaneswar Stock-yard rate of that particular section of steel and cement as the case may be as on the date of accountability. If the Contractor fails to return the scraps/wastage generated as per the above percentage, recovery of such scrap/wastage shall be made at the rate of Rs. 7000/- per tonne.

The charging of penal rate shall be without the prejudice to the other remedies or action available to the owner against the contractor including any criminal action.

52.3.7. Accounting for Materials:

Every month the Contractor shall submit a statement for all the materials supplied to him by the owner in the proforma prescribed by the Engineer-in-Charge.

52.3.8 On completion of the work, the Contractor shall submit material appropriation statement for the materials supplied to him by the Owner.

52.3.9 All materials supplied to the contractor shall remain the absolute property of the all times and title therein shall not pass to the contractor at any time. The possession of the materials in the hands of the contractor is only for the

purpose of incorporating the same in the Owner's work. The material supplied shall not be removed by the contractor on any account from the site of work and shall be at all times open for inspection by the Engineer-in-Charge or owners representative. The contractor shall not use the materials supplied to him for any purpose or work other than the work, which the said materials are supplied.

53. Conditions for issue of Materials:

- (i) Materials specified as to be issued by the Owner will be supplied to the contractor by the Owner from his stores. It shall be the responsibility of the contractor to take delivery of the materials and arrange for its loading, transport and unloading at the site work at his own cost. The material shall be issued during the working hours of his Stores and as per the rules of the Owner framed from time to time.
- (ii) The contractor shall bear all incidental charges for the storage and safe custody of materials at site after these have been issued to him.
- (iii) The contractor shall construct suitable godown at the site of work for storing the materials safe against damage by rain, dampness, fire, theft, etc. He shall also employ necessary watch and ward establishment for the purpose.
- (iv) Materials specified as to be issued by the Owner shall be issued in standard sizes as obtained from the manufacturers.
- (v) It shall be duty of the contractor to inspect the materials supplied to him at the time of taking delivery and satisfy himself that they are in good condition. After the materials have been delivered by the Owner, it shall be the responsibility of the contractor to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/or replaced by him at his own cost according to the directions of the Engineer-in-Charge.
- (vi) The Owner shall not be liable for delay in supply or non-supply of any materials, which the Owner has undertaken to supply where such failure or delay is due to natural calamities, act of enemies, transport and procurement difficulties and any circumstances beyond the control of the Owner. In no case, the contractor shall be entitled to claim any compensation or loss suffered by him on his account.
- (vii) It shall be the responsibility of the contractor to arrange in time all materials required for the works other than those to be supplied by the Owner. If however in the opinion of the Engineer-in-Charge the execution of the work is likely to be delayed due to the contractor's inability to make arrangements for supply of materials which normally he has to arrange for, the Engineer-in-Charge shall have the right at his own discretion to issue such materials if available with the Owner or procure the materials from the market or elsewhere. The contractor will be bound to take such materials at the rates decided by the Engineer-in-Charge. This however, does not in anyway absolve the contractor from responsibility of making arrangement for the supply of such materials in part or in full, should such a situation occur nor shall this constitute a reason for the delay in the execution of the work.

- (viii) Non of the materials supplied to the contractor will be utilised by the contractor for manufacturing item which can be obtained as supplied from standard manufacturer in finished form unless approved by Engineer-in-Charge in writing.
- (ix) The contractor shall, if desired by the Engineer-in-Charge, be required to execute an indemnity bond in the prescribed form for safe custody, usage and accounting of all materials issued by the Owner.
- (x) The contractor shall furnish to Engineer-in-Charge sufficiently in advance a statement showing his requirements of the quantities of the materials to be supplied by the Owner and the time when the same will be required by him for the works, so as to enable the Engineer-in-Charge to make necessary arrangement for procurement and supply of material.
- (xi) Account of the materials to be issued by the Owner shall be maintained by the contractor indicating the daily receipt, consumption and balance in hand in a manner prescribed by the Engineer-in-Charge. All connected papers requisitions, issues returns etc. shall be always available for inspection in the contractor's office at site.
- (xii) The contractor should see that only the required quantities of materials are got issued. The contractor shall not be entitled to cartage and incidental charges for returning the surplus materials, if any, to the stores, place of issue or to the place as directed by the Engineer-in-Charge.
- (xiii) Materials/equipment supplied by Owner shall not be utilised for any other purpose (s) than issued for.
- (xiv) The owner may issue the material in phases at his discretion keeping in view the programmes of the work.
- (xv) In case of free issue of materials, the contractor shall submit an indemnity bond in the prescribed format for 80% (eighty) value of the materials and a bank guarantee for 20% (twenty) of the value of the materials. The indemnity bond and bank guarantee shall be valid till the material account is totally settled.

54. Return of Surplus:

Notwithstanding anything contained to the contrary in any or all the clauses of this contract where any materials for the execution of the contract are procured with the assistance of the Owner either by issue from Owner's stock or purchases made under orders, or permits or licences issued by government the contractor shall hold the said materials as trustee for the owner and use such materials economically and solely for the purpose of the contract and not dispose them off without the permission of the Owner and return, if required by the project head all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on his being paid or credited such price as the Project head shall determine having due regard so the condition of the materials. The price allowed to the contractor however, shall not exceed the amount charged to him excluding the storage charges, if any. The decision of the project head shall be final and conclusive in such matter. In the event of breach of the aforesaid conditions, the contractor shall, in the terms of the licences, or permits and/ or

for criminal breach of trust, be liable to compensate the Owner at double rate or any higher, in the event of those materials at the time having higher rate or not being available in the market, then any other rate to be determined by the project head and his decision shall be final and conclusive.

55. Materials Obtained From Dismantling:

If the contractor in the course of execution of the work is called upon to dismantle any part for reasons other than those stipulated in clauses 57 and 65 hereunder, the materials obtained in the work of dismantling etc. will be considered as the Owner's property and will be disposed off to the best advantage of the Owner.

56. Articles of Value Found:

All gold silver and other materials of any descriptions, precious stones, coins, treasures, relics, antiques and other similar things which shall be found, in, under or upon the site, shall be property of the Owner and the contractor shall duly preserve the same to the satisfaction of the Engineer-in-Charge and shall from time to time delivery the same to such person or persons indicated by the Owner.

57. Inspection of Works:

57.1 The Engineer-in-Charge will have full power and authority to inspect the works in progress at any time wherever the premises/ workshops situated, of the Contractor, person, firm or corporation where works in connection with the contract may be or where materials are being or intended to be supplied.. The contractor shall afford or procure every facility and assistance to Engineer-in-Charge carry out such inspection. The contractor shall, at all time during the usual working hours and at all other times at which reasonable notice of the intention of the Engineer-in-Charge or his representative to visit the works shall have been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing be present for the purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

57.2 The contractor shall give not less than seven days notice in writing to the Engineer-in-Charge before covering up or otherwise placing beyond reach of inspection and measurement any work in order that the same may be inspected and measured. In the event of failure of above the same shall be uncovered and all facilities made available again at contractor's expense for carrying out such measurement or inspection.

57.3 The contractor is to provide at all times during the progress of the work and maintenance period proper means at access with ladders gangways etc. and the necessary attendance to move and adopt as directed for inspection or measurement of the works by the Engineer-in-Charge.

58. Assistance to the Engineer:

The Contractor shall make available to the Engineer-in-Charge free of cost all necessary instructions and assistance in checking of settling out of works and

in the checking of any works made by the contractor for the purpose of setting out and taking measurements of work.

59. **Discrepancies between instructions:**

Should any discrepancy arise between the various instructions furnished to the contractor or his agents or staff or if any doubt arises on the meaning or implementation of any such instructions or should there be any difference of opinion on the issues, the contractor shall refer the matter immediately in writing to the Engineer-in-Charge whose decisions thereon shall be final and conclusive. No claim on losses alleged to have been caused by such discrepancies between instructions, doubts or misunderstanding shall in any event be admissible.

60. **Alterations in Specifications and Designs and Extra Works:**

(a) The Project Head shall have power to make any alterations, in omission from additions to or substitutions, for the schedule of rates, the original specifications, drawings and instructions that may appear to him to be necessary or advisable during the progress of the work, and the contractor shall be bound to carry out such altered/ extra/ new items of work in accordance with any instructions which may be given to him in writing signed by the Project Head and such alterations, omissions, additions or substitutions shall not invalidate the contract and any altered, additional or substituted work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work. The time of completion of work may be extended for the part of the particular job at the discretion of the Project Head for any such alterations, additions, or substitutions of the work, as he may consider as just and reasonable. The rates for such additional, altered or substituted work under the clause shall be worked out in accordance with the following provisions:-

(b) If the rates for the additional, altered or substituted work are specified in the contract for the work, the contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract.

(c) If the rates for the additional, altered or substituted work are not specifically provided in the contract for the work, the rates will be derived from rates for similar class of work as are specified in the contract for the work. The opinion of the Project head as to whether or not the rates can be reasonably so derived from the items in this contract will be final and binding on the contractor.

(d) If the rates for the additional, altered or substituted work can not be determined in the manner specified in sub-clause (a) & (b) above, then the contractor shall within 7 days of the date of receipt of order to carry out

the work, inform the Project Head of the rate which it is his intention to charge for such class of work, supported by analysis of the rate or rates claimed, and the project Head shall determine the rate or rates on the basis of the prevailing market rates of materials plus labour cost including equipment hire charge at schedule of hourly/ daily rates plus 15% to cover contractor's supervisions overhead and profit and pay to the contractor accordingly. The opinion of the Project Head to current market rates of the materials and the quantum of labour and equipment involved per unit of measurement will be final and binding on the contractor. The schedule of hourly/ daily rates shall be as enclosed.

61. Action Where no Specification is issued:

In case of any class of work for which there is no such specification supplied by the Owner as is mentioned in the tender document such work shall be carried out in accordance with the Indian Standard Specifications. If the Indian Standard Specifications do not cover the same, the work should be carried out as per standard Engineer in Practice subject to the approval of the Engineer-in-Charge.

62. Abnormal Rates:

The contractor is expected to quote the rate for each item after careful analysis of cost involved for the satisfactory performance and completion of item work considering all specifications and conditions of contract. This will avoid loss of profit or gain in case of curtailment or change in specification for any other item. In case the rate quoted by the tenderer for any item are usually high or unusually low it will be sufficient cause of the rejection of the tender unless the Owner is convinced about the reasonableness of the analysis for such rate furnished by the tenderer (on demand) after scrutiny.

63. Tests For Quality Works:

63.1 All materials and workmanship shall be of the respective kinds described in the contract documents and in accordance with the instructions of the Engineer-in-Charge and shall be subjected from time to time to such tests at contractor's cost as the Engineer-in-Charge may direct at the place of manufacture or fabrication or at the site or at all or any such places. The contractor shall provide assistance, instruments, machines, labour and materials as are required for examining, measuring and testing any workmanship as may be selected and required by the Engineer-in-Charge.

63.2 All the tests that will be necessary in connection with the execution of the work as decided by Engineer-in-Charge shall be carried out at the field testing laboratory of this Owner if available by paying the charges as decided by the Owner from time to time. In case of non-availability of testing facilities with the Owner, the required laboratory as directed by Engineer-in-Charge.

63.3 If any tests are required to be carried out in connection with the work or materials or workmanship not supplied by the contractor, such tests shall be

carried out by the contractor as per the instructions of Engineer-in-Charge and cost of such tests shall be reimbursed by the Owner.

64. Samples:

The contractor shall furnish to the Engineer-in-Charge for approval when request or if required by the specifications, adequate samples of all materials and finished to be used in the work. Such samples shall be submitted before the work is commenced and in sample time to permit tests and examinations thereof. All materials furnished and finishes applied in actual work shall be fully equal to the approved samples.

65. Liabilities for Defect, Imperfections etc. and Rectifications Thereof:

If it shall appear to the Engineer-in-Charge that any work has been executed with unsound, imperfect or unskilled workmanship, or with materials of any inferior description, or that any materials or articles provided by the contractor for the execution of work are unsound or of quality inferior to that contracted for, or otherwise not in accordance with the contract, the contractor shall on demand in writing from the Engineer-in-Charge or his authorised representative specifying the work, materials or articles complained of, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct that work so specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of failure to do so within a period to be specified by the Engineer-in-Charge in his demand aforesaid, the Engineer-in-charge may on expiry of notice period rectify or remove, and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expense in all respects of the contract. The decision of the Engineer-in-Charge as to any question arising under this clause shall be final and conclusive.

66. Suspension of Works:

- (i) Subject to the provision of sub para (ii) of this clause, the contractor shall if ordered in writing by the Engineer-in-Charge, or his representative, temporarily suspend the works or any part thereof such period and such time as so ordered and shall not, after receiving such written orders, proceed with the work therein, ordered to be suspended until he shall have received a written order to proceed therewith. The contractor shall not be entitled to claim compensation for any loss or damage sustained by him by reason of temporary suspension of the works aforesaid. An extension of time for completion, corresponding with the delay caused by any such suspension of the works as aforesaid will be granted to the contractor should he apply for the same provided that the suspension was not consequent to any default or failure on the part of the contractor.
- (ii) In case of suspension of entire work, ordered in writing by the Engineer-in-Charge, for a period of more than two months, the contractor shall have the option to terminate contract.

67. Possession Prior to Completion:

The Engineer-in-Charge shall have the right to take possession of or any completed or partially completed work or part of the work. Such possession or use shall not be deemed to be an acceptance of any work completed in accordance with the contract. If such prior possession or use by the Engineer-in-Charge delay the progress of work, equitable adjustment in the time of completion will be made and the contract agreement shall be deemed to be modified accordingly.

68 Twelve months Period of Liability from the Date of Issue of Completion Certificate:

- 68.1 The contractor shall guarantee the installation/work for a period of 12 months from the date of completion of work as certified by the Engineer-in-Charge which is indicated in the completion certificate. Any damage or defect that may arise though remained undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by him or in the workmanship shall be rectified or replaced by the contractor at his own expenses as deemed necessary by the Engineer-in-Charge or in default the Engineer-in-Charge may cause the same to be made good by other agency and deduct expenses (of which the certificate or Engineer-in-Charge shall be final) from any sums that may be then or at any time thereafter become due to the contractor or from his security deposit, or the proceeds of sale thereof or of a sufficient portion thereof.
- 68.2 If the contractor feels that any variation in work or in quality of materials or proportions would be beneficial or necessary to fulfil the guarantees called for, he shall bring this in writing to the notice of the Engineer-in-Charge.

68.3 Care of works:

From the commencement of completion of the work, the contractor shall take full responsibility for the care of all works including all temporary works and in case any damage, loss or injury shall happen to the work or to any part thereof or to any temporary works from any cause whatsoever, shall at his own cost repair and make good the same so that on completion the work shall be in good order and in conformity in every respects with the requirements of the contract and the Engineer-in-Charge's Instructions.

68.4 Defects Prior to Taking Over:

If at any time before the work is taken over, the Engineer-in-Charge shall:

- (a) Decide that any work done or materials used by the contractor or any sub-contractor is defective or not in accordance with the contract, or that the works or any portion thereof are defective, or do not fulfil the requirements of contract (all such matter, being hereinafter, called 'Defects' in this clause) and (b) as soon as reasonably practicable gives to the contractor notice in writing of the said decision specifying particulars of the defects claimed to exist or to have occurred then the contractor shall at his own expenses and with all speed make good the defects so specified.

In case contractor shall fail to do so, the Owner may take, at the cost of contractor, such steps as may in all circumstances be reasonable to make good such defects. The expenditure so incurred by the owner be recovered from the amount due to the contractor. The decision of the Engineer-in-Charge with regard to the amount to be recovered from the contractor will be final and binding on the contractor. As soon as the works have been completed in accordance with the contract (except minor respects that do not affect their use for the purpose for which they are intended and except for maintenance thereof provided in clause 68.1 of General Conditions of Contract) and have passed the tests on completion, the Engineer-in-Charge shall issue a certificate (hereinafter called completion certificate) in which he shall certify the date on which the works have been so completed and have passed the said tests and the Owner shall be deemed to have taken over the works on the date so certified. If the works have been divided into various groups in the contract, the Owner shall be entitled to take over any group or groups before the other or others.

68.5 Defect After Taking Over:

In order that the contractor could obtain a completion certificate he shall make good with all possible speed, any defect arising from the defective materials supplied by the contractor or that may have been noticed or developed, after the works or group of the works has been taken over, the period allowed, for carrying out such work will be normally one month. If any defect be not remedied within a reasonable time, the owner may proceed to do the work at contractor's Risk and expenses and deduct from the final bill such amount as may be decided by the Owner.

If by reason of any default on the part of the contractor a completion certificate has not been issued in respect of every portion of the works within one month after date fixed by the contract for the completion of the works, the Owner shall be at liberty to use the work or any portion thereof in respect of which a completion certificate has not been issued, provided that the works or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completion of these works for the issue of completion certificate.

68.6 Guarantee/Transfer of Guarantee:

For works like water-proofing, acid & alkali resisting materials, pre-construction soil treatment against termite or any other specialized works etc. the contractor shall invariably engage sub-contractors who are specialists in the field and firms of repute and such a sub-contractor shall furnish guarantees for their workmanship to the Owner, through the contractor. In case such a sub-contractor/firm is not prepared to furnish a guarantee to the owner, the contractor shall give that guarantee to the Owner directly.

SECTION – VI CERTIFICATE AND PAYMENT

69. SCHEDULE OF RATE AND PAYMENTS:

69.1 Contractor's Remuneration:

The price to be paid by the Owner to the contractor for the whole of the work done and for the performance of all the obligations undertaken by the contractor under the contract document shall be ascertained by the application of the respective schedule of rates (the inclusive nature of which is more particularly defined by way of application but not of limitation, with clause No. 69.2) and payment to be made accordingly to the work actually executed and approved by the Engineer-in-Charge. The sum so ascertained shall (exception only as and to the extent expressly provided here in) constitute the sole and inclusive of remuneration of the contractor under the contract and no further or other payment whatsoever shall be or become due or payable to the contractor under the contract.

69.2 Schedule of Rates to the Inclusive:

The prices/rates quoted by the contractor shall remain firm till the issue of final certificate and shall not be subject to escalation. Schedule of rates shall be deemed to include and cover all costs, expenses and liabilities of every description and all risks of every kind to be taken in executing, completion and handing over the work to the Owner by the contractor. The contractor shall be deemed to have known the nature, scope, magnitude and the extent of the works and materials required though the contract document may not fully and precisely furnish them. He shall make such provision in the schedule of rates as he may consider necessary to cover the cost of such items of work and materials as may be reasonable and necessary to complete the work. The opinion of the Engineer-in-Charge as to the items of work which are necessary and reasonable for completion of work shall be final and binding on the contractor although the same may not be shown on or described specifically in contract documents.

Generality of this present provision shall not be deemed to cut down or limited in any way because in certain cases it may and in other cases it may not expressly stated that the contractor shall do or perform a work or supply articles or perform with services at his own cost or without addition of payment or without extra charge or works to the same effect or that it may be stated or not stated that the same are included in and covered by the schedule of rates.

69.3 Schedule of rates to cover Constructional Plant, Materials. Labours etc.:

Without in any way limiting the provision of other subclauses the schedule of rates shall be deemed to include the cover the cost of all constructional plant, temporary works (except as provided for herein), pumps, materials, labour, insurance, fuel, stores, and appliances to be supplied by the contractor and all other matters in connection with each items in the schedule of quantities and

the execution of the works or any portion thereof finished complete in every respect and maintained as shown or described in the contract documents or as may be ordered in writing during the continuance of the contract.

69.4 Schedule of Rates to cover Royalties, Rents and Claims:

The schedule of rates shall be deemed to include and cover the cost of all royalties and fees for the articles, processes, protected by letters, patent or otherwise incorporated in or used in connection with the works, also all royalties, rents, and other payments in connection with obtaining materials of whatsoever kind for the works and shall include an indemnity to the owner which the contractor hereby gives against all actions, proceedings, claims, damages, costs and expenses arising from the incorporation in or use on the works of any such articles, processes or charges if levied on materials, equipment or machinery to be brought to site for use on work, shall be borne by the contractor.

69.5 Schedule of Rates to cover taxes and duties:

No exemption or reduction of custom duties, excise duties, sales tax, quay or any port duties, transport charges, stamp duties or Central or State Government or Local Body (or from any other body) or Municipal Taxes or duties, taxes or charges whatsoever will be granted or obtained and all expenses of which shall be deemed to be included in and covered by the schedule of rates. The contractor shall obtain and pay for all permits or other privileges necessary to complete the work.

69.6 Schedule of Rates to cover Risk of Delay:

The schedule of rates shall be deemed to include and cover the risk of all responsibilities of delay and interference with the contractor's conduct of work which occur from any cause including orders of the owner in the exercise of his powers and on account of extension of time granted due to various and for all other possible or probable causes of delay.

69.7 Schedule of Rates cannot be altered:

For work under unit rate basis no alteration will be allowed in the schedule of rates by reasons of works or any part of them being modified, altered, extended, diminished or omitted. The schedule of rates is of fully inclusive rates which have been fixed by the contractor and agreed to by the Owner and cannot be altered.

- 69.7.1 The schedule of rates to cover for working in operating plant. Contractor's rates shall be deemed to include taking into account that he has to work in operating plant and shall take sufficient care in moving the plants, equipments and materials from one place to another, so that they do not cause any damage to any person or to the property of the owner or to third party including overhead and underground cable/pipe lines. In the event of such damages including eventual loss of production and operation of the plant or services in any plant or establishment as estimated by the owner or ascertained or by the

third party shall be borne by the contractor. Since the work is to be executed for the expansion of the plant, the rate of the contractor shall also deem to include all interference/obstruction/interruption for which no compensation shall be paid to be contractor.

70. Procedure For Measurement/ Billing of Work in Progress:

70.1 All measurements shall be in metric system. All the works in progress will be jointly measured by the representative of the Engineer-in-Charge and the contractor's authorised agent progressively. Such measurements will be got recorded in the measurement book by the Engineer-in-Charge or his authorised representative and signed in token of acceptance by the contractor or his authorised representative.

For the purpose of taking joint measurement the contractor's representative shall be bound to be present whenever required by the Engineer-in-Charge. If, however, he absents for any reason whatsoever the measurements will be taken by the Engineer-in-Charge or his representative and this will be deemed to be correct and binding on the contractor.

70.2 Billing:

The contractor will submit a bill in approved proforma in accordance with the contract terms and the agreed billing schedules in quintuplicate to the Engineer-in-Charge giving abstract and detailed measurement for the various items executed during a month, before the expiry of the first week of the succeeding month. The Engineer-in-Charge shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim as far as admissible, adjusted, if possible, before the expiry of 10 days from presentation of the bill.

70.2.1 The bill shall be submitted by the contractor in computerised formats approved by the owner. The bills along-with floppies containing measurement of work, particulars of materials, recoveries etc. have to be submitted to the owner.

70.2.2 For lump-sum contracts, the payment will be according to agreed billing schedule. No adjustment shall be allowed in lump-sum prices for any variations in the quantities, specifications etc. shall take or a cause to be taken the requisite measurement for the purposes of having the same verified and the claim as far as admissible, adjusted, if possible, before the expiry of 10 days from presentation of the bill.

70.3 Secured Advance on Materials:

In case of tenders for completed items of works, contractor may be allowed "Secured Advance" on the security of materials brought to site for execution of the contracted items of work to the extent of 75% of the value of materials which go into the completed works as assessed by the Engineer-in-Charge provided that the materials are of an imperishable nature and that formal

agreement is drawn up with the contractor under which the Owner secures a lien on the materials and is safe guarded against losses due to the contractor postponing the execution of the work or to the improper storage &/or misuse of the materials and against the expenses entitled for their proper watch and safe custody. Recoveries of advances so made would not be postponed until the whole of the work entrusted to the contractor is completed. They should be adjusted from his running account bills for work done as the materials are used, the necessary deductions being made whenever the items of work in which they are used and billed for.

70.4 Dispute in Mode of Measurement:

In case of any dispute as to the made of measurement not covered by the contract to be adopted for any item of work, mode of measurement as per latest Indian Standard Specifications shall be followed.

70.5 Rounding of Amounts:

In calculating the amount of each item due to the contractor in every certificate prepared for payment, sum of less than 50 paisa shall be omitted and the total amount on each certificates shall be rounded off to the nearest, i.e. sum of less than 0.50p shall be omitted and sums of 0.50p and more upto one rupee shall be reckoned as one rupee.

71. LUMPSUMS IN TENDER:

For the item in tender where it includes lumpsum in respect of parts of work, the contractor shall be entitled to payment in respect of the items at the same as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-Charge capable of measurement, or determination, the Owner may at his discretion pay the lumpsum amount entered in the tender or a percentage thereof and the certificate in writing of the Engineer-in-Charge shall be final and conclusive against the contractor with regards to any sum payable to him, under the provisions of this clause.

72. RUNNING ACCOUNT PAYMENTS TO BE REGARDED AS ADVANCE:

All Running Account Payment shall be regarded as Payments by way of advance against the final payment only and not as payment for work actually done and completed, and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due Performance of the contract, or any part thereof, in this respect, or of the accruing of any claim by the contractor, nor shall it, conclude, determine or affect in any way the powers of the Owner under these conditions or any of them as to the final settlement and adjustments of the accounts or otherwise, or in any other way vary or affect the contract. The final bill shall be submitted by the contractor within one month from the sate of physical completion of the work, otherwise,

the Engineer-in-Charge's certificate of the measurement and of total amount payable for the work accordingly shall be final and binding on all parties.

73. NOTICE OF CLAIMS FOR ADDITIONAL PAYMENT:

Should the contractor consider that he is entitled to any extra payment or compensation or to make any claims whatsoever in respect of the works arising under the terms of this contract he shall forthwith give notice in writing to the Engineer-in-Charge that he claims extra payment within ten days from the ordering of any work or happening of any event upon which the contractor bases such claims and such notice shall contain full particulars of the nature of such claims with necessary particulars as above within the time above specified shall be an absolute waiver thereof. No omission by the Owner to reject any such claim and no delay in dealing therewith shall be waiver by the Owner of any right in respect thereof.

74. PAYMENT OF CONTRACTOR'S BILL:

No payment shall be made for works estimated to cost less than Rs. 10,000/- till the whole of the work shall have been completed and a certificate of completion given. But in case of works estimated to cost more than Rs. 10,000/- the contractor, on submitting the bill thereof be entitled to receive a monthly payment proportionate to the part thereof approved and passed by the Engineer-in-Charge, whose certificate of such approval and passing of the sum so payable be final and conclusive against the contractor. This payment will be made after making necessary deductions as stipulated elsewhere in the contract document for materials, security deposit etc. or any statutory recoveries.

Payment due to the contractor shall be made by the Owner, by Crossed Account Payee Cheque forwarding the same to registered office or the notified office of the contractor. In no case will owner be responsible if the Cheque is mislaid or misappropriated by un-authorized person/ persons. In all cases, the contractor shall present his bill duly pre-receipted on proper revenue stamp.

All payment shall be made in Indian Currency.

75. Receipt For Payment:

Receipt for payment made on account of work when executed by a firm, must be signed by a person holding due power of attorney in this respect on behalf of the contractor, except when the contractors are described in their tender as limited company in which case the receipts must be signed in the name of the company by one of its principal officers or by some other persons having authority to give effectual receipt for the company.

76. Completion Certificate:

76.1. Application for completion certificate:

When the contractor fulfils his obligation under clause 69.4 he shall be eligible to apply for completion certificate in respect of the work by submitting the completion documents along with such application for completion certificate.

The Owner or his representative shall normally issue to the contractor the completion certificate within one month after receiving an application therefor from the contractors after verifying from the completion documents and satisfying himself that the work has been completed in accordance with and as set out in the construction and erection drawings, and the contract documents.

The contractor, after obtaining the completion certificate, is eligible to present the final bill for the work executed by him under the terms of contract.

76.2. Completion Certificate:

Within one month of the completion of work in all respects, the contractor, shall be furnished with a certificate by the owner or his representative of such completion but no completion certificate shall be given not shall the work be deemed to have executed until all, scaffolding, surplus materials and rubbish is cleared off the site completely not until the work shall have been measured by the Engineer-in-Charge, whole measurement shall be binding and conclusive. The work will not be considered as complete and taken over by the owner, until all the temporary work, labour and staff colonies etc. constructed are removed and work site cleared to the satisfaction of the Engineer-in-Charge.

If the contractor shall fail to comply with the requirements of this clause on or before the date fixed for the completion of the work, the Engineer-in-Charge may at the expenses of contractor remove such scaffolding, surplus materials and rubbish and dispose off the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall forthwith pay the amount for all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

Completion Certificate shall be in 3 parts as follows:

- (1) Physical/ Mechanical Completion work.
- (2) Satisfactory completion of commissioning of equipment with load.
- (3) Satisfactory completion of guarantee.

The contractor shall clearly indicate the 3 dates separately.

76.3. Completion Documents:

For the purpose of Clause 76 the following documents will be deemed to form the completion documents:

- (i) The technical documents according to which the work was carried out.

- (ii) Three sets of construction drawings showing therein the modification and corrections made during the course of execution and signed by the Engineer-in-Charge.
- (iii) Completion Certificate for embedded and covered –up works.
- (iv) Certificate of final levels as set out for various works.
- (v) Certificate of tests performed for various works.
- (vi) Material appropriation statement to the materials issued by the owner for the works and list of surplus materials returned to the owner's store duly supported by necessary documents.
- (vii) Physical/ Mechanical Completion work.
- (viii) Satisfactory completion of commissioning of equipment with load.
- (ix) Satisfactory completion of guarantee.

The Contractor shall clearly indicate the 3 dates separately.

77. Final Decision And Final Certificate:

Upon the expiration of the period of liability and subject to the Engineer-in-Charge being satisfied that the works have been duly maintained by the contractor during monsoon or such period as herein provided in clause 68.1 and that the contractor has in all respect duly made up all subsidence and performed all his obligations under the contract, the Engineer-in-Charge shall (without prejudice to the right of the Owner to retain the provisions of relevant clause hereof) otherwise give a certificate, herein referred to as the final certificate, to the effect and the contractor shall not be considered to have fulfilled the whole of his obligations under the contract until Final Certificate shall have been given by the Engineer-in-Charge notwithstanding any previous entry upon the work and taking possession, working or using of the same or any part thereof by the Owner.

78. Certificate And Payments No Evidence of Completion:

Except the final certificate no other certificate or payment against a certificate or on general account shall be taken to be an admission by the Owner of the due performance of the contract of any part thereof or of occupancy or validity of any claim by the Contractor.

SECTION – VII

TAXES AND INSURANCE

79. TAXES, DUTIES, OCTROI ETC.

- 79.1. The Contractor shall defray all charges, such as rent, toll local taxes excise duty, other payments and compensations, if any, in connection with the procurement and handling of materials, fabrication and execution of works or any method or process connected with the works or Temporary works.

Sales Tax or any other tax on materials required for the works as also Tax on works contract shall be payable by the Contractor and the Owner will not entertain any claim whatsoever in this regard.

- 79.2. Notwithstanding anything contained elsewhere in the contract, the owner shall deduct at source from the payments due to the contractor, the taxes as required under Section -13-AA of the Orissa Sales Tax Act or as amended from time to time or under any other statute. The amounts so deducted shall be deposited by the Owner with the Sales Tax authorities as per Law. It is for the contractor to deal with the Sales Tax authorities directly in respect of any claim or refund relating to the above deductions and the owner shall not be liable or responsible for any claims or payments or reimbursement in this regard.

80. INSURANCE:

Contractor shall at his own expense carry and maintain insurance with reputed insurance companies to the satisfaction of the Owner as follows:

80.1 Employees State Insurance Act:

The contractor agrees to and does hereby accept full and exclusive liability for compliance with all obligations imposed by the Employees State Insurance Act., 1948, and the contractor further agrees to defend, indemnify and hold Owner harmless from any liability of penalty which may be imposed by the Central, State or Local authority by the reason of any asserted violation by contractor or Sub-contractor of the Employee's State Insurance Act, 1948 and also from all claims, suits or proceeding that may be brought against the Owner arising under, growing out of or by reasons of the work provided for by this contract whether brought by employees of the contractor, by third parties or by Central or State Government authority or any political sub-division thereof.

The contractor agrees to fill in with the Employees State Insurance Corporation, the Declaration Forms and all forms which may be required in respect of the contractor's or sub-contractor's employees, whose aggregate remuneration is Rs. 560.00 per month or less and who are employed in the work provided for or those covered by ESI from time to time under the Agreement. The contractor shall deduct and secure the agreement of the sub-contractor to deduct the employee's contribution as per the first schedule of the Employee's State Insurance Act from wages and affix the employee's

contribution cards at wages payments intervals. The contractor shall remit and secure the agreement of the sub-contractor to remit to the State Bank of India, Employees State Insurance Corporation Account, the employee's contribution as required by the Act. The contractor agrees to maintain all cards and records as required under the Act in respect of employees and payments and the contractor shall secure the agreement of the sub-contractor to maintain such records. Any expenses incurred for the contributions, making contributions or maintaining records shall be to the contractor's or sub-contractor's account.

The Owner shall retain such sum as may be necessary from the total contract value until the contractor shall furnish satisfactory proof that all contribution as required by the Employees State Insurance Act, 1984, have been paid. This will be pending on the contractor when the Employees State Insurance Act is extended to the place of work.

80.2 Workmen Compensation and Employees Liability Insurance:

Insurance shall be affected for all the contractor's employees engaged in the performance of this contract. If any of the work is subject, the contractor shall require the sub-contractor to provide workmen's compensation and employer's liability insurance for the latter's employees if such employees are not covered under the contractor insurance.

80.3 Any other insurance required under Law or Regulations or by Owner:

Contractor shall also carry and maintain any and all other insurance, which he may be required under any law or regulation from time to time. He shall also carry and maintain any other insurance, which may be required by the Owner.

80.4 Accident or Injury to workmen:

The owner shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the Employment of the contractor or any sub-contractor save and except an accident or injury resulting from any act or default of the Owner, his agents or servants and the contractor shall indemnify and keep indemnified the Owner against all such damages and compensation (save and except as aforesaid) and against all claims, demands, proceeding, costs, charges and expenses, whatsoever in respect or in relation thereto.

80.5 Transit Insurance:

In respect of all items to be transported by the Contractor to the site of work, the cost of transit insurance should be borne by the contractor and the quoted price shall be inclusive of this cost.

81 DAMAGE TO PROPERTY OR TO ANY PERSON OR ANY THIRD PARTY:

81.1 Contractor's rate shall deem to include taking into account that he has to work in operating plant and shall take sufficient care in moving the plants, equipment and materials from one place to another so that they do not cause

any damage to any person or to the property of the Owner or to a third party including over head and underground cables, pipelines. In the event of such damages including eventual loss of production and operation of the plants or services in any plant or establishment as estimated by the Owner or ascertained or by the third party shall be borne by the Contractor.

81.2 Contractor shall also be responsible for making good to the satisfaction of the Owner any loss or any damage to all structures and properties belonging to the Owner or being executed or procured or being procured by owner or by other agency within the premises of all the work or Owner. If such loss or damages is due to fault and or the negligence or willful acts or omission of the contractors, his employees, agents, representatives or sub-contractors.

81.3 The contractor shall indemnify and keep the owner harmless of all claims for damages to property other than owner's property arising under or by reason of this contract if such claims result from the fault and/ or negligence or willful acts or omission of the contractor, agents, representative or sub-contractor.

82 DEMURRAGE DUES:

The contractor shall pay demurrage charges incurred by the Owner because of the contractor's failure to load or unload any goods or materials within the time allowed by the Railway and/ or Transport Agency for such loading or unloading as charges incurred by the contractor within the permissible time as also charges due on consignments booked by or to him. In case the contractor fails to pay these charges, these charges shall be deducted from any sums, which may be due or become due to the contractor in terms of this contract and/ or any other contract.

SECTION – VIII LABOUR LAWS AND ARBITRATION

83 LABOURER LAWS:

Contractor shall comply with any and all laws, ordinances, regulations and decision of courts (which shall be deemed to be a part of this Agreement) concerning the health, sanitary arrangements, wages, welfare, safety and employment of any and all of his workers upon the Project or any portion thereof and shall exclusively bear the consequences of failure to comply therewith Contractor shall Indemnify and hold Engineer and Owner harmless from any claims, fines or penalties which may be made against Engineer or Owner as result of Contractor's failure to fulfil these obligations.

Without limiting the generality of the foregoing, Contractor shall fully comply with.

The contractor shall obtain clearance from the Labour Department regarding the compliance of the labour laws on 6 monthly basis and submit to the owner for record.

- (i) No labour below the age of 18 (eighteen) years shall be employed on the work.
- (ii) The contractor shall not pay less than what is provided under law to labourers engaged by him on the work.
- (iii) The contractor shall at his expense comply with all labour laws and keep the Owner indemnified in respect thereof .
- (iv) The contractor shall pay equal wages for men and women in accordance with applicable labour laws.
- (v) If the contractor is covered under the contractor labour (Regulation and Abolition) Act, he shall obtain a licence from licensing authority (i.e. office of the labour commissioner) by payment of necessary prescribed fee and the deposit, if any, before starting the work under the contract.
- (vi) The Contractor shall employ labour in sufficient numbers either directly or through sub-contractors to maintain the required rate of progress and of quality to ensure workmanship of the degree specified in the Contract and to satisfaction of the Engineer-in-Charge. The contractor shall not employ in connection with the works any person who has not completed his 18 (eighteen) years of age.
- (vii) The Contractor shall furnish to the Engineer-in-Charge the distribution return of the number and description, by trades of the work people

employed on the works. The Contractor shall also submit on the 4th and 19th of every month to the Engineer-in-Charge a true statement showing in respect of the second half of the preceding month and the first half of the current month (1) the accidents that occurred during the said fortnight showing the circumstance-under which they happened and the extent of damage and injury caused by them and (2) the number of female workers who have been allowed Maternity benefit as provided in the Maternity Benefit Act 1961 or Rules made thereunder and the amount paid to them.

- (viii) The contractor shall comply with the provisions of the payment of Wages Act 1936, Minimum Wages Act 1938, Employees Liability Act 1928, Workmen's Compensation Act, 1923, Industrial Dispute Act 1947, the Maternity Benefit Act 1961, Employees Provident Fund Act, 1952 and Contract Labour regulation and abolition Act 1937, Employment of Children Act 1938 or any modifications thereof or any other law relating thereto and rules made thereunder from time to time.
- (ix) The Engineer-in-Charge shall on a report having been made by an Inspecting Officer as defined in Contract Labour (Regulation and Abolition) Act 1970 have the power to deduct from the moneys due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or Workers by reason of non-fulfillment of the Conditions of the Contractor for the benefit of workers, non-payment of wages or of deductions made from his or their wages which are not justified by the terms of the Contract or non-observance of the said regulations.
- (x) The Contractor shall indemnify the Owner against any payments to be made under and for the observance of the provisions of the aforesaid Acts without prejudice to his right to obtain indemnity from his sub-contractors. In the event of the contractor committing a default or breach of any of the provisions of the aforesaid Acts as amended from time to time, of furnishing any information or submitting or filling any Form/Register/Slip under the provisions of these Acts which is materially incorrect then on the report of the inspecting Officers the Contractor shall without prejudice to any other liability pay to the owner a sum not exceeding Rs. 50.00 as liquidated damages for every default, breach of furnishing, making submitting, filling materially incorrect statement as may be fixed by the Engineer-in-Charge and in the event of the contractor's default continuing in this respect the liquidated damages may be enhanced to Rs. 50.00 per day of default subject to a maximum of one percent of the estimated cost of the works put to tender. The Engineer-in-Charge shall deduct such amount from bills or security deposit of the Contractor and credit the same to the welfare fund constituted under these acts. The decision of the Engineer-in-Charge in this respect shall be final and binding.

84 Implementation Of Apprentices Act 1961:

The contractor shall comply with the provisions of the Apprentices Act 1961 and the Rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the Engineer-in-Charge may, at his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising of any violation by him of the provisions of the Act.

85 Contractor to Indemnify the Owner:

85.1 The contractor shall indemnify the Owner and every member, Officer and employee of the owner, also the Engineer-in-Charge and his staff against all actions, proceedings, claims, demands costs and expenses whatsoever arising out of or in connection with the matter referred to in clause 81 and elsewhere and all actions, proceedings, claims demands costs and expenses which may be made against the Owner for or in respect of or arising out of any failure by the contractor in the performance of his obligations under the contract. The Owner shall not be liable for or in respect of any demand or compensation payable by law in respect or in consequence of any accident or injury to any workman or other person in the employment of the contractor or his sub-contractor and contractor shall indemnify and keep indemnified the Owner against all such damage and compensation and against all claims, damages, proceedings, costs, charges and expenses whatsoever thereof or in relation thereto.

85.2 Payment of Claims and Damages:

Should the Owner have to pay any money in respect of such claims or demands as aforesaid the amount so paid and the cost incurred by the Owner shall be charged to and paid by the Contractor and the contractor shall not be at liberty to dispute or question the right of the Owner to make such payments notwithstanding the same may have been made without his consent or authority or in law or otherwise to the contrary.

85.3 In every case in which by virtue of the provisions of section 12, sub-section (i) of workmen's compensation Act, 1923 or other applicable provision of Workman Compensation act or any other act, the Owner is obliged to pay compensation to workman employed by the contractor in execution of the works, the Owner will recover from the contractor the amount of the compensation so paid, and without prejudice to the rights of Owner under section 12, sub-section (2) of the said act. Owner shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due to the contractor whether under this contract or otherwise. The Owner shall not be bound to contest any claim made under section 12 sub-section (I) of the said Act except on the written request of the contractor and upon his giving to the Owner full security for all costs for which the Owner might become liable in consequence of contesting such claims.

86. Health and Sanitary Arrangements For Workers:

- 86.1 In respect of all labour directly or indirectly employed in the works for the performance the contractor's part of this agreement, the contractor shall comply with or cause to be complied with all the rules and regulations of the local sanitary and other authorities or as framed by the Owner from time to time for the protection of health and sanitary arrangements for all workers.
- 86.2 The contractor shall provide in the labour colony all amenities such as Electricity, water and other sanitary and health arrangements. The Contractor shall also provide necessary surface transportation to the place of work and back to the colony for their personnel accommodated in the labour colony.

87. Arbitration:

All disputes or differences whatsoever which shall at any time arise between the parties hereto touching or concerning the works or the execution or maintenance thereof of the contract or the rights touching or concerning the works or the execution or maintenance thereof of this contract or the construction meaning operation or effect thereof or to the rights or liabilities of the parties or arising out of or in relation thereto whether during or after completion of the contract or whether before or after determination, fore closure or breach of the contract (other than those in respect of which the decision of any person is by the contract expressed to be final and binding shall after written notice by either party to the contract to the other of them and to the Appointing Authority hereinafter mentioned be referred for adjudication to a sole Arbitrator to be appointed as hereinafter provided.

For the purpose of appointing the sole Arbitrator referred to above, the Appointing Authority will send within thirty days of receipt of the notice, to the contractor a panel of three names of persons.

The contractor shall on receipt of the names as referred selected any one of the person names to be appointed as a sole Arbitrator and communicate his name to the Appointing Authority within thirty days of receipt of the names. The appointing Authority shall there upon without any delay appoint the said person as the sole Arbitrator. If the contractor fails to communicate such selection as provided above within the period specified, the Appointing Authority shall make the selection and appoint the selected person as the sole Arbitrator.

If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacate his office due to any reason whatsoever sole Arbitrators shall be appointed as aforesaid. The work under the contract shall, however continue during the arbitration proceedings.

The Arbitrator shall be deemed to have entered on the reference on the date he issues notices to both the parties fixing the date of the first hearing.

The Arbitrator may, from time to time, with the consent of the parties, enlarge the time for making and publishing the award.

The Arbitrator shall give a separate award in respect of each dispute or difference and shall give a reasoned and speaking award/ awards.

The venue of arbitration shall be at Bhubaneswar. However, if the situation so warrants, it may, as and when required, be held at the place where the site of work is situated.

The fees, if any, of the Arbitrator shall, if required to be paid before the award is made and published be paid half and half by each of the parties. The costs of the reference and of the award including the fees, if any of the Arbitrator shall be in the discretion of the Arbitrator who may direct to and by whom and in what manner, such costs or any part thereof shall be paid may fix or settle the amount of costs to be so paid.

The award of the arbitrator shall be final and binding on both the parties.

Subject to aforesaid, the provisions of the Arbitration Act 1940 or any statutory modification or re-enactment thereof and the rules made thereunder, and for the time being in force shall apply to the arbitration proceeding under this clause.

For Public Sector Enterprises guidelines as per the circular of BPE No. 15/9/86-BPE (FIN) dated 30.03.89 as amended time to time will be followed.

88. Jurisdiction/ Governing Laws:

(a) Jurisdiction:

For all disputes arising of this contract, the jurisdiction shall be lie under the jurisdiction of direct courts in the respective areas in the State of ORISSA (India) only.

(b) Governing Laws:

The contract shall be governed by and constructed according to the laws in force in INDIA.

SECTION – IX SAFETY CODE

89. GENERAL:

Contractor shall adhere to safe construction practice and guard against hazardous and unsafe working conditions and shall comply with Owner's safety rules as set forth herein. Prior to start of construction, contractor will be furnished copies of Owner's 'Safety Code' for information and guidance, if it has been prepared.

90. SAFETY REGULATIONS:

90.1. In respect of all labour, directly or indirectly employed in the work for the performance of contractor's part of this agreement, the contractor shall at his own expense arrange for all the safety provisions as per (i) Safety codes of CPWD & Indian Standards Instructions (ii) The electricity Act, (iii) The Mines Act, and (iv) Regulations. Rules and orders made thereunder and such other acts as applicable.

90.2. The contractor shall observe and abide by all fire and safety regulations of the Owner. Before starting construction work, contractor shall consult Owner's Safety Engineer or Engineer-in-Charge and must make good to the satisfaction of the Owner any loss or damage due to fire to any portion of the work done under this contract or to any of the Owner's existing property.

91. First Aid and Industrial Injuries:

(i) Contractor shall maintain first aid facilities for his employees and those of his subcontractors.

(ii) Contractors shall make outside arrangements for ambulance service and for treatment of industrial injuries. Name of those providing these services shall be furnished to Owner prior to start of constructions and their telephone numbers shall be prominently posted in Contractor's field office.

(iii) All critical industrial injuries shall be reported promptly to owner, and a copy of Contractor's report covering each personal injury requiring the attention of a physical shall be furnished to the Owner.

92. General Rules:

Smoking within the Battery Areas, rank farm, or dock limits is strictly prohibited. Violators of the "No Smoking" rules shall be discharged immediately.

93. Contractor's Barricades:

(i) Contractor shall erect and maintain barricades required in connection with his operation to guard or protect.

- (a) Excavations.
 - (b) Hosting Areas.
 - (c) Areas adjudged hazardous by Contractor's or Owner's Inspectors.
 - (d) Owner's existing property subject to damage by Contractor's operation.
 - (e) Rail road unloading spots.
- (ii) Contractor's employees and those of his sub-contractors shall become acquainted with Owner's barricading practice and shall respect the provisions thereof.
 - (iii) Barricades and hazardous areas adjacent to but not located in normal routes of travel shall be marked by red flasher lanterns at nights.

94. Scaffolding:

- (i) Suitable scaffoldings should be provided for workmen for all works that cannot safely be done from the ground or from solid construction except such short period works as can be done safely from ladders. When a ladder is used a Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical).
- (ii) Scaffolding or staging more than 4 metres above the ground or floor swing on suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise retarded at least one metre high above the floor or platform of such scaffolding or staging and extending along with entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- (iii) Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform of gangway or the stairway is more than 4 metres above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (ii) above.
- (iv) Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 metre.
- (v) Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 metres in length. The width between the side rails in run ladder shall in no case be less than 30 cm. For ladder up to and including 3 metres in length; for longer ladders this width should be

increase at least 15 mm for each additional metre of length. Uniform step spacing shall not exceed 30 cms. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or public. The contractor shall also provide all necessary fencing and lights to protect the workers and staff from accidents, and shall be bound to bear the expenses of defence of every suit, action or other proceedings of law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit or action or proceedings to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.

95. Excavation and Trenching:

All trenches 1.2 metres or more in depth, shall at all times be supplied with at least one ladder for each 50 M length or fraction thereof.

Ladder shall be extended from bottom of the trench to at least 1 metre above the surface of the ground. The sides of the trenches which are 1.5 metres in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5 metres of the edge of the trench or half of the trench width whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or under-cutting shall be done.

96. General Safety:

- (i) Before any demolition work is commenced and also during the process of the demolition work.
 - (a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.
 - (b) No electric cable or apparatus which is liable to be a source of danger shall remain electrically charged.
 - (c) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.
- (ii) All necessary personal safety equipment as considered adequate by the Engineer-in-Charge, should be kept available for the use of the persons employed at the site and maintained condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by persons concerned as outlined below:

- (a) Workers employed on mixing asphalt materials, cement and lime mortars shall be provided with protective footwear and protective gloves.
- (b) Those engaged in white washing and mixing or stacking of cements bags or any materials which are injurious to the eyes shall be provided with protective goggles.
- (c) Those engaged in welding and cutting works, shall be provided with protective face and eye –shields, hand gloves etc.
- (d) Stonebreakers shall be provided with protective goggle and protective clothing and seated at sufficiently safe intervals.
- (e) When workers are employed in sewers and manholes which are in use, the contractor shall ensure that the manhole cover are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or board to prevent accident to the public.
- (f) The contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken:
 - (1) No paint containing lead or lead products shall be used except in the form paste or readymade paint.
 - (2) Suitable facemasks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
 - (3) Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash them on cessation of work.
- (iii) When the work is done near any place where there is a risk of drowning all necessary safety equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- (iv) Use of hoisting machines and tackles including their attachments anchorage and supports shall conform to the following standard or conditions:
 - (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good working order.
 - (b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.

- (c) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding which or give signals to the operator.
- (d) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be marked with the safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
- (e) In case of department machines, the safe working load shall be notified by the Engineer-in-Charge. As regards contractor's machines, the contractor shall notify the safe working load of the machine to the Engineer-in-Charge, whenever he brings any machinery to site of work and get it verified by the Engineer-in-Charge.
- (v) Motors, gears, transmission lines, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe-guards. Hoisting appliances should be provided with such means as to reduce to the minimum the accidental descent of the load, adequate precaution should be taken to reduce to the minimum the risk of any part or parts of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats, wearing apparel such as gloves sleeves and boots as may be necessary should be provided. The workers shall not wear any rings, watches and carry keys or other materials, which are good conductors or electricity.
- (vi) All scaffolding, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions and no scaffoldings, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of works.
- (vii) These safety provisions should be brought to the notice of all concerned by displaying on a notice board at a prominent place at the work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.
- (viii) The ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the contractor shall be open to inspection by the welfare officer Engineer-in-Charge or safety Engineer of the Administration or their representatives.
- (ix) Notwithstanding the above clauses there is nothing in these to exempt the contractor from the operations of any other Act or rules in force in the Republic of India. The works throughout, including any temporary works, shall be carried out in such a manner as not to interfere in any way whatsoever with the traffic on any roads or footpaths at the site or in vicinity thereto or any existing works whether the property of the Administrations or of a third party.

97. Care in handling Inflammable gas:

The Contractor has to ensure all precautionary measures and exercise utmost care in handling the inflammable gas cylinder/ inflammable liquids/ paints etc. as required under the law and/ or as advised by the fire authorities of the Owner.

98. Temporary Combustible Structures:

Temporary combustible structures will not be built near or around work site.

99. Precautions Against Fire:

The Contractor will have to provide Fire Extinguisher/ Fire Buckets and drums at work site as recommended by Engineer-in-Charge. They will have to ensure all precautionary measures and exercise utmost care in handling the inflammable gas cylinders/ inflammable liquid/ paints etc. as advised by Engineer-in-Charge. Temporary combustible structures will not be build near or around the work-site.

100. Explosives:

Explosives shall not be stored or used on the works or on the site by the contractor without the permission of the Engineer-in-Charge in writing and then only in the manner and to the extent to which such permission is given. When explosives are required for the works they shall be stored in a special magazine to be provided at the cost of the contractor in accordance with the Explosive Rules. The contractor shall obtain the necessary licence for the storage and the use of explosives and all operations in which or for which explosives are employed shall be at sole risk and responsibility of the contractor and the contractor shall indemnify the owner against any loss or damage resulting directly or indirectly therefrom.

101. Mines Act:

101.1 Safety Code: The contractor shall at his own expense arrange for the safety provisions as required by the Engineer-in-Charge in respect of all labour directly employed for performance of the works and shall provide all facilities in connection therewith. In case the Contractor fails to make arrangements and provides necessary facilities as aforesaid. The Engineer-in-Charge shall be entitled to do so and recover the costs thereof from the Contractor.

101.2 Failure to comply with Safety code or the provisions relating to report on accidents and to grant of maternity benefits to female worker shall make the Contractor liable to pay Company liquidated damages an amount not exceeding Rs. 50/- for each default or materially incorrect statement. The decision of the Engineer-in-Charge in such matters based on reports from the Inspecting Officer or from representatives of Engineer-in-Charge shall be final and binding and deductions for recovery of such liquidated damages may be made from any amount payable to the Contractor from all the provisions of the Mines Act 1952 or any statutory modification's or re-enactment thereof the time being in force and any Rules and Regulations made thereunder in respect of all the

persons employed by him under this contractor and shall indemnify the Owner from and against any claim under the Mines Act or the rules and regulations framed thereunder by or on behalf of and persons employed by him or otherwise.

102. Preservation of Peace:

The Contractor shall taken requisite precautions and use his best endeavors to prevent any riotous or unlawful behaviour by or amongst his workmen and other employed on the works and for the preservation of peace and protection of the inhabitants and Security of property in the neighborhood of the work. In the event of the Owner requiring the maintenance of a special Police force at or in the vicinity of the site during the tenure of works, the expenses thereof shall be borne by the Contractor and if paid by the Owner shall be recoverable from the Contractor.

103. Outbreak of Infectious Diseases:

The Contractor shall remove from his camp such labour and their families as refuse protective inoculation and vaccination when called upon to do so by the Engineer-in-Charge's Representative. Should Cholera, Plague or other infectious diseases break out the Contractor shall burn the huts, bedding clothes and other belonging of or used by the infected parties and promptly erect new huts on healthy sites as required by the Engineer-in-Charge failing which within the time specified in the Engineer's requisition, the work may be done by the Owner and the cost thereof recovered from the Contractor.

104. Treatment of Contractor's Staff in Company's Hospital:

The Contractor and his staff, other than labourers and their families requiring medical aid from the Owner's hospitals and dispensaries will be treated as private patients and charged accordingly. The contractor's labourers and their families will be granted from treatment in the Owner's hospitals and dispensaries where no other hospitals or dispensaries are available provided the contractor pays the cost of medicines dressing and money accordingly to the normal scale as also additional charges if any for special examination e.g. X- Ray etc.

105. Use of Intoxicants:

The sale of dent spirits or other intoxicating beverages upon the work in any of the buildings, encampments or tenements owned, occupied by or within the control of Contractor or any of his employee is forbidden and the contractor shall exercise his influence and authority to the utmost extent to secure strict compliance with this condition.

In addition to the above, the contractor shall abide by the safety code provision as per CPWD safety code and Indian Standard Code framed from time to time.

PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

(To be executed on non-judicial stamped paper of appropriate value)

B. G. No. _____

Date: _____

1. WHEREAS M/s National Aluminium Company Limited (A Government of India Enterprise), having its Corporate Office at NALCO BHAWAN, P-1 Nayapalli, Bhubaneswar (hereinafter called "The Company Owner" which expression shall unless repugnant to the subject or context includes its legal representatives, successors and assigns) has issued tender paper vide its Tender No.for
..... (hereinafter called "the said tender") to M/s.(hereinafter called the said Tenderer(s)" which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns and as per terms and conditions of the said tender, the tenderer shall submit a Bank guarantee for Rs.(Rupeesonly) towards earnest money in lieu of cash.
2. WEBank having its branch office atdo hereby undertake to pay the amount due and payable under this guarantee without any demur, merely on a demand from the Company stating that in the opinion of the company which is final and binding, the amount claimed is due because of any withdrawal of the tender or any material alteration to the tender after the opening of the tender by way of any loss or damage caused to or would be caused or suffered by the Company by reason of any breach by the said tenderer(s) of any of the terms and conditions contained in the said tender or failure to accept the letter of Intent Agreement or that the amount covered under this Guarantee is forfeited. Any such demand made on the Bank by the owner shall be conclusive as regards the amount due and payable by the Bank under this guarantee, However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.....(Rupees.....only).
3. We undertake to pay to the Company any money so demanded notwithstanding any dispute or disputes raised by the tenderer (s) in any suit or proceeding pending before any office, court or tribunal relating thereto our liability under this present guarantee being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder. Our liability to pay is not dependent or conditional on the owner proceeding against the tenderer.
4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said tenderer(s) but shall in all respect and for all purposes be binding and operative until payment of all money due or liabilities under the said contract(s)/ Order(s) are fulfilled.
5. WEBank Ltd. further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the finalisation of the said tender and that it shall continue to be enforceable till the said tender is

finally decided and order placed on the successful tenderer(s) and or till all the dues of the company under or by virtue of the said tender have been fully paid and its claims satisfied or discharged or till a duly authorised officer of the company certifies that the terms and conditions of the said tender have been fully and properly carried out by the said tenderer (s) and accordingly discharges the guarantee.

6. That the Owner Company will have full liberty without reference to us and without affecting this guarantee to postpone for any time or from time to time. The exercise of any of the power of the owner under the tender.
7. Notwithstanding anything contained herein before, our liability shall not exceed Rs.....(Rupees.....only) and shall remain in force till.....Unless a demand or claim under this Guarantee is made on us within three months from the date of expiry we shall be discharged from all the liabilities under this guarantee.
8. We.....Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time on the request of Tenderer (s).

Date.....
Corporate Seal of the Bank

.....Bank
By its constitutional Attorney

Signature of duly
Authorised person
On behalf of the Bank
With seal & signature code

Note: BGs to be furnished from any of the banks listed earlier.

BANK GUARANTEE FOR SECURITY DEPOSIT

(To be executed on non-judicial stamped paper of appropriate value)

B. G. No. _____

Date: _____

1. In consideration of National Aluminium Company Limited (A Government of India Enterprise), having its office at _____ (hereinafter called “ The Company Owner” which expression shall unless repugnant to the subject or context includes its legal representatives, successors and assigns) having agreed to exempt M/s. (Hereinafter called “the said Contractor (s)/ Seller(s)” which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) from the demand under the terms and conditions of Contract(s)/ Order(s) No. dt. of cash security deposit for the due fulfillment by the said contractor(s) seller(s) of the terms and conditions contained in the said Contract(s)/Order(s), on production of Bank Guarantee for Rs. (Rupees.....only).
2. We Bank having its branch office at do hereby agree and undertake to pay the amount due and payable under this guarantee without any demur, merely on a demand from the Company stating that in the opinion of the company which is final and binding, the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of any breach by the said Contractor(s)/seller(s) of any of the terms and conditions contained in the said contract(s) or ders(s) or by reasons of the said Contractor(s)/ Seller(s) failure to perform the said Contract(s)/ Order(s) including defect liability obligations or that the amount covered under this guarantee is forfeited. Any such demand made on the Bank by the owner shall be conclusive as regards the amount due and payable by the Bank under this guarantee, However, our liability under this guarantee shall be restricted to an amount not exceeding Rs..... (Rupees.....only).
3. We undertake to pay to the Company any money so demanded notwithstanding any dispute or disputes raised by the contractor (s)/ Seller(s) in any suit or proceeding pending before any office, court or tribunal relating thereto our liability under present guarantee being absolute and unequivocal. The payment so made by us under this bond shall be valid discharge of our liability for payment there under. Our liability to pay is not dependent or conditional on the owner proceeding against the Contractor(s)/ Seller(s).
4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said Contractor(s)/ Seller(s) but shall in all respect and for all purposes be binding and operative until payment of all money due or liabilities under the said contract(s)/ Order(s) are fulfilled.
5. We Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract(s)/ Order(s) and that it shall continue to be enforceable till all the dues of the company under or by virtue of the said Contract(s)/Order(s) have been fully paid and its claims satisfied or discharged or till a duly Authorised officer of the company certifies that the terms and conditions of the said Contract(s)/Order(s) have been fully

and properly carried out by the said contractor(s) and accordingly discharges the guarantee.

6. WeBank further agree with the Company that the company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract(s)/ Order(s) or to extend the time of performance by the said Contractor(s) Seller(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Company against the said Contractor(s)/ Seller(s) and to forbear or enforce any of the terms and conditions relating to the said Contract(s)/ Order(s) and we shall not be relieved from our liability by reason of any such variations, or extension being granted to the said Contractor (s)/ Seller(s) or for any forbearance, act or omissions on the part of the Company or any indulgence by the Company to the said Contractor(s)/ Seller(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have affect of so relieving us.
7. Notwithstanding anything contained herein before, our liability shall not exceed Rs.....(Rupees.....only) and shall remain in force till.....Unless a demand or claim under this Guarantee is made on us within three months from the date of expiry we shall be discharged form all the liabilities under this guarantee.
8. We.....Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time at the request of Contractor(s)/ Sellers(s).

Date.....

.....Bank

Corporate Seal of the Bank

By its constitutional Attorney

Signature of duly
Authorised person
On behalf of the Bank
With seal & signature code

BGs to be furnished from any of the banks listed as per Annexure.

**PROFORMA FOR CONTRACT CUM PERFORMANCE GUARANTEE BY SELLER/
CONTRACTOR.**

(To be executed on non-judicial stamped paper of appropriate value)

B. G. No.....

Date.....

1. WHEREAS National Aluminium Company Limited (A Government of India Enterprise) having its office at(hereinafter referred to as “The Company/Owner” which expressions shall unless repugnant to the subject or context includes its legal representatives, successors and assigns) has entered into a contract with M/s. / has placed a purchase order on M/s.....(hereinafter referred to as “Contractor(s)/ Seller(s)” which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) foron the terms and conditions as set out inter alia, in the Company’s contract No./ P.O. No.dateand various documents forming part thereof hereinafter referred to as the “said contract” which expression include all amendments, modifications and/ or variations thereto and where as the Contractor(s)/ Seller(s) has agreed for due execution of the entire contract and guarantees its performance including any parts executed through any other agencies/ subcontractors.

AND WHEREAS one of the conditions of the “said contract” is that “contractor(s)/seller(s) shall furnish to the owner a Bank Guarantee from a bank for% (.....percent) of the total value of the “said contract” against due and faithful performance of the “said contract” including defect liability obligations” and the performance guarantee obligations of the contractor(s)/seller(s) for execution/ supplies made under the “said contract.”

2. WeBank having its branch office atdo hereby agree and undertake to pay the amount due and payable under this guarantee without any demur merely on a demand from the Company stating that in the opinion of the Company, which is final & binding, the amount claimed is due by reason of default made by the Contractor(s)/ Seller(s) in performing any of the terms & conditions of the said Contract including defect liability obligations, in fulfilling the performance guarantee obligation or loss or damage caused to or would be caused to or suffered by the Company by reason of any breach by the said Contractor (s)/ Seller(s) of any of the terms & conditions of the contract. Any such demand made on the Bank by the owner shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However our liability under this guarantee shall be restricted to Rs.(Rupees.....only).
3. We undertake to pay to the Company any money so demanded notwithstanding any dispute or disputes raised by the contractor(s)/ Seller(s) in any suit or proceeding pending before any office, court or tribunal relating thereto our liability under this present guarantee being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under. Our liability to pay is not dependent or conditional on the owner proceeding against the Contractor(s)/ Seller(s).

4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said Contractor(s)/ Seller(s) but shall in all respect and for all purposes be binding and operative until payment of all money due or liabilities under the said contract(s)/ Order(s) are fulfilled.
5. WeBank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract(s)/ Order(s) and that it shall continue to be enforceable till all the dues of the company under or by virtue of the said Contract(s)/Order(s) have been fully paid and its claims satisfied or discharged or till a duly authorised officer of the Company certifies that the terms and conditions of the said Contract(s)/Order(s) have been fully and properly carried out by the said contractor(s) and accordingly discharges the guarantee.
6. WeBank further agree with the Company that the company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract(s)/ Order(s) or to extend the time of performance by the said Contractor(s) Seller(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Company against the said Contractor(s)/ Seller(s) and to forbear or enforce any of the terms and conditions relating to the said Contract(s)/ Order(s) and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor (s)/ Seller(s) or for any forbearance, act or omission on the part of the Company or any indulgence by the Company to the said Contractor(s)/ Seller(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have affect of so relieving us.
7. Notwithstanding anything contained herein before, our liability shall not exceed Rs.....(Rupees.....only) and shall remain in force till.....Unless a demand or claim under this Guarantee is made on us within three months from the date of expiry we shall be discharged form all the liabilities under this guarantee.
8. We.....Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time at the request of Contractor(s)/ Sellers(s).

Date.....

Corporate Seal of the Bank

.....Bank

By its constitutional Attorney

Signature of duly

Authorised person

On behalf of the Bank

With seal & signature code

BGs to be furnished from any of the banks listed as per Annexure.

BANK GUARANTEE FOR ADVANCE PAYMENT

(To be executed on non-judicial stamped paper of appropriate value)

B. G. No. _____

Date: _____

1. In consideration of National Aluminium Company Limited (A Government of India Enterprise), having its office at _____(hereinafter called “ The Company Owner” which expression shall unless repugnant to the subject or context includes its legal representatives, successors and assigns) having agreed to make an advance payment of Rs.....(Rupees.....only) to M/s. (hereinafter called “the said Contractor (s)/ Seller(s)” which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) from the demand, terms and conditions of Contract/Order dated.on production of a bank guarantee of equivalent amount.
2. WeBank having its branch office atdo hereby agree and undertake to pay the amount due and payable under this guarantee without any demur, merely on a demand from the Company stating that in the opinion of the Company which is final and binding, the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of non-payment / adjustment of any part of the said advance or any dues to the company or any breach by the said Contractor(s)/seller(s) of any of the terms and conditions contained in the said contract(s) orders(s) or by reasons of the Contractor(s)/ Seller(s) failure to perform the said Contract(s)/ Order(s). Any such demand made on the Bank by the owner shall be conclusive as regards the amount due and payable by the Bank under this guarantee, However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.....(Rupees.....only).
3. We undertake to pay to the Company any money so demanded notwithstanding any claim dispute or disputes raised by the contractor (s)/ Seller(s) in any suit or proceeding pending before any office, court or tribunal relating thereto our liability under this present guarantee being absolute and unequivocal. The payment so made by us under this bond shall be valid discharge of our liability for payment thereunder. Our liability to pay is not dependable or conditional on the owner proceeding against the Contractor(s)/ Seller(s).
4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said tenderer(s) but shall in all respect and for all purposes be binding and operative until payment of all money due or liabilities under the said tenderer(s) are fulfilled.
5. WeBank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the finalisation of the said tenderer(s) and that it shall continue to be enforceable till the said tender is finally decided and order placed on the successful tender and/or till all the dues of the company under or by virtue of the said tender have been fully paid and its claims satisfied or discharged or till a duly authorised officer of the Company certifies that the terms and conditions of the said Contractor(s)/ Order(s) have been fully and properly carried out by the said tenderer(s) and accordingly discharges the guarantee.

6. That the owner/Company will have fully liberty without reference to us and without affecting this guarantee to postpone for any time or from time to time the exercise of any of the power of the owner under the tender.
7. Notwithstanding anything contained herein before, our liability shall not exceed Rs.....(Rupees.....only) and shall remain in force till.....Unless a demand or claim under this Guarantee is made on us within three months from the date of expiry we shall be discharged form all the liabilities under this guarantee.
8. We.....Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time on the request of the Contractor(s)/ Seller(s).

Date.....

.....Bank

Corporate Seal of the Bank

By its constitutional Attorney

Signature of duly
Authorised person
On behalf of the Bank
With seal & signature code

- i) BGs to be furnished from any of the banks listed as per Annexure.
- ii) Address of Corporate Office should be referred in case of Foreign BG.

LIST OF STANDARDISED BANKS

SCHEDULED PUBLIC SECTOR BANKS (INDIAN)

1. State Bank of India.
2. State Bank of Bikaner and Jaipur
3. State Bank of Hyderabad
4. State Bank of Indore.
5. State Bank of Mysore.
6. State Bank of Patialia.
7. State Bank of Saurashtra
8. State Bank of Travancore.
9. Allahabad Bank
10. Andhra Bank
11. Bank of Baroda.
12. Bank of India
13. Bank of Maharashtra
14. Canara Bank
15. Central Bank of India
16. Corporation Bank
17. Dena Bank
18. Indian Bank
19. Indian Oversea Bank
20. Oriental Bank of Commerce
21. Punjab National Bank
22. Punjab and Sid Bank
23. Syndicate Bank
24. Union Bank of India
25. *United Bank of India (Deleted)*
26. UCO Bank
27. Vijaya Bank.

LIST OF STANDARDIED BANKS

SCHEDULED PRIVATE SECTOR BANKS (INDIAN)

1. Vyasa Bank
 2. UTI Bank Ltd.
 3. SBI Commercial & International Bank Ltd.
 4. ICICI Banking Corporation Bank Ltd.
 5. HDFC Bank Ltd.
 6. IDBI Bank Ltd.
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SCHEDULED FOREIGN BANKS

1. American Express Bank Ltd.
 2. ANZ Grindlays Bank Plc
 3. Bank of American NT & SA
 4. Bank of Tokyo Ltd.
 5. Banque Nationale de Paris
 6. Barclays Bank Plc
 7. Citi Bank N.A.
 8. Deutsche Bank A.G.
 9. Hongkong & Shanghai Banking Corporation.
 10. Standard Chartered Bank
 11. The Chase Manhattan Bank Ltd.
 12. Dresdner Bank AG.
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**DETAILS OF WORKS OF SIMILAR NATURE & MAGNITUDE CARRIED OT
DURING THE LAST 5 YEARS**

Sl. No.	Name of work done	Estimated cost	When started	When completed	Date of Completion As per contract.	Remarks
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-
- Note :** 1. In the remarks column, please state whether the works stated above are carried out by you in the name of the Firm in which the present Bid is submitted or any other names, if later, state relationship of the firm and also a copy of the Partnership Deed.
2. Please enclose the true copy of the certificate issued by the authorities, if any.

Signature of Bidder

Name of Work:

Name of Tenderer:

CONCURRENT COMMITMENTS OF THE TENDERER

Full Postal Address of Client & Name of Officer-in-Charge	Description of the work	Value of contract	Date of commencement of work	Scheduled Completion period	Percentage Completion as on date	Expected date of completion	Remarks if any

SIGNATURE OF BIDDER

NAME OF WORK:

NAME OF TENDERER:

DETAILS OF EQUIPMENT, TOOLS & TACKLES

Tenderer shall submit herein details of equipment, tools, tackles, etc required to perform the work and shall note in each case whether the same is (a) already owned by tenderer and available for use on this contract (b) anticipated to be hired by Contractor or (c) anticipated to be purchased by Contractor, in case of (a) anticipated (b) and (c) Location of hirer or supplier shall be stated.

Sl. No.	Description, Make & Capacity	Year of Manufacture	Category (a) or (b) or (c) below	Location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)

1. Contractor agrees to augment the above chart with additional number/ categories of equipment, if required to complete the work within the agreed time schedule of completion and directed by the Engineer-in-charge.
2. In case of hiring of equipment from other agencies, copies of the arrangements made with the hirer/ supplier shall have to be furnished.

(Signature of Bidder)

**DETAILS OF MINIMUM MANPOWER PROPOSED TO BE
DEPLOYED ON THIS WORK**

Sl. No.	Details of Manpower	No.	Remarks
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Note : Please furnish the above details in two categories – To be deployed by (I) Contractor and (ii) Sub- contractors.

Minimum manpower deployment shall be based broadly as above and will be modified as mutually agreed to suit the detailed construction programme jointly worked out; further if any additional man power is required for completion of work in time, the same shall be provided by you as directed by Engineer without any extra cost.

The manpower proposed to be deployed in the work needs to be given quarter wise separately for direct personnel of the contractor and the manpower proposed to be deployed through the sub-contractors.

(Signature of Bidder)

**ORGANISATION CHART SHOWING NO. OF QUALIFIED
ENGINEERS & SUPERVISORY PERSONNEL ETC.**

Sl. No.	Details of personnel to be deployed on this work	No.
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Note: Names and short resume of their experiences may also be given for key personnel.

The tentative chart of your site organisation as above furnished by you shall be subject to variation to suit the construction programme/ requirement and as directed by Owner/ Engineer.

(Signature of Bidder)

LIST OF PROPOSED SUB CONTRACTORS

Sl. No.	Name of sub-contractor	Description of work or trade	Amount (Rs.)
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-
- 1) Types of work executed by the sub-contractors.
 - 2) The particulars of clients where the sub-contractors did the works.
 - 3) Approximate value of the work carried by the sub-contractors in the last 3 years.

(Signature of Bidder)

PPROGRESS BILLINGS

(Bidder's anticipated progress billing month by month to be inserted here)

Tentative construction schedule indicating the expected dates of start of activity is to be given by the contractor. This schedule shall be updated within specified milestones from time to time depending upon the availability of fronts equipment and priorities fixed by Engineer. Contractor shall submit within 15 days of the date of letter of intent programme/ schedule for supply of items covering all phases of work including design, procurement, manufacture, assembly, fabrication, testing, transportation, erection, testing at site and commissioning matching the overall completion schedule.

The billing as well as all the connected documents shall be computerized.

(Signature of Bidder)

NAME OF WORK

NAME OF TENDERER :

INFORMATION ABOUT TENDERERS (FORM – H)

- 1.0. In case of Individual:
 - 1.1. Name of Business:
 - 1.2. Whether his business is registered:
 - 1.3. Date of Commencement of Business:
 - 1.4. Whether he pays Income Tax over Rs. 10,000/- per year:
- 2.0. In case of Partnership:
 - 2.1. Name of Partnership with qualification:
 - 2.2. Whether the Partnership is Registered:
 - 2.3. Date of Establishment of firm:
 - 2.4. If each of the partners of the firm pays Income Tax over Rs. 10,000/- a year and if not, who of them pays the same.
- 3.0. In case of Limited Liability Company or Company Limited by Guarantees:
 - 3.1. Amount of paid of capital:
 - 3.2. Name of Directors:
 - 3.3. Date of Registration of Company:
 - 3.4. Copies of the Balance Sheet of the Company of the last two years:

Copies of audited Profit & Loss Account and the Balance sheet shall be enclosed in case of Individuals, partnerships as well as limited companies for the last 3 years.

(Signature of Bidder)
Name & Address of the Bidder

NAME OF WORK:

NAME OF TENDERER:

LIST OF ENCLOSURES (FORM– I)

The tenderer is required to enclose the following documents as part of his tenderer.

1. Power of attorney of the signatory to the tender.
2. Income Tax/ Sales Tax Clearance Certificate in the proforma prescribed by the Govt. of India.
3. Documents showing annual turnover for similar works for the past two years such as annual report, profit and loss account etc.
4. Solvency Certificate by Nationalized Schedule Bank.

(Signature of Bidder)

** In absence of Income Tax Clearance Certificate tenderer may not be awarded the work tendered for as per Central Govt. Directives.

NAME OF WORK:

NAME OF TENDERER:

EXCEPTION AND DEVIATION (FORM – J)

As pointed out in the NIT/ LIT, tenderer may stipulate here exceptions and deviations to the tender conditions, if considered un-avoidable.

Sl. No.	Page No. of tenderer document	Sl. No. of tender document	Subject	Deviation
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(Signature of Bidder)

AMENDMENT TO GCC

Sl No.	Clause No	Brief Description of Clause	Modification
01	2.3 2.3.10	Power Supply	<p>i) Clause No. 2.3 of General Condition of Contract stands modified to the following extend:</p> <p>The cost of construction power appearing in the 10th and 11th line as Rs 1/- per kwh shall be read as Rs.4.30 (Rupees four and thirty paise only) per kwh</p> <p>The state Electricity Inspector appearing in the second line shall be read as 'Central Electricity Authority at Chennai'.</p>
02	2.4	Land for Contractor's Field office, Godown and Workshop	<p>Clause No. 2.4 of General Condition of Contract modified to the following extend:</p> <p>"The owner shall provide land to the Contractor for their offices, godown and workshop "</p>
03	2.5	Land for Residential Accommodation	<p>Clause No. 2.5 of General Condition of Contract modified to the following extend:</p> <p>"The land for residential accommodation for staff and labour may be made available to Contractor outside plant boundary limit."</p>
04	22	Extension of time	The word "any one" appearing in the end of the second para of Clause No. 22.0 shall be read as "OWNER".
05	52.3.6	Return of unutilised materials and scrap/wastage.	<p>i) The words "SAIL, Bhubaneswar stock yard rate" appearing in 3rd line of first para shall be replaced by "Landed cost".</p> <p>ii) The words " Rs.7000/- per tonne" Appearing in last para shall be replaced by " twice the landed cost of materials".</p>
06	53 (xv)	Conditions for issue of materials	<p>The contents of the sub-clause No.53.(xv) shall stand deleted and replaced with the following:</p> <p>"For the free issue materials, the following norms shall be adopted:</p> <p>i. For issue of materials within plant boundary wall limit, the Contractor shall submit only indemnity bond for the entire value of the materials issued to them free of cost as Clause 53 (ix) of GCC.</p> <p>ii. For the materials which are issued to out side plant boundary like township etc., the Contractor shall furnish Bank Guarantee equivalent to 20 % of value of materials and indemnity bond for the 80</p>

Sl No.	Clause No	Brief Description of Clause	Modification
			<p>% value of the materials.</p> <p>iii. For materials taken out side Damanjodi/ Angul to the vendor's Shop, 100 % Bank Guarantee against value of the materials will be submitted by the vendor before taking of the materials. The Indemnity Bond and the Bank Guarantee shall remain valid till the material account is totally settled.</p>
07	60 (c)	Alterations in Specifications and Design and Extra Works	The words "including equipment hire charges at Schedule hourly/ daily rates" appearing in 7 th line shall be replaced by the words " prevalent at site the time of execution".
08	60(d)	Alterations in Specifications and Design and Extra Works	<p>Add new sub-Clause 60 (d) as follows:</p> <p>"The quoted prices/rates indicated in Schedule of Rates shall remain firm for all variations in contract value within range of (+) 50 % and (-) 25 % for the entire duration of the contract. In case the actual contract value varies from the awarded contract value beyond the above mentioned limit than adjustment to contract value shall be made in accordance with procedure specified in proforma for adjustment for increase/ decrease in contract value enclosed as per Annexure to SCC."</p>
09	76.3 (ii)	Completion documents	<p>Clause No. 76(ii) of General Condition of Contract shall be replaced by:</p> <p>"Six sets of construction drawings showing there in execution of the work duly approved by Engineer-in-charge and one set of reproducible on polyester film."</p>
10	80.1	Employees State Insurance Act	Delete the word "whose aggregate remuneration is Rs.560.00 per month or less and" appearing in the 3 rd & 4 th line of the 2 nd para of this sub clause.
11	New Sub clause	-	<p>Add a new clause designated as Sub clause 80.6 after existing Cl no. 80.5,</p> <p>"80.6 – The contractor shall comply with all relevant and applicable statutory provisions in respect of the workers engaged by him at his cost and above stipulation are only indicative are not exhaustive."</p>

Sl No.	Clause No	Brief Description of Clause	Modification
12	83 (viii)	Labour Laws	<p>Clause 83 (viii) of GCC shall be modified to the following extent:</p> <p>Add the words “<i>all relevant statutes at their own costs including</i>” between the words “<i>provisions of</i>” and “<i>the payment of Wages Act 1936</i>” appearing in the first line of this sub-clause.</p> <p>Provided further that-</p> <p>a) The payment of minimum wages to contract labour shall be as per the rates notified by the Central Govt. as per Minimum Wage Act, 1948 and as adopted by the NALCO Management from time to time including any additional element and statutory dues there on</p> <p>b) The minimum wage as notified by the Chief Labour Commissioner (Central) has a variable component as Special Allowance which is linked to average AICPI for Industrial workers, which keeps on changing every six months. The contractor has to absorb all such variations due to increase in Minimum wage in their quoted price, and no claim whatsoever on this account shall be entertained.</p> <p>c) Where the minimum wages notified by the concerned State Government are higher than the rates notified by Central Government, the State Government rates should apply in concerned <i>scheduled employment</i> as long as the same remains higher than the Central Government rates</p> <p>d) The classification of workers in different categories will be as per the notification issued by the Central Government fixing the minimum wages for the above scheduled appointment.</p>
13	New Clause	Jurisdiction/ Governing Law	<p>Add a new clause designated as Sub clause 88 (c) after existing Cl no. 88 (b)</p> <p>All the works that will be carried out inside the factory premises shall attract the provisions of factory act for the contract labourers engaged therein.</p>

Sl No.	Clause No	Brief Description of Clause	Modification
			<p>The Contractor, before commencement of work will arrange medical examination at his cost and shall submit the certificate of fitness in respect of the workers in the prescribed form from the nearby District HQ hospital or any Govt. Hospital for his workers, who will be handling or working with hazardous substance.</p> <p>In respect of contracts having more than one year, the medical check up of such workers shall have to be repeated by the contractor on completion of every one year.</p>
14	79	Taxes & Duties	<p>The rates quoted by the tenderer will cover all the taxes, duties, and levies as applicable on the date of bid/ revised bid (if any).</p> <p>-In case of any imposition of <u>new taxes</u> by Govt notification at a later date, same shall be reimbursed to the contractor against submission of authentic document towards payment of such taxes by them.</p> <p>-In case of revision of rate of Works Contract Tax by Govt notification, same shall be reimbursed to the contractor against submission of documentary evidence towards payment of such extra amount by them.</p>
15	74	Payment of Contractor's Bill	<p>Insert the following after the last para:</p> <p>“However, owner prefers to release the payment due to the contractor electronically. The e-payment facility is available under INTERNET mode through company banker as well as in NEFT/RTGS mode through designated enabled branches. The contractor shall submit duly filled Bank Mandate form in duplicate with due authentication from their banker to avail e-payment facility. The payment of Rs. 1 lakh and above shall be made only through e-mode. The prescribed mandate form is appended as Appendix to GCC. The bid documents submitted without bank mandate is liable for rejection”</p>

(To be submitted in duplicate)

MANDATE FORM FOR ELECTRONIC PAYMENT THROUGH INTERNET & RBI

To
National Aluminium Company Limited,

Dear Sir,

Sub: Authorization for release of payment due from NALCO, _____ through
Electronic fund transfer(RBI-EFT)/Internet / RTGS.
Refer Order No.....dt.....and/or Tender/Enquiry/Letter No.....dt.....

(Please fill in the information in CAPITAL LETTERS. Please TICK wherever it is applicable)

1. Name of the Party :
2. Address of the party :
.....
.....
City :.....Pin Code:.....
E-mail Id:
Permanent Account Number :.....

3. Particulars of Bank:

Bank Name		Branch Name	
Branch Place		Branch City	
Pin Code		Branch Code	
MICR No			
(9 Digits code number appearing on the MICR Band of the cheque supplied by the Bank. Please attach Xerox copy of a cheque of your bank for ensuring accuracy of the bank name, branch name and code number)			
Account Type	Savings ف	Current ف	Cash Credit ف
Account Number(as appearing in the Cheque Book)			
RTGS / IFSC Code			

4. Date from which the mandate should be effective :

I hereby declare that the particulars given above are correct and complete. If any transaction is delayed or not effected for reasons of incomplete or incorrect information, I shall not hold National Aluminium Company Limited responsible. I also undertake to advise any change in the particulars of my account to facilitate updation of records for purpose of credit of amount through RBI EFT / Internet / RTGS.

Place:

Date:

Signature of the party/Authorized Signatory

Certified that particulars furnished above are correct as per our records.

Bank's Stamp:

Date:

(Signature of the Authorized Official from the Banks)

N.B. : RBI EFT / RTGS facilities Centre:
New Delhi, Chandigarh, Kanpur, Jaipur, Ahmedabad, Mumbai, Nagpur, Hyderabad, Bangalore, Chennai,
Trivandrum, Kolkata, Bhubaneswar, Guwahati, Patna.

N.B. : RTGS charges if any, is to be borne by the party.

(To be submitted in duplicate)

MANDATE FORM FOR ELECTRONIC PAYMENT THROUGH INTERNET

To
National Aluminium Company Limited,

Dear Sir,

Sub: Authorisation for release of payment due from NALCO, _____ through
Electronic fund transfer by Internet Mode .
Refer Order No.....dt.....and/or Tender/Enquiry/Letter No.....dt.....

(Please fill in the information in CAPITAL LETTERS. Please TICK wherever it is applicable)

1. Name of the Party :
2. Address of the party :
.....
.....
City :.....Pin Code:.....
E-mail Id:
Permanent Account Number :.....

3. Particulars of Bank:

Bank Name			Branch Name										
Branch Place			Branch City										
Pin Code			Branch Code										
Account Type	Savings ف		Current ف	Cash Credit ف									
Account Number(as appearing in the Cheque Book)													
Please attach Xerox copy of a cheque of your bank for ensuring accuracy of the bank name, branch name and code number .													

4. Date from which the mandate should be effective :

I hereby declare that the particulars given above are correct and complete. If any transaction is delayed or not effected for reasons of incomplete or incorrect information, I shall not hold National Aluminium Company Limited responsible. I also undertake to advise any change in the particulars of my account to facilitate updation of records for purpose of credit of amount through Internet.

Place:

Date:


Signature of the party/Authorized Signatory

Certified that particulars furnished above are correct as per our records.

Bank's Stamp:

Date:

(Signature of the Authorized Official from the Banks)

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-IV - ADDENDUM TO TENDER DOCUMENTS (COMMERCIAL)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 01
			DTD. 28/03/2023

ANNEXURE - IV


ADDENDUM TO TENDER DOCUMENTS (COMMERCIAL)

1.0 SCOPE

- 1.1 The subject tender is being issued to main bidder with all the contractual responsibilities for the execution of entire work resting on the main bidder. Main bidder in turn may associate reputed Indian company for carrying out the works and supplies from India including site activities at the Project Site.
- 1.2 The overall responsibility of the scope of work / supply covered under the above separate contracts including project management up to successful Commissioning and handing over of plant / equipment / system to the Owner shall be with the main bidder. A separate agreement / MOU amongst the main bidder and Indian associate company may be signed before order finalization.
- 1.3 The prospective associate Indian Company's credentials should be informed to the Owner for their acceptance. Necessary commercial data for evaluation of Indian Associate (as mentioned below) should be furnished. Bidder is also expected to be ready with name of alternative associate, in case proposed Indian Associate is not acceptable.
 - (i) Document showing annual turnover for similar works for the past three years.
 - (ii) Annual Report, certified profit and loss statement etc. for the last three years.
 - (iii) Concurrent commitments giving details namely start date, value, expected date of completion, and contact person with Telephone No. etc.
 - (iv) Solvency certificate from Nationalised / Scheduled Bank.
- 1.4 The Effective Date of Order shall be considered as the date of Notification of Award/ Brief Order/ Purchase Order. All contractual obligations shall commence from the Effective Date of Order.
- 1.5 The vendor has to submit the itemized list of Two Years O&M Spares & Consumables in their offer. The itemized un - priced list is to be submitted in Part - I Bid and the itemized price list is to be submitted in the Part - II Bid. Vendor also has to submit estimated requirements of spares consumption per annum. The Two Years Spares & Consumables shall not be considered for comparison. The order for these spares shall be placed separately. Hence, the quoted prices of Two Years Spares shall be valid for **three months** beyond the validity of main offer.

2.0 PAYMENT TERMS

- 2.1 Following Payment Terms will be applicable:

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-IV - ADDENDUM TO TENDER DOCUMENTS (COMMERCIAL)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 01
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(i) Supply (excluding Design & Engineering):

- (i) Payment for 80% (eighty percent) of the basic supply value (excluding applicable taxes) along with 100% taxes and freight charges shall be made on prorated basis against dispatch documents through bank.
- (ii) Payment for 10% (ten percent) of the basic supply value (excluding applicable taxes) shall be made after completion of erection against certificate duly certified by Engineer-in-charge.
- (iii) Balance 10% (ten percent) of the basic supply value (excluding applicable taxes) shall be made after final handing over of system to the Owner at site.

(ii) Site Work

- (i) Payment for 80% (eighty percent) of the basic service value (excluding applicable taxes) along with 100% taxes on monthly progress bills against certification by Engineer-In-charge.
- (ii) Payment for 10% (ten percent) of the basic service value (excluding applicable taxes) shall be made after completion of erection against certificate duly certified by Engineer-in-charge.
- (iii) Balance 10% (ten percent) of the basic service value (excluding applicable taxes) shall be made after successful completion of PG Test and handing over of system to the Owner at site.

2.2 **NOTE:**


(i) Final Handing Over:

Final Handing Over shall mean Commissioning including acceptance of PG Tests. However, in case PG Test could not be conducted within 6 months from commissioning, for reasons not attributable to vendor, last 10% payment will be released against submission of Bank Guarantee of equal amount valid for 12 months initially and extendable thereafter.

- (ii) Payment for indigenous supply shall be through Bank against dispatch documents. Payment through bank shall be as per normal banking procedure.

Direct Payment can be made through e-payment mode through SBI as well as NEFT/RTGS mode through designated enabled branches. In case of Direct Payment, duly filled Bank Mandate form in duplicate should be furnished with due authentication from bidder's Banker.


3.0 Following points must be taken care while submitting your bid:

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-IV - ADDENDUM TO TENDER DOCUMENTS (COMMERCIAL)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 01
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- (a) Selection of associate Indian company is subject to approval of Owner.
- (b) Scope division between main bidder and associate Indian company shall be clearly defined in the bid.

4.0 GST Clause applicable for Indigenous Bidders:

- 4.1 It would be the responsibility of the contractor to get the registration with the respective Tax authorities under provision of GST. Any taxes being charged by the Contractors would be claimed by issuing proper TAX Invoice in a GSTN (Goods & Services Tax Network) acceptable format indicating details elements of all taxes charged and necessary requirements as prescribed under the respective tax laws and also to mention his correct and valid GSTN number along with NALCO's GSTN number as applicable for particular supply on all invoices raised on NALCO under GST Regime.
- 4.2 The contractor would be liable to reimburse or make good of any loss/claim by NALCO towards tax credit rejected /disallowed by any tax authorities due to non-deposit of taxes or non updation of the data in GSTIN network or non-filing of returns or non-compliance of tax laws by the Contractor by issuance of suitable credit note to NALCO. In case, contractor does not issues credit note to NALCO, NALCO would be constrained to recover the amount including interest payable alongwith Statutory levy/Tax, if any, payable on such recovery.
- 4.3 Tax element on any Debit Note / Supplementary invoice, raised by the contractor will be reimbursed by NALCO as long as the same is within the permissible time limit as per the respective taxation laws and also permissible under the Contract terms and conditions. Contractors to ensure that such debit Notes are uploaded while filing the statutory returns as may be prescribed from time to time.
- 4.4 The contractor will be under obligation for quoting/charging correct rate of tax as prescribed under the respective Tax Laws. Further the Contractor shall avail and pass on benefits of all exemptions/concessions/benefits/waiver or any other benefits of similar nature or kind available under the Tax Laws. In no case, differential Tax Claims due to wrong classification of goods and/or services or understanding of law or rules or regulations or any other reasons of similar nature shall be entertained by NALCO.
- 4.5 In case, NALCO's Input Tax Credit (ITC) is rejected on account of wrong levy of tax i.e., payment of Integrated Tax in place of Central Tax+ State/Union Territory Tax or vice versa, the contractor is liable to make good the loss suffered by NALCO by issuance of suitable credit note to NALCO. In case, contractor does not issue credit note to NALCO, NALCO would be constrained to recover the amount including interest payable along with Statutory levy, if any, payable on such recovery.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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- 4.6 NALCO shall reimburse GST levied as per invoice issued by the Contractor as prescribed under section 46 of the CGST Rules 2017 and respective states Act and Rules.
- 4.7 To enable NALCO to avail ITC, the contractor/supplier shall furnish/submit any and all certificates, documents and declarations as are required by NALCO to avail of the ITC with respect to GST reimbursed by NALCO on materials sold to NALCO.
- 4.8 The HSN Code under which the goods/service will fall should be clearly mentioned along with the Rate at the time of submission of invoice for releasing payment.
- 4.9 In case, NALCO is not able to take Input Tax Credit due to any noncompliance/default/ negligence of the seller, the same shall be recovered from the pending bills/ dues (including security deposit, BG etc.).
- 4.10 Seller shall be responsible to indemnify NALCO for any loss, direct or implied, accrued to NALCO on account of supplier's failure to discharge his statutory liabilities like paying taxes on time, filing appropriate returns within the prescribed time etc.
- 4.11 Any benefit by way of reduction in rate of tax or increase in input tax credit arising due to introduction of GST shall be passed on to NALCO through reduction in supply value by way of commensurate reduction in Bill value.
- 4.12 Tax deduction at source (TDS) under GST: As per section 51 of CGST Act 2017, Nalco shall deduct TDS as applicable at time of payment.


5.0 **INSURANCE**

- 5.1 The Contractor shall, at his expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, a composite and comprehensive Marine-cum-Erection Insurance Policy or separate insurance policies for Marine/transit and storage-cum-erection with an Insurance Regulatory and Development Authority of India (IRDAI) registered Insurance Company(s) for entire LSTK package till successful execution of the contract.
- 5.2 The risks that are to be covered under the insurance shall include the following:

(i) Transit Insurance Policy for indigenous cargo:

The policy shall cover movement of all goods from the manufacturer's/ Contractor's/ Supplier's works to the project's warehouse at final destination site. The sum insured shall be for 110% of total of FOT dispatch point price + inland freight charges up to Site including unloading + applicable taxes and duties in India till delivery at Site.

The cover should be an Open policy on Warehouse to warehouse basis and should be taken in the Joint Name of Both Principal (NALCO) and Contractor.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-IV - ADDENDUM TO TENDER DOCUMENTS (COMMERCIAL)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 01
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However, if the Contractor is having an open policy for its line of business, it should obtain an endorsement of the open cover policy from the insurance company indicating that the dispatches against this Contract are duly covered. The insurance policy should cover All risk Institute Transit Clause 'A', War, SRCC, terrorism, Institute replacement clause, Special replacement clause (Air duty) and deferred unpacking clause, Insurers right of subrogation against all parties (excluding carrier) waived. This policy will also cover the replacement items, if any.


The deductible shall be 0.25% of Consignment Value.

(ii) Erection All Risk Policy/Contractor All Risk Policy:

The policy should cover all physical loss or damage to the facility at site during storage, erection and commissioning covering all the perils as provided in the policy as a basic cover and the add on covers as mentioned below:

- Earthquake
- RSMD
- STFI
- Terrorism
- Escalation cover (approximately @10% of sum insured on annual basis)
- Extended Maintenance cover of 12 months for Defect Liability Period
- Design Defect cover
- Air Freight cover
- Extra charge cover if any
- Clearance & Removal of Debris - Rs.10.00 Crores for Project of value More than Rs.100.00 Crores and 10% of Project Cost for project value less than Rs.100.00 Crores.
- Offsite Storage and Fabrication Limit - Rs.10.00 Crores for Project value More than Rs.100.00 Crores and 10% of Project Cost for project value less than Rs.100.00 Crores.
- Contractor's plant & machinery - Rs.25.00 lakhs. Cross liability
- Additional custom duty for imported machine (if any) for adequate value
- 72 hours' clause
- 50:50 Clause
- Owners Surrounding Property - Rs.10.00 Crores for Project of value more than Rs.100.00 Crores and 10% of Project Cost for project value less than Rs.100.00 Crores.
- Loss minimization clause
- Waiver of subrogation clause (for projects of more than Rs.100.00 crores)

The sum insured should be the sum insured value of supplied materials as per Para (i) above plus 110% of cost of site work including taxes (including erection, civil works, allied works etc.) cover should be taken in the Joint Name of both Principal (NALCO) and Contractor. The deductible shall be Minimum as per insurance Policy.

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(iii) Third Party Liability cover with cross Liability as on ADD-on cover to the basic EAR cover:

The third party liability add-on cover shall cover bodily injury or death suffered by third parties (including Owner's (NALCO) personnel) and loss of or damage to property (including Owner's (NALCO) property and any parts of the Facilities which have been accepted by the Owner's (NALCO)) occurring in connection with supply and installation of the Facilities.

The sum insured shall be Rs.10.00 Crores for Project of value more than Rs.100.00 Crores and 10% of Project Cost for project value less than Rs.100.00 Crores.


The deductible shall be Minimum as per insurance Policy.

- 5.2.1 In case any equipment and materials will be supplied by the Owner as Free Issue Material for the erection (as per Technical Specification), it shall be kept insured by the Contractor against any loss, damage, pilferage, theft, fire, etc. from the point of unloading up to the time of taking over by Owner including handling, transportation, storage, erection, testing and commissioning etc. The insurable value of the equipment being supplied by the Owner shall be intimated to the Contractor for arranging the insurance. The Premium paid to the Insurance Company by the Contractor for such insurance shall be reimbursed by Owner to the Contractor. The Contractor shall obtain competitive quotation for such insurance and shall take prior approval from Owner before taking the insurance. Alternatively, the Contractor may take a single policy covering the entire cost of the project including the cost of Free Issue Material. For this purpose, the Contractor shall submit documentary evidence for the premium paid for the entire project to the Owner and Owner shall reimburse to the Contractor the proportion of premium equal to value of FIM to total sum insured.
- 5.2.2 The insurance policy should be taken on replacement value basis and/or incorporating appropriate insurance clause.
- 5.2.3 On receipt of material at site, the Contractor shall promptly check for damages if any and notify the Owner and shall take necessary action for lodging insurance claim for damages.
- 5.2.4 If during the execution of Contract, the Owner/ NALCO requests the Contractor to take any other add-on cover(s)/ supplementary cover(s) in aforesaid insurance, in such a case, the Contractor shall promptly take such add-on cover(s)/ supplementary cover(s) and the charges towards such premium for such add-on cover(s)/ supplementary cover(s) shall be reimbursed to the Contractor on submission of documentary evidence of payment to the Insurance company.
- 5.2.5 Any loss or damage to the plant and equipment during handling, transportation, storage, installation, commissioning, civil works (including structural steel works),

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allied works etc. and all activities to be performed till the Completion of Project i.e. till taking over of the plant shall be to the account of the Contractor. It will be the responsibility of the Contractor to lodge, pursue and settle all claims with the insurance company in case of any damage, loss, theft, pilferage or fire during execution of Contract and Owner shall be kept informed about it. The transfer of title shall not in any way relieve the Contractor of the above responsibilities during the period of the Contract. Any FIR required to be lodged to local Police Station shall be the responsibility of the Contractor. The Contractor shall replace the lost/ damaged materials promptly by way of repairs and/or replacement of plant and equipment damaged or lost. Notwithstanding the extent of insurances cover and the amount of claim available from the underwriter, the contractor shall be liable to make good the full replacement/rectification of all the equipment/materials and to ensure their availability as per project requirement without additional financial liability to the Owner (NALCO). The losses, if any, in such replacement will have to be borne by the Contractor.

- 5.2.6 If the work is completed earlier than the period of policy considered, the Contractor shall obtain the refund as per provisions of the policy and pass on the benefit to Owner. In case no refund is payable by the insurance company then the certificate to that effect shall be submitted to Owner at the completion of the project.
- 5.2.7 Upon grant of extension of time for completion by Owner (NALCO), the Contractor shall promptly furnish documentary evidence to Engineer In-charge towards extension of insurance policies for the period of time extension.
- 5.2.8 The Contractor shall, in accordance with the provisions of the Contract Agreement, deliver to the Owner certificates of insurance (or copies of the insurance policies) and proof of payment of premium thereof as evidence that the required policies are in full force and effect.
- 5.2.9 The Contractor shall also inform the Owner in writing at least sixty (60) days in advance, regarding the expiry, cancellation and/or change in any of such documents and ensure revalidation/renewal, etc. as may be necessary well in time. The contractor, while arranging the insurance, shall ensure to obtain all discounts on premium, which may be available for higher volume or for reason of financing arrangement of the project.
- 5.2.10 All costs on account of insurance liabilities covered under the Contract as above will be on Contractor's account and will be quoted in the price bid as required. The reimbursement of premium paid by the Contractor towards insurance shall be made against copy of certificates of insurance (or copies of the insurance policies) and proof of payment of premium subject to total and maximum amount quoted in the price bid. The reimbursement shall be made along with payment against 1st supply bill (for marine/ transit insurance) and against 1st RA bill for site work (for EAR/ CAR policy).

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5.2.11 The Owner at its discretion may arrange for the above insurance cover at its own expense. In such an event, the amount quoted towards 'Comprehensive/ Transit, Storage cum erection insurance' in 'Price Schedule', shall not be payable to the contractor. However, processing of all the insurance claims shall be the responsibility of the contractor. Also, the Contractor shall perform all the obligations as mentioned in sub-clauses above.

5.3 The Contractor shall arrange insurance to cover all risks in respect of their personnel, materials and equipment belonging to the Contractor or its subcontractor (if applicable) or hired during the currency of the contract. The Contractor shall, at his expense take out and maintain in effect the following policies to protect their own interest:

5.3.1 Automobile Liability Insurance:


The Contractor shall ensure that all the vehicles deployed by the Contractor or its Subcontractors (whether or not owned by them) in connection with the supply and installation of the Facilities in the project are duly insured as per RTA act. Further the Contractor or its Subcontractors may also take comprehensive policy (own damage plus third party liability) of each individual vehicles deployed in the project on their own discretion in their own name to protect their own interest against all claims for injuries, disability, disease and death to members of public including the Owner's men and damage to the property of others arising from the use of motor vehicles, during on or off the Site Operations, irrespective of the ownership of such vehicles.

5.3.2 Workmen's Compensation/Employer's liability Policy:

Workmen Compensation Policy shall be taken by the Contractor in accordance with the statutory requirement applicable in India. The Contractor shall ensure that all the workmen employed by the Contractor or its Subcontractors for the project are adequately covered under the policy.

The policy may either be project specific covering all men of the Contractor and its Subcontractors. The policy shall be kept valid till the date of Operational Acceptance of the project. Alternatively, if the Contractor has an existing 'Workmen Compensation Policy' for all its employees including that of the Subcontractor(s), the Contractor must include the interest of the Owner/ NALCO for this specific Project in its existing 'Workmen Compensation Policy'.

Without relieving the Contractor of its obligations and responsibilities under this Contract, before commencing work the Contractor shall insure against liability for death of or injury to persons employed by the Contractor including liability by statute and at common law. The insurance cover shall be maintained until all work including remedial work is completed including the Defect Liability Period. The insurance shall be extended to indemnify the Principal (NALCO) for the Principal's statutory liability to persons employed by the Contractor.

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The Contractor shall also ensure that each of its Subcontractors shall effect and maintain insurance on the same basis as the 'Workmen Compensation Policy' effected by the Contractor.

5.3.3 Contractor's Plant and Machinery (CPM) Insurance:

The Owner (NALCO) (including without limitation any consultant, servant, agent or employee of the Owner) shall not in any circumstances be liable to the Contractor for any loss of or damage to any of the Contractor's Equipment or for any losses, liabilities, costs, claims, actions or demands which the Contractor may incur or which may be made against it as a result of or in connection with any such loss or damage.

5.3.4 Employees State Insurance Act:


The Contractor agrees to and does hereby accept full and exclusive liability for the compliance with all obligations imposed by the Employee State Insurance Act 1948 and the Contractor further agrees to defend, indemnify and hold Owner harmless for any liability or penalty which may be imposed by the Central, State or Local authority by reasons of any asserted violation by Contractor or his Sub-contractor of the Employees' State Insurance Act, 1948 and also from all claims, suits or proceeding that may be brought against the Owner arising under, growing out of or by reasons of the work provided for by this Contractor, whether brought by employees of the contractor, by third parties or by Central or State Government authority or any political sub-division thereof.

The Contractor agrees to fill in with the Employee's State Insurance Corporation, the Declaration forms, and all forms which may be required in respect of the Contractor's or his Sub-contractor's employees, who are employed in the WORK provided for or those covered by ESI from time to time under the Agreement. The Contractor shall deduct and secure the agreement of his sub-contractor to deduct the employee's contribution as per the first schedule of the Employee's State Insurance Act from wages and affix the Employees Contribution Card at wages payment intervals. The contractor shall remit and secure the agreement of his sub-contractor to remit the State Bank of India, Employee's State Insurance Corporation account the Employees contribution as required by the Act. The Contractor agrees to maintain all Cards and Records as required under the Act in respect of employees and payments and the contractor shall secure the agreement of his sub-contractor to maintain such records.

Any expenses incurred for the contributions; making contributions or maintaining records shall be to the Contractor's or his Sub-contractor's account.

Owner shall retain such sum as may be necessary from the total value of contract until the Contractor shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948 have been paid. This will be pending on the Contractor when the ESI Act is extended to the place of work.

5.3.5 Comprehensive General Liability Insurance:

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This insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others, due to any act or omission on the part of the Contractor, his agents, his employees, his representative and Sub-Contractors or from riots, strikes and civil commotion. This insurance shall cover all the liabilities of the contractor arising out of the relevant clauses of enquiry documents.

The hazards to be covered will pertain to all the works which and areas where, the Contractor, his Sub-Contractors, his agents and his employees have to perform work pursuant to the contract.

5.3.6 Any other Insurance required under Law or Regulations:

Contractor shall also carry and maintain any and all other Insurance(s) which he may be required under any law or regulation from time to time without any extra cost to Owner.

5.3.7 The above are only illustrative list of insurance covers normally required and it will be the responsibility of the Contractor to maintain all necessary insurance coverage to the extent both in time and amount to take care of all his liabilities either direct or indirect, in pursuance of the contract.


5.3.8 All costs on account of insurance liabilities covered under the Contract as above will be on Contractor's account and will be quoted in the price bid as required or included in their quoted price in case no separate break-up is sought in the price schedule.

5.4 Accident or Injury to Workmen:

The Contractor shall arrange Accident Insurance Policy for all his personnel including foreign Experts / Specialists / Personnel deputed to site and Contractor's / his sub-contractors' manufacturing works as well as for his Indian engineers & supervisory staff. Owner shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or his Sub-Contractor and the Contractor shall indemnify and keep indemnified the Owner against all such damages and compensation and against all claims, demands, proceedings, costs, charges and expenses, whatsoever in respect or in relation thereto.

5.5 The Contractor shall follow local acts and laws as may be prevalent for insurance purposes.

5.6 The Contractor shall ensure that, where applicable, its Subcontractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Subcontractors are covered by the policies taken out by the Contractor.

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- 5.7 Notwithstanding the insurance requirements mentioned above, it would be the Contractor's responsibility to take adequate insurance cover as may be pertinent to protect his interest and interest of the Owner. If at any point of time during execution of the Contract, the insurance policies are found to be inadequate, the Contractor shall take fresh insurance policies meeting aforesaid requirements. The Contractor's failure in this regard shall not relieve him of any of his Contractual responsibilities and obligations.
- 5.8 Should there be a lapse in any insurance required to be carried out by the Contractor for any reason whatsoever, loss/damage claims resulting therefrom shall be to the sole account of Contractor.
- 5.9 The Owner reserves the right to take out whatever policy that is deemed necessary by him if the Contractor fails to keep the said policy alive and valid at all times and / or causes lapses in payment of premium thereby jeopardising the said policy. The cost of such policy(s) shall be recovered / deducted from the amount payable to the Contractor.

6.0 **CONSTRUCTION, ERECTION OF PLANT AND MATERIAL**

6.1 Contractor's Material brought on the Site


The Contractor shall bring to Site all equipments, components, parts, materials, including construction equipment, tools and tackles for the purpose of the Works under intimation to the Owner. All such goods shall, from the time of their being brought vest in the Owner, but may be used for the purpose of the Works only and shall not on any account be removed or taken away by the Contractor without the written permission of the Owner. The Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.

6.2 Work & Services to be provided by the Owner

Works and services which shall be provided by the Owner for carrying out complete work at Site shall be as defined in the technical part of the Enquiry Documents and its clarification up to award of Contract.

- (a) Water supply for construction purpose may be provided by the Owner at one mutually agreed point at Site. Drinking water will also be made available at one central point at Site. The Contractor shall make his own arrangement for any further distribution. Such distribution pipe network shall have the prior approval of the Engineer at Site so as not to interfere with the layout and progress of other construction works. Supply of water shall be charged from Contractor at the rates prevailing at Site.

Contractor shall ensure that there is no wastage of water. On completion of the work, the Contractor shall remove all such work and shall reinstate and make good any work disturbed to the satisfaction of the Engineer.

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- (b) Cranes, if available, will be provided by Owner on payment of rent to the Owner.

6.3 Work and Services to be provided by the Contractor

The following work and services shall also be provided under the contract:

- (i) Material transportation to erection site at Contractor's risk and cost.
- (ii) All construction activities to complete the plant as per the specifications agreed by the Owner. The activities shall be included but not limited to building structures, rooms, foundations for equipments and accessories and stack etc.
- (iii) Labor license for contractor and sub-contractor's labor if required / applicable as per State Govt.


6.4 Owner's Lien on Equipments

The Owner shall have lien on all equipments including those of the Contractor brought to the Site for the purpose of construction, erection, testing and commissioning of the plant. The Owner shall continue to hold the lien on all such equipments throughout the period of Contract. No material brought to the Site shall be removed from the Site by the Contractor and / or his Sub-contractors without the prior written approval of the Owner.

6.5 Protection of Work

The contractor shall have total responsibility for protecting his Works till it is finally taken over by the Owner. No claim will be entertained by the Owner or the Consultant for any damage or loss to the Contractor's Works and the Contractor shall be responsible for the complete restoration of the damaged works to its original condition to comply with the specifications and drawings. Should any such damage to the Contractor's Works occur because of other party not under his supervision or control, the Contractor shall make his claim directly with the party concerned. If disagreement or conflict or dispute develops between the Contractor and the party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be resolved as per the provisions of the clause entitled 'Co-operation with other Contractors'. The Contractor shall not cause any delay in the repair of such damaged works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the work immediately and no cause thereof will be assigned pending resolution of such dispute.

6.6 Security

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The Contractor shall have total responsibility for all equipments and materials in his custody stored, loose, semi-assembled and / or erected by him at Site. The Contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the Contractor shall enter and leave the Project Site only with the written permission of the Owner in the prescribed manner.

Contractor's employees shall wear identification badges while on the work at Site.

6.7 Contractor's Area Limits

The Owner will mark-out the boundary limits of access road, parking spaces, storage and construction areas for the Contractor and the Contractor shall not trespass the areas not so marked out for him. The Contractor shall be responsible to ensure that none of his personnel move out of the areas marked out, for his operation. In case of such a need for the Contractor's personnel to work, out of the areas marked out for him, the same shall be done only with the written permission of the Owner.


6.8 Contractor's Co-operation with the Owner

In cases where the performance of the Site Work by the Contractor affects the operation of the system facilities of the Owner such Site Work of the Contractor shall be scheduled to be performed only in the manner stipulated by the Owner and the same shall be acceptable at all times to the Contractor. The Owner may impose such restriction on the facilities provided to the Contractor such as electricity, water, etc. as he may think fit in the interest of the Owner and the Contractor shall strictly adhere to such restrictions and co-operate with the Owner. It will be responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and operation of the equipment systems which are erected by him. The Contractor shall also be responsible for flushing and initial filling of all the oil and lubricants required for the equipment supplied and erected by him, so as to make such equipments ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in these documents and specifications.

6.9 Protection of Property and Contractor's Liability

6.9.1 The Contractor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of the Owner and the employees of other Contractors and Sub-Contractors and all public and private property including structures, building, other plants and equipments and utilities either above or below the ground.

6.9.2 The Contractor will ensure provisions of necessary safety equipment such as barriers, sign-boards, warning lights and lamps, etc. to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice

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to the Owner and the Owner of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his works and shall make all necessary arrangements with Owners, related to removal and/or replacement of such property and utilities.

6.10 Painting

All exposed metal parts of the equipment including piping, structures railing, etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oil and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by the Engineer for painting. Afterwards, the above parts shall be finished with two coats of an alloyed resin machinery enamel paints. The quality of the finish paint shall be as per the standards of ISI or equivalent and to be of the colour as approved by the Owner.

6.11 Unfavorable Working Conditions


The Contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc. and during other unfavourable construction conditions. No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof unless special precautions or measures are taken by the Contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of the Consultant/Owner. Such unfavorable construction conditions will in no way relieve the contractor of his responsibility to perform the works as per the schedule.

6.12 Protection of monuments and reference points

The Contractor shall ensure that any finds such as relic, antiquity, coins, fossile, etc. which he may come across during the course of performance of his works either during excavation of elsewhere, are properly protected and handed over to the Owner. Similarly, the Contractor shall ensure that the bench marks, reference points, etc. which are marked out either with the help of Owner or by the Owner shall not be disturbed in any way during the performance of his works. If any work is to be performed which may disturb such reference, the same shall be done only after these are transferred to other suitable locations under the direction of the Owner.

7.0 **CONSTRUCTION**

7.1 Rules and Regulations

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Contractor shall observe all national and local laws, ordinances, rules and regulations pertaining to the work, and shall be responsible for extra costs arising from violations of same.

7.2 Safety

Contractor shall take all necessary measures to protect the work and workmen against accidents and occupational disease. They shall observe and comply with all Government safety regulations as specified by the Owner. The Contractor shall be responsible for following the proper procedures in reporting accidents or incident.


The Owner's Safety Engineer located in Site will be immediately notified by faster means possible of any accident which involves the following:

- (a) Death from any cause whatsoever.
- (b) A fractured skull, arm, thigh or spine, fore-arm or leg.
- (c) A dislocated shoulder.
- (d) The amputation of arm or hand, or of one or more fingers on the same hand, or of a leg or a foot.
- (e) The loss of sight of an eye.
- (f) Any other serious bodily injury, including internal bleeding or burns or asphyxia where such injury is likely to endanger life, cause permanent incapacity or temporary incapacity of 5 days or more.

- 7.3 In case of death, the Contractor shall be responsible for immediately notifying the nearest Indian Police so that they can make the proper investigation in accordance with the law.

8.0 **CLAUSE 44.02: REGULATION OF LOCAL AUTHORITIES & STATUES (TENDER DOCUMENT COMMERCIAL – INDIGENOUS)**

- 8.1 The payment of minimum wages to contract labour shall be as per the rates notified by the Central Govt. as per Minimum Wage Act, 1948 and as adopted by the NALCO Management from time to time plus any additional element and statutory dues thereon.
- 8.2 The Minimum wage as notified by the Chief Labour Commissioner (Central) has a variable component as Special allowance which is linked to average AICPI for Industrial workers, which keeps on changing every six Months. The Contractor has to absorb all such variations due to increase in Minimum wage in their quoted price and no claim whatsoever on this account shall be entertained.
- 8.3 Where the Minimum wages notified by the concerned State Government are higher than the rates notified by the Central Government, the states Government rates should apply in concerned scheduled employment as long as the same remains higher than the Central Government rates.

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- 8.4 The classification on workers in different categories will be as per the notification issued by the Central Govt. fixing the minimum wages for the above scheduled appointment."

9.0 **GUARANTEE PERIOD**

Guarantee Period wherever mentioned in tender documents shall be read as 12 running months of the system after successful performance guarantee test and handing over of the system to NALCO.


10.0 **PRICE REDUCTION SCHEDULE FOR DELAY IN COMPLETION**

- (i) Liquidated Damages (LD) for delay in delivery/ completion wherever mentioned in tender documents, is to be read as Price Reduction Schedule (PRS).
- (ii) The Contractor's liability for delay in completion shall not in any case exceed **five percent** of the total contract price.

All other provisions of these clauses remain unaltered.

11.0 **LIMITATION OF LIABILITIES**

- 11.1 "Notwithstanding the above, the maximum liability shall be 100% of contract value and the vendor will not be liable for any indirect consequential damages/losses".

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ANNEXURE - V

TERMS & CONDITIONS FOR ERECTION, TESTING, COMMISSIONING AT SITE


1. The lump sum charges quoted for erection, testing, commissioning at site shall include lodging, boarding, transport, out of pocket expenses, all health care/ medical expenses and all other incidental charges for your personnel.
2. Seller shall be working at Owner's site along with agencies who will be engaged in similar other activities. The vendor shall perform their jobs in eco-friendly manner and in consonance with the objectives of NALCO Project Site environment management system. Seller shall be working at Owner's site along with agencies who will be engaged in similar other activities. For this purpose, the third party risk shall also be covered by seller at his cost.
3. Following site conditions shall apply:
 - (i) Working hours at those prevailing site - normally 8 hours a day, Monday through Saturday.
 - (ii) Vendor's personnel to observe/ abide by
 - Site working conditions and Safety codes.
 - All applicable Indian Laws at Site.
 - (iii) Payment Terms shall be as per Special terms & condition of PO & as per special instruction to the bidder attached to the NIT Documents.

The lump charges for erection, testing, commissioning, etc. activities of Indian Vendor shall be inclusive of Income Tax. Indian Income Tax will be deducted from the bill amount & Tax Deducted at Source Certificate will be issued.

4. The charges shall be exclusive of applicable GST. Indian Vendors shall indicate the SAC code and the applicable GST rate for this activity in the price schedule. For Foreign vendors the same shall be borne by NALCO.
5. Since it is an existing NALCO Site with various units in operation, the proposed site has constraints of space availability, restriction in movement of over dimensioned/ overweight consignments both within and outside the NALCO Site limits. Further, construction/ erection work for several other project facilities at various location within Site will be progressing concurrently. It will be the responsibility of vendor to seek approvals from the Owner for working within & outside the NALCO Site limits and also of taking all suitable safety measures as per regulations in force for the safety of existing NALCO Site.
6. The material shall be collected by the vendor from Owner's Store/ Project Site/ Vendor's Own Store (as the case may be) and transported to the erection Site at vendor's cost and risk.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-V - TERMS & CONDITIONS FOR ERECTION, TESTING, COMMISSIONING AT SITE	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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7. All labour (both skilled and unskilled), tools, tackles and consumables shall be arranged by vendor at his own cost.
8. Vendor shall arrange for the necessary transport, accommodation, medical, canteen and other facilities for their employees/ staff at their own cost and abide by all labour laws/ safety codes and statutory regulations and keep Owner indemnified in respect thereof.
9. Vendor shall arrange and pay for all insurances as may be required under the law for their employees/ materials/ subcontractor(s) and shall also cover against all risk for the material issued by Owner. Vendor shall be working at Owner's Site along with agencies who will be engaged in other activities. For this purpose the third party risk shall also be covered by Vendor.
10. The vendor is responsible for keeping his work place neat and clean and shall always avoid scattering of any materials around the work place. The vendor shall clear the work site of all debris, materials, tools & tackles etc. immediately upon completion of the job. Any temporary lines/ cables etc. laid for the purpose of execution of a particular job shall be immediately removed to an agreed location and the site cleared off all such materials.
11. The vendor shall not throw out gaskets, used electrode pieces, hand gloves, cotton wastes, gunny bags, polythene bags etc. into open channel, any drains or pipeline systems. These are to be collected together and deposited in bins/ waste collectors earmarked for the purpose of disposal after consultation with Engineer In - charge.
12. The contractor is required to arrange all handling equipments, Mobile Crane of required capacity, welding sets and other materials for erection and commissioning at their cost. However, on request the same can be spared from site subject to availability on payment basis.
13. As per the applicable factory act, the labour license required shall be taken by the vendor before starting the works.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-VI - AGREED TERMS & CONDITIONS (INDIGENOUS)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - VI

AGREED TERMS & CONDITIONS (INDIGENOUS) **(FOR INDIGENOUS BIDDERS)**


IMPORTANT

1. This questionnaire must be filled in against all Serial nos. & enclosed with the Un-priced offer. Non submission or submission of incomplete questionnaire may lead to rejection of the offer.
2. All commercial terms except the deviations to Tender Documents must be given in this questionnaire itself and not elsewhere in the quotation. In case of contradiction, the terms given below shall prevail. Deviations to Tender Documents, if any, must be listed in the format attached at the end of this questionnaire.


Sl. No.	Descriptions	Vendor's Confirmations
1	(i) Acceptance of Technical specifications and scope of work as per attached Annexure - I .	
	(ii) In case of deviations, confirm that the same has been highlighted separately.	
2	Confirm that data sheets/ technical questionnaire duly filled in are attached, wherever required.	
3	Confirm Spare parts list, wherever required with item wise prices have been submitted for following categories of Spares	
	(a) Commissioning Spares	
	(b) Standard Tools & Tackles	
	(c) Consumables for first 02 years	
	(d) O&M Spares for first 02 years	
	(e) Optional attachments	
4	It is noted that deviations to terms & conditions shall lead to loading of prices or rejection of offer.	
5	Indicate Manufacturer's name & address with Tel/ Fax no. etc.	
6	Confirm that the quoted prices are based on FOR/ FOT Despatch point including packing & forwarding.	
	Indicate dispatch station.	
7	Please confirm that firm freight charges up to Site are inclusive in quoted price.	
8	In case you have not quoted the freight charges separately in the Price Schedule, please quote the same in terms of % of the quoted FOT dispatch point price.	NA
9	Confirm you have quoted prices strictly in the price schedule format enclosed with NIT documents.	
10	Confirm insurance is included in the quoted prices.	

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-VI - AGREED TERMS & CONDITIONS (INDIGENOUS)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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Sl. No.	Descriptions	Vendor's Confirmations
11	(a) Statutory variation in GST, if any, upto the contractual delivery date (CDD) shall be borne by NALCO. Any increase beyond the CDD shall be borne by the vendor. However, the benefit of any reduction in any of the above statutory levies beyond CDD must be passed on to NALCO. Pl. note and confirm.	
	(b) Please indicate the present rate of GST applicable on the supplies (For Intra-state supplies CGST + SGST shall be applicable whereas for Inter-state IGST shall be applicable. Vendor to quote accordingly).	
	(c) If there is any increase in GST at the time of supplies for any reasons, other than statutory, including turnover, confirm the same will be borne by the vendor..	
	(d) If GST is presently not applicable, confirm whether the same will be borne by the vendor in case it becomes leviable later.	
	(e) In case (c) or (d) is not acceptable, advise maximum rate of GST chargeable	
12	Confirm submission of GSTIN along with acknowledgement receipt containing the ARN	
13	Confirm in case of delay on a/c of vendor, any new or additional taxes and duties imposed after contractual delivery shall be to vendor's account.	
14	Confirm acceptance to Delivery/ Completion Period as mentioned in tender documents	
15	Confirm utility requirement wherever applicable are given in offer.	
16	Confirm customer references are given in offer.	
17	Confirm complete technical literature/catalogue are being submitted along with offer.	
18	Confirm acceptance of Price Reduction Schedule for delay in deliveries specified in Tender Documents.	
19	Confirm acceptance of relevant terms of payment as per the tender documents attached.	
20	Confirm that the quoted prices shall remain firm and fixed till complete execution of order.	
21	Confirm that Contract cum Performance Bank Guarantee wherever required will be furnished for value and terms & conditions as per document attached with tender documents.	
22	Confirm acceptance of Guarantee/ Warranty as per documents attached with tender.	
23	Confirm that quoted prices are inclusive of all inspection &	

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-VI - AGREED TERMS & CONDITIONS (INDIGENOUS)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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Sl. No.	Descriptions	Vendor's Confirmations
	testing charges as per NIT terms.	
24	Although you were not eligible for input tax credit of Central & State Taxes in pre-GST period but under GST you are entitled to full credit of GST paid and you shall have benefit of incremental input tax credit under the GST regime as above. As such you need to pass on the benefit of your incremental input tax credit to NALCO. Accordingly, Please quote your best basic prices (In Price bid)	
25	Indicate type of your Vendor category under GST: Compounding Scheme Vendor or Registered Vendor or Un Registered Vendor If Vendor is GST Compounding Scheme vendor, Please confirm that you have submitted the copy of the declaration: FORM GST–CMP 01 or FORM GST CMP 02. (In case of non-submission of these documents, your offer may be liable for rejection.)	
26	Please confirm that you have quoted the HSN (Harmonized System of Nomenclature) code of goods or Accounting Code of services for all items as per scope of work of NIT.	
27	(i) All other Commercial terms & conditions shall be as per Standard Terms & Conditions of Purchase Order (Indigenous) and other documents attached with the NIT. Confirm acceptance.	
	(ii) Please confirm acceptance to attached Terms & Conditions for erection, testing, commissioning at Site	
	(iii) In case of deviations, confirm clause wise comments have been specified in the format attached at the end of this questionnaire.	
	(iv) All the terms & conditions have been indicated in this format including Annexure and has not been repeated elsewhere. It is noted that terms & conditions indicated elsewhere shall be ignored.	
28	If offer is based on certain Imported Raw Materials required for Equipments/ Materials offered, please note and specify the following:	
	(i) Owner will not provide any Import License for the same. Any expenditure towards the same shall be borne by Seller.	
	(ii) Indicate Description, Quantity & CIF value of Imported Materials (in Rs.) for each Equipment/ item	

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Sl. No.	Descriptions	Vendor's Confirmations
	of quotation in price bid. (iii) Confirm that all variations in Customs duty and Foreign Exchange till complete execution of the contract shall be to Seller's account.	
29	Confirm that all taxes, duties and levies of any kind payable by Seller up to the stage of handing over of the system to Owner shall be borne by you.	
30	The vendor is required to state whether any of the Directors of vendor is a relative of any of the Directors of Owner or the vendor is a firm in which any Director of Owner or his relative is a partner or the vendor is a Private Company in which any of the Directors of Owner is a member or Director.	
31	Confirm that the quoted prices are valid for acceptance up to six months from the final due date of submission of Bid.	
32	Confirm that quoted prices for Optional attachments are valid for the stated period as asked in the tender documents.	
33	Confirm that in case of conflicting version of various terms & conditions at different places, Owner can choose any version.	
34	Confirm that net worth of your company during the last financial year is positive.	
35	Please furnish Annual Report containing Balance Sheet & Profit & Loss Account for the last 3 years.	
36	As soon as shipment/ dispatch is made, the seller shall intimate Nalco's Underwriters the dispatch details at the address, to be intimated later.	
37	Please note that you have not been banned or de-listed by any Government or Quasi Government agencies or PSU. Confirm you have submitted declaration to this effect as per tender conditions.	
38	Please furnish name and address of the official to whom correspondence should be sent including telephone number/ fax number and e-mail id. If e-mail id is not available, an undertaking is to be given that e-mail id is to be registered within 2 weeks of bid submission	
39	Vendors shall indicate the SAC code and the applicable GST rate for the Service activity	
40	Confirm you have submitted EMD as per NIT	
41	Confirm you have submitted two original copies of the pre - contract Integrity Pact as per NIT.	
42	Confirm you have submitted the duly filled in SA 8000 Questionnaire as per NIT.	

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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Sl. No.	Descriptions	Vendor's Confirmations
43	The Vendor is required to state whether M/s AP/ ALCAN has any shareholding/ management control in your Company.	
43	Please confirm that you will generate the E-waybill as per tax invoice following the provision of E-waybill Rule 138 to 138 D read with notification issued by respective States, if any.	
44	Please confirm type of Supplier i.e., Whether Class-I or Class-II local supplier or Non Local Supplier (As defined in order dtd. 16.09.2020 & OM Dtd. 04.03.2021 of DPIIT, Ministry of Commerce and Industry, GoI).	
45	Provision for PREFERENCE TO MAKE IN INDIA: Please confirm your acceptance to the said provision	
46	Confirm percentage of local content for the offered goods.	
47	Confirm, Certificate for local content from statutory auditor or cost auditor of the company or form a practicing cost accountant or practicing chartered accountant.	
48	Confirm, submission of certificate/ declaration that bidder is not from a country which shares a land border with India.	

Place:


Signature:

Date:

Name :

Designation :

Seal :

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
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DEVIATIONS TO TENDER DOCUMENTS

SL. NO.	REFERENCE OF TENDER DOCUMENT		SUBJECT	DEVIATIONS
	DOCUMENT	CLAUSE NO.		

NOTE: This shall be submitted along with the Un - priced Offer. Deviation mentioned anywhere else in the offer shall not be considered.

Signature:

Date:

Name:

Designation:

Seal

Tender Inviting Authority: GM (Materials), NALCO Corporate Office, Bhubaneswar (Odisha), India

Name of Work: Engineering, supply, storage, fabrication, erection, commissioning of Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India

NIT No: NBC/MM/510/3-8937/TIPPLER/2023 Dtd: 28/03/2023

Name of the Bidder/ Bidding Firm / Company :


PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

- Prices for all Items shall be on FOT NALCO Site Basis. This also includes Unloading all the items at NALCO's Site(s).
- Below break-up pertains to supply of major items. It will be the responsibility of the CONTRACTOR to supply all materials / equipment required for completion of work as per the Contract, irrespective of whether all items are identified above or not.
- Bidder to clearly indicate Quoted / Not Quoted against each Sl. No. in the column 5 in the BOQ below and submit the same duly stamped and signed in the un-priced bid. The priced part of this BOQ shall be submitted in the price bid only.
- In the Price Schedule, no column should be left blank.
- GST shall be payable extra at actuals against GST compliant invoice based on the HSN code indicated by the bidder in their offer/ un-priced bid.
- Bidder to submit the itemized list with item description, HSN code, quantity, UOM but without price in Un-priced bid..

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in (Rs.)	TOTAL AMOUNT Without Taxes in (Rs.)	TOTAL AMOUNT In Words
1	2	3	4	5	6	7
1	SUPPLY: Supply of all equipment/ materials forming part of the LSTK package for Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India.					
1.1	Package consists of Manufacturing, Procurement, Inspection, Assembly, Painting, Testing at Supplier's works, Packing & Forwarding, Supply of all equipments / materials forming part of LSTK package including Commissioning & Start-up Spares & Consumables, Special Tools & Tackles, first fill of oil & lubricants/ oil and consumables, insurance, as per Tender Documents on FOT destination basis in packed conditions for entire LSTK package for Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India	1.00	LS		0.00	INR Zero Only
1.2	Any other item not covered above but required for the completion of work.	1.00	LS		0.00	INR Zero Only

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in (Rs.)	TOTAL AMOUNT Without Taxes in (Rs.)	TOTAL AMOUNT In Words
1	2	3	4	5	6	7
2	SERVICES: All services for LSTK package for Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India.					
2.1	Carrying out all service activities including but not limited to Design, Engineering, Supervision, Prefabrication, fabrication, Dismantling of existing equipments & structures, Construction, Civil & Structural Work, installation, erection, mechanical completion, Electrical & Instrumentation works, pre-commissioning, testing, Commissioning & Performance Guarantee Tests, for completing and establishing the entire LSTK package for Wagon Tippler, Side Arm Charger, Hydraulic Breaker, associated Conveying System, Up-Gradation of existing Conveyor-3A/3B and DFDS system in Coal Handling Plant (CHP) in Steam-Cum-Power Plant (SPP), NALCO, Damanjodi, Odisha, India under Contractor's scope as a fully functional and operative UNIT, including (but not limited to) providing all labour and manpower, resources, Handling & Transportation of Equipment/ Materials at Site, loading, unloading at site, stores management, construction equipment, tools, tackles and aids, safety devices, testing devices, insurance including all statutory/ contingency insurance coverage, e.g. third party liability, ESI, workmen compensation, etc., facilities, utilities, communication systems, material and other reconciliations, handing over of final drawings / documents/ manuals, obtaining and satisfying all statutory licenses, clearances, consents, no objections, approvals and certificates and complying with all statutory formalities and all other services whatsoever required including Training, for completing the works in all respects in accordance with the Tender Documents and Direction of Engineer-in charge.	1.00	LS		0.00	INR Zero Only
2.2	Any other activity not covered above but required for completion of the work	1.00	LS		0.00	INR Zero Only
Total in Figures					0.00	INR Zero Only
Quoted Rate in Words		INR Zero Only				

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TENDER DOCUMENT	ANNEXURE-VIII - PROFORMA FOR CONTRACT-CUM-PERFORMANCE BANK GUARANTEE	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - VIII

PROFORMA OF CONTRACT CUM PERFORMANCE GUARANTEE BY SELLER/CONTRACTOR

(To be executed on non-Judicial stamped paper of appropriate value)


B.G. No _____

Date _____

1. WHEREAS National Aluminium Company Limited (A Government of India Enterprise), having its Unit/ Office at (Foreign vendors to incorporate Nalco's Corporate Office address/ Indigenous vendors to incorporate Nalco's Unit address where the supply or work is to be executed) (hereinafter called "the Company/Owner") which expression shall unless repugnant to the subject or context includes its legal representatives, successors and assigns), has entered into a contract with M/s. _____/ has placed a purchase order on M/s. _____ (hereinafter referred to as "Contractor(s)/Seller(s)") which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) for on the terms and conditions as set out inter alia, in the company Contract No/ P.O. No..... dt..... and various documents forming part thereof herein after referred to as the "said contract" which expression include all amendments, modification and/or variation thereto and whereas the Contractor/Seller has agreed for due execution of the entire contract and guarantees its performance including any parts executed through any others agencies/sub-contractors.


AND WHEREAS one of the conditions of the "said contract" is that "contractor/seller shall furnish to the owner a Bank Guarantee from a bank for% (..... percent) of the total value of the "said contract" against due and faithful performance of the "said contract" including defects liability obligations and the performance guarantee obligations of the contractor/seller for execution/supplies made under the "said contract".

2. We _____ Bank having its branch office at _____ do hereby agree and undertake to pay the amount due and payable under this guarantee without any demur merely on a demand from the Company stating that in the opinion of the company which is final & binding, the amount claimed is due by reason of default made by the Contractor(s)/ Seller(s) in performing any of the terms and conditions of the said Contract including defects liability obligations, in fulfilling the performance Guarantee obligation or loss or damage caused to or would be caused to or suffered by the Company by reason of any breach by the said Contractor(s)/Seller(s) of any of the terms and conditions of the contract. Any such demand made on the Bank by the owner shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However our liability under this guarantee shall be restricted to Rs..... (Rupees..... only)
3. We undertake to pay to the Company any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s)/Supplier(s) in any suit or proceeding pending before any office, court or Tribunal relating thereto, our liability under this

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-VIII - PROFORMA FOR CONTRACT-CUM-PERFORMANCE BANK GUARANTEE	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under. Our liability to pay is not dependent or conditional on the owner proceeding against the contractor(s)/seller(s).

4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said Contractor(s)/ Seller(s) but shall in all respects and for all purposes be binding and operative until payment of all money due or liabilities under the said Contract(s)/Order(s) are fulfilled.
5. We _____ Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract(s)/Order(s) and that it shall continue to be enforceable till all the dues of the Company under or by virtue of the said Contract(s)/Order(s) have been fully paid and its claims satisfied or discharged or till a duly authorised officer of the Company certifies that the terms and conditions of the said Contract(s)/Order(s) have been fully and properly carried out by the said Contractor(s) and accordingly discharge this guarantee.
6. We..... Bank further agree with the Company that the Company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contractor(s)/ Order(s) or to extend time of performance by the said Contractor(s)/Seller(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Company against the said Contractor(s)/Seller(s) and to forbear or enforce any of the terms and conditions relating to the said Contractor(s)/Seller(s) and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s)/Seller(s) or for any forbearance, act or omission on the part of the Company or any indulgence by the Company to the said Contractor(s)/Seller(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.
7. Notwithstanding anything contained herein before, our liability shall not exceed Rs._____ (Rupees _____ only) and shall remain in force till _____ unless a demand or claim under this guarantee is made on us within three months from the date of expiry we shall be discharged from all the liabilities under this guarantee.
8. We _____ Bank further agree that this Guarantee shall be invocable at our place of business at _____ (Bank Name), _____ (Branch name and address of the branch), Bhubaneshwar, Odisha-751XXX.
9. We _____ Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time at the request of Contractor(s)/Seller(s).

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Date: _____
Corporate Seal of the Bank

.....Bank
By its constitutional Attorney


Signature of duly authorised person
on behalf of the Bank with seal & signature code

Details of person issuing the BG:

Name: _____
Address for correspondence: _____
Telephone and Fax No.: _____
E-mail: _____
IFSC Code of the Bank: _____

Note:-

- BG is to be furnished from any of Nalco approved Banks.
- In case, any domestic guarantee issued by PSU Banks (or) Private Banks (or) Foreign Banks operating in India must be operational and invocable in Bhubaneswar (Odisha, India) only. For guarantee to be operational in Bhubaneswar, the issuing Bank must designate a specified Bank branch in Bhubaneswar. If the Bank issuing BG is not operational in India, the clause no. 9 above may be ignored. However, point no. 'C' is to be followed.
- In the case of foreign currency BGs, the BG issuing Bank must have correspondent relationship with State Bank of India.

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TENDER DOCUMENT	ANNEXURE-IX - PROFORMA FOR ADVANCE PAYMENT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - IX


PROFORMA FOR ADVANCE PAYMENT

(To be executed on non-Judicial stamped paper of appropriate value)

B.G. No _____

Date _____

1. In consideration of National Aluminium Company Limited (A Government of India Enterprise), having its registered office at P/1, Nayapalli, Bhubanesar 751013 (hereinafter called "The Company ", which expression shall unless repugnant to the subject or context includes its legal representatives, successors and assigns) having agreed to make an advance payment of Rs..... (Rupees only) to M/s (hereinafter called the said "Contractor(s)/Seller(s)", which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) under the terms and conditions of the Contract/Order dated for (work/ assignment description) on production of a bank guarantee equivalent to 110% of the advance payment indicated above.
2. We Bank having its branch office at do hereby undertake to pay the amount due and payable under this guarantee without any demure merely on a demand from the Company stating that in the opinion of the company which is final and binding, the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of non-payment / adjustment of any part of the said advance or any dues to the company or any breach by the said Contractor(s)/ Seller(s) of any of the terms or conditions contained in the said Contract(s)/Order(s) or by reason of the Contractor(s)/Seller(s) failure to perform the said Contract(s)/Order(s). Any such demand made on the bank by the owner shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs..... (Rupees Only).
3. We undertake to pay to the Company any money so demanded notwithstanding any claim dispute or disputes raised by the Contractor(s)/Seller(s) in any suit or proceeding pending before any office, court or Tribunal relating thereto, our liability under this present guarantee being absolute and unequivocal. The payment so made by us under this bond shall be valid discharge of our liability for payment there under. Our liability to pay is not dependable or conditional on the owner proceeding against the Contractor(s)/Seller(s).
4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said Contractor(s)/Seller(s) but shall in all respect and for all purposes be binding and operative until payment of all money due or liabilities under the said Contract(s)/Order(s) are fulfilled.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-IX - PROFORMA FOR ADVANCE PAYMENT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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5. We..... Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract(s)/Order(s) and that it shall continue to be enforceable till all the dues of the Company under or by virtue of the said Contract(s)/Order(s) have been fully paid and its claims satisfied or discharged or till a duly authorized officer of the Company certifies that the terms and conditions of the said Contract(s)/Order(s) have been fully and properly carried out by the said Contractor(s)/ Seller(s) and accordingly discharges this guarantee.
6. Notwithstanding anything contained herein before, our liability shall not exceed Rs. (Rupees Only) and shall remain in force till Unless a demand or claim under this guarantee is made on us within three months from the date of expiry we shall be discharged from all the liabilities under this guarantee.
7. We Bank further agree that this Guarantee shall be invocable at our place of business at (Bank Name), (Branch name and address of the branch), Bhubaneswar, Odisha-751XXX.
8. We Bank, lastly undertake no to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time at the request of Contractor(s)/Seller(s).

Date: Bank
Corporate Seal of the Bank by its constitutional Attorney.


Signature of duly authorized person
on behalf of the Bank with seal & signature code

Details of person issuing the BG:

Name:
Address for correspondence:
Telephone and Fax No.:
E-mail:
IFSC Code of the Bank:

Note:-

- BG is to be furnished from any of Nalco approved Banks.
- In case, any domestic guarantee issued by PSU Banks (or) Private Banks (or) Foreign Banks operating in India must be operational and invocable in Bhubaneswar (Odisha, India) only. For guarantee to be operational in Bhubaneswar, the issuing Bank must designate a specified Bank branch in Bhubaneswar. If the Bank issuing BG is not operational in India, the clause no. 9 above may be ignored. However, point no. 'C' is to be followed.
- In the case of foreign currency BGs, the BG issuing Bank must have correspondent relationship with State Bank of India.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-X - PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - X

PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

(To be executed on non-Judicial stamped paper of appropriate value)

B.G. No _____


Date _____

1. WHEREAS National Aluminium Company Limited (A Government of India Enterprise), having its Office at Nalco Bhavan, P/1, Nayapalli, Bhubaneswar - 751 013, Orissa (hereinafter referred as "The Company" which expression shall unless repugnant to the subject or context includes its legal representatives, successors and assigns), has issued tender paper vide its Tender No. dtd. for..... (hereinafter called "the said tender") to M/s..... (hereinafter called "the said Tenderer(s)" which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) and as per terms and conditions of the said tender, the tenderer shall submit a Bank Guarantee for Rs. _____ (Rupees _____ Only) towards earnest money in lieu of cash.

2. We _____ Bank having its branch office at _____ do hereby undertake to pay the amounts due and payable under this guarantee without any demur merely on a demand from the Company stating that in the opinion of the company, which is final & binding, the amount claimed is due because of any withdrawal of the tender or any material alteration to the tender after the opening of the tender by way of any loss or damage caused or would be caused or suffered by the Company by reason of any breach by the said tenderer(s) of any terms and conditions contained in the said tender or failure to accept the letter of Intent/Agreement or that the amount covered under this Guarantee is forfeited. Any such demand made on the Bank by the Company shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However our liability under this guarantee shall be restricted to an amount not exceeding Rs..... (Rupees..... Only).

3. We undertake to pay to the Company any money so demanded notwithstanding any dispute or disputes raised by the tenderer(s) in any suit or proceeding pending before any office, court or Tribunal relating thereto, our liability under this present guarantee being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under. Our liability to pay is not dependant or conditional on the Company proceeding against the tenderer(s).

4. The guarantee herein contained shall not be determined or affected or suspended by the liquidation or winding up, dissolution or change of constitution or insolvency of the said tenderer(s) but shall in all respects and for all purposes be binding and operative until payment of all money due or liabilities under the said tender are fulfilled.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-X - PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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5. We _____ Bank Ltd., further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the finalisation of the said tender and that it shall continue to be enforceable till the said tender is finally decided and order placed on the successful tenderer(s) and/or till all the dues of the Company under/or by virtue of the said tender have been fully paid and its claims satisfied or discharged or till a duly authorised officer of the Company certifies that the terms and conditions of the said tender have been fully and properly carried out by the said tenderer(s) and accordingly discharges the guarantee.
6. That the Company will have full liberty without reference to us and without affecting this guarantee to postpone for any time or from time to time, the exercise of any of the power of the owner under the tender.
7. Notwithstanding anything contained herein before, our liability shall not exceed Rs. _____ (Rupees _____ Only) and shall remain in force till _____ unless a demand or claim under this guarantee is made on us within three months from the date of expiry, we shall be discharged from all the liability under this guarantee.
8. We _____ Bank further agree that this Guarantee shall be invocable at our place of business at _____ (Bank Name), _____ (Branch name and address of the branch), Bhubaneshwar, Odisha-751XXX.
9. We _____ Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Company in writing. We further undertake to keep this Guarantee renewed from time to time on the request of the Tenderer(s).

Date: _____ Bank


Corporate Seal of the Bank

By its constitutional Attorney

Signature of duly authorised person
on behalf of the Bank with seal & signature code

Details of person issuing the BG:


Name: _____
Address for correspondence: _____
Telephone and Fax No.: _____
E-mail: _____
IFSC Code of the Bank: _____

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-X - PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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- (i) BG is to be furnished from any of Nalco approved banks.
- (ii) In the case of Foreign currency BGs, BG issuing bank must have correspondent relationship with State Bank of India.

Note:-

- (a) BG is to be furnished from any of Nalco approved Banks.
- (b) In case, any domestic guarantee issued by PSU Banks (or) Private Banks (or) Foreign Banks operating in India must be operational and invocable in Bhubaneswar (Odisha, India) only. For guarantee to be operational in Bhubaneswar, the issuing Bank must designate a specified Bank branch in Bhubaneswar. If the Bank issuing BG is not operational in India, the clause no. 9 above may be ignored. However, point no. 'C' is to be followed.
- (c) In the case of foreign currency BGs, the BG issuing Bank must have correspondent relationship with State Bank of India.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-X - PROFORMA FOR BANK GUARANTEE FOR EARNEST MONEY DEPOSIT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
			DTD. 28/03/2023

**FORMAT FOR ONLINE SUBMISSION OF EARNEST MONEY DEPOSIT (EMD)
FOR INDIGENOUS BIDDERS SUBMITTING EMD IN INR**

DETAILS TO BE FURNISHED BY NALCO

1)	TENDER NO.	NBC/MM/510/3-8937/TIPPLER/2023
2)	DATE	XX/XX/2023.
3)	DESCRIPTION OF TENDER	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha
4)	EMD AMOUNT (IN RS)	INR 25,00,000/- (Rupees Twenty Five Lakh Only).
5)	SBI ACCOUNT NO	10044880013
6)	SBI BRANCH CODE	09817
7)	SBI IFSC CODE	SBIN0009817


DETAILS TO BE FURNISHED BY BIDDER

1)	NAME OF THE BIDDER	
2)	NALCO VENDOR CODE	(FOR EXISTING VENDOR)
3)	AMOUNT DEPOSITED	
4)	DATE OF DEPOSIT	
5)	NAME OF BANK & BRANCH	
6)	BRANCH CODE	
7)	IFSC CODE	
8)	UTR NO.	(ENCLOSE COPY)
9)	DATE	

Indian bidders submitting the EMD in INR should send the scanned copy of the duly filled in and signed Annexure – XV along with the scanned copy of Transaction Slip/ receipt of the Bank on the same day of payment by e-mail to purna.gummadi@nalcoindia.co.in with copy marked to mihir.behera@nalcoindia.co.in .

The bidders should upload the scanned copy of the duly filled in and signed above format along with the scanned copy of Transaction Slip/ receipt of the Bank with their On - line Part - I - Bid.

The original copy of the duly filled in and signed format along with the Transaction Slip/ receipt should be submitted in cover - 1 of the hard copy offer.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XI - LIST OF NALCO APPROVED BANKS & BANK MANDATE FORM	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
			DTD. 28/03/2023

ANNEXURE - XI


LIST OF STANDARDIZED BANKS

I . SCHEDULE OF PUBLIC SECTOR (PSU) BANKS OF INDIA

Sl.No.	Public Sector Banks of India
01	Allahabad Bank
02	Andhra Bank
03	Bank of Baroda
04	Bank of India
05	Bank of Maharashtra
06	Canara Bank
07	Central Bank of India
08	Corporation Bank
09	Dena Bank
10	IDBI Bank
11	Indian Bank
12	Oriental Bank of Commerce
13	Punjab & Sind Bank
14	Punjab National Bank
15	State Bank of India
16	Syndicate Bank
17	UCO Bank
18	Union Bank of India
19	Vijaya Bank

II . SCHEDULE OF PRIVATE SECTOR BANKS OF INDIA


Sl.No.	Private Sectors Banks of India
01	HDFC Bank Ltd.
02	ICICI Bank Ltd.
03	Axis Bank Ltd.
04	Kotak Mahindra Bank Ltd.
05	YES Bank
06	IndusInd Bank Ltd.
07	The Federal Bank Ltd.
08	The Jammu & Kashmir Bank Ltd.
09	The South Indian Bank Ltd.
10	The Karur Vysya Bank Ltd.
11	The Karnataka Bank Ltd.
12	IDFC Bank
13	RBL Bank
14	The Lakshmi Vilas Bank Ltd.
15	Tamilnad Mercantile Bank Ltd.
16	City Union Bank Ltd.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XI - LIST OF NALCO APPROVED BANKS & BANK MANDATE FORM	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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III. SCHEDULE OF FOREIGN BANKS

Sl.No.	Foreign Banks	BIC
01	Abu Dhabi Commercial Bank Limited	ADCB AE AA
02	Australia & New Zealand Banking Group Limited	ANZB AU 3M
03	Bank of America NA	BOFA US 3N
04	Bank of Bahrain and Kuwait B.S.C.	BBKU BH BM
05	Bank of Ceylon	BCEY LK LX
06	Barclays Bank PLC	BARC GB 22
07	BNP Paribas	BNPA FR PP
08	Citibank N.A.	CITI US 33
09	Commonwealth Bank of Australia	CTBA AU 2S
10	Credit Agricole Corporate & Investment Bank	BSUI FR PP
11	Credit Suisse AG	CRES CH ZZ
12	DBS Bank Ltd.	DBSS SG SG
13	Deutsche Bank AG	DEUT DE FF
14	Doha Bank	DOHB QA QA
15	FirstRand Bank Ltd.	FIRN ZA JJ
16	Industrial Bank of Korea	IBKO KR SE
17	Industrial & Commercial Bank of China Limited	ICBK CN BJ
18	JP Morgan Chase Bank	CHAS US 33
19	KEB Hana Bank	KOEX KR SE
20	Krung Thai Bank Public Company Ltd.	KRTH TH BK
21	Mashreqbank PSC	BOML AE AD
22	Mizuho Bank Ltd.	MHCB JP JT
23	National Australia Bank Ltd.	NATA AU 33
24	Sberbank	SABR RU MM
25	Shinhan Bank	SHBK KR SE
26	Societe Generale	SOGE FR PP
27	Sonali Bank Ltd.	BSO N BD DH
28	Standard Chartered Bank	SCBL GB 2L
29	Sumitomo Mitsui Banking Corporation	SMBC JP JT
30	The Bank of Nova Scotia	NOSC CA TT
31	The Bank of Tokyo-Mitsubishi UFJ, Ltd.	BOTK JP JT
32	The Hongkong and Shanghai Banking Corp.Ltd.	HSBC HK HH
33	The Royal Bank of Scotland PLC	RBOS GB 2L
34	United Overseas Bank Ltd.	UOVB SG SG
35	Westpac Banking Corporation	WPAC AU 2F
36	Woori Bank	HVBK KR SE

Note: In the case of Foreign currency BGs, BG issuing bank must have correspondent relationship with State Bank of India

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XI - LIST OF NALCO APPROVED BANKS & BANK MANDATE FORM	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ECS MANDATE FORM

ELECTRONIC CLEARING SERVICES / ELECTRONIC FUND TRANSFER/ INTERNET BANKING MANDATE FORM

To
National Aluminium Company Limited,
NALCO Bhawan, Plot No. P/1, Nayapalli,
Bhubaneswar - 751013

Dear Sir,

Sub: Authorization for release of payment due from NALCO, Corporate Office, Bhubaneswar through Electronic Clearing Services (RBI)/ Electronic fund transfer (RBI/SBI)/ Internet Banking (SBI).

Refer Order No.....dt.....and/or Tender/Enquiry/Letter No.....dt.....

(Please fill in the information in CAPITAL LETTERS. Please TICK wherever it is applicable)

1. **Name of the Vendor** : _____
2. **Address of the vendor** : _____

City : _____ Pin Code: _____

E-mail Id: _____

Permanent _____ Account


Number: _____

3. Particulars of Bank:

Bank Name		Branch Name	
Branch Place		Branch City	
Pin Code		Branch Code	
MICR No.			
(9 Digits code number appearing on the MICR Band of the cheque supplied by the Bank. Please attach Xerox copy of a cheque of your bank for ensuring accuracy of the bank name, branch name and code number)			
Account Type ?	Savings ?	Current ?	Cash Credit ?
Account Number(as appearing in the Cheque Book)			
RTGS / IFSC Code			

4. Date from which the mandate should be effective:

I hereby declare that the particulars given above are correct and complete. If any transaction is delayed or not effected for reasons of incomplete or incorrect information, I shall not hold National Aluminium Company Limited responsible. I also undertake to advise any change in the particulars of my account to facilitate updation of records for purpose of credit of amount through RBI ECS/RBI EFT/SBI NET.

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XI - LIST OF NALCO APPROVED BANKS & BANK MANDATE FORM	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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Place: _____

Date: _____


Signature of the vendor/Authorized Signatory

Certified that particulars furnished above are correct as per our records

Bank's Stamp:

Date: _____

(Signature of the Authorized Official from the Banks)

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XII - SOCIAL ACCOUNTABILITY 8000 COMPLIANCE FORMAT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
			DTD. 28/03/2023

ANNEXURE - XII

SOCIAL ACCOUNTABILITY 8000 COMPLIANCE FORMAT

A. Basic information


Name of the organization		
Address		
Telephone No		
Name of the Proprietor		
Nature of Business		
License Number and date of expiry		
Employees	Staff (Total Number)	Workmen (Total Number)
• <u>Permanent</u>		
• Casual		
• Badli		
• Temporary		
• Contracted		

B. Information regarding Social Accountability

- What is the minimum age required to join your organization? _____ Years
- What types of certificates (Like mark sheet, Xerox birth certificate) you keep with you? Original Copy /
- Do you require to keep any kind of deposit inform of cash at the time of employment? Yes/No
- Do you provide safe & healthy work environment as per statutory requirement? Yes/No
- If directly not provided by you, do you get health & safety benefits from NALCO? Yes/No

Are you certified for SA 8000? Yes/No
If Yes, please submit a copy of SA8000 Certificate along with this filled up questionnaire

Have you undergone Code of Conduct Audit (COC Audit) in last 2 years? Yes/No

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XII - SOCIAL ACCOUNTABILITY 8000 COMPLIANCE FORMAT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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If yes, please submit a copy of Code of Conduct Audit Report along with this filled up questionnaire

Have your sub-suppliers been certified for SA 8000? Yes/No

Have your sub-suppliers undergone Code of Conduct Audit (COC Audit) in last 2 years? Yes/No

- Do you provide personal protective equipment(s) to your employees free of cost? Yes/No
- Do you provide safety training to your employees? Yes/No
- Do you ensure canteen facility for your employees? Yes/No
- If not, do you get the facilities from NALCO Yes/No
- What types of medical benefits you provide to your employees?

- Do you allow trade union and collective bargaining in your organization? Yes/No
If no, how do you ensure freedom of expression?


- In case of non-performance of any employee, how do you deal with such situations?

- What are the procedures of hiring/promotion/ remuneration in your organization?


- Do you provide appointment letter to your employees?
Yes/No
- Do you maintain a documented terms and conditions of employment?
Yes/No

- Do you maintain a disciplinary procedure? Yes/No

- If no, how do you terminate your employee?

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XII - SOCIAL ACCOUNTABILITY 8000 COMPLIANCE FORMAT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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- How do you ensure that your employees are not discrimination on the basis of cast creed, gender, religion, age and dieses?
- How many shift you have? _____ shifts
- What is the official working time? _____ hours
- Which day is off day in your organization? _____
- In case, a person works in off day or holiday, how is he/she compensated? _____
- Do you pay overtime to your employees as per law? Yes/No
- What is the lowest amount (salary/wage) you pay to Rs. _____/- your employees?
- Is there any case of deduction in wage? Yes/No
- In case, it is yes, what are the general reasons for such deduction? _____
- Is there any apprentice period in your organization? Yes/No
- If yes, what is the apprentice period in your organization? _____
- Do you have any international certification Yes/No
- If yes, please specify _____
- Do you receive, handle or promote goods and/or services from supplier/subcontractors or sub-suppliers Yes/No

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XII - SOCIAL ACCOUNTABILITY 8000 COMPLIANCE FORMAT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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- Do you receive, handle or promote goods and/or services from supplier/subcontractors or sub-suppliers who are classified as home worker? Yes/No
- If yes, what steps you have taken to ensure that they get similar level of protection as afforded to directly employed employees?

- Have you taken care to look into issues related to child labor
Yes/No

Forced labor, health & safety, working hours and remuneration of your suppliers

We do hereby declare that our organization is committed to social accountability. We will promptly implement remedial/corrective actions identified against the requirement and promptly inform your organization. We also declare that the sub-contractors/sub supplier's performances are monitored by us. Moreover, we declare that if invited, we shall participate in awareness program as well as monitoring program organized by you.


We declare that the above-mentioned information is correct.

Signature:

Designation:

Date

Seal of the organization

 National Aluminium Company Limited	Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha		
TENDER DOCUMENT	ANNEXURE-XIII - PROFORMA FOR PRE CONTRACT INTEGRITY PACT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - XIII

PRE CONTRACT INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on _____ day of the month of _____ 2023, between, on one hand, the National Aluminium Company Limited (NALCO), a company registered under the Companies Act 1956 and a Government of India Enterprise, having its Registered Office at NALCO Bhawan, P/1, Nayapalli, Bhubaneswar- 751013, Odisha, India (referred to as NALCO) acting through **Ms.S Sahay, GM (Materials)** (with designation of the Officer) (hereinafter called the "BUYER", which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and M/s. _____ represented by Shri _____, Chief Executive Officer (hereinafter called the "BIDDER / Seller" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the BUYER proposes to procure for LSTK package for **"Installation of new Wagon Tippler, Side Arm Charger, Hydraulic Breaker, new Conveying System as well as Up-gradation of Conveyors-3A/3B in existing Coal Handling Plant (CHP) in SPP, NALCO, Damanjodi, Odisha"** and the BIDDER/ Seller is willing to offer/has offered the stores and

WHEREAS the BIDDER is a private company / public company / Government undertaking/ partnership/ registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a Company under the administrative control of the Ministry of Mines, Govt. of India.

NOW THEREFORE


To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/ prejudiced dealings prior to during and subsequent to the currency of the contract to be entered into with a view to :-

Enabling the BUYER to obtain the desired said stores/equipment at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling BIDDERS to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the BUYER will comment to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:


Commitments of the BUYER

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- 1.1 The BUYER undertakes that no official of the BUYER, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person or organisation or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.
- 1.2 The BUYER will, during the pre-contract stage, treat all BIDDERS alike and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERS.
- 1.3 All the officials of the BUYER will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.
2. In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the BUYER with full and verifiable facts and the same is prima facie found to be correct by the BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

Commitments of BIDDERS


3. The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following :-
 - 3.1 The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER, connected directly or indirectly with the bidding process, or to any person, organisation or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.
 - 3.2 The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Government for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with the Government.

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- 3.3 BIDDERS shall disclose the name and address of agents and representatives and Indian BIDDERS shall disclose their foreign principals or associates.
- 3.4 BIDDERS shall disclose the payment to be made by them to agents / brokers or any other Intermediary, in connection with this bid / contract.
- 3.5 The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the BUYER or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.
- 3.6 The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 3.7 The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.
- 3.8 The BIDDER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.
- 3.9 The BIDDER commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable fact.
- 3.10 The BIDDER shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.
- 3.11. If the Bidder or any employee of the Bidder or any person acting on the behalf of the Bidder, either directly or indirectly, is a relative of any of the officers of the Buyer, or alternatively, if any relative of an officer of the Buyer has financial interest/stake in the Bidder's firm, the same shall be disclosed by the Bidder at the time of filing of tender. The term "relative" for this purpose would be as defined in Section 6 of the Companies Act 1956.
- 3.12. The Bidder shall not lend to or borrow any money from or enter into monetary dealings or transactions, directly or indirectly, with any employee of the Buyer.
- 3.13 Bidder(s)/ Contractor(s) who have signed the integrity pact shall not approach the courts while representing the matter to IEMs and shall wait for their decision in the matter.

4. **Previous Transgression**

- 4.1. The Bidder declares that no previous transgression occurred in the last three years immediately before signing of this integrity Pact, with any other company in any


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country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India that could Justify Bidder's exclusion from the tender process.


- 4.2. The Bidder agrees that if it makes incorrect statement on this subject, Bidder can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

5. **Sanctions for Violations:**

- 5.1. Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle of the BUYER to take all or any one of the following actions, wherever required: -
- (i) To immediately call off the pre-contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.
 - (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit / Performance Bond (after the contract is signed) shall stand forfeited either fully or partially, as decided by the BUYER and the BUYER shall not be required to assign any reason therefore.
 - (iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.
 - (iv) To recover all sums already paid by the BUYER, and in case of an Indian BIDDER with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank of India, while in case of a BIDDER from a country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract for any other stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.
 - (v) To en-cash the advance bank guarantee and performance bond / warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.
 - (vi) To cancel all or any other Contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation / rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.
 - (vii) To debar the BIDDER from participating in future bidding processes of NALCO for a minimum period of five years, which may be further extended at the discretion of the BUYER.

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- (viii) To recover all sums paid in violation of this Pact by BIDDER(s) to any middleman or agent or broker with a view to securing the contract.
- (ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER, the same shall not be opened.
- (x) Forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.
- 5.2 The BUYER will be entitled to take all or any of the actions mentioned at para 5.1(i) to (x) of this Pact also on the Commission by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER), of an offence as defined in Chapter IX of the Indian Penal Code 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.
- 5.3 The decision of the BUYER to the effect that a breach of the provisions of this Pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the BIDDER can approach the independent Monitor(s) appointed for the purposes of this Pact.
6. **Independent External Monitors (IEMs):**
- 6.1 The BUYER has a panel of Independent External Monitors (hereinafter referred to as IEMs) for this Pact in consultation with the Central Vigilance Commission as mentioned in NALCO's NIT/ NALCO's website (www.nalcoindia.com).
- 6.2 The task of the IEMs shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.
- 6.3 The IEMs shall not be subject to instructions by representatives of the parties and perform their functions neutrally and independently.
- 6.4 Both the parties accept that the IEMs have the right to access all the documents relating to the project / procurement including minutes of meetings.
- 6.5 As soon as the IEM notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the BUYER.
- 6.6 The BIDDER(s) accepts that the IEM has the right to access without restriction to all Project documentation of the BUYER including that provided by the BIDDER. The BIDDER will also grant the IEM, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The IEM shall be under contractual obligation to treat the information and documents of the BIDDER / Subcontractor(s) with confidentiality.
- 6.7 The BUYER will provide to the IEM sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on

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the contractual relations between the parties. The parties will offer to the IEM the option to participate in such meetings.

- 6.8 The IEM will submit a written report to the designated Authority of BUYER / Secretary in the Department / within 8 to 10 weeks from the date of reference or intimation to his by the BUYER / BIDDER and should be occasion arise, submit proposals for correcting problematic situations.

7. Facilitation of Investigation:

In case of any allegation of violation of any provisions of this Pact or payment of commission, the IEMs shall be entitled to examine all the documents including the Books of Accounts of the BIDDER and the BIDDER shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

8. Law and Place of Jurisdiction:

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the BUYER.

9. Other Legal Actions:

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

10. **Validity:**

- 10.1 This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the contract, and for all other Bidders 6 months after the contract has been awarded. If any claim is made/lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by CMD, NALCO.


- 10.2 Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

11. If the bidder/ Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members

12. The parties hereby sign this Integrity Pact at _____ on _____.

For & on behalf of

For & on behalf of

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BUYER

BIDDER

Name of the Officer:

Designation:

Company: NALCO

Official Seal

Witness


1. _____

2. _____

Witness

1. _____

2. _____

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TENDER DOCUMENT	ANNEXURE-XIV - RESTRICTION FOR BIDDERS/ SUPPLIERS FROM A COUNTRY WHICH SHARES A LAND BORDER WITH INDIA	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - XIV

RESTRICTION FOR BIDDERS/ SUPPLIERS FROM A COUNTRY WHICH SHARES A LAND BORDER WITH INDIA

1. Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with the Competent Authority (as specified).
2. A bidder is permitted to procure raw materials, components, sub-assemblies etc. from the vendors from the countries sharing land borders with India. Such vendors will not be required to be registered with the Competent Authority, as it is not regarded as "sub-contracting".
3. However, in case a bidder has proposed to supply finished goods procured directly/ indirectly from the vendors from the countries sharing land borders with India, such vendors will be required to be registered with the Competent Authority.

Note:


- (i) Competent authority shall be the Registration Committee constituted by the Department of Industry and Internal Trade (DPIIT), Government of India.
- (ii) 'Bidder' (including the term 'tenderer', 'consultant' or 'service provider' in certain context) means any person or firm or company, including any member of a consortium or joint venture (that is association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.
- (iii) "Bidder from a country which shares a land border with India" for the purpose of this Order means: -
 - a. An entity incorporated, established or registered in such a country; or
 - b. A subsidiary of an entity incorporated, established or registered in such a country; or
 - c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - d. An entity whose *beneficial owner* is situated in such a country; or
 - e. An Indian (or other) agent of such an entity; or
 - f. A natural person who is a citizen of such a country; or
 - g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
- (iv) The beneficial owner for the purpose of (iii) above will be as under:
 - (a) In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

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- (b) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
- (c) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
- (d) Where no natural person is identified under (a) or (b) or (c) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
- (e) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
- (v) An Agent is a person employed to do any act for another, or to represent another in dealings with third person.
- (vi) The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

4. **Model Certificate/ declaration for Renderers':** In this regards, bidders are required to give declaration / certificate for tenders as follows failing which your offer may be considered for further evaluation:

"I have read the clause regarding restrictions on procurement from a bidder of a Country which shares a land border with India; I certify that _____ (bidder name) is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that _____ (bidder name) fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

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TENDER DOCUMENT	ANNEXURE-XV – DECLARATION ON PERCENTAGE OF LOCAL CONTENT	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - XV

(Declaration by the bidder on their letter head)

To,
GM (Materials)
National Aluminium Company Limited,
NALCO Bhawan, P/1,
Nayapalli, Bhubaneswar,
Odisha – 751013, INDIA

Date-


Dear Madam/Sir,

We, M/s. _____ (*bidder name*) having its office
at _____ (*address*)
hereby confirm that the offered product has ____% of the local content.

Following is/are the location(s) at which local value addition is made:

Yours sincerely,


Signature
Name
Designation
Contact No.

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TENDER DOCUMENT	ANNEXURE-XVI – GUIDELINE TO BIDDERS ON REVERSE AUCTION (RA)	DOC. No. : NBC/MM/510/3-8937/ TIPPLER/2023	REV. 00
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ANNEXURE - XVI

GUIDELINE TO BIDDERS ON REVERSE AUCTION (RA)


1. All bidders are requested to make themselves conversant with reverse auction process in CPP Portal. Any excuse on later date will not be entertained.
2. Date and time of price bid opening and the subsequent reverse auction shall be communicated to all the techno-commercially accepted bidders through email.
3. If a bidder does not participate in the Reverse Auction, the price quoted by him in the price bid shall be considered as the valid price of that bidder. The inter-se position of the said bidder shall be considered based on their position on completion of reverse auction.
4. The bidders to participate in tender-cum auction process in CPP Portal, has to log into CPP Portal (i.e. <https://eprocure.gov.in/eprocure/app>) with DSC to access the application and quote from their own offices/ place of their choice. Once logged in, the software gives them a platform to place bids.
5. Price bid shall be opened at --:-- Hrs on XX/XX/2023 and Reverse Auction shall commence at about --:-- Hrs on XX/XX/2023 and shall remain open for minimum two hours. Date & Time of Price bid opening shall be uploaded along with technical evaluation of the tender at CPP Portal. Start & end time of Reverse Auction shall be configured at CPP Portal after price bid opening and before start of reverse auction.
6. Starting bid price shall be the L1 offer price received against the tender. System displays L1 landed price in auction creation form and allows TIA to edit the value as 'start bid' price. Normally, TIAs will enter the L1 Price as the start bid price.

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7. All electronic bids submitted during the reverse auction process shall be legally binding on the bidder. The bid values submitted by the bidder are digitally signed by the bidders before submitting. The bidder, after initial submission of a bid cannot subsequently increase the bid value. They can only reduce their bid by the minimum permissible decrement or its multiples. The last bid submitted by the bidder in the Reverse Auction will be considered as the valid price bid offered by that bidder and will be the basis for evaluation/ acceptance by NALCO.
8. CPP Portal Server time shall be the basis of Start time and Closing time for bidding and shall be binding for all.
9. Bid Decremental Value shall be Rs.50,000/-. The reduction to be offered by the bidder shall be as per the decrement value or in multiple thereof.
10. Initial period of reverse auction will be for two hours from auction start time. Elapse time of ten minutes shall be given for reverse auction. There will be auto extensions of time, every time, (by ten minutes) in case of any reduction recorded in the elapse time duration. The reverse auction will come to a close only when there is no further bid recorded in the elapse time duration.
11. Other relevant parameters shall be displayed in the CPP Portal reverse auction window.
12. **Maximum Seal Percentage:** Maximum Seal percentage shall be fixed at 3%. It is the maximum reduction that will be allowed in the bidding process in single go. Higher reduction will not be allowed by the system. This protects any possible mistakes by bidders. For any higher discount, the bidder has to repeat the action and the system allows it.

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13. Last bid submitted by the bidder till end of auction shall be considered as the valid price bid of that bidder. Any bid submitted early by the bidder prior to submission of his last bid will not be considered as valid price bid.
14. Auction flow is started and is closed after completion of the process. Once the Auction process is initiated the system takes over for auto auction activity. Then, comparison chart is generated.
15. Final BOQ-Comparative-Chart is generated from the system, by freezing the tender at the end of reverse auction process. This chart contains original offer and L1 auction price details. The log details of the entire reverse auction process will be generated by the system once the process of reverse auction is completed. The above information can also be accessed by the participating bidders, once the reverse auction process is completed.
16. **Elapsed time & Auto Extension Time:** Shall be set as 10 (Ten) minutes. All the bidders shall get at least 10 minutes time period to submit their fresh bids, after receipt of latest bid during reverse auction process. There will be auto extensions of time, every time, (by ten minutes) on receipt of any valid bid with in the last 10 minutes time period calculated from prevailing bid end time. For example, if bid end time is set as 11:00 Hrs and if any fresh bid is received during 10:50 and 11:00 Hrs, bid end time shall be auto extended by 10 minutes to 11:10 Hrs. If bids are received during last 10 minutes of end time, bid end time keeps on auto extended by 10 minutes every time. The reverse auction will come to a close only when there is no new bid recorded in the last ten minutes slot of bid end time.
17. In case of Item-rate-BOQ for placement of order on over-all-L1 basis; after completion of auction process either the rates of individual items are reduced

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proportionately to match the lowest landed rate quoted by the L1 bidder, in the reverse auction process or L1 bidder can furnish break-up as per Item-rate-BOQ matching the lowest landed rate quoted by the L1 bidder within two days of completion of auction process.

18. In case of disruption of service at the CPP Portal end during Reverse Auction Process, the Reverse Auction Process will start all over again. In such a situation, the last recorded lowest price of prematurely ended Reverse Auction Process, will be the 'Start Bid' price for the restarted process. Disruption and restarting of Reverse Auction Process shall be intimated to all the bidders through system/SMS/e-mail through CPP Portal. All the stipulations of pre-maturely ended Reverse Auction Process will be applicable to the restarted process.
19. Bidders at their own interest should ensure uninterrupted internet connectivity at their end during the reverse auction with necessary backups to take care of any connectivity problem.