Tender Enquiry for SELECTION OF CONSULTANT for providing Engineering, Procurement, Construction Management Consultancy Services for setting-up an Integrated Steel Plant at YSR (Kadapa) District, A.P.
Ref No: 07/YSRSCL/Consultancy/2021-22 Dated: 23.10.2021

ADDENDUM NO: 1
Date: November 10, 2021

Revised timelines with respect to the Tender document are as given below. Any reference to these timelines within the Tender document are to be read as amended accordingly.

Sl.No.	Page No:	Chapter	Para/ Clause	Existing timeline as per Tender Document	Revised Timeline
1	page-4 of 83	SCHEDULE OF EVENTS & BID DATA SHEET (BDS)	Sl No:5 - Close date & time for the submission of Tenders	12-11-2021 (16.00 Hrs IST)	**29-11-2021 (16.00 Hrs IST)**
2	page-4 of 83	SCHEDULE OF EVENTS & BID DATA SHEET (BDS)	Sl. No: 6 - Last date for receipt of Tender Queries/ reporting any error by e- mail	03-11-2021(17.00 Hrs IST)	**19-11-2021 (17.00 Hrs IST)**
3	page-4 of 83	SCHEDULE OF EVENTS & BID DATA SHEET (BDS)	Sl No:9 - Date and Time of opening of Techno- Commercial Bid	12-11-2021 (17.00 Hrs IST)	**29-11-2021 (17.00 Hrs IST)**

Sl.No.	Page No:	Chapter	Para/ Clause	Existing clause as per Tender Document	Revised Clause / To be read as
4	**Page 1 of 83**	Title Page	-	Tender Enquiry for SELECTION OF CONSULTANT	Tender Document for SELECTION OF CONSULTANT
5	-	General		"Tender Enquiry" or "tender enquiry"	"Tender"
6	-	General		"Govt"	"Government of Andhra Pradesh "
7	-	General		"bidder" or "tenderer"	"Bidder" or "Tenderer"
8	Page-2 of 83	DISCLAIMER	Para-2	This Tender enquiry includes statements, which reflect various assumptions and assessments arrived at by YSRSCL in relation to the Firm.	This Tender includes statements, which reflect various assumptions and assessments arrived at by YSRSCL in relation to the **Project and the scope of work of the Consultant**.
9	Page-2 of 83	DISCLAIMER		YSRSCL, its employees and/or firms ...	YSRSCL, its employees, **contractors, advisors, consultants** …
10	page-6 of 83	BACKGROUND INFORMATION	Project Background - Clause 2.6	10 MVA Construction power substations are constructed to provide power to the construction activities. The power will be distributed to various construction locations as designed by the consultant.	10 MVA Construction power substations are constructed to provide power to the construction activities. **Consultant is to design the construction power distribution and connectivity with Construction Power Sub Station (CPSS) based on the package contractors requirement. Package contractor is to make his own arrangements to draw the power from CPSS**
11	-	NOTICE INVITING TENDERS (NIT)	PREAMBLE-Clause 1.14	New Clause	Conditional bids are liable to be rejected at the discretion of YSRSCL.
12	Page-8 of 83	NOTICE INVITING TENDERS (NIT)	BID SECURITY DECLARATION-Clause 2.1	Bidders shall submit a Bid Securing Declaration accepting that if they withdraw or modify their bids during the period of bid validity, or in the event of being awarded the contract, if they fail to sign the contract or submit a performance security before the deadline defined in this tender document or any extended time notified by the Employer, they will be suspended for the period of two years from being eligible to submit bids for contracts of YSRSCL. The format for submission of Bid Securing Declaration is attached at Annexure-II	Bidders shall submit a Bid **Security** Declaration accepting that if they withdraw or modify their bids during the period of bid validity, or in the event of being awarded the contract, if they fail to sign the contract or submit a performance security before the deadline defined in this Tender document or any extended time notified by the Employer, **or have indulged in corrupt/fraudulent/collusive/coercive practice**, they will be **put on watch list/holiday/banning list** (as per policies of YSRSCL in this regard) and will be suspended for the period of 2 (two) years from being eligible to submit bids for contracts of YSRSCL. The format for submission of Bid **Security** Declaration is attached at Annexure-II
13	-	NOTICE INVITING TENDERS (NIT)	TENDER VALIDITY Clause 7.3	New Clause	Once a withdrawal letter is received from any Bidder, the offer will be treated as withdrawn and no further claim / correspondence will be entertained in this regard.
14	-	NOTICE INVITING TENDERS (NIT)	TENDER VALIDITY Clause 7.4	New Clause	The selected Bidder will be required to enter into a formal contract, which will be based on their bid and Form of Contract Agreement forming part of this Tender.
15	-	NOTICE INVITING TENDERS (NIT)	TENDER VALIDITY Clause 7.5	New Clause	Time will be regarded as the essence of the contract and the failure on the part of the Consultant to complete the work within the stipulated time shall entitle the Company to recover liquidate damages and / or penalty from the Consultant as per terms of the Tender /Contract.

16	Page-9 of 83	NOTICE INVITING TENDERS (NIT)	OTHERS Clause 8.4	… The Contracting Agency in such cases shall make good to YSRSCL any loss or damage resulting from such termination. Recovery of risk and cost charges etc., will be applied. Decision of YSRSCL will be final and binding in this regard.	… **The selected Bidder** in such cases shall make good to YSRSCL any loss or damage resulting from such termination. Recovery of risk and cost charges etc., will be applied. Decision of YSRSCL will be final and binding in this regard.
17	Page-13 of 83	INSTRUCTIONS TO TENDERERS	BID DOCUMENT PREPARATION: Clause 7.6.3	One envelope containing prices in figures & words as per Price Schedule Format given in Schedule-3, ...	One envelope containing prices in figures & words as per **Summary Price Schedule** given in Schedule-3, …
18	Page-18 of 83	INSTRUCTIONS TO TENDERERS	SECURITY DEPOSIT: Clause 22.1	Upon acceptance of the tender, the successful tenderer shall deposit with the Employer a sum sufficient, to make the Security Deposit to the extent of 5% (Five percent) of the total contract value, at all times, towards performance guarantee	Upon acceptance of the Tender, the successful Tenderer shall deposit with the Employer a sum sufficient, to make the Security Deposit to the extent of **3% (Three percent)** of the total contract value, at all times, towards performance guarantee
19	Page-19 of 83	INSTRUCTIONS TO TENDERERS	SECURITY DEPOSIT: Clause 22.2	Retention money shall be deducted at 5% from Running bills. However, the total Security deposit together with retention money shall not exceed 10% of total contract value.	Retention money shall be deducted at 5% (Five percent) from Running bills. However, the total Security deposit together with retention money shall not exceed **8% (Eight percent)** of total contract value.
20	Page-19 of 83	INSTRUCTIONS TO TENDERERS	SECURITY DEPOSIT: Clause 22.13	If Security Deposit is submitted in the form of BG, the proforma for the same shall be agreed by YSRSCL	If Security Deposit is submitted in the form of BG, the proforma for the same is enclosed to this amendment and shall be considered as **annexure XI** of the Tender Document
21	-	INSTRUCTIONS TO TENDERERS	SECURITY DEPOSIT: Clause 22.17	New Clause	The BG may be encashed by the Employer on account of Consultant's failure to fulfil its obligations under the Contract / breach of Contract and/or non-performance/un-satisfactory performance of the Consultant. The Employer shall not be required to prove any loss or damage on account of Consultant's non-performance/un-satisfactory performance.
22	-	INSTRUCTIONS TO TENDERERS	SECURITY DEPOSIT: Clause 22.18	New Clause	The BG will not accrue any interest during its period of validity or extended validity.
23	Page-21 of 83	Annexure - I		FORM OF TENDER	Revised"FORM of TENDER" as enclosed to this amendment
24	Page-22 of 83	Annexure - II		BID SECURITY DECLARATION	Revised "BID SECURITY DECLARATION" as enclosed to this amendment
25	Page-26 of 83	Annexure-VII: DOCUMENTS TO BE SUBMITTED IN PART-I OF THE BID ENVELOPE	Sl.No. 12	Tenderer's declaration on Compliance of Company Law as per provision of clause 13.0 mentioned hereinafter.	Tenderer's declaration on Compliance of Company Law as per provision of clause 13.0 **under the Instruction to Tenderers**
26	Page-32 of 83	Annexure - X: TECHNICAL EVALUATION MATRIX	4e .Expert in Thin Slab Casting & Rolling (TSCR) in the Flats segment	**Criteria**: Expert in Thin Slab Casting & Rolling (TSCR) in the Flats segment - must be graduate in Engineering in any discipline **Scoring Method**: Number of Years of experience in EPCM consultancy services of TSCR: 01. More than 5 years and less than 10 years - 01 Mark OR 02. More than 10 years and less than 15 years – 02 Marks OR 03. More than 15 years – 03 Marks	**Criteria**: Expert in Casting, and Expert in Continuous Slab Rolling in the Flats segment - must be graduate in Engineering in any discipline **Scoring Method**: Number of Years of experience in EPCM consultancy services of Casting: 01. More than 5 years and less than 10 years - 0.5 Mark OR 02. More than 10 years and less than 15 years – 01 Mark OR 03. More than 15 years – 1.5 Marks Number of Years of experience in EPCM consultancy services of Continuous Slab Rolling : 01. More than 5 years and less than 10 years - 0.5 Mark OR 02. More than 10 years and less than 15 years – 01 Mark OR 03. More than 15 years – 1.5 Marks
27	Page-31 of 83	Annexure - X: TECHNICAL EVALUATION MATRIX	4 .Key Personnel	**Documents for confirmation:** CV (Curriculum Vitae): To be endorsed by self and countersigned by authorized representative of the company	**Documents for confirmation:** CV (Curriculum Vitae): To be endorsed by self and countersigned by authorized representative of the company. Relevant expereience of the specific field with details of responsibility and project to be provided
28	Page-35 of 83	GENERAL CONDITIONS OF CONTRACT	DEFINITIONS & INTERPRETATIONS - Clause 1.2	"Tenderer" shall mean person or persons, firms or Company /corporation submitting a tender against the Invitation to Tender and shall include his / its / their heirs, executors, administrators, legal representatives, successors and his / their Indian Agents.	"Tenderer / **Bidder**" shall mean person or persons, firms or Company /corporation submitting a Tender against the Invitation to Tender and shall include his / its / their heirs, executors, administrators, legal representatives, successors and his / their **permitted assigns**.
29	-	GENERAL CONDITIONS OF CONTRACT	ASSIGNMENT AND SUB LETTING - Clause 2.2	New Clause	The Employer shall have the right to assign this contract to its successors or assigns or any other third party, without the requirement to obtain the consent of the Consultant in this regard, and all covenants or agreements hereunder shall inure to the benefit of and be enforceable by or against its successors or assigns or such third party as the case may be.
30	-	GENERAL CONDITIONS OF CONTRACT	TERMINATION OF THE CONTRACT - Clause 5.7	New Clause	Termination on expiry of the contract: The Contract shall be deemed to have been automatically terminated on the expiry of the Contract Period unless the Parties have mutually agreed to extend this Contract.

31	-	GENERAL CONDITIONS OF CONTRACT	TERMINATION OF THE CONTRACT - Clause 5.8	New Clause	Termination on account of insolvency: In the event that the Consultant at any time during the term of the Contract, becomes insolvent or makes a voluntary assignment of its assets for the benefit of creditors or is adjudged bankrupt or under the process of insolvency or liquidation, then the Employer shall, by a notice in writing have the right to terminate the Contract and all the Consultant's rights and privileges hereunder, shall stand terminated forthwith.
32	-	GENERAL CONDITIONS OF CONTRACT	TERMINATION OF THE CONTRACT - Clause 5.9	New Clause	However, Employer shall be at liberty to give the receiver or liquidator or insolvency professional manager, as appointed by the Competent Court/Tribunal, the option of carrying out the Contract subject to its technical & financial competence and his providing a guarantee for due and faithful performance of the Contract.
33	-	GENERAL CONDITIONS OF CONTRACT	TERMINATION OF THE CONTRACT - Clause 5.10	New Clause	Notwithstanding the termination of this Contract, the parties shall continue to be bound by the provisions of this Contract that reasonably require some action or forbearance after such termination. Upon termination of this Contract, Consultant shall return to Employer all of Employer's properties, which are at the time in Consultant's possession. In the event of termination of Contract, Employer will issue notice of termination of the contract with date or event after which the contract will be terminated. The contract shall then stand terminated and the Consultant shall demobilize their personnel & materials. Demobilization charges shall not be payable by Employer.
34	-	GENERAL CONDITIONS OF CONTRACT	TERMINATION OF THE CONTRACT - Clause 5.11	New Clause	Termination for Convenience: Notwithstanding any other provision of the Contract, the Employer may at any time, and without cause, terminate the Contract in whole or in part, upon not less than seven (7) calendar days' written notice to the Consultant. Such termination shall be effected by delivery to the Consultant of a notice of termination specifying the effective date of the termination and the extent of the work to be terminated, as the case may be.
35	-	GENERAL CONDITIONS OF CONTRACT	TERMINATION OF THE CONTRACT - Clause 5.12	New Clause	If there is any change in ownership of the Consultant, the Consultant shall require prior consent of Employer. If the change in ownership of the Consultant takes place without such prior consent of the Employer, then the Employer shall, by a notice in writing have the right to terminate the Contract and all the Consultant's rights and privileges hereunder, shall stand terminated forthwith.
36	Page-39 of 83	GENERAL CONDITIONS OF CONTRACT	FORCE MEASURE - Clause 6.1	If at any time during the continuance of the Contract, the performance in whole or in part by either party or any obligations under the Contract shall be prevented or delayed by reason of any war, hostilities, act of public enemy, civil commotion, sabotage, fire, floods, explosions, epidemics, quarantine restrictions and Acts of God (hereinafter referred to as 'Events') and provided notice of the happening of any of the above mentioned Event duly certified by Indian Chamber of Commerce in case of Indian Parties or International Chamber of Commerce, Paris, France in case of foreign parties) is given by either party to the other within 21 days from the date of occurrence thereof, the Employer shall have the right by reason of such Event to terminate the Contract without however affecting the right to any claim for damages on the Consultant in respect of such non-performance or delay in performance.	If at any time during the continuance of the Contract, the performance in whole or in part by either party or any obligations under the Contract shall be prevented or delayed by reason of **a force majeure event which is beyond the reasonable control of a party and that materially and adversely affects the performance by that party of its obligations under or pursuant to the Contract, provided, however, that such material and adverse effect could not have been foreseen, prevented, overcome or remedied in whole or in part, including but not limited to** any war, hostilities, act of public enemy, civil commotion, sabotage, fire, floods, explosions, epidemics, **pandemic/lockdown** and Acts of God (hereinafter referred to as 'Events') and provided notice of the happening of any of the above mentioned Event duly certified by Indian Chamber of Commerce in case of Indian Parties or International Chamber of Commerce, Paris, France in case of foreign parties) is given by either party to the other within 21 (twenty one) da
37	-	GENERAL CONDITIONS OF CONTRACT	FORCE MEASURE - Clause 6.3	New Clause	If however, relative obligation of the party affected by such 'Event' is limited to part of the obligation(s), the Contract shall not be terminated and the parties shall continue to perform their respective obligations, which are not affected by the 'force majeure' condition, provided the obligations affected by the 'force majeure' do not preclude the parties in performing the obligations not affected by such conditions.
38	Page-41 of 83	SPECIAL CONDITIONS OF CONTRACT	Clause 3	Extension of time: If, for any special circumstances, an extension of time for consultancy services/submission of the report is required, then the Consultant shall inform to the Engineer, within 15 days from the date of occurrence of such circumstances, full particulars of any request for extension of time for which he may consider himself entitled in order that such request may be examined. The decision of YSRSCL shall be final and binding in this aspect and no additional remuneration shall be payable for the extended period for the scope of work covered under LOA.	Extension of time: If, for any special circumstances, an extension of time for consultancy services/submission of the report is required, then the Consultant shall inform to the Engineer, within 15 days from the date of occurrence of such circumstances, full particulars of any request for extension of time for which he may consider himself entitled in order that such request may be examined. The decision of YSRSCL shall be final and binding in this aspect and no additional remuneration shall be payable for the extended period for the scope of work covered under **Contract Agreement**.

39	Page-42 of 83	SPECIAL CONDITIONS OF CONTRACT	Clause 6	EMPLOYEES' PROVIDENT FUNDS AND MISCELLANEOUS PROVISIONS ACT 1952	EMPLOYEES' PROVIDENT FUNDS, MISCELLANEOUS PROVISIONS ACT 1952 **AND OTHER APPLICABLE LABOUR LAWS**
40	Page-42 of 83	SPECIAL CONDITIONS OF CONTRACT	Clause 6.1	The consultant shall ensure strict compliance of provisions of the Employees' Provident Funds and Miscellaneous Provisions Act 1952 and the schemes framed there under so far as they are applicable to their establishments and agencies engaged by them. The Consultant also required to indemnify the Employer against any loss or claims or penal damages whatsoever resulting out of non-compliance on the part of the Consultant with the provisions of the aforesaid Act and the Schemes framed there under.	The Consultant shall ensure strict compliance **with various Indian labour laws and statutory regulations, to the extent applicable, but not limited** to provisions of the Employees' Provident Funds and Miscellaneous Provisions Act 1952 and the schemes framed there under so far as they are applicable to their establishments and agencies engaged by them. The Consultant also required to indemnify the Employer against any loss or claims or penal damages whatsoever resulting out of non-compliance on the part of the Consultant with the provisions of the aforesaid Act and the schemes framed there under.
41	Page-42 of 83	SPECIAL CONDITIONS OF CONTRACT	TERMS OF PAYMENT - Clause 8	The terms of payment are as per clause of technical specification	The terms of payment are as per **Schedule-V**
42	Page-43 of 83	SPECIAL CONDITIONS OF CONTRACT	PENALTY - Clause 9	As per clause 2 of technical specification	As per clause 2 of **Schedule-V**
43	Page-43 of 83	SPECIAL CONDITIONS OF CONTRACT	LIQUIDATED DAMAGES - Clause 11.3	If any adverse performance as indicated below is noticed in the various services rendered by the consultant at all the stages of the contract duration as elaborated in the scope of services of the contract, the consultant shall be liable to pay as agreed liquidated damages and not by way of penalty sum of 0.25% of the consultancy contract value per occurrence of such adverse performance	If any adverse performance as indicated below is noticed in the various services rendered by the consultant at all the stages of the contract duration as elaborated in the scope of services of the contract, the consultant shall be liable to pay as agreed liquidated damages and not by way of penalty sum of 0.25% of **apportioned consultancy fees for the respective package (as per Schedule 5) for which the deficient or adverse service has been provided per occurrence of such adverse performance**
44	Page-45 of 83	SPECIAL CONDITIONS OF CONTRACT	Approval of Personnel - Clause 14.3.1	The Key Personnel listed in clause 5.10 in Schedule - 1 of the Agreement are hereby approved by the Employer. No other Key Personnel shall be engaged without prior approval of the Employer	The Key Personnel listed in **clause 5.9 in Schedule - 1** of the Agreement are hereby approved by the Employer. No other Key Personnel shall be engaged without prior approval of the Employer
45	Page-45 of 83	SPECIAL CONDITIONS OF CONTRACT	Substitution of Key Personnel - Clause 14.4.1	The Employer expects all the Key Personnel specified in the Proposal to be available during implementation of the Agreement. The Employer will not consider any substitution of Key Personnel except under compelling circumstances beyond the control of the Consultant and the concerned Key Personnel. Such substitution shall be limited to 1 (one) Key Personnel subject to equally or better qualified and experienced personnel being provided to the satisfaction of the Employer. Without prejudice to the foregoing, substitution of the Key Personnel shall be permitted only upon reduction of payment equal to 0.1% (Zero point one per cent) of the total Agreement Value.	The Employer expects all the Key Personnel specified in the Proposal to be available during implementation of the Agreement. The Employer will not consider any substitution of Key Personnel except under compelling circumstances beyond the control of the Consultant and the concerned Key Personnel. • Replacement of first 10% of key personnel will be subject to reduction of payme equal to 0.05% of the total Contract Price • In case of replacement of next 10% of key personnel will be subject to reduction payment equal to 0.1% of the total Contract Price • In case of third 10% replacement,the reduction of payment will be equal to 0.15% the total Contract Price
46	-	SPECIAL CONDITIONS OF CONTRACT	LIABILITY - Clause-19	New Clause	19.1 Except as otherwise expressly provided herein, neither the Employer nor its servants, agents, nominees, contractors, or sub-contractor shall have any liability or responsibility whatsoever to whomsoever for loss of or damage to the equipment and/or loss of or damage to the property of the Consultant, irrespective of how such loss or damage is caused and even if caused by the negligence of Employer and/or its servants, agent, nominees, assignees, contractors and sub-contractor.
47	-			New Clause	19.2. The Consultant shall protect, defend, indemnify and hold harmless the Employer from and against such loss or damage and any suit, claim or expense resulting there from. Neither Employer nor its servants, agents, nominees, assignees, contractors, sub-contractors shall have any liability or responsibility whatsoever for injury to, illness, or death of any employee of the Consultant irrespective of how such injury, illness or death is caused and even if caused by the negligence of the Employer and/or its servants, agents nominees, assignees, contractors and sub-contractors. Consultant shall protect, defend, indemnify and hold harmless the Employer from and against such liabilities and any suit, claim or expense resulting there from.
48	-			New Clause	19.3 The Consultant hereby agrees to waive its right of recourse and further agrees to cause its underwriters to waive their right of subrogation against the Employer and/or its underwriters, servants, agents, nominees, assignees, contractor and sub-contractors for loss or damage to the equipment of the Consultant when such loss or damage or liabilities arises out of or in connection with the performance of the contract limited to the Consultant's liabilities agreed to under this Contract.

49	-			New Clause	19.4 The Consultant hereby further agrees to waive its right of recourse and agrees to cause its underwriters to waive their right of subrogation against the Employer and/or its underwriters, servants, agents, nominees, assignees, contractors and sub-contractor\s for injury to, illness or death of any employee of the Consultant when such injury, illness or death arises out of or in connection with the performance of the contract limited to the Consultant's liabilities agreed to under this Contract.
50	-	SPECIAL CONDITIONS OF CONTRACT	RISK PURCHASE - Clause-20	New Clause	20.1 In the event of, Consultant's failure to provide the services as per the contractual scope, terms and conditions, Employer reserves the right to hire the services from any other source at the Consultant's risk & cost and the difference in cost shall be borne by the Consultant. Further, Employer shall retain the right of forfeiture of Security Deposit and any other action as deemed fit. In certain operational situations Employer reserves the right to take over the site including the service equipment at the risk and cost of the Consultant.
51	-	SPECIAL CONDITIONS OF CONTRACT	RECORDS, REPORTS AND INSPECTION - Clause-21	New Clause	21.1 The Consultant shall, at all times during the currency of the Contract, permit the Employer and its authorized employees and representatives to inspect all the work performed and to witness and check all the tests made in connection with the said work.
52	-			New Clause	21.2 The Consultant shall keep an authentic, accurate history and logs including safety records of each service item with major items consumed, which shall be open at all reasonable times for inspection by the Consultant's designated representatives and its authorized employees.
53	-			New Clause	21.3 The Consultant shall provide the Employer's designated representatives with a daily written report, on form prescribed by the Employer showing details of operations during the preceding 24 hours and any other information related to the said services requested by the Employer whenever so requested. The Consultant shall not, without Employer's written consent allow any third person(s) access to the said information or give out to any third person information in connection therewith.
54	-	SPECIAL CONDITIONS OF CONTRACT	SET OFF - Clause-22	New Clause	22.1 Any sum of money due and payable to the Consultant (including Security Deposit refundable to them) under this or any other Contract, whether in progress or in future, may be appropriated by the Employer and set-off against any claim of Employer (or such other person or persons contracting through the Employer) for payment of a sum of money arising out of this Contract or under any other contract made by the Consultant with Employer (or such other person or persons contracting through Employer).
55	-	SPECIAL CONDITIONS OF CONTRACT	WITH HOLDING - Clause-23	New Clause	23.1 Employer may withhold or nullify the whole or any part of the amount due to Consultant, after informing the Consultant of the reasons in writing, on account of subsequently discovered evidence in order to protect Employer from loss on account of: (a) For non-completion of jobs assigned as per Scope of Work and terms set out in this Contract. (b) Defective work not remedied by Consultant. (c) Any failure by Consultant to fully reimburse Employer under any of the indemnification provisions of this Contract.
56	-			New Clause	23.2 Withholding will also be effected on account of the following: (a) Order issued by a court of law or statutory authority in India. (b) Income-tax deductible at source according to law prevalent from time to time in the country. (c) Any obligation of Consultant which by any law prevalent from time to time to be discharged by Employer in the event of Consultant 's failure to adhere to such laws.
57	-	SPECIAL CONDITIONS OF CONTRACT	GENERAL HEALTH, SAFETY & ENVIRONMENT (HSE) GUIDELINES - Clause-24	New Clause	24.1 It will be solely the Consultant's responsibility to fulfil all the legal formalities with respect to the Health, Safety and Environmental (HSE) aspects of the entire job (namely; the person employed by him, the equipment, the environment, etc.) under the jurisdiction of the district of that state where it is operating.
58	-			New Clause	24.2 Any compensation arising out of the job carried out by the Consultant whether related to pollution, safety or health will be paid by the Consultant only.
59	-			New Clause	24.3 Any compensation arising due to accident of the Consultant's personnel while carrying out the job, will be payable by the Consultant.

60	-			New Clause	24.4 When there is a significant risk to health, environment or safety of a person or place arising because of a non-compliance of HSE measures, the Employer shall have the right to direct the Consultant to cease work until the non-compliance is corrected.
61	Page-51 of 83	Schedule 1- SCOPE OF WORK	GENERAL SERVICES - Clause 5.1.3	Assisting YSRSCL by providing all necessary drawings/ documents / data required for obtaining all statutory clearances from statutory authorities like Directorate of Factories, Central Electricity Authority, Inspectorate of Explosives, Indian Bureau of Mines, Directorate General of Mines and Safety, Inspectorate of Boilers, etc., for obtaining licenses as required under Contract Labour act etc., and for obtaining approvals / permissions from APGENCO, AP TRANSCO etc. YSRSCL has already obtained the environmental clearance from the Ministry' of Environment, Forests and Climate Change :(MoEF&CC), Government of India. YSRSCL is in the process of obtaining the consent for establishment from Andhra Pradesh Pollution Control Board (APPCB) for setting up 3 MTPA greenfield integrated steel plant.	Assisting YSRSCL by **coordinating with package suppliers, approving and** providing all necessary drawings/ documents / data required for obtaining all statutory clearances from statutory authorities like Directorate of Factories, Central Electricity Authority, Inspectorate of Explosives, Indian Bureau of Mines, Directorate General of Mines and Safety, Inspectorate of Boilers, etc., for obtaining licenses as required under Contract Labour act etc., and for obtaining approvals / permissions from APGENCO, AP TRANSCO etc. YSRSCL has already obtained the environmental clearance from the Ministry' of Environment, Forests and Climate Change :(MoEF&CC), Government of India. YSRSCL is in the process of obtaining the consent for establishment from Andhra Pradesh Pollution Control Board (APPCB) for setting up 3 MTPA greenfield integrated steel plant.
62	Page-52 of 83	Schedule 1- SCOPE OF WORK	BASIC ENGINEERING - Clause 5.2.6	Based on the basic feed back data provided by equipment / technology suppliers preparation of Basic design of civil, structural, instrumentation& automation. Process control. Telecommunication., telemetry fire detection and alarm systems, fire fighting systems ,all utilities and other services	Based on the basic feed back data provided by equipment / technology suppliers preparation of **"Balance Of Plant"** Basic design of civil, structural, instrumentation& automation. Process control. Telecommunication., telemetry fire detection and alarm systems, fire fighting systems ,all utilities and other services
63	Page-58 of 83	Schedule 1- SCOPE OF WORK	CONSTRUCTION MANAGEMENT AND SITE SUPERVISION - Clause 5.6.2.d	Suggest substitution of non-available sections as proposed by the turnkey contractors	**Review and approving** substitution of non-available sections as proposed by the turnkey contractors
64	Page-59 of 83	Schedule 1- SCOPE OF WORK	CONSTRUCTION MANAGEMENT AND SITE SUPERVISION - Clause 5.6.3.n	Shall compile all survey data and use the same for preparation of completion layouts, As- built drawings, project completion reports etc	Review of all the data submitted by the turnkey contractors for preparation of project reports
65	Page-60 of 83	Schedule 1- SCOPE OF WORK	CONSTRUCTION MANAGEMENT & SITE SUPERVISION - Clause 5.6.9	The Consultant shall arrange for experienced teams of personnel with all necessary survey equipment for ensuring that the lines and levels at different stages of the construction activities, setting out schemes, pre and post construction / erection survey schemes for all the construction / erection activities of the entire scope of work of YSRSCL, submitted by the contractor are proper and as per the standards and drawings to avoid any inter-discipline mismatch and to achieve the accuracy as per drawings and good engineering practice. The Consultant shall monitor the overall quality of work by reviewing test results, protocols, construction schemes submitted by turnkey contractors as per approved QAP, technical specifications, respective contract documents and approved construction drawing. QAP and quality test protocols submitted by turnkey contractors will be finalised jointly with Employer prior to commencement of job. Required arrangement and standard laboratories will be arranged by turnkey contractors in joint discussion and approval with Employer and Consultant. Standard tests are to be done as specified in the contractor's scope, witnessed and approved by consultant.	The Consultant shall arrange for experienced teams of personnel with all necessary survey equipment for ensuring that the lines and levels at different stages of the construction activities, setting out schemes, pre and post construction / erection survey schemes for all the construction / erection activities of the entire scope of work of YSRSCL, submitted by the contractor are proper and as per the standards and drawings to avoid any inter-discipline mismatch and to achieve the accuracy as per drawings and good engineering practice. The Consultant shall monitor the overall quality of work by reviewing test results, protocols, construction schemes submitted by turnkey contractors as per approved QAP, technical specifications, respective contract documents and approved construction drawing. QAP and quality test protocols submitted by turnkey contractors will be finalised jointly with Employer prior to commencement of job. Required arrangement and standard laboratories will be arranged by turnkey contractors in joint discussion and approval with Employer and Consultant. Standard tests are to be done as specified in the contractor's scope, witnessed and approved by consultant. **Required surveyors and necessary instruments will be arranged by the Turnkey contractors.**
66	-	Schedule 1- SCOPE OF WORK	CONSTRUCTION MANAGEMENT & SITE SUPERVISION - Clause 5.6.16	New Clause	The Consultant shall undertake Construction Management services for intake well, pipe line and raw water reservoir
67	Page-63 of 83	Schedule 1- SCOPE OF WORK	OTHER RESPONSIBILITIES OF THE CONSULTANT - Clause 5.9.1.a	The Consultant shall be required to submit a monthly man power deployment report indicating the manpower deployed for various activities indicating their qualification, experience and the area of responsibility for review by YSRSCL	The Consultant shall be required to submit a monthly man power deployment report indicating the manpower deployed for various activities indicating their qualification, experience and the area of responsibility for review **and approval** by YSRSCL
68	Page-63 of 83	Schedule 1- SCOPE OF WORK	OTHER RESPONSIBILITIES OF THE CONSULTANT - Clause 5.9.1.a	Trial runs, PAT, provisional acceptance tests, FAT, etc. The head of discipline shall participate in the guarantee tests.	Trial runs, PAT, provisional acceptance tests, FAT, etc. **Competent persons from Consultant's team shall participate in the guarantee tests**

69	Page-63 of 83	Schedule 1- SCOPE OF WORK	OTHER RESPONSIBILITIES OF THE CONSULTANT - Clause 5.9.1.c	All the expenditure on all works undertaken by such staff engaged by the consultant, including cost towards office furniture / postage / telegram / telephones / cables / travelling expenses / computers / fax machines, internet connections etc., should be borne and paid by the consultant.	All the expenditure on all works undertaken by such staff engaged by the consultant, including cost towards office furniture / postage / telegram / telephones / cables / travelling expenses / computers / fax machines, internet connections etc., should be borne and paid by the consultant. **Space for construction of site office will be provided. All facilities on chargeable basis.**
70	Page-64 of 83	Schedule 1- SCOPE OF WORK	OTHER RESPONSIBILITIES OF THE CONSULTANT - Clause 5.9.1.j	In case the performance or conduct of any employee engaged by the consultant for this consultancy services either at site or anywhere else is found to be unsatisfactory, then such an employee shall be replaced suitably within fifteen (15) days of such a request made by YSRSCL	In case the performance or conduct of any employee engaged by the consultant for this consultancy services either at site or anywhere else is found to be unsatisfactory, then such an employee shall be replaced suitably within thirty (30) days of such a request made by YSRSCL
71	Page-66 of 83	Schedule 3- SUMMARY PRICE SCHEDULE	Item No 1.3	Consultancy Fee towards Construction Management and site supervision during construction, erection and assistance in testing and commissioning as stipulated in the scope of work of Schedule - 1	Consultancy Fee towards Construction Management and site supervision during construction, erection and assistance in testing and commissioning as stipulated in the scope of work of Schedule - 1, **considering an estimated site deployment of 3000 man-months.**
72	Page-69 of 83	Schedule 5 - TERMS OF PAYMENT	PAYMENT TERMS - Clause 1.2	A) Blast Furnace 10% B) Sinter Plant 7% C) Raw material handling system (RMHS) 15% D) Steel Melting Shop (DS Unit, BoF & Secondary Metallurgy system) 15% E) Thin Slab Casting & Rolling (TSCR) 15% F) Balance of Plant Facilities (Auxiliary facilities) 25% G) Anciliary Buildling & Facilities 4% H) Air Separation Plant (on BOO basis) 3% I) Gas based Power Plant (on BOO basis) 4% J) Lime & Dolo Plant 2%	A) Coke Oven and Coal Chemicals Plant (COCCP) - **10%** B) Blast Furnace 10% C) Sinter Plant 7% D) Raw material handling system (RMHS) **10%** E) Steel Melting Shop (DS Unit, BoF & Secondary Metallurgy system) 15% F) Thin Slab Casting & Rolling (TSCR) 15% G) Balance of Plant Facilities (Auxiliary facilities) 25% H) Anciliary Buildling & Facilities 4% I) Air Separation Plant (on BOO basis) **2%** J) Gas based Power Plant (on BOO basis) **1%** K) Lime & Dolo Plant **1%**
73	Page-69 of 83	Schedule 5 - TERMS OF PAYMENT	PAYMENT TERMS - Clause 1.2	In case any of the above package is clubbed with other package or any package is further broken down, the corresponding weightage allocated for the respective package shall also be added or reduced in proportion to the scope which shall be added/deducted (as the case may be) upon mutual agreement between Employer and Consultant and the billing schedule shall be updated accordingly.	In case any of the above package is clubbed with other package or any package is further broken down **or any other package is added for the completion of the project**, the corresponding weightage allocated for the respective package shall also be added, reduced or **adjusted** in proportion to the scope which shall be added/deducted (as the case may be) upon mutual agreement between Employer and Consultant and the billing schedule shall be updated accordingly.
74	Page-76 of 83	FORM OF CONTRACT AGREEMENT	Article 4 - Contract Price - Clause 4.1	The Contract Price is based on an estimated deployment of 8500 man-months for rendering services as per the scope of work given in Schedule-1. In case additional deployment of Consultant's personnel at site is required due to extension of time of contract, no additional payment shall be payable if such extensions are for reasons solely attributable to the Consultant. However, in case additional deployment of Consultant is required beyond the estimated number of deployment mentioned herein above and as indicated in Schedule-3, for reasons not solely attributable to the Consultant, Employer shall pay to Consultant additional fee for such additional deployment of Consultant's personnel at site at mutually agreed man-month rate to be arrived at based on the price quoted in Schedule-3 for construction management and site supervision services.	The Contract Price as specified in the Contract Agreement shall be for the entire Scope of the work of the Consultant as an EPCM consultant, as mentioned in Article-1 and detailed under Schedule-1 of the Contract, and is inclusive of an estimated deployment of 30**00 man-months at site** for rendering **Construction management & site supervision services** during construction, erection and assistance in testing and commissioning as per the scope of work given in Schedule-1. In case additional deployment of Consultant's personnel at site is required due to extension of time of contract, no additional payment shall be payable if such extensions are for reasons solely attributable to the Consultant. However, in case additional deployment of Consultant is required beyond the estimated number of deployment mentioned herein above and as indicated in Schedule-3, for reasons not solely attributable to the Consultant, Employer shall pay to Consultant additional fee for such additional deployment of Consultant's personnel at site at mutually agreed man-month rate to be arrived at based on the **price quoted under Sl no 1.3 of Schedule-3 (Summary Price Schedule) and the above mentioned man-months of deployment at site.**
75	Page-76 of 83	FORM OF CONTRACT AGREEMENT	Article 7 - Security Deposit	The Consultant shall provide a Security Deposit through Demand Draft /RTGS/Bank Guarantee equivalent to five (5%) of the contract price within twenty-one (21) days from the date of issuance of Letter of Award in pro-forma as agreed by Employer…	The Consultant shall provide a Security Deposit through Demand Draft /RTGS/Bank Guarantee equivalent to **three percent (3%)** of the Contract Price within twenty-one (21) days from the date of issuance of Letter of Award in pro-forma as agreed by Employer…

76	-	FORM OF CONTRACT AGREEMENT	Article 10 - Miscellaneous	New Clause	**Entire Agreement**: The Contract constitutes the entire agreement between Employer and the Consultant with respect to the subject matter of the Contract and supersedes all communication, negotiations and agreement (whether written or oral) of the parties with respect thereto made prior to the date of this agreement, unless such communication(s) expressly forms part of the contract or included by reference.
77	-	FORM OF CONTRACT AGREEMENT	Article 10 - Miscellaneous	New Clause	**Amendment in Contract**: No Amendment of the Contract shall be valid unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each party thereto. Employer shall not be bound by any printed conditions, provisions in the Consultant's bid, forms of acknowledgement of Contract, invoice and other documents which purport to impose any condition at variance with or supplement to Contract.
78	-	FORM OF CONTRACT AGREEMENT	Article 10 - Miscellaneous	New Clause	**Waivers**: It is fully understood and agreed that none of the terms and conditions of this contract shall be deemed waived by either party unless such waiver is executed in writing only by the duly authorized representatives of both the parties. The failure of either party to execute any right shall not act as a waiver of such right by such party.

Annexure-I

FORM OF TENDER

YSR STEEL CORPORATION LIMITED

To,
Managing Director,
YSR Steel Corporation Limited,
4th floor, IHC Corporate,
Mangalagiri, Guntur District,
Andhra Pradesh - 522503 (A.P)

Dear Sir,

Sub: YSR Steel Corporation Limited – Tender Document for **Providing Consultancy Services for setting-up an Integrated Steel Plant at YSR (Kadapa) District, A.P.**

1. With reference to the Tender (Ref No. 07 /YSRSCL/Consultancy/2021-22) invited by YSR Steel Corporation Limited, I/We have examined the General Conditions of Contract, Special Conditions of Contract, Contract Agreement, invitation to Tender, Instructions to Tenderer and Specifications.
2. I/We hereby offer the Consultancy services in conformity with the said General Conditions of Contract, Special Conditions of Contract, Contract Agreement, Invitation to Tender and Specifications at the prices mentioned in the Price Bid.
3. I/ We acknowledge that YSRSCL will be relying on the information provided in the Bid and the documents accompanying the Bid for selection of the Consultant for the aforesaid Project, and we certify that all information provided therein is true and correct; nothing has been omitted which renders such information misleading; and all documents accompanying the Bid are true copies of their respective originals.
4. I/ We shall make available to YSRSCL any additional information it may find necessary or require to supplement or authenticate the Bid.
5. I/ We declare that I/ We have examined and have no reservations to the Tender documents, including any addendum / corrigenda issued by YSRSCL (if any);
6. I / We undertake to complete and deliver the whole of the works comprised in the contract within48 calendar months from the date of commencement of work.
7. I / We have submitted a Bid Security Declaration as per the format of set out in the Tender accepting that if I / we withdraw or modify our bids during the period of validity, or if I / we are awarded the Contract and fail to sign the Contract, or to submit a Security Deposit Bank Guarantee before the deadline stipulated in the Tender document, I / We agree to be suspended for the period of 2 (two) years from being eligible to submit bids for any work of YSRSCL.
8. I/We confirm that the Bid is valid for minimum period of period of 180 days (6 Months) from the due date/ extended due date of opening of the Bid.
9. I / we hereby agree that unless and until the formal agreement is prepared and executed in accordance with the Contract Agreement, this Tender together with your written letter of

intent / Letter of Award thereof, shall constitute a binding Contract between us.

10. I/ We acknowledge the right of YSRSCL to reject our Bid without assigning any reason or otherwise and hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

11. I/ We do not have any conflict of interest in accordance with Clauses 16 of the Special Conditions of Contract.

12. I/ We understand that you may cancel the bidding process at any time and that you are neither bound to accept any Bid that you may receive nor to invite the Bidders to Bid for the Project, without incurring any liability to the Bidders.

13. I/ We further certify that in regard to matters relating to security and integrity of the country, we or any of our affiliates / associates have not been charge-sheeted by any agency of the Government or convicted by a Court of Law.

14. We further certify that no investigation by a regulatory authority is pending either against us or against our affiliates / associates.

Yours faithfully,

Name of Partners of the Firm, if any. Signature

1. Address:
2. Date:

Annexure-II

BID SECURITY DECLARATION

Tender Notice No: 07/YSRSCL/Consultancy/2021-22 Dated 23.10.2021

From:

M/s: _____

To:

Managing Director,
YSR Steel Corporation Limited,
4th floor, IHC Corporate,
Mangalagiri, Guntur District,
Andhra Pradesh - 522503 (A.P)

I/We, the undersigned, declare that:

I/We understand that, according to your conditions, bids must be supported by a Bid- Security Declaration.

I/We confirm that the Bid is valid for minimum period of period of 180 days (6 Months) from the due date/ extended due date of opening of the Bid.

I/We understand that if I/We withdraw or modify our Bids during the period of validity, or if I/We are awarded the contract and I/We fail or refuse to sign the contract, or fail or refuse to submit a performance security before the deadline defined in the Tender document, or have indulged in corrupt/fraudulent/collusive/coercive practice, I/We will be put on watch list/holiday/banning list (as per policies of YSRSCL in this regard) and will be suspended for the period of 2 (two) years from being eligible to submit Bids for all future contracts.

I/We understand this Bid Security Declaration shall cease to be valid if I am/we are not the Successful Bidder.

Seal of Company

For M/s _____

Signature of the Bidder:
Name:
Designation:

Annexure-XI

BANK GUARANTEE FOR SECURITY DEPOSIT

(To be executed on stamp paper of appropriate value)

B.G.No. Dated:

To
YSR Steel Corporation Limited

1. **WHEREAS** M/s YSR Steel Corporation Limited having its registered Office at Mangalagiri (C/o YSRSCL, 4th Floor, IHC Corporate, Mangalagiri, Guntur District, Andhra Pradesh - 522503) (hereinafter referred to as "YSRSCL" 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. …….. (hereinafter referred to as "Consultant" which expression shall unless repugnant to the subject or context includes their legal representatives, successors and assigns) for provision of Engineering, Procurement & Construction Management(EPCM) Services for setting up 3 MTPA Integrated Steel Plant in YSR (Kadapa) District, Andhra Pradesh, India (work/assignment description) on the terms and conditions as set out inter alia, in YSRSCL's contract No.. …….. dated .....and various documents forming part thereof hereinafter referred to as the "said contract" which expression include all amendments, modifications and/ or variations thereto and whereas the Consultant has agreed for due execution of the entire contract and guarantees its performance.

   AND WHEREAS one of the conditions of the "said contract" is that "Consultant shall furnish to YSRSCL 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 Consultant for execution 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 YSRSCL stating that in the opinion of YSRSL, which is final & binding, the amount claimed is due by reason of default made by the Consultant 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 YSRSCL by reason of any breach by the said Consultant of any of the terms & conditions of the contract. Any such demand made on the Bank by YSRSCL 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 YSRSCL any money so demanded not withstanding any dispute or disputes raised by the Consultant 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 YSRSCL proceeding against the Consultant.

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 Consultant 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 is 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 Consultant and that it shall continue to be enforceable till all the dues of YSRSCL under or by virtue of the said Consultant have been fully paid and its claims satisfied or discharged or till a duly authorized officer of YSRSCL certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said Consultant and accordingly discharges the guarantee.

6. We ……Bank further agree with YSRSCL that YSRSCL 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 or to extend the time of performance by the said Consultant from time to time or to postpone for any time or from time to time any of the powers exercisable by YSRSCL against the said Consultant and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Consultant or for any forbearance, act or omission on the part of YSRSCL or any indulgence by YSRSCL to the said Consultant 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 until a demand or claim under this Guarantee is made on us within three months from the date of expiry.

8. We..... Bank, lastly undertake not to revoke this guarantee during its currency except with the prior consent of YSRSCL in writing. We further undertake to keep this Guarantee renewed from time to time at the request of Consultant.

9. The Bank declares that it has power to issue this Guarantee and discharge the obligations contemplated herein, the undersigned is duly authorized and has full power to execute this Guarantee for and on behalf of the Bank.

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 Persons Issuing the BG:

Name ----------

Address for Correspondence: ----------

Telephone & Fax No. -------

E-mail: ----------

APPENDIX - 1

PLANT CONCEPT

Plant Concept

YSRSCL envisages installing a 3 mtpa flat product based integrated steel plant (ISP) at Kadapa District of AP with future expansion provision. The entire land of 3465.8 acres has been acquired to cater to the 3 mtpa present plant installation with future expansion to 10 mtpa. The future expansion will also have long product in the basket.

Product Mix

YSRSCL will set upthe envisaged 3 mtpa flat product based integrated steel plant at the initial phase for producing Hot Rolled Coils. Based on the market potential, 100% flat products has been envisaged. The mill will have the potential to produce the following mix of grades and sizes in general:

Table 3-1 – Product Mix

Quality/ Grade	% Share	Size Range
Structural (Weldable) Quality	40%	(1.2 - 16) x (1000 - 1850)
Pipes & Tubes	30%	(1.2 - 6) x (1000 - 1850)
Pipes & Tubes (API Grades)	7%	(6 - 16) x 1850
Cold Rolling	12%	(1.2 - 4.8) x (900 - 1850)
Automotive Grades	4%	(1.6 - 5) x (1000 - 1850)
Flanging & Forming	3%	(1.2 - 16) x (1000 - 1850)
Drawing Quality	2%	(1.2 - 4.8) x (900 - 1850)
Corrosion Resistance	1%	(1.2 - 16) x (1000 - 1850)
Boiler Quality	1%	(3 - 16) x (1000 - 1850
Total HR Coils	100%	

The proposed plant will be based on the Blast Furnace – Basic Oxygen Furnace (BF-BOF) route, with appropriate auxiliary facilities. For a potential energy savings, continuous

Plant Configuration

Based on the above, the configuration of the plant is summarized in Table 3-7.

Table 3-7: Plant configuration

Production Units	Design Capacity	Quantity
Sinter Plant	496 sq m	5.01 mtpa
Coke	2 x 48 ovens	1.20 mtpa
Blast Furnace	1 x 4200 cum	3.23 mtpa hot metal (HM)
Steel Melt Shop	• 1 x 165 T HMDS • 2 x 165 ton BOFs • 2 x 165 ton twin LF • 1 x 165 ton RH-OB	3.083 mtpa liquid steel
Thin slab casting & rolling	1 x 2 strand	3 mtpa HRC
Lime Calcining Plant (BOO basis)	3 x 425 tpd kilns	0.3 mtpa flux

Captive power plant (BOO basis)	2 x 75 MW	123 MW from LD gas, CO and BF gases
Air Separation Unit (ASU)	2 x 1200 tpd	2400 tpd

The production facilities will be supported by necessary auxiliary facilities such as raw material handling system, unloading and storage facilities, electric power receiving and distribution stations, water treatment plant etc.

Future Expansion Strategy

The plant layout has been developed in such a manner to have seamless future Phase-2 expansion using the same external infrastructure planning viz external railway entry for raw materials and exit for finished products, external water tapping, road, and power. The layout enclosed with this Report portrays the future expansion facilities as well. The approximate plant capacity envisaged in Phase-2 will be around 7 mtpa so that the total plant capacity will be finally 10 mtpa. However, the expansion strategy of Phase-2 is a preliminary consideration and is a basis for developing the layout and will have to be again reviewed before conceptualization of Phase 2 with review of market study and other applicable factors. However, the layout design ensures a proper expansion base and will support witha bit different configuration as well. The plant configuration assumed for phase-2 is as below:

- Sinter plant - 400 sq m
- Pellet Plant – 6 mtpa (to have a BF burden of 60% pellet and 40% sinter)
- COBP - 3 mtpa
- SMS – BOF-Slab caster & billet caster based 7 mtpa steel capacity
- Mills – 5 mtpa HSM, 1.2 mtpa Rebar mill, 0.8 mtpa WRM / structural mill
- Lime plant, ASU, CPP, Plant Auxiliaries etc

RAW MATERIALS

Raw Materials

The annual gross requirement of major raw materials procured and transported to plant for the proposed integrated steel plant, considering moisture, handling, and screening losses as applicable, is given below in Table

Table: Annual Gross Major Raw Materials

Unit	Raw materials	Mode of receipt to plant yard	Net Annual Requirement, tpa	Gross Annual Requirement, tpa
Sinter plant	Iron ore Fines	Rail	3,625,692	4,110,800
	BF grade Limestone	Rail	302,974	325,429
	BF grade Dolomite	Rail	271,334	291,443
	Quartzite	Road	34,000	36,600
	Coke Breeze	Road	151,540	169,926
Coke oven	Prime/Hard coking coal	Ship – Rail	481,900	534,496
	Semi-soft coking coal	Ship – Rail	963,800	1,068,990
	Lean coal	Ship – Rail	160,600	178,200
Blast furnace				
	Quartzite	Road	42,120	45,200
	PCI coal	Ship – Rail	647,986	726,600
	I/O Lump	Rail	1,123,635	1,246,300
BOF	Ferro-alloy	Road	62,300	62,300
	I/O Lump	Rail	123,300	137,000
Calcining plant	Limestone	Ship- Rail	507,000	545,000
	Dolomite	Ship – Rail	235,700	253,500

Note:

(1) The daily average quantities have been derived considering the following days of working for the process plants:

Sinter plant .. 330
Blast furnace .. 350
BOF .. 2- BOFs: 313, 1-BOF each: 26
Coke Oven .. 365
LCP .. 330

(2) Partially in-plant generated.

(3) While calculating the gross quantity, the losses due to moisture, screening and handling have been considered.

Iron ore

The major requirement of iron ore fines (for use in sinter plants) and lump (for use in blast furnace and steel melt shop) are envisaged to be procured from the major merchant iron ore producers in Bellary-Hospet-Sandur region (NMDC-Donimalai mines, Obulapuram mines) of Karnataka and Andhra Pradesh. The balance requirement of raw materials are considered to be procured from Chhattisgarh region (Bailadila mines). To secure the supply of iron ore on sustained basis, it is suggested to make a long term purchase agreement with the major iron ore producers in Karnataka as well as secure an iron ore blocks in Karnataka/Andhra Pradesh. MOU with NMDC for 5 mtpa has already been taken up. The likely chemical analyses of iron ores are given below in Table 4-2.

Coal

Coking coal

It is envisaged that the entire requirement of prime/hard and semi-soft coking coal with low ash content will be met through imports, and the same will be mixed with Indian lean coal. The possible sources of imports are Mozambique, Australia and Canada.

Coal for Injection

Coal with low volatile matter and ash content will be used for pulverized coal injection (PCI) in the blast furnace. PCI coal is proposed to be imported from countries like Australia, South Africa, Russia and Indonesia.

Limestone

The requirement of BF grade limestone for use in the sinter plant and blast furnace is envisaged to be procured from the quarries located in the mines located in the Bagalkotarea in Karnataka or Jukehi-Katni-Niwar area in Central India depending upon the availability. SMS grade limestone for use in the calcining plant will be met through imports from the Middle East (UAE and Oman). The chemical analysis of limestone considered is given in Table 4-5.

Dolomite

The entire requirement of dolomite is envisaged to be met through purchase from the mines located in the Bagalkot area in Karnataka or imported from suitable sources.

Quartzite

Quartzite will be used in the blast furnace and the sinter plant. It is envisaged that the entire requirement of quartzite will be procured from domestic sources.

LOCATION, LAYOUT & LOGISTICS

Location, Layout & Logistics

`The plant location, along with the land availability for the proposed integrated steel plant, site features and layout are discussed in this chapter.

General information on plant site

The Penneru river flows along the northern side of the plant site. The Kosinepalle reserve forest is located near the south-west corner of the plant. Few key featuresof the site are listed in Table.

Table: General Information on Plant Site

Features	Description
Location	Latitude: 14º45' N; Longitude: 78º25' E. Sunnapurallapalle and Peddandluru villages, Jammalamadugu Mandal, YSR District (formerly known as Kadapa district), Andhra Pradesh
Survey of India Topo sheet No	D44G05, 6, 9, 10 (57 J/5, 6, 9, 10)
Seismic zone	Seismic Zone: II as per IS: 1893 (part -1): 2002, (RA: 2016) and can be classified as a LOW damage risk zone
Site surroundings	North - Jammalamadugu – RTPP Power Plant connecting road South - Kosinepalle RF East – Open land West - Brahmani industries ltd
Nearest highway	National Highway NH67: starts at Ramnagar, Karnataka and ends at Krishnapatnam Port, Andhra Pradesh - North direction Jammalamadugu – Rayalaseema Thermal Power Plant connecting road - North direction
Nearest railway station	Muddanuru railway station – 4.4 km – Southwest direction (under South-Central zone, Guntakal Division)
Nearest sea port	Krishnapatnam Port – 190 km – Southwest direction
Nearest airport	Kadapa Airport – 49 km – Southeast direction
Nearest city	Proddatur - 8.5 km – Northeast direction Kadapa – 50 km – Southeast direction
Land area	3465.82 acres – Total land (Phase I area occupied – 1000 acres)

Land & Terrain

The identified land area of about 3465.82 acres (as shown in site survey drawing) at YSR district in Andhra Pradesh, for setting up a greenfield integrated steel plant. Among the available land area, some spaces has been allotted for the proposed 4-lane connecting road.

The shape of proposed land is almost rectangular with encroachment of a strip of land with populated village & agriculture land. Land is rocky and undulating with approximate level difference of 90 m or even more. The maximum & minimum elevations above mean sea level within the site limit are 185 m towards north and 280 m towards south as per topographic survey map of the project site. To minimize the site enabling cost, it is recommended to build multiple level zone for disposition of different production units.

Sub-Soil Characteristics and Foundations

General

Based on the soil investigation report, investigated and furnished by Indian Institute of Science (IISC), Bangalore, 2021 for the proposed site, the following guidelines on sub-soil stratification and foundation aspects are foreseen:

Sub-Soil Stratification

Based on available soil data, generalised sub-soil lithology in this area may be divided into the following basic strata :

Stratum I	:	Very dense Silty Sand with Gravel. Average depth is 0.90 m below OGL.
Stratum II	:	Fractured Quartzite Hard Rock. This extended upto termination/explored depth of 15.0 m below OGL. CR = 20% to 90%; RQD = 0 to 30%.

OGL (Original Ground Level) varies between RL+190.0 m to RL+260.0 m, based on the contour drawing. Due to huge variation in OGL, several terrace levels (TLs) were proposed for different units. FGL (Finished Ground Level)/ TL varied between +190.0 to +230.0 m. Ground Water Table (GWT) was not reported in any of the boreholes upto termination depth.

Meteorological Data

The climatic conditions pertaining to the plant site are as follows:

Temperature

The maximum temperature is 43.1 °C and minimum temperature is 22.9 °C.

Humidity

The daily relative humidity values are observed to range between 13 to 90%. The mean value of humidity is 45%.

Rainfall

This area plays a prominent role in high, moderate and low rainfalls. The average annual rainfall is about 710 mm. Highest rainfall observed in the month of August, September and October, while lowest in the month of January and March.

Wind direction

The predominant wind direction is west to east. Average wind speed is within the range of 10-15 km/hr.

Infrastructure Availability

Power

Grid Power will be fed from Jamalamadugu 400kV/220kV/132kV Substation, located approximately 25 km from proposed steel plant site.

Water

Raw water will be sourced from Gandikota reservoir drawing through Mylavaram reservoir on Penna River, which is around 15 km in NW direction from the proposed site. This raw water may require further treatment inside the plant premises before using it as make-up water for the plant.

Road

A 4-lane road is being constructed at site as a part of external infrastructure facilities connecting NH-67 to plant at an approximate length of 8 km. The prposed plant will be accessed through two plant gates, Gate A and Gate B. Gate A will be assigned for personnel entry and Gate B will be for material entry gate and product despatch. The personnel and raw material entry cum finished product despatch gates of the plant are located at the north end of the plant.

Following table estimates an approximate number of raw material trucks foreseen to be handled per day within the plant.

It is assumed that about 70% finished products from the greenfield steel plant will be despatched by rail and the remaining 30% by road.

To cater to the increased traffic load due to the project, the 4-lane road connecting NH 67 to plant site has been foreseen for smooth plying of heavy and medium class vehicles.

Railway

There are two existing rail heads passing nearby the proposed plant – (a) Guntakal-Renigunta section (Electrified double line section) and (b) Nandyal-Yerraguntla section (Non electrified single line section) and passing very close to the north of project site. Jammalamagadu and Proddatur are the major towns through which the line passes. Both the lines are under the administration control of Guntakal Railway Division of South-Central Railway Zone. M/s Rites, Railway Consultant for YSRSCL ha sprposed railway connectivity to the plant, from the take-off point at the proposed block station at Km 94/950 between Jammalamagadu and Proddatur station with “Y” connectivity leading to plant.

In-plant railway yards have been considered for receipt of indigenous inbound raw materials like coal, iron ore fines, lump ore, fluxes for various plants like coke oven, blast furnace and sinter plant, etc and also for despatch of saleable products. A

wagon loading system for BF slag has also been considered in the layout near to BF.

The raw material unloading yard with wagon tipplers is located at the western boundary of the site, for receipt and handling of raw material rakes

Plant General Layout and Logistics

The major parameters and considerations, influencing the disposition of the proposedplant facilities, plant logistics, and development of the plant general layout, are discussed below:

1) The land area, as shown in the layout drawing, has been considered as an encumbrance free area and available for the proposed greenfield steel plant facilities.

2) Owing to the undulating land and varied levels, terrace modelled layout has been considered to minimize the impact of earthwork cost that will also require blasting, cutting and filling. Different production units have been placed at different levels ensuring technical feasibility.

3) The layout has been developed considering smooth and seamless future expansion of Phase II to the tune of 7 mtpa. Assumed configuration for such expansion is indicated in earlier. The present phase area considers space for some of the facilities (which are falling within the Phase I installation area) envisaged for Phase 2 expansion for planned and smooth expansion and for operational flexibility. The layout portrays the future expansion.

4) 50 m wide corridor has been left for the green belt on the eastern, northern and western side of the plant, as per environment clearance. On the southern side, a 300 m wide corridor has been left for the green belt. No facilities have been planned within this corridor.

5) The disposition of the plant facilities has been planned based on the unidirectional flow of materials as far as possible, so as to ensure optimal tonne-km.

6) Railway track connection from the external Indian Railway network has been considered for the receipt of indigenous raw materials and despatch of saleable products assuming take-off from the block station at KM 94/950 between Jammalamagudu and Proddatur station with “Y” connectivity.

7) Major raw materials will be received on the western side of the plant through the rail route, hence the raw material storage areas for the proposed ISP have been kept on the western side and the subsequent process flow direction has been considered from west to east.

   The transfer of raw materials from the storage yard to the subsequent consuming units shall be through conveyors in majority while others by trucks.

   The blast furnace, steel melt shop and mill are planned to be located next to each other for best logistics.

8) The transfer of hot metal shall be by rail with torpedo ladles. Ladles will be pulled out from the BF and pushed into the steel melt shop by locomotives. Based on the evaluation of the capacity of the blast furnaces and steel melt shops, inter-

changeability, operational flexibility, ladle logistics, ease of ladle maintenance etc., around 350 tonne capacity torpedo ladles have been considered for the hot metal transfer.

9) Torpedo ladle repair shop is considered near to BF. Loco repair shop for future installation has been considered. Presently, loco repair will be outsourced.

10) Areas have been considered for storage of BF slag, BOF slag, metal recovery plant, debris dump, hazardous waste, etc. These areas offer limited slag storage capacity, for about 30 days of production. As the generation of different wastes is continuous, it is necessary to arrange for the consistent evacuation of these waste materials at a rate which exceeds the rate of generation, so that the demarcated areas do not get saturated with waste.

    Given the volumes, the provision of despatch of BF slag by rail has also been considered in the layout. Wagon loading station for despatch of BF slag has been considered.

11) Railway connectivity is necessary to evacuate 3 mtpa of HRC. The despatch ratio through road and rail for the 3 mtpa of production has been assumed as 30:70 respectively.

12) To minimize the in-plant road movement, rail connectivity has also been considered from the mill, to evacuate the products directly loaded for despatch on to the wagons.

    However, a separate product despatch yard will have to be considered in future Phase II for rail bound despatch, so that rakes can be loaded and released withinthe stipulated time allowed by the Indian Railways. The despatch yard will be required mainly for the future mills which will not have direct rail connection to insideproduct yard. In that case, HRCs from the present mill can also be despatched via the yard.

13) The location of the proposed air separation plant has been considered at the north of the plant to be installed and operated on BOO basis.

14) The location of the proposed lime calcining plant has been considered at the north-west of the plant to be installed and operated on BOO basis. The raw material yard for plant has been planned adjacently.

15) To locate the external power receiving facilities at nearby locations, the main receiving substation (MRSS) for the project has been planned to be located nearthe northern boundary wall.

16) The location of the captive gas-based power plant has been considered at the eastern side of the plant to be installed and operated on BOO basis.

17) A common overhead yard utility corridor (mostly along the internal roads) has been considered for all service lines like gas pipelines, water pipelines, power cables, etc.

18) A truck parking area has been planned near material entry/exit gate.

19) Separate gates for material entry and personnel entry with security office has been

planned.

20) Raw water will be sourced from Gandikota reservoir drawn through Mylavaram reservoir on Penna River. In order to ensure uninterrupted plant operations even during the dry season, the minimum raw water storage capacity be considered at 90 days of consumption of raw water.

21) A rainwater collection pond has been envisaged near the raw water reservoir so that the rainwater can be collected in this pond during the rainy season and suitably used for plant operations after the required treatment.

22) Adequate'Green Belt' is considered as per the EC requirements.

23) In order to minimize the cross movement and congestion and maximize the safety and efficiency of materials movement by road within the plant boundary, following basic parameters have been kept in view during planning the in-plant logistics:

    i) Unidirectional/one-way movement of trucks/ dumpers as far as possible.

    ii) Dedicated route for trucks/dumpers as far as possible with raw materials and finished product through slurry pipelines.

24) In order to establish better logistics, number of incoming and outgoing vehicles need to be optimized by deploying suitable capacity trucks/dumpers, as far aspracticable.

Suitable roads will be provided all over the plant. Roads will generally be straight as far as possible. All the in-plant roads will be bituminous construction to optimize cost with both side berms and storm water drains. Roads of adequate width and strength will be provided for catering inbound and outbound heavy vehicles. Width of carriageway of major roads will be minimum 7 m with necessary turning radius. However, based on the traffic volume, type of movement and area availability, the width of the roads may be increased/decreased during execution of the project.

Based on the above considerations, the plant layout has been developed and represented in the Annexure.

MAJOR PLANT FACILITIES

Major Plant Facilities

The major plant facilities envisaged as part of the expansion are discussed in this chapter. A summary of the facilities is depicted below

Summary of envisaged facilities

Unit	Phase I
Raw Materials Handling System	✓
Sinter Plant	✓
Coke Ovens	✓
Blast Furnace	✓
Steel Melt Shop	✓
Thin Slab Casting & Rolling	✓
Calcining Plant (BOO)	✓
Captive Power Plant (BOO)	✓
Air Seperation Unit (BOO)	✓

Raw Materials Handling System

This section describes facilities provided for receipt of raw materials, unloading, storage and stockpiling, reclamation and subsequent distribution of the various raw materials to the different consuming units.

i. Receipt and unloading of raw materials

Iron ore fines, Iron ore lump, coking coal, PCI, limestone & dolomite will be received by rail and will be unloaded on daily basis. Three (3) nos. Rotary-type wagon tippler has been considered for the same. Other materials like coke breeze, bentonite, quartzite, ferro-alloys etc will be received by road by means of dumper/ truck. Transfer of in-plant materials will be done through the conveyor system.

Within the RMHS yard, the major raw materials like iron ore, limestone, dolomite, coking coal, non-coking coal, PCI & coke breeze will be stored in their respective stockpiles. The daily average gross quantity of raw materials to be handled and their mode of receipt are given in Table

Table– Receipt and Mode of Transport of Major Raw Materials.

Unit	Raw materials	Mode of receipt to plant railway yard / store	Mode of transport from stockyard to plant units	Gross quantity(1) (3)	
				Annual,tpa	Daily, tpd
Sinter plant (SP)	Iron ore Fines	Rail	Conveyor	4,110,800(2)	12,500
	BF grade Limestone	Rail	Conveyor	325,429 (2)	1000
	BF grade Dolomite	Rail	Conveyor	291,443 (2)	787
	Quartzite	Road	Conveyor	36,600	111
	Coke Breeze	Road	Conveyor	169,926(2)	500
Coke oven (COBP)	Prime/Hard coking coal	Rail	Conveyor	534,496	1,448
	Semi-soft coking coal	Rail	Conveyor	1,068,990	2,895
	Lean coal	Rail	Conveyor	178,200	484
Blast furnace (BF)	Product Sinter	In house produced in SP	Conveyor	5,012,362	14,300
	Quartzite	Road	Conveyor	45,200	130
	PCI coal	Rail	Conveyor	726,600	2,078
	I/O Lump	Rail	Conveyor	1,246,300	3,475
	Charge Coke	In house produced from COBP	Conveyor	1,088,600	3,100
BOF	Ferro-alloy	Road	Bottom discharge bucket	62,300	170
	I/O Lump	Rail	Conveyor	137,000	416
Calcining plant (4)	Limestone	Rail	Conveyor	545,000	1,652
	Dolomite	Rail	Conveyor	253,500	769

Storage and stockpiles of raw materials

Raw materials received by road will be unloaded in respective ground hoppers within the plant boundary adjacent to raw material yard and stored in the stockpiles using stacker/reclaimer. Stacker/reclaimer will have the by-pass facility. Material unloaded by wagon tippler will be stored in the same manner. Two covered storages have been envisaged mainly for various types of coals and for PCI Coal &coke breeze.

Despatch of Raw Materials to Various Consuming Units

Despatch of raw materials to BF

Various raw materials required for Blast Furnace, including lump ore & quartzite will be reclaimed by stacker / reclaimer (one material at a time) and will be dispatched to the stock house of the Blast Furnace by conveyor system. The sinter will be fed to the BF stockhouse through the conveyor system from sinter plant product bin. Feeding of coke from coke oven plant will be done through conveyor. PCI reclaimed by stacker/reclaimer will be fed to the conveyor for its onward transmission to the stock house bins at the blast furnace area. Excess coke will be stored in covered shed and will be reclaimed by dumpers and ground hopper. Excess sinter will also be suitably stored and reclaimed.

Despatch of raw materials to coke ovens

Hard coking coal, semi-soft coking coal, and lean coal reclaimed bystacker/reclaimer will be transferred to the blending bunker building (within coke oven area) by conveyors.

Coal of various types will be withdrawn in proportion through a weigh feeder and discharge on to a conveyor for conveying to the crusher house. The blended coal will be passed through the primary and secondary crushing system by conveyors. After crushing the ground coal will befed to the coal tower by conveyor.

Despatch of raw material to the sinter plant

Iron ore fines will be reclaimed from the storage yard by stacker/reclaimer and conveyed to respective stock bins of pre-porportioning bin building. Limestone, dolomite will be reclaimed from the storage yard similarly and conveyed to the flux crushing and screening system. From there, the crushed material will be conveyed to the respective stock bins of the pre-proportioning bin building. Coke breeze after reclaiming from the storage yard will be conveyed to the respective stock bins at pre-proportioning bin building after the close-loop crushing-screening system. Other additives like mill scale and flue dust will be conveyed to respective bins by conveyors through ground hopper. From pre-proportioning building, materials will be conveyed to sinter plant after mixing in mixing chamber.

Dispatch of raw materials to LCP

Limestone/ Dolomite after reclaiming by stacker/reclaimer from the storage yard will be conveyed to the screening building through a set of the conveyor system. Sized limestone/ dolomite, after the screening, will be discharged to the weigh hopper for onward charging to the lime kilns. The product lime/ dolo from kilns will be dispatched to storage bunkers through the conveyor system.

Dispatch of raw materials to steel melt shop

Calcined Lime/ dolo from storage will be screened to the required size and after the screening will be conveyed to SMS building and stored in respective bunkers of BOF and LF. Ferro-alloys will be stored in a ferroalloy store and will be either sent to SMS by means of bottom discharge buckets for loading to bunkers or by dump truck -ground hopper-conveyor system for loading to bunkers. I/O lump will be conveyed from stock yard through stacker / reclaimer.

Despatch of Blast Furnace slag

From the slag granulation plant inside BF, slag will be conveyed to the slag ground dumping area (adjacent to BF area) by a set of conveyors. At the slag dump yard, slag will be stacked on the ground by a tripper. Subsequently, stored slag will again be reclaimed by pay-loaders and conveyed to wagon loading station bunkers by another set of conveyors. At the wagon loading station, slag will be filled in to the railway wagons with the help of shuttle conveyors for despatch.

Coke Oven and By-Product Plant

Major Facilities

The coke oven unit will consist of the following major facilities:

- Stamp-charged, by-product recovery type coke oven batteries with oven machines and auxiliaries
- Coke dry quenching unit
- Standby wet quenching station
- Land-based pushing and charging emission control system

- By-product plant for the recovery of crude tar; de-sulphurization of coke oven gas and recovery as elemental sulphur.
- Coal handling and preparation system
- Coke sorting system

Coal preparation & handling system

The coal handling system will be designed for the receipt, storage, reclaiming, blending crushing and conveying of coking coal to the batteries. For the purpose of achieving better control over coal blend, bin blending is considered.

Each constituent of the coal blend envisaged for the plant will be drawn from blending bins through belt weigh feeders. The blended coal will be passed through magnetic separator and crushed in the crushers to achieve the desired fineness (~90% of -3.15 mm). Constituent coals with lower grindability will be crushed in two stages, first through primary crusher then through secondary crusher. Reversible hammer mills one (working+one stand-by) are proposed for the primary and the secondary crusher house. After blending and crushing, tar sludge and water addition will be done to adjust the moisture content of the coal blend to 10%. The blended crushed coal will then be fed to coal towers.

Dust extraction system will be provided for the crushing stations. The coal transfer points in the junction houses will be provided with DFDS systems. Fire hydrant line will be provided along the new coal stockpile, conveyor galleries, each floor of the buildingsand junction houses. In addition to that MVWS will be provided along the coal conveyor galleries.

Coke Oven Battery

Coal from the coal tower will be withdrawn through sector gates and discharged into the receiving hopper of the stamping-charging-pushing (SCP) machine. Compacting of the

coal blend will be performed continuously with the feeding of coal into the stamping box, till the desired height of the coal cake is achieved. After the stamping operation, the machine will move to the oven to be charged.

After charging the coal cake, the charging plate will be withdrawn. The charging gas transfer car, operating at the oven top, will transfer the charging gases to the adjacent ovens. When the oven is ready, after completion of carbonization, the SCP machine will push the hot coke into the hot coke car through the coke guide car (CGC). The door extractor device, provided in both the SCP and CGC machines will open the doors before the pushing of coke. The door extractor device will be equipped with mechanical door and frame cleaners.

After completion of the coke pushing operation, the coke side door will be positioned in place before charging the empty oven with stamped cake. After charging the stamped cake into the oven, the SCP machine will close the pusher side door. Red hot coke discharged into the hot coke car will be taken to the coke dry quenching (CDQ) station.

Land-based pushing emission control system, integrated with a coke guide car will be provided to restrict the coke side emission during pushing. Emission during charging will also be ensured with this system.

The ovens will be suitable for underfiring with both mixed gas and coke oven gas (COG). The battery will be underjet/gas gun type with air stage/waste gas re-circulation to achieve uniform temperature distribution and to restrict the formation of thermal NOx.

Each oven will be provided with a separate gas transfer hole at the coke side to facilitate the transfer of charging gases to the adjacent/ alternate oven through a U-tube connection. The U-tube will be mounted on the charging gas transfer car. To minimize emission during charging, a high pressure liquor aspiration system will be provided for effective on-main charging.

The coordination of the ovens, the oven machines, operation & traveling of machines to the ovens and the pushing schedule will be accomplished via a control center through remote data transmission. For the exact spotting of machines, the machine will be provided with an improved measuring and sensor system. DCS based automatic heating control system will be provided for efficient and uniform oven heating.

After the completion of the carbonization, the SCP machine will push the incandescent coke out of the oven. Red hot coke will be discharged into the coke bucket placed on the hot coke car through coke guide car and will be taken to coke dry quenching (CDQ) station.

Coke quenching system

Single-chamber CDQ units will be installed with standby wet quenching stations for scheduled maintenance in CDQ chamber/boiler facilities and emergencies.

Stand-by wet quenching stations will be provided with quenching towers of adequate height, settling basin for quenching water, quenching water pumps, over head quenching water tanks, pipelines and fittings. The quenching towers will be provided with baffles/grit arrestors. Coke quenched in quenching cars will be discharged into the coke wharf.

In the CDQ plant, the hot coke will be charged from the coke bucket into the cooling chamber with the help of an overhead crane. The hot coke will be cooled with circulating inert gas in the cooling chamber. The hot coke will flow continuously from the top to the bottom of the chamber and the inert gas will flow in the opposite direction.

The heat of the hot coke will be recovered by direct contact of circulating inert gas and the absorbed heat will be subsequently utilized for the generation of high pressure steam in the waste heat boiler. From the waste heat boiler, the cooled circulating gaswill then be admitted into cyclones, where the fine fraction of coke dust will be removed.

Coke sorting system

The hot coke pushed out from the ovens will be collected by the hot coke car and will be taken to the CDQ stations or by a quenching car to the wet quenching stations to quench the hot coke from the ovens. CDQ units will be used during normal operations

for coke quenching for all the batteries; wet quenching will be used during the annual shutdown of the CDQ boilers and auxiliaries.

The wet-quenched coke will be dumped into the wharf for drying. The dried coke from the wharf or the discharge of CDQ will be first screened through 80 mm screens. (+) 80 mm will be passed through the coke cutter. A toothed roll crusher is proposed for the sizing of oversized coke.

The coke from the cutting station will be sent to coke screening for separation of different size fractions namely (+)35 mm to (-)80 mm, (+)15 mm to (-)35 mm and (-) 15 mm. Coke bunkers will be provided for daily storage of the different size fractions of coke.

The coke conveyor system will also have a provision for coke to be diverted to the ground storage area for storing. A covered store has been considered for groundstorage for excess coke. Reclaiming will be done by dumpers and through ground hopper, same can be charged to BF.

Dust extraction system will be provided at all coke transfer points.

Fire hydrant line will be provided along the conveyor galleries, in each floor of the buildings and the junction houses. Additionally, the MVWS will be provided along the coke conveyor galleries.

By-product recovery plant

By-product plant facilities will be planned for the production of clean COG for use as plant fuel, as well as, for the production of crude tar, naphthalene and elemental sulphur. Various impurities present in crude COG need to be removed prior to its utilization as fuel. It is also important to contain the SOx and NOx concentration of product of combustion (waste gas) within the prescribed limit as per air pollution control norms. The typical concentrations of different recoverable chemicals in crude COG and desired concentration of the same in clean COG are indicated as follows:

However, for the purpose of the feasibility study and analysis of the techno-economics of the project, the following major units are considered:

- Gas cooling and tar-liquor condensation section,
- Combined ammonia and hydrogen sulphide scrubbing,
- De-acidifier and ammonia stripper unit,
- Sulphur recovery Unit,
- Naphthalene recovery unit

Gas cooling and tar-liquor condensation section: Crude COG produced during the carbonization of coal in the ovens will be collected in the gas collecting main, where it will be cooled with a direct spray of ammonia liquor. Crude COG from the gas collecting main will be sucked by exhausters through the primary gas coolers and electrostatic tar precipitators.

Crude COG after the down-comers will be cooled to a temperature of about 21 °C in indirect, cross tube type primary gas coolers in two stages; in the upper stage with circulating cooling water and in the lower stage with circulating chilled water. Theprimary gas coolers will be provided with requisite extra capacity in the upper part (cooling water zone) to take care of probable fluctuations in the temperature of the crude gas.

The coke oven gas after being cooled in the primary gas coolers will enter the electrostatic tar precipitators (ETP) for separation of tar mist from the coke oven gas. The coke oven gas exhausters will be electric motor driven and will be provided with the required lubrication, safety, idling, and suction condition control arrangement.

Tar and liquor condensed in the crude gas pipelines, primary gas coolers, ETPs, and exhausters will be processed in the tar-liquor condensation unit. This will consist of decanting tanks with thick tar/ammonia liquor separators, tar centrifuges, condensate pit tanks, flushing liquor pumps, condensate pumps etc. The separated tar will be transferred to the oil depot and the liquor will be transferred by flushing the liquor pumps to the gas collecting main for cooling the gas. Excess liquor from the tar ammonia liquor separating tank will be taken to a separating tank for separation ofheavy oil and will be finally pumped out with excess liquor pump to the filtering system.

Combined ammonia-hydrogen sulphide removal unit: Coke oven gas from the exhauster will be first fed into the final cooling stage at the lower part of the hydrogen sulphide scrubber. Coke oven gas after final cooling will be cleaned in respect of

ammonia and hydrogen sulphide by scrubbing with soft water and circulating stripped liquor. The ammonia and H_2S removal unit will comprise the following major process equipment:
Coke oven gas leaving the exhauster will be admitted to the H_2S scrubbers. The lower section of the H_2S scrubbers will be designed for final cooling to remove the compression energy of the exhauster. The scrubbing of H_2S will be carried out by enriched ammonia liquor and de-acidified water. Soda lime solution will be used at the final stage of the H_2S scrubber. Carbon dioxide, hydrogen cyanide and ammonia present in the gas will also be scrubbed during the same operation.

After H_2S scrubbing, the gas will be taken to the ammonia scrubber. The ammonia will be removed from the coke oven gas by scrubbing with the cooled stripped liquor from the ammonia still. Soft water and excess ammonia liquor will be admitted at the top and bottom stages of ammonia scrubbers respectively. A combined ammonia and H_2S scrubber will also be installed as standby to achieve uninterrupted operations.

The enriched liquor from the H_2S scrubber containing ammonia, H_2S, carbon dioxide and HCN will be stripped in the de-acidifier. A portion of the ammonia vapour will also be admitted to the de-acidifier. A portion of the de-acidifier liquor will be treated in the ammonia still for the stripping of ammonia.

The vapour leaving the de-acidifier will contain ammonia, H_2S, carbon dioxide and HCN along with water vapour. For cooling of stripped liquor, inter-stage circulation and suitable heat recovery tubular heat exchangers have been considered. The circulationof liquors will be achieved through pumps.

Sulphur recovery unit: The vapours from the top of the de-acidifier containing ammonia,

hydrogen sulphide, water vapour, hydrogen cyanide and carbon dioxide etc. will be fed into the sulphur recovery plant for the destruction of ammonia and the production of sulphur. In the reactor, the acid gas will be brought into contact with the required quantity of air. Secondary air will also be added at the lower part of the reactor. Suitable temperature will be maintained in the reactor. The heat generated in thereactor will be utilized for the generation of steam in the heat recovery boiler. Most of the heat required for the reaction will be generated by partial burning of hydrogen sulphide.

The ammonia and hydrogen cyanide present in the acid gas is decomposed into hydrogen, nitrogen and carbon monoxide by catalytic cracking. The Claus conversion will be continued by the catalytic method in the Claus reactor. The Claus reactor will be followed by a sulphur condenser and separator where sulphur will be removed from the process gas. Low pressure steam will be produced in the sulphur condenser.

The molten sulphur will then be fed to the solidification plant for the production of sulphur pellets. The sulphur produced by this process will be of high purity (99.5%). Thetail gas from the reactor will be introduced to the coke oven gas in the suction main or foul gas main. The sulphur pellets will be packed and finally transported out with truck dispatch.
Naphthalene scrubbing and naphthalene distillation section: Naphthalene scrubbing from the coke oven gas will be carried out after the removal of ammonia and hydrogen sulphide. Naphthalene scrubbing will be carried out by using petroleum-based wash oil.

A small portion of the oil will be continuously withdrawn from the system to restrict the naphthalene build-up in the re-circulating oil. Rich oil withdrawn from circulation will be regenerated in the naphthalene stripping columns. Heavy sludge/ spent wash oil removed from the unit will be taken to the spent oil tank for either mixing with tar or outside disposal.

Naphthalene strippers will be provided. The regenerated oil along with make-up oil will be introduced to the oil circulating system. The naphthalene fraction recovered will be mixed with crude tar.
The clean coke oven gas, after naphthalene removal, will be fed to the coke oven gas network through gas holder.

Oil Depot: Separate storage for crude tar, solar oil, caustic soda and spent solar oil will be provided. Suitable facilities for loading of crude tar into road tankers will be provided.

Sinter Plant

Production Programme

One sinter machine of around 496 sq m is foreseen in order to produce 5,012,362 tpa of product sinter to cater to blast furnace charge that will constitute 80 percent of the burden.

Plant Facilities

The facilities envisaged for the sinter plant are:

a) Fuel and flux crushing & screening system

b) Preproportioning system

c) Proportioning system

d) Mixing and nodulizing system

e) Sinter machine

f) Sinter cooling system

g) Sinter screening system

h) Waste gas system

i) Plant dedusting system

j) Cranes and hoists

k) Sinter storage

For the various types of input materials, including sinter return fines and dust from various plants, an adequate number of proportioning bins mounted on load cells to ascertain the material level in each bin will be provided. Under each bin, an electronic weigh feeder will be provided to draw the required materials in the correct proportions.

Mixing and nodulizing drum with internals and water proportioning system will be provided for the sinter machine, which will facilitate stage-wise intimate mixing and rolling of the sinter mix. An appropriate amount of water will be added to this area.

The sinter machine will be complete with a hearth layer feeding system, raw mix feeding system comprising anti-segregation filling method at the top of the raw mix feed bin and drum feeder, ignition furnace, sinter breaker, crash deck, segregation chute, and the sinter strand proper comprising of lifting wheel assembly, lowering wheel assembly, supportstructure, sliding bars, thermal compensation device, wind boxes with compensators, spillage chute, SG iron pallet assembly with spring-loaded sealing and high chrome grate bar, lubrication system, etc. Sintering will be performed during the movement of the bed from the ignition furnace to the discharge end.

A suitable segregation chute with adequate sandwiching capability will be provided for the efficient operation of the sinter cooler, keeping the SPM level of dust pollution within limits. The sinter breaker will break the hot sinter cake to a suitable size. One elevator will be provided in the sinter machine building. A suitable forced draft type circular cooler comprising an adequate number of fans, drives, cooler troughs, sealing, etc will be provided to discharge sinter below 100 ˚C from the cooler. The cooler discharge hopper will be load cell mounted.

The heat recovered from the hot air of the annular cooler will be used as combustion air for the ignition furnace and in the annealing hood, after the ignition furnace. New generation sinter plants are equipped with total heat recovery systems.. In earlier days, when such recovery systems were not available, the useful heat from the hot sinter used to be utilized for heating cold air supplied by separate fan and this air was used to be utilised to generate steam through heat recovery boiler for power generation. The cooled sinter from the sinter cooler will be fed to the screening system for separation of the hearth layer material (10-20mm), the plant return fines (0-5mm), and the product sinter (5-50mm).

The waste gas system of suitable capacity will be provided to maintain the dust emission from the stack as per the extant pollution control norms. Necessary steps will be taken to reduce the emission in off gas with use of latest technologies available. A separate ESP (dry type)

will be provided to handle the dust generated from the different transfer points of the sinter plant to control dust emissions. The collected dust will be recycled.

Waste gas fans of adequate capacity and with electric motor, silencer, heat and sound insulation, will be provided for the sinter machine. A metallic/concrete self- supported stack, lined with acid-proof brick lining, will also be provided. The sinter plant will be provided with adequate cranes and hoists for the maintenance of equipment. Necessary store and repair

shop and store for the sinter plant will be considered in the sinter plant area.

Storage provision for one day of production of sinter will be made available for the sinter plant. Facilities will also be provided to discharge sinter from the storage onto the conveyor for transportation to the blast furnace stock house.

Blast Furnace

Production Programme

To cater to the charge requirement to BOFs of the steel melt shop, hot metal production will be around 3,239,930 tpa. The hot metal will be produced from a blast furnace of 4200 cu m in phase-I of the expansion. Bigger size blast furnaces always give an advantage to fuel efficiency and reduce coke consumption. Facilities will be provided for granulation of hot metal when there will be no off-take at the steel melt shop and these granules, thus produced, will be consumed in the steel melt shop.

Major Facilities

The plant will comprise the following facilities:

a) BF proper
b) Cast house
c) Slag granulation plant
d) Hot blast stoves
e) Gas cleaning plant
f) Stock house and charging system
g) Hot metal handling system
h) Cranes and hoists
i) Coal dust injection system
j) Hot metal granulation
k) Ladle repair shop
l) Stockhouse & Cast house de-dusting system
m) Air blowing system
n) Top recovery turbine

Sinter from the sinter plant, coke from the coke oven, and sized LO and fluxes from the raw material storage yard will be received on separate conveyors and will be distributed to the BF stock house through the common conveyor gallery. The stock house operation will be fully automated. The furnace will be provided with a conveyor belt charging system. Return fines will be transported to the sinter plant/raw material storage yard through conveyors. A facility for grinding coal for injection will be provided. Raw coal will be transported via conveyors to the coal grinding unit in the blast furnace area. It will be transferred to the raw coal silo in the coal preparation plant by a conveyor. Pulverized coal will be injected throughtuyeres in the blast furnace.

The blast furnaces will be designed for high top pressure of 2.5-3.0 kg/cm^2. BF will have four tap holes. The furnace will be of self-supporting freestanding type. The top equipment and platform at the various levels around the furnace will be supported by an independent tower structure. The blast furnace will be provided with a bell less top charging system. Itwill be provided with modern facilities like the above burden probe, heat flux, and pressure profile measurement, etc. Advanced cooling elements will be provided for cooling refractory from the hearth to the stack. The cooling system will be complete with all piping, valves, pumps, etc. One emergency overhead tank will also be provided in the blast furnacerecirculating circuit, which will be operated during a power failure.

The hearth bottom including the tap hole will be lined with high conductive carbon. Bosh to the lower shaft will be lined with silicon carbide/high alumina. The rest of the shaft will be lined with high Al_2O_3 bricks and the cone portion will be gunned with CO resistant refractory materials.

Automation and control systems, which will include control of hot blast temperature, charging, etc. will be provided to take care of the smooth operation of the blast furnace. Instruments for measuring flow, pressure, temperature, etc. will also be provided.

Blast furnace will be served by three stoves, along with a provision for a fourth stove. The stoves will be provided with ceramic burners to supply hot blast at a temperature of about 1200 °C. The stoves will be fired with blast furnace gas. Combustion air fans will be provided for the supply of combustion air to the stove burner. Waste heat from the stove flue gas will be recovered to preheat the BF gas and the combustion air. One chimney will be provided for the stove system. The upper high-temperature zone of the stoves will be lined with high alumina refractory and other portions will be lined with fire clay refractory, except for the dome which will be lined with silica refractory. Hot blast main and bustle mainwill be lined with high alumina refractory. The stoves will be provided with the necessary platforms for providing an approach to various valves, fittings, etc. Necessary lifting beams with hoist will be provided above the stove valves to facilitate maintenance. The stove valves will be hydraulically/pneumatically actuated, and the stove changing will be PLC controlled.

Blast furnace will be provided with two cast houses, having two tap holes each. A hydraulic mud gun and drilling machine will be provided in the cast house. A slag granulation system and dry slag pit will be provided along with the granulated slag handling system. The slag runner arrangement will be made such that it can flow either to the slag pit or to the granulator of the slag granulation plant. Granulated slag bunkers will be provided for collecting the granulated slag. The storage capacity for granulated slag will be about 6-8 hours. The granulated slag will be transported from the bunkers to the slag yard for onward dispatch to the outside of the plant area.

The gas cleaning plant for the blast furnace will consist of a dust catcher and a dry gas cleaning system. The top gas of the furnace will be drawn through off-takes which extend upward to form vertical bleeder pipes provided with bleeder valves at the top. The offtake and uptake pipes would be connected to form a down-comer, which terminates at the dust catcher. Dry dust disposal from the dust catcher will be by road transport. The gas leaving dust catcher will flow into vessels containing bag filters for final gas cleaning. The disposal of dust will be done by road transport using trucks/tankers. The cleanliness of the blast furnace gas will be 5 mg/Nm^3 of clean gas. Following gas cleaning, there will be a top recovery turbine (TRT) to utilize the pressure of the top gas to generate power. A flarestack of adequate capacity will be provided.

Fume extraction and dust extraction facilities will be provided for cast house and stock house respectively to keep the work level dust concentration within the stipulated norms. Disposal

of dust from the stock house dust extraction system and cast house dust extraction system will be by road transport.

A hot metal granulation system of adequate capacity will be installed for the production of granulated iron. A recirculating water system for water required for the granulation process including a hot well, cold well, cooling tower, etc., will be installed. Granulated iron will be stored in the storage yard.

Electric blowers of adequate capacity will be provided for the blast furnace.

One elevator will be provided in the BF proper which will provide access to the control room, BF, and stove platforms. Elevators will also be provided in the stock house and the PCI building.

Hot metal will be transported to steelmaking shop by rail in approx. 350 ton capacity torpedos. The torpedo repair shop will have facilities for servicing, cooling, repairing, and relining of hot metal ladles. The shop will have facilities for drying and heating of relined torpedo ladles. Necessary repair shops and stores for the blast furnace will be consideredin the blast furnace area.

Calcining Plant

The calcining plant will produce burnt lime and dolomite to cater to flux requirement of steel melt shop-(SMS). The size of calcined products(lime and burnt dolomite) to be used in SMS will be 15 to 50 mm. The calcined products or fluxs will be screened before conveying to SMS. The undersize product fines will be stored and used in RH of SMS and to sinter plant.

The lime and dolo calcining plant will be set up on BOO basis. BOO operator will procure and manage the raw materials for calcining plant. The raw materials receipt will be through the railway yard of the plant and JV Company will transfer the raw materials to the storage yard of BOO operator which is located in vicinity of the calcining plant. JV Company will also provide power, make up water, fuel and other utilities.

Plant Facilities

The calcining plant will comprise facilities for raw materials storage, screening and handling, shaft kiln with necessary waste gas cleaning system, calcined product storage, handling, and screening facilities.

Raw material handling

Raw materials will be conveyed to Calcining plant through railway wagon and unloaded by wagon tippler for subsequent storing. Sized limestone and raw dolomite will be stored in dedicated stockyard within the calcining plant. About 45 days storage for each of the raw material will be maintained in this stockyard .

After reclaiming from the stockyard, the raw materials will be delivered to the kiln feed building bunkers over a system of belt conveyors. Kiln feed building bunkers will have suitable storage capacity.

In order to separate the fines generated in the material handling system, raw materials will be screened before being fed into the kiln. The kiln feed building will house raw materials screening facilities. The screened limestone and raw dolomite will be fed into the kilns using a skip hoist and stone distribution system located at the kiln top.

Shaft kiln

The shaft kilns will be installed on a specially designed RCC platform. The kilns will be designed with the required combustion system, instruments, and controls. The kilns will be lined with a suitable grade of refractories. Mixed gas (Coke Oven Gas and Blast Furnace Gas) with calorific value of 2,000 Kcal/N cu m will be used as fuel in each kiln of the Calcining plant.

Product handling

In order to convey calcined products from below the kilns, belt conveyors will be provided. Calcined products will be stored in product storage bunkers. About one day's stock will be maintained for the calcined products. The undersize fraction of calcined products will be stored in a separate bunker and will be conveyed to RH-OB of SMS and Sinter Plant.

Other facilities

In order to house the blowers, electrical equipments, instruments and controls in a common shade, a multi–storied building will be constructed for the calcining plant. The kiln automation system will be housed in this building. The building will also have office space, laboratory and other ancillary facilities as required. The boosters will be installed in a separate building.

Various utilities, such as fuel, compressed air, electric power, water, etc, will be made available to the plant. The plant will be provided with kiln waste gas cleaning system and a dedusting system for raw materials and product handling facilities.

The preliminary list of major equipments/facilities for Calcining Plant is given in Table 6-24 below:

Table 6-24 – Major Equipment & facilities

Calcining Plant (3 X 425 TPD)	Quantity
Vertical shaft kiln complete with charging and discharging system,refractories, combustion system, hydraulic system, kiln waste gas cleaning system, electrics,instruments and automation system	3 No.
Incoming raw materials conveyor system	1 Lot
Raw materials storage, screening facilities, bunker etc	1 Set
Product conveyor from kiln bottom to storage bins	1 Set
Product storage and screening facilities comprising conveyor, bunker, screen	1 Set
Dedusting systems for handling and storage of raw materials and product	2 Sets
Ventilation system for cable vaults, electrical room	1 Set
Air-conditioning system for control room	1 Set
Plant electrics/power distribution	1 Set

Steel Making

Considering the production requirement and the product-mix, BF-BOF process route has been envisaged for the project. To achieve the inherent advantages of bigger heat size viz. higher yield from liquid steel to crude steel conversion at the caster, lower consumption of refractory, consumables, etc., higher heat size has been selected.

The following major production facilities are envisaged:

a) A steel melt shop (SMS) including one no. hot metal desulphurization facility, two basic oxygen furnaces (BOF), secondary metallurgy units, and two strand thin slab casting and rolling (TSCR) facilities.

b) The production facilities will be adequately supported by necessary auxiliary facilities such as raw materials, electric power receiving and distribution facilities, various utility facilities and distribution systems, water treatment, and distribution system, etc.

Based on the finished product requirements i.e 3 mtpa of hot rolled coil, the envisaged production requirement from BOFs will be around 3.083 mtpa of liquid steel. Metallics to BOF will be met from hot metal from new blast furnace, granulated iron, plant return /purchased scrap.

Steelmaking technology envisaged

The major features of steelmaking technology proposed to be adopted, considering the product-mix with the latest available state-of-the-art technology are as follows:

a. Desulphurization of 50% hot metal in charging ladle by injection desulphurisation process.

b. Top oxygen blown BOFs with bottom inert gas stirring facilities for the production of low carbon steel, yield improvement and reduction of slag FeO, associated material handling facilities, lance handling facilities, hot metal, scrap, liquid metal, and slag handling facilities.

c. Dry-type GCP for reduced dust emission level.

d. Slag splashing for improvement of BOF life.

e. Manual temperature and sampling facilities. Future provision for sublance installation for online temperature measurement and sampling of BOF.

f. Secondary Emission System for entire steel melt shop.

g. Secondary refining of metal through two (2) nos. twin Ladle furnaces and one(1) no. RH Degassing unit for close control of composition, degassing, temperature, matching of caster sequence, and maintaining production schedule.

h. Continuous casting facility including slag detection system, continuous tundish temperature monitoring system, automatic mold level control system, breakout detection system, facility for width adjustment within the sequence, dynamic soft reduction etc.

Major Facilities for SMS

Configuration for meltshop is given in Table 6-29:

Table 6-29 - SMS configuration

Production unit	No X Capacity
Hot metal desulphurization	1 x 165 ton Hot metal desulphurization unit
BOF	2 x 165 ton
Secondary metallurgy units	2 x 165 ton twin LF 1 x 165 ton RH
Thin slab caster	1 x 2-strand

The major facilities proposed to be installed in SMS are briefly described below.

a) Scrap handling facilities

Scrap will be received by road in the scrap aisle where scrap can be stocked in a pit. The aisle will be served by two EOT magnet cranes. Scrap will be loaded into scrap boxes (chute) for charging into the BOFs by magnet cranes. Two (2) nos. of self-propelled transfer cars will transfer the scrap boxes from the scrap aisle to the charging aisle. The transfer car track will be equipped with a scrap weighbridge. The scrap chute will be taken either by a dedicated semi-portal crane or by scrap charging EOT crane at the charging aisle for charging scrap in BOF.

b) Hot metal handling facilities

Hot metal will be supplied in torpedo ladle car. Hot metal from torpedo ladle will be poured into hot metal charging ladle placed on a transfer car. There will be two torpedo pits and three torpedo car tracks for unloading of hot metal into the charging ladle.

To meet the quality requirement of various steel grades, one (1) no. of injection type HMDS will be provided for pre-treatment of hot metal and space provision for another HMDS has been kept in the layout. The desulphurization units will beequipped with reagent handling facilities and other additive addition facilities. The stations will be completed with all necessary storage silo, dispensers, injectionsystem, self-propelled combined (hot metal and slag pot) cars with tiltingarrangement, and slag raking facilities. Slag will be poured in slag pot placed in the combined car and slag pot will be subsequently placed in a slag pot transfer car to transfer the slag pot to slag aisle. Then slag will be dumped into slag pit.

The station will be capable of processing 50 per cent of hot metal on daily basis.

After desulphurization and deslagging, the ladle will be taken to the charging aisleby hot metal transfer car for charging hot metal into the BOFs by shop EOT crane. Fume extraction facilities at the torpedo re-ladling station and desulphurization station have been envisaged.

c) BOF and associated facilities

The 165 ton BOF will be of symmetrical shape with a useful volume of about 157 m3. The BOF will have an integral bottom and will be provided with hollow trunnions for the installation of bottom stirring facilities and slag stopper. Each BOF will be provided with two sets of water-cooled lances. Below each BOF, there will be two self-propelled transfer cars, one for steel ladle and the other for slag pot.

Temperature measurement and sampling will either be done by sub-lance or manually by tilting the BOF.

The permanent lining of the BOFs will be of magnesite bricks and the wear lining will be of mag-carbon bricks. BOFs will be equipped with a slag splashing system for refractory lining protection.

d) Relining facilities

At the end of each campaign, the BOF will be under shutdown for relining. Facilities will be provided for cooling the BOF and wrecking the worn-out lining. BOFs will be relined from the top, for which suitable facilities will be provided.

e) BOF gas cleaning plant

The BOFs will be equipped with gas collection, cleaning, and recovery system. The gas cleaning system will be designed with an air factor of 0.10. The gas cooling system will be an evaporative cooling type or pressurised water cooling system. Thesensible heat of the off-gas will be utilized to generate steam in case of evaporated type cooling system while high-pressure water will be recirculated in pressurised water cooling system. The gas cleaning system will be of dry type (comprisesEvaporation cooler, ESP(Electrrostatic precipitator), gas cooler) and will have necessary analyzers and automation. The ID fan will have adequate capacity to handle the generated gases. The initial gas before the start of the collection will be flared in a flare stack. The dust emission level in the flare stack will be within30 mg/Nm^3.

The dust level of the LD gas at the inlet of the gas holder or outlet of the gas cooling tower is 10 mg/ Nm^3. For gas recovery, gas holders of adequate capacity have been envisaged. Duct to gas holder will be designed considering the simultaneous blowing of BOFs. A gas export system has been envisaged downstream of the gas holder comprising duct, dampers, booster fans, U-seal etc.

Proper handling of dust from gas cleaning facilities will be provided for further processing by using a pneumatic conveying system or other mechanical conveying systems to dust silo and successive evacuation by dust carrying tanker.

f) Secondary emission control

Secondary emission control facilities will be provided to collect and clean the fugitive gases and fumes generated at the time of hot metal reladling, BOF charging/tapping/blowing, argon rinsing operation, desulphurization stations, deslagging, dust extraction sysyem for material handling system of BOF, LF and RH. Fume extraction system for LF may also be connected to secondary emission control facilities. The system will be designed for work zone dust level within3 mg/ Nm^3 over and above the ambient dust concentration and stack emission up to 30 mg/ Nm^3.

g) Flux handling facilities

Calcined flux, iron ore, and other materials will be transported by a conveyor from a junction house and charged to the high-level bunkers in the BOF aisle by a shuttle

conveyor. A set of high-level bunkers complete with vibratory-feeders, weigh hoppers, chutes, surge bins etc. will be provided for each BOF.

h) Ferro-alloy handling facilities

Ferro-alloys will be received in the BOF building either by bottom-discharge containers or by conveying system. In case of containers, it will be handled by crane/monorail hoists and the ferro-alloys will be unloaded into storage bins located in the BOF high rise building. Whereas, in case of conveying system, ferro alloys will be unloaded into storage bins by a shuttle conveyor. Automatic batching, sequencing and charging system, including control of vibrating feeders, weigh hoppers, etc. will be provided and the ferro-alloys will be charged into teeming ladles through a chute during tapping from BOF and also in subsequent online argon rinsing station.

i) Steel handling facilities

After tapping the heat, the steel ladle will be transferred to the online argon rinsing station by self-propelled steel transfer cars and subsequently to the secondaryrefining treatment facilities. After secondary refining treatment, ladle will be placed inturret for continuous casting.

j) Slag and debris handling facilities

The BOF slag will be poured into slag pots placed on the self-propelled transfer car running below the BOFs and moved to the slag aisle. The liquid slag will be dumped into pit by EOT crane and disposed off by the pay-loader and dumper after cooling. BOF slag granulation can be considered in future. The metallic portion from the slag will be recovered in a metal recovery plant for reuse in the steel melt shop. The non-metallic portion can be used for road making, ground filling, and railway ballast.

The debris from the wrecked lining of the BOF will also be dumped into the slag pot and disposed of in the same manner. The slag from the casting shop will be transported to slagyard by mobile equipments.

k) Secondary refining facilities

For secondary refining of steel, two(2) nos. twin ladle furnaces (LF) and one(1) no. RH-OB degassers unit will be installed. Online argon rinsing stations will be provided in the downstream of BOF to facilitate homogenization of steel after tapping, before sending the heat to secondary refining facilities or continuous casting machine.

Online rinsing station- After tapping of liquid steel from BOF, liquid steel ladle will move to online rinsing station. In online rinsing station inert gas stirring, ferro-alloy addition, aluminum wire addition, temp. measurement and sampling will take place. After these treatments, ladle will be either sent to any of the secondary refining units or it will be transferred to continuous casting machine.

Ladle furnace – Two (2) nos. of twin station type ladle furnaces of 165-ton heat size in SMS will be installed in the secondary refining aisle. The ladle furnaces will be capable of performing heating, alloy adjustment, desulphurization, inert gas stirring

and carbon injection. The unit will be complete with facilities for alloy storage,batching and charging, sampling and temperature measurement and wire feeder arrangement. The furnace will be equipped with a water-cooled furnace cover with raising and lowering facilities. The ladle furnace will be capable of performing heating at the rate of around 4ºC per min. LF will have either dedicated fume extraction system or it will be connected to secondary FES system.

RH-OB Degassing unit- RH-OB degassing unit of 165-ton heat size will be provided to produce quality steel by removal of carbon, hydrogen, nitrogen, and oxygen to the desired levels. The salient features of RH-OB unit are given below:

Vacuum system:Steam ejector

Alloy addition system: Mechanized addition system of micro-alloys and other ferro -alloys under vacuum

The vacuum vessel system will have a vessel lifting type or ladle lifting type mechanism and will be connected with a steam ejector system via hot off-take. The unit will be equipped with a multifunctional lance system, a vaclock system for addition of alloy under vacuum, temperature and sampling device, wire feeder arrangement, maintenance facilities for hot offtake, vacuum vessel along with snorkel exchange arrangements and vessel heating system, etc.

l) Ladle preparation facilities

The steel teeming ladles will be equipped with a slide-gate system, adequate free-board, and porous plug. Ladle (Hot metal and steel teeming ladle) debricking, relining, drying, slide gate setting & porous plug fixing for steel teeming ladle and drying facilities will be provided in the ladle preparation aisle. Online ladle preheaters will be provided over the steel transfer car track for preheating the ladle while waiting for tapping. Vertical ladle preheaters will be provided for heating hot metal ladles and for steel teeming ladles.

Thin Slab Casting & Rolling

For liquid steel casting, thin slab casting and rolling facilities have been foreseen considering lower investment cost, lower specific energy consumption, product cost and higher yield. Apart from the above, this process is uniform with respect to temperature control and speed which enables rolling of very thin final thickness.

Major Facilities for caster

Slab casters will be provided with the following:

- Ladle turret with ladle cover manipulator
- Ladle shroud manipulator, slide gate cylinder fixing facility
- Tundish and tundish car
- Tundish preheaters
- Emergency equipment like emergency launder, emergency ladle and emergency tundish discharge boxes
- Submerged entry nozzle
- Mould along with electro-magnetic stirring & breaking equipment and breakout detection system
- Mould oscillation equipment
- Automatic mould level control system
- Mould cooling, spray cooling and machine cooling systems along with necessary water syste

- Segments with liquid core reduction
- Dummy bar system along with parking facility
- Pendulam shear with drive unit
- Emergency torch cutting equipments.
- Crop end disposal system
- Utilities, lubrication, and hydraulic systems
- Scale flume, scale pit, oil skimmer, scale pit pump house, and necessary water system
- Necessary electrics and automation system
- Technological steel structures
- Tundish preparation facilities
- Mould & segment repair and maintenance facilities.

Major equipment/facilities

The major equipment and facilities of the rolling mill will include two roller hearth tunnel furnaces, a crop shear, a high-pressure water descaling system, a

continuous finishing mill train, a run-out roller table with a laminar cooling water system, two hydraulic down coilers, coil conveying system, coil yard and roll & bearing shop. A brief description of major facilities envisaged is given below.

Tunnel furnaces

Two roller hearth tunnel furnaces have been envisaged for heating and equalising continuously cast thin slabs for subsequent rolling to finished strip. The furnaceswill be installed downstream of the casters. One of the tunnel furnaces will be directly in line with the mill, while the second tunnel furnace will feed hot slabs to the mill line through a suitable transfer arrangement. Each furnace will be of recuperative tunnel type which will serve the dual purpose of heating the slabs and simultaneously conveying them from the caster exit to the rolling mill.

Crop shear

A crop shear is proposed to be installed at the upstream side of the rolling train forcutting the head and tail ends of the slab prior to rolling.

High pressure descaler

A high pressure descaler will be installed at the entry to the finishing mill to remove scales from the thin slab. Pinch rolls will be provided at the entry and exit sides of the descaler. The descaling water system will be complete with suitable filtration unit and booster pumps. Water will be supplied from the DCW circuit of the mill water system.

Finishing mill

A finishing mill train comprising of six nos. 4 -high stands will be provided. Provision will be kept in the mill for installation of a seventh finishing mill stand in future. Each mill stand will include rigid housings, work rolls and back-up rolls with hydraulic roll gap adjustment and automatic gauge control. The stands will be provided with necessary work roll bending and shifting systems for strip profile and flatness control. Suitable roll cooling pipes, headers and spray nozzles will be provided. An automatic quick work roll

changing system will be provided for the finishing train. The finishing mill will have interstand loopers of modern design to work in consonance with fast automatic controls.

Run-out table

A run-out roller table will be provided to transport the hot rolled strip emerging from the last finishing mill stand to the downcoiler. Measuring gauges and surface inspection systems for the strip will be provided in the run-out table as necessary.

Laminar cooling system

The hot rolled strip will be cooled to the coiling temperature on the run-out roller table by a laminar cooling system comprising top and bottom headers for spraying

water on both top and bottom surfaces of the strip. The strip cooling system will be divided into a number of sections to facilitate controlled cooling of the strip as per the product grades being rolled. Lateral sprays will be provided in order to blow-off residual water from the top of the strip.

Downcoiler

Two downcoilers will be provided to coil the full range of strip sizes envisaged. The downcoiler will ensure tight wound coils without any marking on the strip surface. Each downcoiler will be complete with entry side guides, pinch rolls, mandrel and wrapper rolls.

Coil conveyor system

The coil conveyor system will include all necessary equipment required to deliverthe coils to the coil yard after sampling, strapping, weighing and marking. The conveying system will include coil transport cars, walking beam conveyors, coil sampling station, strapping machines for circumferential and eye strapping of coils, coil weighing and marking machines. The coils will be transported by the conveyor system with coil eye in horizontal position. Off-line coil inspection line will also be provided.

Coil yard

The coils will be unloaded from the coil conveyor at designated locations by the EOT cranes of the coil yards. The coil yards will be designed for storage of about seven days production of hot rolled coils from the Thin Slab Casting and Rolling plant. Despatch of coils from the plant will be carried out both by railway wagons and trailers.

Roll and bearing shop

For ginding of new hot strip mill rolls and regrinding of used work rolls and back -up rolls, pinch rolls, wrapper rolls, shear knives and for disassembly, cleaning, inspection and assembly of bearings and chocks, a roll and bearing shop is envisaged in the hot strip mill complex. Facilities provided in the roll shop will include work roll grinding machines, back-up roll grinding machine, shear blade grinder, chock mounting/dismounting equipment, induction heater for roll neck bearing and labyrinth ring, work roll chock and bearing cleaning machine, chock tilter, work roll cooling station, greasing station for work roll chocks, machine tools, measuring gauges and instruments. Other facilities like sub-store, roll storage etc. will be provided as required. The roll shop will be adjacent to the mill bay. Transfer cars of adequate capacity will be installed for shifting of the rolls from the mill bay to the roll shop and vice versa.

Cranes and hoists

Necessary handling facilities, like overhead cranes, jib cranes, hoists and transfer cars will be provided to meet the normal operational and maintenance requirements of the mill.

Other facilities

Other than the above, the mill will be provided with power distribution system and electrics; recirculating water system; utility services like fuel system, compressor, chiller plant etc. and auxiliary services, i.e., oil lubrication systems, grease lubrication systems, hydraulic systems and pneumatic systems.

Captive Power Plant

The by-product gases from the blast furnace, coke ovens, BOF shop will be utilized by various steel plant consumers. The balance excess gases will be utilized for captive power generation. The captive power plant will be installed on BOO basis. JV Company will provide power, make up water, gases and utilities to BOO operator. Process steam required for the steel plant will be take f rom power plant boiler.

A part of steam generated from the boiler will be used to meet the steel plant requirement and balance will be used to generate power. The below table 6-35 provides the steam demand for steel plant, steam generation from available by-product gases (as in above Table 6-34) and steam available for power generation:

Steam cycle

A common header system will be adopted with any boiler steam output connected to any turbo generator system (TG). The power plant cycle for each unit will comprise of a boiler, steam turbine generator, condenser, condensate extraction system, heating system, deaerator boiler feed water pumping & heating system, turbine governing system, lubricating & control oil system along with all other necessary auxiliary equipment.

The main steam from the boiler super heater outlet will be fed to the HP steam turbine through control valves. The exhaust steam from the HP turbine is re-circulated back to the boiler as a cold reheat cycle; the steam is heated to the temperature of the main steam by flue gas or nitrogen in the case of the CDQ power plant. The hot reheated steam is connected to the LP turbine. The exhaust steam from the LP turbine will be condensed in the main condenser by the circulation of the required quantity of cooling water and its vacuum will be maintained by one of the two 100 percent capacity vacuum pumps for maintaining the backpressure of 0.1 atm.

The condensate drawn from the condenser hot well by 3 x 50 percent (2 workings + 1 standby) capacity condensate extraction pumps will be pumped to the deaerator through the LP heaters. The water in each deaerator will be deaerated using steam from turbine extraction. The feed water from the deaerator will be pumped to the boiler using 2 x 100 percent capacity (1 working + 1 standby) boiler feed pumps and the feed water will be heated through a set of high-pressure heaters for each boiler.

Plant Facilities

The following plant facilities are envisaged for the captive power plant (On BOO basis)

a) Boiler and auxiliaries.

b) Steam turbine and auxiliaries.

c) Water system.

d) Fire fighting system.

e) Utility system & HVAC system.

f) Cranes, hoists, and elevators.

g) Power generation, distribution, and evacuation system.

h) Instrumentation & control system, plant communication system

i) De NOX system (if required)

UTILITIES AND SERVICE FACILITIES

Utilities and Service Facilities

This chapter details the electric power distribution system, instrumentation, automation, communication, water system, utilities, and auxiliary facilities required for the proposed project.

Power Distribution System and Plant Electrics

Source of power

The power requirement for the proposed plant will be met through grid from Jammalamadugu 400kV/220kV/132kV substation, located approximately 25 Kms from the project site.

Power requirement

Annual energy consumption in million kWh	1937
a)15 minute maximum demand:	
- in MW	268
- in MVA(considering 0.95 p.f)	282
b)1 minute peak demand in MW	282

Characteristics of plant loads

The major power consumers for the proposed steel plant are RMHS, Sinter Plant, Blast Furnace, Steel Melt Shop (SMS), Rolling mill, Air Separation Plant and Utilities. The electrical load for SMS is mainly by ladle furnaces and loads for rolling mill is fluctuating in nature whereas other loads of the plant are more or less steady power consumers. In order to compensate for the fluctuating consumers, reactive power compensation equipment with power factor improvement capacitor banks arranged in harmonic filter circuits will be provided. The plant overall power factor will be maintained in the range of 0.95.

Emergency power supply to essential loads

Critical emergency load of the various plant facilities will be supplied over adequate capacity Diesel Generator (DG) sets installed at strategic locations to ensure safety of the personnel as well as equipment during total black-out condition.

Plant power distribution system

Selection of voltages: In order to minimise disturbances on the utility power systems, it is desirable to operate fluctuating loads, like ladle furnaces as well as rolling mills from power systems with high short circuit level. Following voltage levels have been envisaged for the proposed steel plant.

220 kV	..	Plant incoming power supply from grid
33 kV	..	Plant primary distribution
11 & 6.6 kV	..	For secondary distribution of power to individual plant units as well as for feeding motors rated from 200 kW and up to 2000 kW.
415-240 V	..	Low voltage distribution as well as utilisation voltage within various plant units.
690 V	..	Higher rated EOT cranes.

System short circuit levels : Elaborate short circuit studies need to be carried out during implementation stage. However, it is proposed to adopt 50 kA for 3 seconds for 220 kV, 31.5 kA for 3 secs for 33 kV, 40 kA for 3 seconds for 11 kV and 6.6 kV and 50 kA for 1 sec for 415 V switchgear in all substations planned for the proposed steel plant.

Power Distribution scheme: The power distribution system for plant electrics and other downstream equipment are briefly described below.

The power distribution system has been planned on the basis of proposed plant general layout and power demand as indicated above. Single line diagram of the proposed power distribution system is shown in Drawing No 11611-97A-000-ELE-0001-RA

The break-up of 15-min maximum demand as indicated above for the proposed steel plant are indicated in Table 7-1.

The source substation should have adequate capacity to meet the demand of 120 MW (126 MVA). Due to presence of Ladle Furnace (LF) for the proposed integrated steel plant, the fault level at PCC (Point of Common Coupling) will have to be adequate enough to run the system smoothly.

220 kV power supply at the proposed plant MRSS will be stepped down to 33 kV over 2 Nos 220/34.5 kV, 60/75 MVA ONAN/ONAF transformers for furnace loads (dirty bus)through 33 kV furnace switchboard as well as over 3 Nos 220/34.5 kV, 150/180 MVA, ONAN/ONAF transformers for plant utilities and auxiliary loads (clean bus) over another 33kV switchboard as shown in the Single Line Diagram. Both these 33 kV switchboards willbe located at MRSS area. All 220 kV transformer feeders shall be provided with Isolator and LA outside the 220 kV GIS. For safe working on any of the two bus sections, in case of any eventuality, the segregation of the bus through external isolators (outside the GIS) will be considered.

33 kV power from furnace switchboard at MRSS will feed 33 kV furnace switchboard for LF & SVC proposed to be located at steel melt shop substation (SMS LBSS). Respective furnace duty 33 kV switchgear at LF electrical room will be fed from the above 33 kV switchboard at SMS LBSS. Reactive Power Compensation system for the furnaces will alsobe connected with the above switchboard at SMS LBSS.

33 kV power from clean bus at respective major plant areas like Raw Marerial Handling system, Coke Oven, Sinter Plant, Blast Furnace, Basic Oxygen Furnace, Steel Melt Shop,

Mills (TSCR), Air Separation Plant, water system and other service & utility will be stepped down to either 6.6 kV or 11 kV over adequate capacity 33/6.9 kV or 33/11.5 kV power transformers at respective Load Block Substaions (LBSSs) in order to feed various 6.6 kV or 11 kV loads as well as 415 V loads. Certain 33 kV loads may direcly be fed from 33 kV power supply. Separate 33 kV feeders from MRSS will be considered for blast furnace blower motors. 11 kV and 6.6 kV supply will further be stepped down to 415 V over suitably rated 11/0.433 kV or 6.6/0.433 kV distribution transformers at respective Load Centre Substations (LCSSs) to cater to the power supply of various 415 V and 240 V loads of the plant. Higher rated EOT cranes will preferably be fed from 690 V supply over adequately rated 11/0.72 kV or 6.6/0.72kV Load Centre Substations (LCSSs).

220 kV and 33 kV substation at MRSS will be gas insulated type (GIS) where as 33 kV, 11 kV, 6.6 kV, 415 V and 690 V switchgear in other plant areas will be air insulated type (AIS).

The philosophy of power distribution will be as follows.

Load-center type of distribution :

:

The load-center type distribution principle has been adopted in designing the entire power distribution system for the plant electrics. In this type of system, substations or switching stations will be located near the load-centers of individual groups of loads in an area, with bulk power being carried either at higher voltage or over high capacity feeders up to these substations or switching stations. This type of distribution system has the advantage of lower losses, simplified operations as well as ease of maintenance work.

Radial distribution system :

Adoption of simple radial system of distribution is another important feature of the plant power distribution scheme. This will ensure continuity of power supply to the production shops to a high degree of reliability and will also make the operation and maintenance of the plant easier and safer. Power system protection coordination will also be simplified.

Stand-by capacity :

It is necessary to provide adequate stand-by capacity in the system so as to ensure a high degree of continuity of power supply to various plant departments on a firm basis, so that production is not hampered for a prolonged duration due to power supply interruptions. This aspect has been given due consideration in designing the power distribution system. The number and capacity of transformers as well as main feeders have been so selected, that even with the outage of one of the transformers or feeders, the remaining capacity is adequate for maintaining the power supply, without adversely affecting the plant operations.

Selection of electrical equipment

The type and ratings of various major electrical equipment to be adopted for the plant including power transformers, high and low voltage switchgear, motors and controls, cables etc are briefly elaborated below.

Process Electrics : The description of major process electrics are briefed below.

Ladle Furnaces

Power supply to Ladle Furnaces (LFs) of the steel melt shop will be made available at the 33 kV over cable feeders from the 33 kV system of upstream substation. The auxiliary high voltage loads of the furnaces namely, the ID fans of the gas cleaning plant are proposed to be fed at 6.6 kV and other auxiliary loads are proposed to be fed at 415 V.

Dedicated furnace transformers of adequate capacity have been envisaged for the LFs. All the transformers will be of OFWF type and provided with duplicate full capacity oil circulating pumps and oil to water heat exchangers. In order to minimize interruptions in the furnace operations, these transformers will be provided with on–load tap changing mechanism to vary power input to the furnace.

The furnace transformers will be fed over their individual 33 kV switchboard comprising of furnace duty vacuum circuit breakers/vacuum switch, selected to withstand frequent switching operations with minimum maintenance. Fault protection features will be provided by appropriate relaying.

Necessary surge absorbers and R-C surge suppressers to protect the transformers against switching over voltages will be provided. Secondary conductor system will be complete with water-cooled bus tubes and flexible water cooled cable system.

Latest and proven PLC based digital electrode regulation system will be considered for accurate control of the electrodes of the ladle furnaces. The system will be complete with all necessary equipment, sensors including suitable devices for monitoring transformer secondary current of each phase. The electrode regulation systems will be suitably interfaced with the automation system so that all information and parameters are availablein the HMI.

The basic level automation (Level-1) system required for interlocking, sequencing, switching, etc. will be carried out by distributed control philosophy through programmable logic controllers (PLC), microprocessor based systems and PCs as described in detail under the Automation section.

Main mill drive motors and controls

Due to the proven technology and advantages of AC drive systems over conventional DC drive systems, which have become nearly obsolete, AC drive systems have been considered for all variable speed applications in the proposed mills. The mill stands will be powered by specially designed AC squirrel cage induction/ synchronous motors with overload capabilities as per IEC standards for non-reversing/reversing rolling mill applications and suitable for feeding from variable voltage variable frequency IGBT based inverters, without causing overheating and insulation damage for the specified application. These motors will be of B3 construction, class F or H insulation with temperature riselimited to class B or F respectively at 100 per cent continuous loading. Individual motor ventilation unit will be mounted on the respective motor with necessary instruments.

Medium voltage AC drive system shall be adopted for feeding the main stand AC motors. For a logical group, regenerative type IGBT/IGCT/IEGT based common Active Front End (AFE) converter, common DC Bus (Copper) fed individual vector controlled PWM Inverters will be considered for individual stand motors of the group. Individual regenerative AFE converter and vector controlled PWM Inverter will be considered depending on the rating of the stand motor. However, grouping or individual feeding arrangement will be decided witha view to standardize the rating of the converter transformers and drive modules. Proper care will be taken for regenerative mode of operation to avoid device failure while deliveringpower to the bus. The converter will be capable of maintaining rated DC voltage at allvalues of load current including short time service current rating at 90 per cent rated AC voltage considering incoming voltage fluctuations as stipulated.

Special requirements, if any, for the cables between the inverter to the motor (flexible copper conductor cable with copper screen etc.) will be considered so that there is nofailure of the motor bearings due to common mode voltage. Noise level of the drive panels

will be limited to 65 db as measured from 1 m distance. Overload capability of the inverter units will match with that of the motors. In order to avoid failure of semi-conductor power devices due to higher ambient temperature or undue loading, design of the converter/inverter will be done considering safe temperature limit for operation of semi- conductor devices 15 °C less than the manufacturer specified temperature limit of devices. Apart from the built-in panel door mounted console, basic parameter programming, drive diagnostics and troubleshooting will also be possible from one point through Drive LAN.

Only two types of frame sizes for the stand motors and one type of converter transformer will preferably be selected for standardization purpose and lower inventory. However, this aspect will be finalized after review of equipment offered by various bidders.

Auxiliary mill and other drive motors and their controls

In-line auxiliary drives that require speed and/or position controls e.g. shears etc. will be powered by AC induction motors. Suitable groups will be considered, with each group comprising of associated converter transformer, common rectifier/converter, DC bus and individual PWM type IGBT inverter units (4-quadrant operation) with microprocessor based fully digital regulation and control system in line with the system adopted for main drives. Roller table motors are proposed to be fed from similar IGBT based group inverters with standard V/F control. Adequate number of roller table distribution boards (RTDB) is envisaged for distribution of roller table motors, to be located in the shop floor, comprising incoming isolator and requisite number of breakers. The variable speed AC motors will be specially designed for rolling mill applications and suitable for feeding from variable voltage variable frequency IGBT based inverters without causing overheating and insulation damage for the specified application. These motors will preferably be of B3 construction, class F or H insulation with temperature rise limited to class B or F respectively at 100 per cent continuous loading. Other technical features and facilities including parameterization and diagnostic facilities will be similar to those mentioned above for the AC main drive system.

Off line auxiliary applications e.g. pumps, blowers etc. will be powered by general purpose AC induction motors of totally enclosed, fan-cooled design. The control of these motors will be logically grouped to form motor control centers (MCCs). All switching and interlocking will be carried out through PLC.

Diesel Generator (DG) set

During total power failure i.e. outage of grid, power supply to the critical loads within the various plant units are proposed to be met from local diesel generator sets in order to avoid injury to personnel and damage of equipment. The DG sets will be provided complete with engines, alternators, fuel systems, lubricating oil systems, exhaust system, starting systems, cooling systems, battery and battery charger etc. Automatic mains failure (AMF) starting facility will also be provided. The capacities of the DG sets will be finalized during implementation stage based on actual unit–wise emergency power requirement.

Uninterrupted power supply unit (UPS)

UPS will be installed at selected locations to cater to the requirements of instant stabilized power for short periods for proper functioning of instrumentation and automation system in case of power failure.

Plant lighting system

The various factors proposed to be taken into consideration in designing the plant internal and external lighting system are the illumination levels desired, architectural requirements, environmental conditions, green building concept for office buildings, practicable, easy access for maintenance and energy saving.

The plant lighting system with energy efficient type LED fittings will be provided to meet illumination requirements for different units of the plant. In substations and control rooms, emergency lighting will be provided in addition to the general illumination. Emergency lighting will also be provided for other critical areas of the plant as required.

LED type tube light fittings will be provided for indoor lighting of various buildings/rooms, whereas for illumination of outdoor yards, building peripheries and roads, LED type flood light fittings and street lighting fittings will be provided. For high-bay areas, high-bay type LED light fittings are proposed, whereas for general lighting in low bay areas, direct or semi-direct type LED fittings are proposed.

The lighting power supply will be arranged from the 415 V AC, 3–phase, 4–wire distribution system in the various plant departments. Lighting power will be distributed through the main lighting distribution boards and the sub-lighting distribution boards. The illumination levels proposed for the various plant units are given in Table 7-5 below. These are based on general practices recommended by various international illumination engineering societies.

Emergency lighting is proposed for substations, control rooms and other strategic points of the plant. Emergency lighting from Inverter/UPS will be arranged for isolated buildings/substations and for process plants, emergency lighting will be provided through DG set. The lighting power supply will be taken from the 415-240 V AC, 3-phase, 4-wire distribution system

DC battery systems: Requisite sets of DC lead acid battery banks sealed maintenance free (SMF) type of adequate capacities will be provided at all the substations to cater to the DC control power requirement. The battery banks shall be so sized as also to cater to the emergency lighting of substations during power outage. Each set of the battery banks will be complete with two identical float–cum–boost charger units and its DC distribution board. The battery bank voltages to be adopted will be selected considering the application requirement.

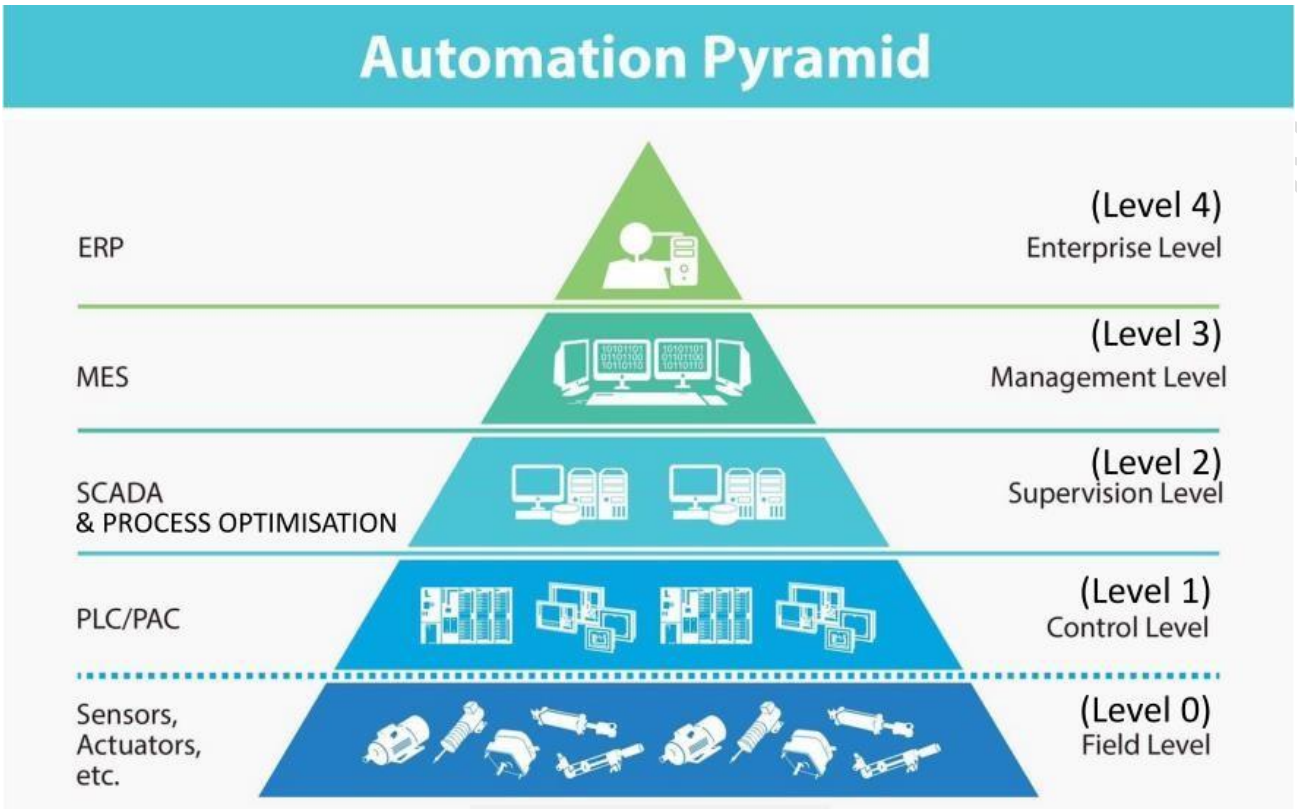
A list of envisaged major equipment for the power distribution and electrics for the project is listed in below Table 7-7

Table 7-7 – List of major electrical equipment

Equipment	Quantity
a) Incoming 220 kV Power lines from Jammalamadugu 400kV/220kV/132kV substation (part of external infrastructure)	1 set double circuit
b) 220/33 kV MRSS	
- 220 kV GIS at MRSS	1 set

Equipment	Quantity
- 150/180 MVA, 220/34.5 kV, ONAN/ONAF power transformers at MRSS	3 sets
- 60/75 MVA, 220/34.5 kV, ONAN/ONAF power transformers at MRSS	2 sets
- 33 kV GIS switchboard at MRSS	2 sets
- Associated cabling, earthing, lightning protection, illumination system etc.	1 lot
c) 33/11 kV, Load Block Substation (LBSS) comprising of 33 kV In-Out switchboard /33 kV switchboard (AIS), 33/11.5 kV ONAN/ONAF power transformer of required KVA rating, 11 kV switchboard (AIS) as well as associated cabling, earthing, lightning protection, illumination system etc.	1 lot
d) 33/6.6 kV, Load Block Substation (LBSS) comprising of 33 kV In-Out switchboard /33 kV switchboard (AIS), 33/6.9 kV ONAN/ONAF power transformer of required KVA rating, 6.6 kV switchboard (AIS) as well as associated cabling, earthing, lightning protection, illumination system etc.	1 lot
e) 11/0.415 kV, Load Centre Substation (LCSS) comprising of 11 kV In-Out switchboard /11 kV switchboard (AIS), 11/0.433 kV ONAN distribution transformer of required KVA rating, 415 V switchboard (AIS) as well as associated cabling, earthing, lightning protection, illumination system etc.	1 lot
f) 6.6/0.415 kV, Load Centre Substation (LCSS) comprising of 6.6 kV In-Out switchboard /6.6 kV switchboard (AIS), 6.6/0.433 kV ONAN distribution transformer of requiredKVA rating, 415 V switchboard (AIS) as well as associated cabling, earthing, lightning protection, illumination system etc.	1 lot
g) 33 kV Reactive Power Compensation system for LFs	1 set
h) 11 kV Reactive Power Compensation system at LBDS	1 lot
i) 6.6 kV Reactive Power Compensation system at LBDS	1 lot
j) Battery, charger, DCDB and AC supply system	1 lot
k) Process plant electrics	1 lot
l) Cables & cabling accessories	1 lot
m) Illumination system	1 lot
n) Earthing & lightning protection system	1 lot

I. Instrumentation, Automation, Communication and Fire detection & Alarm System



Level-0 and level-1 automation systems are considered for all plant units, level-2 automation systems have been envisaged in units as required, depending on the application. Level-3 and level-4 automation systems have been envisaged on the overall plant and organization basis, however, if required, Level-3 and Level-4 systems can be alsoadded later and all provisions can be kept in the initial stage of plant design. The various levels of automation systems will be connected hierarchically. All real-time data from the level-1 automation system of respective plant units will be collected generally by the corresponding level-2 systems and where the level-2 system has not been considered, the level-1 automation system will be interfaced directly to the level-3 automation system.

Water System

Plant water is primarily required in the steel plant for various equipment cooling. Besides, it is also used for other process use, for collecting and conveying of scales, control of dust and debris; for drinking and sanitation; for firefighting, and other miscellaneous purposes.

Water requirement

It is estimated that the total fresh make-up water requirement for the proposed project willbe about 1656 cum/hr for the 3 mtpa ISP.

Raw water system

Raw water will be drawn from Gandikota reservoir/ Mylavaram reservoir. An intake water pumping system will be provided to draw water from the Gandikota reservoir/ Mylavaram reservoir to supply raw water to the proposed plant. A raw water reservoir, of around 90 days of storage (~3.85 MCM) will be provided within the plant boundary. A new raw water pump house at the raw water reservoir will be constructed to supply raw water for the raw water treatment plant.

The raw water treatment plant will be designed for treating the raw water in order to bringthe water close to chemical equilibrium and to render it fit for cooling circuits and necessary treatment facilities such as clarifloculator, coagulant and flocculation dosing equipment, etc.will be provided. Provision will be made for dosing of lime, alum and polyelectrolyte at suitable rates to make the clarified water neither scale-forming nor corrosive.

Make-up water from the raw water treatment plant will be stored in an on-ground storage tank of six (6) hours storage capacity from which make-up water will be distributed to the various consumers of the plant units. In addition, the make-up water will be further treated for the requirement of specific equipment of the plant units and for production of drinking, soft and DM water.

Plant water system

In order to conserve water to the maximum possible extent, independent recirculating systems and treatment units wherever required, have been proposed for the units envisaged for this project. Make-up water will be supplied to the recirculating system. In certain contaminated circuits, make-up water will be fed from blow-down of non-contaminated circuit to minimise water consumption. In those contaminated circuits having pressure filters, the system blowdown will be utilised for backwashing of the pressure filters.

The plant water system will comprise of an industrial quality make-up water system, soft water system, Demin water system, re-circulating water systems, drinking water system, water-based fire-fighting system, waste water and effluent water system, and distribution system as well as emergency water supply system for the vital units of the plant.

Soft water system

Soft (make-up) water will be required for closed cooling circuits of Blast furnace, BOF,LF and TSCR. Soft water will be made available from softening plant to get desired hardnessof water. Feeding water to the plant will be from the plant make-up water system. The distribution of soft water will be routed through a separate network.

DM water system

DM (make-up) water will be required for generation of steam for the power plant and consumption of the steam for the process units. DM water will be made available from DM plant to get desired conductivity of water. Feeding water to the plant will be from the plant make-up water system. The distribution of DM water will be routed through a separate network.

Drinking water system

The drinking water system will cater to the water requirements of plant personnel for drinking and sanitary purposes, central & area laboratories, canteens, and miscellaneous users in the plant. Drinking water of required quantity will be made available from the drinking water treatment plant. The drinking water system will comprise of rapid gravity sand filter, chlorinator, pumps, on-ground storage tank and overhead tank. Drinking water will be distributed from an overhead tank.

Fire-fighting Water System

The water based fire fighting system comprising of ring main and fire hydrants at regular interval conforming to the relevant IS code will be provided to cater to any fire outbreak inside the plant and yard. The fire water will be supplied from fire water reservoir by the fire-fighting pumping system, which will be distributed through a set of additional piping network, valves, hydrants, etc.

Waste water and faecal sewage management

Waste water generated from different areas of the plant will be treated to the desired extent in suitable treatment facilities and returned to the process, to attain 'zero discharge'. This will facilitate adequate re-use of water in the respective recirculating systems and economise on the make-up water requirement. The effluents are mainly categorized intolow TDS and high TDS water. Source of Low TDS water is mainly from blowdown water coming from recirculating industrial water circuits and backwash water from filtration plant where as effluent water coming from neutralization pit of DM plant, BOD plant are the main constituents of HTDS water. Treatment of LTDS and HTDS water will be done separately.

The effluent treatment plant comprises the pre treatment section, ultra-filtration system and RO system. Permeate from RO plant will be collected in the permeate storage tank and reused in make up water system. The reject and wash water from RO plant containing high dissolved solids will be further treated in evaporator and crystallizer to attain "zero liquid discharge".

Sewage generated from toilet blocks etc will be collected and treated in Sewage Treatment Plant (STP). Treated water from the STP will be used in landscrapping and gardening purpose.

Distribution pipework

Different types of water will be distributed/circulated through pipelines, which will be generally of mild steel construction. The pipework will comprise all necessary pipes, valves,fittings, and all other accessories, as required, conforming to the relevant standards. Pipelines will be mostly routed through overhead.

Utilities

Compressed air and dry compressed air system

Compressed air will be required for the operation of caster humidification and for general purposes, cleaning etc. Dry instrument grade compressed air for the operation of various pneumatic devices for instruments and controls, pneumatic tools etc. will

be required ineach of the production shops and other ancillaries.

To meet the above requirement, one centralized compressed air station has been envisaged for the generation of compressed air/ dry air. The compressed air station will be complete with compressors, drive motors, refrigerated type air dryers, air receivers, pipework, and necessary electrics & instrumentation.

capacity will also be installed inside the compressor house. The capacity of compressors selected also takes in account losses and considers some extra room to accommodate any future equipment or facility that might add in this expansion project.

Compressed air will be available at pressure of 6-8 kscg and dry compressed air will be available at pressure of 5-7 kscg in the netwok.

Fuel System

The steel plant will generate large quantities of by-product fuel gases, i.e.Blast Furnace (BF) gas, Coke Oven (CO) Gas and BOF Gas. These by-product fuel gases will be first utilized as fuel for various heating applications (BF stove heating, coke oven under-firing, various furnaces, sinter plant, LCP etc) of the steel plant. Balance available gases will be utilized for steam and power generation in the power plant.

By product fuel gases

The major consumers of fuel gas in the steel plant are blast furnace stoves, sinter plant furnace, heating equipment in the steel melt shop and the boilers.

Blast furnace gas will be used to cater heating requirement of stove, in Pulverized coal injection, pig casting machine, etc. Blast furnace gas will also be mixed with coke oven gas at gas mixing station for supplying mixed gas with required calorific value at different process units. The surplus by-product gases will be directed to the power plant.

Surplus by-product gases, which will be available after meeting the plant demand, will be directed to gas fired power plant (on BOO basis) for power and steam generation.

Gas holder and flare stack

To store and export by-product gases coming out from BOF, 50,000 cum capacity holder has been considered. The BOF gas generation is an intermittent process and has to be ensured for stabilization of gas pressure, hence has to be collected in a gas holder for

exporting to power plant. BF gas holder has not been considered at the present phase and the pipeline will act as buffer. BF gas and CO gas will be mixed in mixing gas station to utilize to various process facilities in the steel plant.

Flare stack of suitable capacity will be considered to flare the excess by-product gases to maintain uniform pressure in the network.

Propane storage

Propane will be used for cutting operation of the continuous casting machine, SEN preheating and for coke oven battery initial under-firing. Propane storage systems alongwith propane unloading, storage and distribution facilities will be installed for meeting the above requirement.

A storage and distribution system of propane comprising three bullets each of 100 MT capacity will be installed. Propane storage will be designed considering fifteen (15) days requirement of propane. The installation will be complete with unloading/distribution pumps,vapourisers, fire protection facilities etc.

Air Separation Plant

The industrial gases viz. oxygen, nitrogen and argon are envisaged to be received from an Air Seperation Plant (ASP)

High pressure oxygen (99.5 % to 99.9 % purity) will be required for converter blowing and heating & cutting operation in the caster. Low pressure oxygen will be required in blast furnace for enrichment of cold blast and for miscellaneous cutting in various plant units.

Nitrogen (99.99% purity) will be required for slag splashing and bottom stirring in converters, ladle stirring in some heats, PCI conveying in blast furnaces, bell less top cooling in blast furnaces and purging of fuel and gas pipelines in the plant.

Argon (99.999% purity) will be required in BOF for bottom stirring, for ladle stirring and for shrouding in casters.

Facilities Proposed

To meet the above requirement of oxygen, nitrogen and argon, cryogenic air separation plant (on BOO basis) of 2 x 1200 tpd capacity have been envisaged.

Besides, the plant will have adequate liquid generation and storage capacity so as to supply oxygen, nitrogen and argon in the event of stoppage of operation of the air separation plant.

Buffer vessels and pressure reducing stations for oxygen, nitrogen and argon have been envisaged in the ASP to cater to the various peak requirements of the process.

i. Process Steam System

Process steam (low-pressure steam) will be required for various heating applications and creating vacuum pressures in the RH Degasser in the SMS. Process steam will be supplied

in the plant network from the Captive Power Plant (on BOO basis).
Steam generation by captive power plant from the by-product gases is 603 tph. Aftermeeting the plant demand, balance steam of 517 tph is used to generate power.

ii. Air Pollution, Ventilation and Air-conditioning system

Air pollution control systems:

The scheme proposed for prevention of air pollution is as follows:

a) Collection of fumes from SMS, deslagging station, argon rinsing station and discharging them to the atmosphere through stacks after cleaning through IDfans, Bag filter (pulse jet type) or ESP will be used.

b) Removal of dust generated during various process operations at

different areasof shop and material handling systems.

Ventilation systems:

The ventilation systems proposed to achieve desired conditions in different areas are as follows:

a) Switchgear rooms, MCC room, PDB room, pipe tunnel, pump house, hydraulic room, blower house, chilled water plant, DG rooms, compressor house, transformer room, cable tunnel, cable basement, oil and hydraulic cellars: Mechanical ventilation system using fan-filter units for supply and exhaust fans.

b) Battery rooms: Supply by air intake louver and exhaust by belt driven/bifurcated fan.

c) Production building: Natural ventilation by roof monitors, turbo ventilators and louvers as necessary.

Air-conditioning systems:

Package type air-conditioning and spilt-type systems have been envisaged for the project and to be designed to maintain the following conditions in the spaces serviced:

a) Max. 25°C dry bulb temperature and max. 70 per cent relative humidity for control rooms, DCS rooms, control pulpits, computer rooms, PLC server/processor rooms etc.

b) Max. 35°C dry bulb temperature and max.70 per cent relative humidity for weigh feeder room, VVVF rooms, PLC I/O room, gas analyser room etc.

c) To meet the above requirement, air cooled package type air conditioners of adequate capacities and standard accessories will be installed .

d) Split type air-conditioning will be provided in small control rooms, small officerooms etc.

e) Environment friendly refrigerant will be used for PAC and split type air conditioners.

Fire Protection System

The proposed fire protection systems are indicated below

Details of Fire Protection System

Premises to be covered	Type
Control rooms	Inergen based fire protection system
Outdoor transformers (as applicable)/hydraulic cellar	High-velocity water spray system
Hot sinter and coal/coke conveyor, propane storage, cable cellar, cable tunnel	Medium velocity water spray system

All other areas including the above areas	Fire extinguishers of CO_2, DCP, ABC, and FOAM type fire extinguishers.

Fire brigade station has also been planned for the plant to be located in administrative building area. The plant will also have water based fire fighting system comprising of ring main and fire hydrants at regular interval conforming to the relevant IS code to cater to any fire outbreak inside the plant and yard.

Pipework

The Steel plant will have a piping network for distribution of the air separation plant products, by product gases, various utility services, steam, water etc. The yard portion of the pipework for all services (except water) will be laid on towers and trestles with a clear height of seven m above finished ground level (FGL). Shop internal pipework will generally be routed in multiple rows through building columns taking support from buildings and girders.

Other Facilities

i) Laboratories

Iron zone Laboratory

This laboratory will be required to test the physical and chemical properties of iron ore, sinter, coal, coke, dolomite and limestone (BF grade), hot metal, slag and any other incoming raw materials for blast furnace. This laboratory will also cater to the requirement of all incoming raw materials.

SMS Laboratory

The SMS laboratory will basically be an express laboratory. This laboratory would deliver the chemical analysis result of steel samples from the BOF converter and secondary metallurgy units within 2 minutes. Samples would be brought to this laboratory through pneumatic tubes. The list of major equipment for SMS laboratory has been given in Table 7-18 below:

Mill Laboratory

This laboratory would be dedicated to testing the finished product samples, i.e. hot- rolled coil. This is a mechanical testing laboratory to measure tensile strength, impact toughness, hardness, microstructure etc. of the finished products. This laboratory generates a test piece analysis certificate for the customer. The list of major equipment for the HSM laboratory has been given in Table 7-19 below:

ii) Repair and Maintenance

Repair and maintenance shops are important for any steel plant, not only for manufacturing spares and replaceable items but also for catering to the plant units' capital and running maintenance requirements. The activities carried out in repair and maintenance shops are extremely varied in nature, as dictated by repair and maintenance practices followed in each plant.

System of maintenance

A proper repair and maintenance system needs to be developed to ensure the proper maintenance of the steel plant equipment and facilities. Therefore, the plant maintenance system will be divided into three separate functional groups -

planning group, repair group and maintenance group. Preventative maintenance and the nature of the repair are to be planned based on equipment manufacturer recommendations. The planning group is responsible for all the functions related to maintenance and materials planning, including inventory control of spares and consumables with special attention to standardisation, periodic inspection of equipment to ascertain replacement or repair of any item, and advance planning to arrange components from outside source etc.

It is estimated that about 15 percent of the total requirement of the spares and replaceable items, excluding structural, will be sourced from the Original Equipment Manufacturers (OEMs) for technological reasons. Around 45 percent of the spares will be outsourced and the balance spares are envisaged for production within the steel plant.

Output and services from repair shops:
The repair and maintenance work is common and repetitive in nature for most of the steel plant units. During certain years of operation of the plant, major repair activities will be outsourced outside. However, every unit of the plant will have their minor and regular normal maintainence in their own area that will be set up ina small building.

This will also include torpedo repair shop. Loco repair is envisaged to be outsourced outside but a future installation space has been considered in the layout.

iii) Stores

The storage facilities of the plant are envisaged to be located in a central store. The entire campus will be fenced to ensure security and have separate covered buildings for general and equipment parts or spares storage. Refractory store and ferro alloys store has also been envisaged. The store office will be located at the entrance to the campus. A large open area will also be considered outside of the general store building for open storage facilities. During construction of the plant, this open area may be used for storing structural steel items.

Central store/warehouse: The general central store/ warehouse will be required for keeping equipment spares, hardwares, oil and lubricants, rubber products, consumables etc. A strong room will be provided in one corner of the building for keeping valuable items. Offices for inventory control, receipt and issue section and toilets etc. will be suitably located inside the store building. Adequate handling facilities will be provided for handling the materials inside the building.

Refractory store*:* This building has been envisaged for keeping the various types of refractory and insulating bricks, imported bricks etc. Unloading and loading platforms with a canopy at the top would be provided along the length of the building. Within this building separate enclosure has been envisaged for office, storekeeper room, record room etc. Forklifts and pallet trucks will be provided for the handling and stacking of refractories in pallets.

Ferroalloy store*:* Ferro-alloy store has been envisaged for storing the various types of ferroalloys, crushed coke breeze, coke breeze, heat-insulating compound etc. All movement of ferroalloys will be by road trucks. A suitable overhead crane will be provided for handling ferroalloys inside the building. The store building will be constructed at +0.85 m above the ground level with a 5 m wide platform provided outside along the length of the building for easy loading and unloading of materials from trucks.

ENVIRONMENTAL POLLUTION MEASURES

Environmental Pollution Mitigation Measures

The production facilities for the proposed 3 mtpa ISP at Kadapa district, AP have been described in the earlier chapters. These production units would generate wastes in different forms, the recipient of which would be air, water, land, and the environment, leading to pollution of these environmental aspects. This chapter accordingly outlines the various mitigation measures for abating the environmental pollution in compliance with the extant environment protection acts and rules of India.

Review of Pollution Potential

The project would involve the installation of various units to produce crude steel andfinished product, via BF-BOF-Thin slab caster and rolling route of steel production. The major process units would be coke ovens with by-product recovery(COBP), sinter plant (SP), blast furnace (BF), steelmelt shop with basic oxygen furnace (BOF), secondary metallurgy units and thin slab caster and rolling. These facilities would be adequately supported by various auxiliary facilities like lime calcining plant, oxygen plant, water treatment etc. .

These facilities would generate large quantities of emissions into the ambient air in the form of particulate matter, oxides of sulphur and nitrogen, dioxin, furan, and carbon dioxide unless suitable mitigation measures are adopted.

The process would also generate waste water, contaminated with suspended and dissolved solids, oil and grease, phenols, cyanide, and heavy metals. These effluent streams have the potential to cause negative impacts to the receiving body of wastewater unless suitably treated and recycling mechanisms are adopted.

There would also be a risk of groundwater and soil contamination from the storage of the industrial solid wastes and hazardous waste if proper in-plant utilization and waste disposal measures are not practiced.

Air pollution mitigation measures

This section addresses the various air pollution control mechanisms proposed to be implemented to control emissions to the air.

Raw material handling

Fugitive dust emissions generated from the handling and stockpiling of raw material in open stockyards would be controlled by water sprinkling at regular intervals. All closed zone working areas such as raw materials handling zone, conveyor transfer points, dust generation points at the screen should be provided with multiple dust extraction (DE)systems/dry fogging (DF) at several emission points to control the fugitive dust emissions. The DE system should consist of suction hood followed by bag filter, ducts, extraction fans, and a stack of appropriate height.

Coke oven and by-product recovery plant

Emissions from coke ovens would mainly result from coal charging, coke pushing, and coke cooling. Fugitive emissions would result from various leakages from the oven doors,charging lids, ascension pipe (AP) covers etc. Charging emissions are to be controlled by High Pressure Liquor Aspiration (HPLA) injection in goose neck for on-main chargingsystem. Coking emissions would be controlled by uniform heating of charge without major temperature fluctuations, self sealing of oven doors, water sealing arrangement of AP cap, etc. Land based fume extraction system would be adopted for pushing emission control. The hot coke would be quenched by coke dry quenching (CDQ) with the recovery of sensible heat for steam generation. Dust generated from charging, handling, and screening would be removed by bag filters.

The raw coke oven gas (COG) would be cleaned by passing through a by-product recovery plant for recovery of tar, ammonia, hydrogen sulphide and naphthalene, to make it suitable for use as plant fuel as well as for desulphurization of COG.

Sinter plant

The sinter plant process waste gas and raw material section, which are the two major emission sources, are to be fitted with separate DE systems and dry type ESPs with stack of adequate height. Emissions of dioxins and furans from the sintering furnace would result mainly from the recycled oily mill scales. These would be controlled by controlling oil content in the recycled mill scales and by adopting waste gas recirculation system. The temperature of the sintering machine would be maintained above 800 deg C to prevent the generation of PCDD/F. The clean waste gas would be vented into the atmosphere througha stack of adequate height. The particulate dust emission from the product sinter screening units would be controlled by DE systems, complete with duct, fabric filters, and stack of suitable height.

Blast furnace (BF)

The BF gas would be cleaned in two stages and the final dust content of the gas would be 5 mg/Nm^3. BF gas would be cleaned in a dry type gas cleaning plant (GCP) before its use. The other main sources of air pollution would be the stock house and cast house. The BF stock house would be equipped with DE systems complete with ducts, ESP, ID fan, and a stack of appropriate height to maintain the regulatory stack emission levels. Each BF cast house would have a separate fume collection system during tapping of hot metal and slag, which would be similarly be collected with the FE system and taken into bag filters for the separation of particulates before venting out through a stack of adequate height.

Lime/dolo calcining plant

The emissions arising from fuel combustion in the lime/dolo calcining plant would be taken through a bag filter to separate the lime/dolo fines. The lime/dolo fines thus collected would be recycled to the sinter plant. The other dust generation areas would be provided with separate DE systems, complete with bag filters and stack of adequate height to clean the particulates.

Steel melt shop (SMS)

BOF gas would be cleaned in dry type gas cleaning plant before its use as plant fuel. Secondary emissions would be generated mainly from charging and tapping operations. The secondary fume emission would be controlled by providing an ESP.

The primary emissions extracted from the LF would be collected by fume extraction (FE) devices. Other seconadry emissions like material handling dedusting, ladle debricking, ladle slag off, skull cutting etc would also be collected by FE devices. Dust laden fumes would be indirectly cooled and cleaned through a bag filter for separation of particulates and the clean gas would be vented into the atmosphere through a stack of adequate height. The secondary emissions would be controlled through canopy hood extraction, which would be integrated with the main system to clean the fugitive emissions during charging & tapping operations.

Caster and mills

The project forsees continuous thin slab casting and rolling to produce the HRCs and hence reaps the benefit of energy saving and no requirement for storage of hot slabs. The casting area would be provided with adequate ventilation to properly disperse the water vapour that would be generated out of slab cooling for solidification.

Burning of the mixed gas in tunnel furnaces would lead to the emission of particulates, CO_2, and NO_x. NO_x emissions would be controlled by optimizing the excess air supply and stage combustion system. Additionally, the FE system would be installed to prevent the formation of oil smog in the mill area. The fairly clean flue gas would be vented through a stack of adequate height.

All stack emissions and fugitive emissions would be maintained $\leq$ 30 mg/nm3

Water pollution control measures

The various types of process effluent streams that would be generated from the steel plant complex and their treatment schemes are as below:

a) The wastewater generated from the different cooling circuits would be routed for recycling through cooling towers and pressure filters, as appropriate. Cooling tower blowdown would be further treated in CETP for further use as plant make up water.

b) Effluents generated from the coke ovens would be separately treated in MBR based Biological Oxidation and Dephenolisation (BOD) treatment unit for removal of phenolic compounds and cyanide. The treated effluent of the BOD plant would be taken to the CETP for further treatment.

c) Effluent streams from caster, mills, etc. would mostly contain suspended solids (SS), oil and grease (O&G) for which physico-chemical treatment schemes like oil separation, settling, clarification, filtration etc. would be employed and the treated water would be further treated in CETP for in-plant use.

d) The plant sanitary wastewater, including canteen effluents is proposed to be treated in a sewage treatment plant for separation of floating oil and reduction of BOD and the treated effluent would be partly used for plant greeneries, road washing, etc.

For the proposed project, the water conservation scheme is based on the following targets:

a) The plant would be designed on zero effluent discharge scheme based on CETP with RO. A part of the treated water from CETP would be subjected to secondary treatment in RO. The permiates from the RO would be recycled into plant make up water network and the RO rejects would be used for low end applications like slag cooling. The balance part of the CETP treated water would also be recycled within the plant for low end use such as dust suppression in RMH yard, road dust suppression, sinter plant and BF slag cooling.

Solid waste management and disposal measures

There would be a number of solid by-products like BF, BOF and LF slag, mill scales, mill sludge, mill scrap, refractory debris, flue dust, etc. generated from the proposed steel plant.

- BF slag would be granulated for sale to cement plants. A small portion (approximately 5%) of the BF slag would be air-cooled and used for construction purposes.

- The iron scrap generated from the BF, BOF, caster & rolling unit would be recycled to the BOF.

- Mill scales, part of flue dust and BOF slag would be utilized in the sinter plant, after recovery of the metallic portion in the slag. The balance BOF slag would require weathering, after which it would be used for applications such as railway ballast,

  construction aggregates, soil conditioner, etc. The ultrafine flue dust would undergo micro pelletization before use in the sinter plant. Mill scales and mill sludge would undergo de-oiling before reuse in the sinter plant to prevent any damage to the ESPs and reduce dioxin and furan emissions.

- Other solid wastes would be dumped temporarily in the earmarked dump area within the plant boundary till new users are found out for the same.

- Hazardous waste would be stored in secured containers for transfer to authorized agencies for safe disposal.

Work zone and noise pollution mitigation

The work zone pollution would be mostly from fugitive dust, heat, and noise. The fugitive dust emission would be controlled by dust suppression and DE systems as described earlier.

Noise arising from the mechanical machineries like crushers, screens, compressors, blowers, pumps, etc. can not be ruled out. Such noise-prone equipment would be installed in a separate housing so as to enhance the noise attenuation. Isolation of the operational staff from the high noise prone zone will be adopted by providing noise-proof control room so that they are not exposed to the noise level exceeding the allowable limit.

Peak noise emission due to the venting of high pressure steam or compressed air would be abated by providing silencers, to ensure that the work zone noise level does not exceed the threshold value of Leq 110 dB(A) for a period of 30 minutes. The ambient noise at the plant boundary would be maintained well within the specified norms of 55 dB (A) and 45 dB (A) at daytime and nighttime respectively.

Workers would be equipped with suitable heat resistant PPEs in heat radiation prone work zones like the BF cast house.

Other regulatory and safety considerations

Plant safety measures would be an integral part of the environmental protection plan of the proposed plants. Worker safety would be accorded the highest priority, as required by the Factories Act, 1948 and OHSAS 18001-2007, to avoid any personal injury or untoward incident. In-built safety measures of plant and machinery would be made adequate to avoid hazardous events causing damage to life and property.

During the development of the plant general layout, it has been kept mandatory to reserve 33 percent of the plant area for greenbelt as per the recent statutory requirements. This would include 50 m greenbelt along the boundary. The greenbelt, thus developed, would not only contain the fugitive dust emissions within the plant boundary but also attenuate the plant noise and improve the plant peripheral appearance. Unpaved areas, if any, within the plant boundary would be provided with grass cover.

PLANT CONSTRUCTION AND PROJECT IMPLEMENTATION SCHEDULE

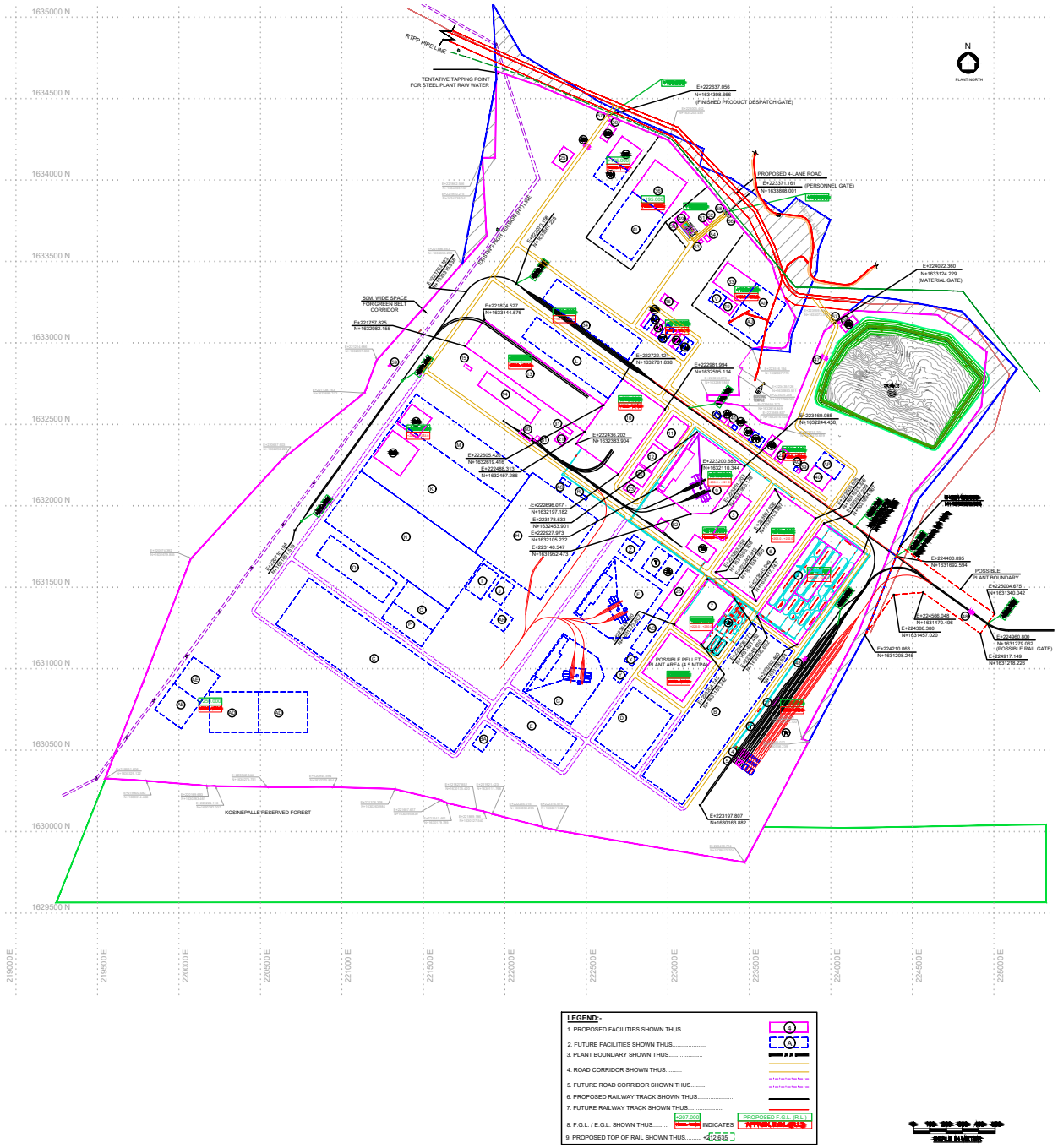
Plant Construction and Project Implementation Schedule

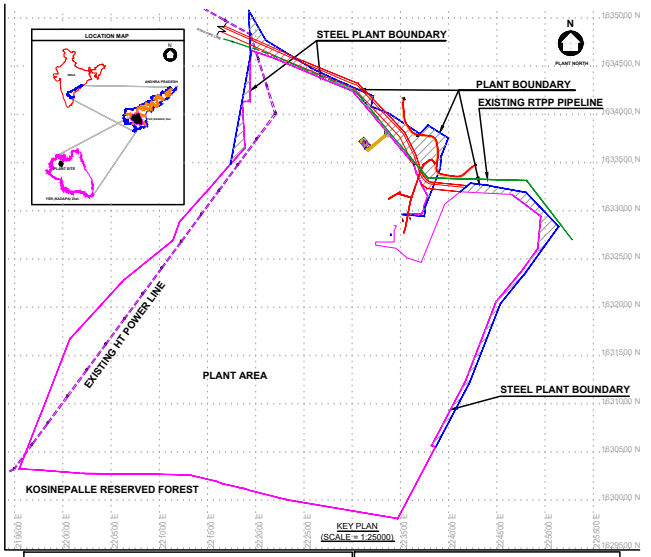
Project Schedule:

The preliminary overall implementation schedule for the project is shown in the form of a bar chart. The Overall Project Execution timeline for the ISP has been considered as thirty seven (37) months from 'Go-Ahead'

The "Go-ahead" date for the project implementation has been considered as the start dateof basic engineering. The schedule has been prepared based on the assumption that the following activities will be completed before the `Go-ahead'.

- Freezing of adequate project details to enable site prepatory activities to commence on Go Ahead.
- Finalizing the arrangement for requisite financing & funding for the projects, as per the estimated capital expenditure schedule, matching with the project implementation schedule
- Obtaining relevant Statutory approvals (like Amendment of Environmental clearances)
- Creation of nucleus project organization and appointment of Consultant
- Enabling work





FACILITIES :-

1. RAW MATERIAL UNLOADING YARD
2. RAW MATERIAL COVERED SHED
3. COVERED YARD FOR COKE STORAGE
4. WAGON TIPPLER
5. WAGON SHUNTER/TRANSFER PLATFORM
6. COKE OVEN GAS / PRODUCT PLANT
7. SINTER PLANT -1
8. FUEL AND FLUX CRUSHING
9. BLAST FURNACE -1
10. STEEL MELT SHOP
11. PRIMARY GAS CLEANING PLANT
12. SECONDARY GAS CLEANING PLANT
13. THIN SLAB CASTING AND ROLLING
14. WATER FOR BLAST FURN.-1
15. MAINTENANCE & PREPARATION FOR BLAST FURN.-1
16. ADMIN OFFICE WITH CANTEEN
17. CHLORINE PLANT -1
18. CHLORINE PLANT -1
19. BY-PRODUCT PLANT
20. BUFFER VESSEL AND PRS -1
21. COKE OVEN GAS BOOSTING STATION
22. ENGINEERING BOOSTING STATION -1
23. COMPRESSOR STATION -1
24. CHILLED WATER PLANT
25. CO GAS HOLDER
26. PHOSPHATE STORAGE AREA -1
27. BF SLAG STORAGE AREA -1
28. BF SLAG GRANULATION STATION
29. METAL RECOVERY PLANT -1
30. LIME/DOLO STORAGE AND DISPATCH AREA -1
31. REFRACTORY STORE -1
32. FERRO ALLOY STORE -1
33. LIME/DOLO HOLDER -1
34. AIR SEPARATION PLANT -1
35. FINISHED PRODUCT STORAGE & DESPATCH YARD
36. MAIN RESERVOIR & PUMP STATION
37. POWER PLANT -1
38. RAW WATER RESERVOIR -1
39. RAW WATER TREATED PLANT & RAW WATER PUMP HOUSE -1
40. SEWAGE TREATMENT PLANT
41. EFFLUENT TREATMENT PLANT
42. SOFTENING PLANT -1
43. DE-MINERALIZATION PLANT -1
44. FIRE FIGHTING PUMP HOUSE -1
45. CENTRAL STORE -1
46. CENTRAL REPAIR SHOP - FUTURE PROVISION BASED ON REQUIREMENTS
47. RAW WATER HYDRANTING TANK
48. ROAD CROSS OVERS WITH CENTRAL ROAD
49. RAIL CROSS OVERS WITH CENTRAL RAILWAY
50. ADMINISTRATIVE BUILDING WITH OFFICE, TRAINING CENTRE, AUDITORIUM, LIBRARY
51. PARKING AREA
52. CENTRAL LAB
53. ENERGY BUILDING
54. MEDICAL CENTER WITH AMBULANCE FACILITY
55. FIRE BRIGADE STATION
56. TRUCK PARKING AREA
57. GATE-1 (PERSONNEL GATE)
58. GATE-2 (RAW MATERIAL UNLOADING & FINISHED PRODUCT DESPATCH GATE)
59. SECURITY CABIN
60. WATCH TOWERS
61. TENTATIVE CABLE AND LOCO REPAIR SHOP
62. TENTATIVE CRANE HIRE UNIT
63. HOT METAL DESULFURISATION UNIT

FUTURE FACILITIES :-

A. RAW MATERIAL UNLOADING YARD
B. RAW MATERIAL COVERED SHED
C. COKE OVEN GAS / PRODUCT PLANT
D. SINTER PLANT -2
E. PELLET PLANT -1
F. BLAST FURNACE -2
G. BLAST FURNACE -3
H. STEEL MELT SHOP
I. PRIMARY GAS CLEANING PLANT
J. SECONDARY GAS CLEANING PLANT
K. HSM
L. BAR MILL
M. STRUCTURAL MILL / RAIL MILL / WIRE ROD MILL
N. GOLD ROLLING MILL
O. PIPE PLANT -1
P. PIPE PLANT -2
Q. WATER FOR SMS MILL
R. MAINTENANCE & PREPARATION FOR SMS MILL -2
S. CHLORINE PLANT -2
T. CHLORINE PLANT -3
U. CHLORINE PLANT -4
V. BUFFER VESSEL AND PRS -2
W. COKE OVEN GAS BOOSTING STATION
X. ENGINEERING BOOSTING STATION -2
Y. COMPRESSOR STATION -2
Z. CO GAS HOLDER -1
AA. CO GAS HOLDER
AB. PHOSPHATE STORAGE AREA -2
AC. BF SLAG STORAGE AREA -2
AD. METAL RECOVERY PLANT -2
AE. LIME/DOLO STORAGE AND DISPATCH AREA -2
AF. REFRACTORY STORE -2
AG. FERRO ALLOY STORE -2
AH. LIME/DOLO HOLDER -2
AI. AIR SEPARATION PLANT -2
AJ. AIR SEPARATION PLANT -3
AK. MAIN RESERVOIR & PUMP STATION
AL. POWER PLANT -2
AM. RAW WATER RESERVOIR -2
AN. RAW WATER TREATMENT PLANT & RAW WATER PUMP HOUSE -2
AO. SEWAGE TREATMENT PLANT
AP. EFFLUENT TREATMENT PLANT
AQ. SOFTENING PLANT -2
AR. DE-MINERALIZATION PLANT -2
AS. FIRE FIGHTING PUMP HOUSE -2
AT. CENTRAL STORE -2
AU. CENTRAL REPAIR SHOP -2

LEGEND:-

1. PROPOSED FACILITIES SHOWN THUS.....
2. FUTURE FACILITIES SHOWN THUS.....
3. PLANT BOUNDARY SHOWN THUS.....
4. ROAD CORRIDOR SHOWN THUS.....
5. FUTURE ROAD CORRIDOR SHOWN THUS.....
6. PROPOSED RAILWAY TRACK SHOWN THUS.....
7. FUTURE RAILWAY TRACK SHOWN THUS.....
8. F.G.L. / E.G.L. SHOWN THUS..... +207.000 INDICATES PROPOSED F.G.L. (R.L.)
9. PROPOSED TOP OF RAIL SHOWN THUS..... +212.65

TENTATIVE GENERAL LAYOUT OF STEEL PLANT