Pre – Feasibility Report

For

Expansion of Ferro Alloys Plant from
Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD

To

Ferro Silicon -50 TPD / Silico Manganese – 90 TPD /Ferro Manganese- 120 TPD (Product Mix of Silico Manganese or Ferro Silicon)

By

M/s. Sri Ramakrishna Ferro Alloys (India) Private Limited

At

Plot no: 5 & 6,
Gollapuram Industrial Area,
Hindupur Mandal,
Ananthpur District
Hindupur, A.P

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1. PROJECT AT A GLANCE

1	NAME OF THE COMPANY	**SRI RAMAKRISHNA FERRO ALLOY (INDIA) PRIVATE LIMITED**
2	REGD. OFF. ADDRESS OF THE COMPANY	Site no, 447, 12th main, Near Mahalakshmipuram Police Station, Mahalakshmipuram, Bangalore 560086.
3	FACTORY ADDRESS	Plot no 5 & 6, Sy no. Part of P, 9,10,13 & 14, Gollapuram Industrial Park, APIIC-IDA, Hindupur Mandal, Hindupur – 515211
4	DATE OF INCORPORATION	24 / 12 / 2009
5	CONSTITUTION	Private Limited Company
6	PROMOTERS/ DIRECTORS OF THE PROJECT	Mr. Nanda Kumar Raman Selladurrai Mr. S. Nirmal Kumar
7	AREA OF PLANT	17.79 Acre (No additional Land is required for the Expansion)
8	EXISTING PROJECTS	Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD
9	PROPOSED UNITS & TOTAL CAPACITY	Expansion of project to increase Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD **to Ferro Silicon -50 TPD / Silico Manganese – 90 TPD /Ferro Manganese- 120 TPD**
10	INSTALLED CAPACITY	Existing – 1 x 7.5Mva Proposed – 2 x 7.5Mva.
11	RAW MATERIALS	Quartz, Coal, M.S Scrap, Mn slag, dolomite, coke and others
12	POWER SANCTIONED	21500 KVA
13	WATER REQUIREMENT	EXISTING: 24 KLD PROPOSED: 160 KLD (To be supplied by APIIC)
14	TOTAL MAN POWER REQUIREMENT	Existing: 120 (both Technical and Non-Technical) Proposed: 300 (both Technical and Non-Technical)
15	DG.SET CAPACITY	625 KVA
16	TOTAL PROJECT COST	25 Cr
17	DURATION OF THE CONSTRUCTION	12 Months (Max)

2. INTRODUCTION:

Silico manganese is an alloy of manganese, silicon and iron with small percentage of carbon and several other elements. The Silico Manganese have an important influence on the properties of steel, depending on the amount added and the combined effect with other alloying metal. It has a strong affinity for oxygen, and will act as deoxidizers. It plays an important role in the manufacturing of steel as deoxidizing, desulphurizing, and alloying agents. Silico Manganese is used as alloying element in manufacturing of spring steel, transformer steel and other types of alloys steels. M/s. Sri Ramakrishna Ferro Alloys (India) Private Limited has proposed for an expansion from existing Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD **to Ferro Silicon -50 TPD / Silico Manganese – 90 TPD /Ferro Manganese- 120 TPD** in a Submerged Electric Arc Furnaces with a rated capacity of 2 X 7.5 MVA, at Hindupur (M), Gollapuram (V), Ananthpur dist., Andhra Pradesh state, India.

The requirement and importance of Ferro alloys are directly connected with the requirements and importance of steel. Since the steel is playing a significant role in the development of modern society and the industrial development of our country, the ferro alloys are equally important for the same.

Project Promoters:

- Mr. S Nanda Kumar
- Mr. S Nirmal Kumar

Employment Generation

The plant would operate about 330 days in a year. The estimated requirement of employment is about 410 employees (direct and indirect) to operate the plant.

3. PROPOSED EXPANSION OF FERRO ALLOYS PLANT

The company was having the Environment Clearance from Ministry of Environment, Forests & Climate Change and Consents from Andhra Pradesh Pollution Control Board for Production of Ferro Alloys capacity of Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD with 1 x 7.5 MVA Submerged Arc Furnace.

The permission for the same was also accorded vide F No. J-11011/208/2010-IA-II (I) Dated 13.07.2010.

In the meantime, the requirement for ferro alloys has been substantially got improved from 2017-18 after Make in India implementation, With the existing 1 x 7.5 MVA arc furnace we are unable to meet the requirement, Subsequently raw material supplies has also been increased from various region.

Now, the company has proposes to increase the production capacity of its Ferro Alloys from initial capacity of Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD **to Ferro Silicon -50 TPD / Silico Manganese – 90 TPD /Ferro Manganese- 120 TPD** by installation of an additional 2 x 7.5 MVA Submerged Arc Furnace.

Need for the proposed expansion of Ferro Alloys Project and its importance to the Country / Region

Ferro alloys are used as raw materials for steel melting, for imparting specific mechanical & chemical properties to the steel. This sector is closely associated with the iron & steel sector. Thus, the demand of this industry is directly related with that of steel. The steel industry after coming out of global recessions has increased demand for ferro alloys, which necessitates proper supply system to meet demand and orderly trade.

India's steel production capacity is going to increase manifold in the coming years as a result of Make in India implementation. The per capita consumption of steel is only 49 kg in our country compared to world average of 182 kg. In addition various steps have been taken to increase domestic steel consumption. India is the 5th largest crude steel producer in the world and is expected to become the second largest by 2015 -16. In order to have product flexibility keeping in view the demand supply scenario and contribution, the company will use the same facility fully or partially to manufacture Ferro Alloys like Ferro Silicon, Silico Manganese and Ferro Manganese.

Ferro alloys like Ferro Silicon, Ferro Manganese, and Silico manganese are additives which impart special quality to the special quality steel. As the production of steel goes up the need for various types of ferroalloys also are increasing. The Ferro Alloy Industry is an essential and vital industry producing basic alloys, which are required for the growth of the steel industry to cater to both domestic and international market. Ferro alloys are the intermediate products used in making of steel as de-oxidants alloying agent and for rust proofing.

- Enhance capacity of existing plant by installing additional furnace with auxiliary machineries/equipment's to meet the market need of ferro-alloys.
- Develop and manage the proposed plant in an environment friendly manner as per guidelines of regulatory bodies with best industrial practices, at the same time as ensuring economic viability;
- Maximize operational flexibility;
- Optimize usages of natural resources; and
- Develop and operate the proposed project to meet stake-holders expectations and empowering all over growth.

Demand and Supply of Ferro Alloys:

The Ferroalloy industries in India not only cater to the demand of domestic steel plants but also aim at earning foreign exchange by export. Capacity increase of the Ferro Alloy Industry in general followed the course to meet the planned target levels of the Steel Industry in the country, and to continue to remain potential exporters of Ferro Alloys in the international market for earning substantial foreign exchange for the country. After initiation of the liberalization programme, there has been a spurt in the export of Bulk Ferro Alloys, like all other products. The present scenario indicates that the ferroalloy production in the country is driven not only indigenous demand but also exports.

Ferro alloy refers to various alloys of iron, which are used in the production of mild steel, carbon steel, special alloy steel and stain less steel. India's steel production is increasing every year, thereby the consumption of Ferro alloys is also increasing. The Indian Ferro Alloy industry has a capacity of 5.15 million tonnes. It is accounting for nearly 10% of the world's ferro alloy production and is among the 10 largest producers of the material in the world.

Thus, the Ferro Alloys Industry, considered to be a vital industry, needs to be encouraged.

It is envisaged by our planners that the Industry should produce larger quantities of basic alloys, which are required for the growth of the Steel Industry at home and also to cater to the international market.

Ferro alloy industry, which is totally dependent on the steel industry in the country, has touched another mile stone in production as well as exports. The National Steel Policy projects an export ratio (i.e., percentage of production exported) in the range of 25-26% by 2019-20. Currently, India exports about 10% of its total finished steel production. The milestone export ratio for the Eleventh Plan period is estimated to remain within a range of 12% - 15% of total production

It also offers a vast potential for export. Presently also, India is exporting ferro alloys product to many countries.

Installed Capacity and Size of the-Furnace:

The Proposed installed capacity is decided considering the economy of the plant and market feasibility in and around the plant location and Export. Considering the above it is decided to install a Submerged Electric Arc Furnace to produce Ferro Silicon -50 TPD / Silico Manganese – 90 TPD /Ferro Manganese-120 TPD with existing 1 X 7.5 MVA and proposed 2 X 7.5 MVA rated Furnace.

The promoters have wide experience in Operation, Administration and Marketing of Ferro alloys since decades. The project is being indigenously designed, fabricated, erected and commissioned through reputed consultant in Ferro alloys sector RG Con consultant.

Today in India, there are equipment suppliers for the Submerged Electric Arc Furnace and same being purchased from them and erected. The transformer and switch yard is purchased from TR / Emco / Mahati / Crompton Greeves.

The Technical details of the furnace are as below:

1.	Submerged Electric Arc Furnace with rated Capacity of furnace transformer	7.5 MVA x 2
2.	Production /annum	50 TPD of Fr Si / 90 TPD of Si Mn / 120 TOD of Fr Mn
3.	No. of working days	330 days in a year
4.	No. of shifts	3 shifts/day

Details of Furnace Transformer

Rated capacity	:	7.5 MVA x 2
Rated Frequency	:	50 Hz
Primary voltage	:	132/ 33 KV
Secondary voltage	:	90-115-150V (Primary Delta)
		52.0-66.4-86.6 v (Primary Star)
No. of Phases	:	3

4. BRIEF DESCRIPTION OF THE PROJECT

The company is operating the Ferro Alloys plant of 1 x 7.5 MVA Submerged Arc Furnace in its premises situated at Gollapuram Industrial Area, Hindupur Mandal, and Ananthpur district.

Environmental Clearances / Consents of existing projects of SRFAPL

The company had established the manufacturing facilities in 2011 vide Permission to Establish letter No. 187/PCB/CFE/RO-KNL/HO/2011/3059 dated 19.12.2011 under Water Act & Air Act obtained from Andhra Pradesh Pollution Control Board.

Subsequently, the company had obtained the TORs vide letter no: F. No. J-11011/208/2010-1A II (I) dated 13.07.2010 and Environment Clearance vide letter no. F. No. J-11011/208/2010-1A II (I) dated 23.11.2010 from Ministry of Environment & Forests, New Delhi

The compliance reports for the existing manufacturing facility is being submitted to the Environmental Engineer, A.P. Pollution control Board, Kurnool.

Public Hearing

As all the Ferro Alloys plants were listed at S.No. 3(a) under primary Metallurgical Industries under category 'A' and appraised at the Central level. It was noted that no public hearing/consultation is required due to project being located in notified industrial area as per section (iii), stage (3), Para (i) (b) of EIA notification 2006. (P.164-167/c).

Accordingly, the above proposal was considered by the Expert Appraisal Committee-1 (Industry) in its 15th meeting held during 25th -27th October, 2010.

5. LOCATION AND SITE ANALYSIS

The Ferro Alloys Plant is located within the total area of 17.79 Acres of existing land in the plant premises of Sri Ramakrishna Ferro Alloys (India) Private Limited. This Industrial Area is developed by APIDC Ltd and is a fast developing growth centre in spite of the recession in the Iron & Steel Sector.

The proposed project is located at Industrial park at Village Gollapuram, Mandal Hindupur, District Ananthpur (Andhra Pradesh) promoted by Andhra Pradesh Industrial Infrastructure Corporation (APIIC) Limited, the environment clearance for this Industrial park, was considered by the Expert Appraisal Committee (EAC) in the Ministry for Industrial Estate/Area, SEZ and highways project in its meeting held on 06-07 April 2017, vide F.No. 21-137/2015-IA-III dtd 07.06.2017

Following are some of the locational and infrastructural advantages of the proposed unit

- Hindupur is an industrial town.
- The Unit is located within the Industrial Park where sufficient infrastructural facilities are available for successful operation of the plant
- Availability of adequate, cheap skilled, semi-skilled and unskilled labours from nearby villages and towns.
- Availability of adequate ground water

Site at a glance

Particulars	Details
Village / Mandal	Gollapuram
Nearest Town & Distance	Hindupur-12 KMS
District	Ananthpur District
State	Andhra Pradesh
Nearest major trade center	Hindupur
Nearest Major railway station & distance from site	Devarapally – 2 Kms
Major road connection at place & distance from site	500 Meter from state Highway connecting Hindupur to Bangalore

Climatic Conditions at Plant Site

Max of mean monthly temp	42.1 C
Min of mean monthly temp	19.6 C
Max of mean monthly temp in winter	38.7 C
Min of mean monthly temp in winter Wet Bulb Temperature	15.8 C
HUMIDITY	
Max. relative humidity	85%
Min. relative humidity	25%
RAINFALL	
Average yearly Precipitation	785 mm
WIND DATA	
Basic wind speed	6-11 Km/Hr
Predominant wind direction	West at 8.30 hrs South East at 17.30 hrs

The Layout map showing the location of the manufacturing units of Rhodium is enclosed.

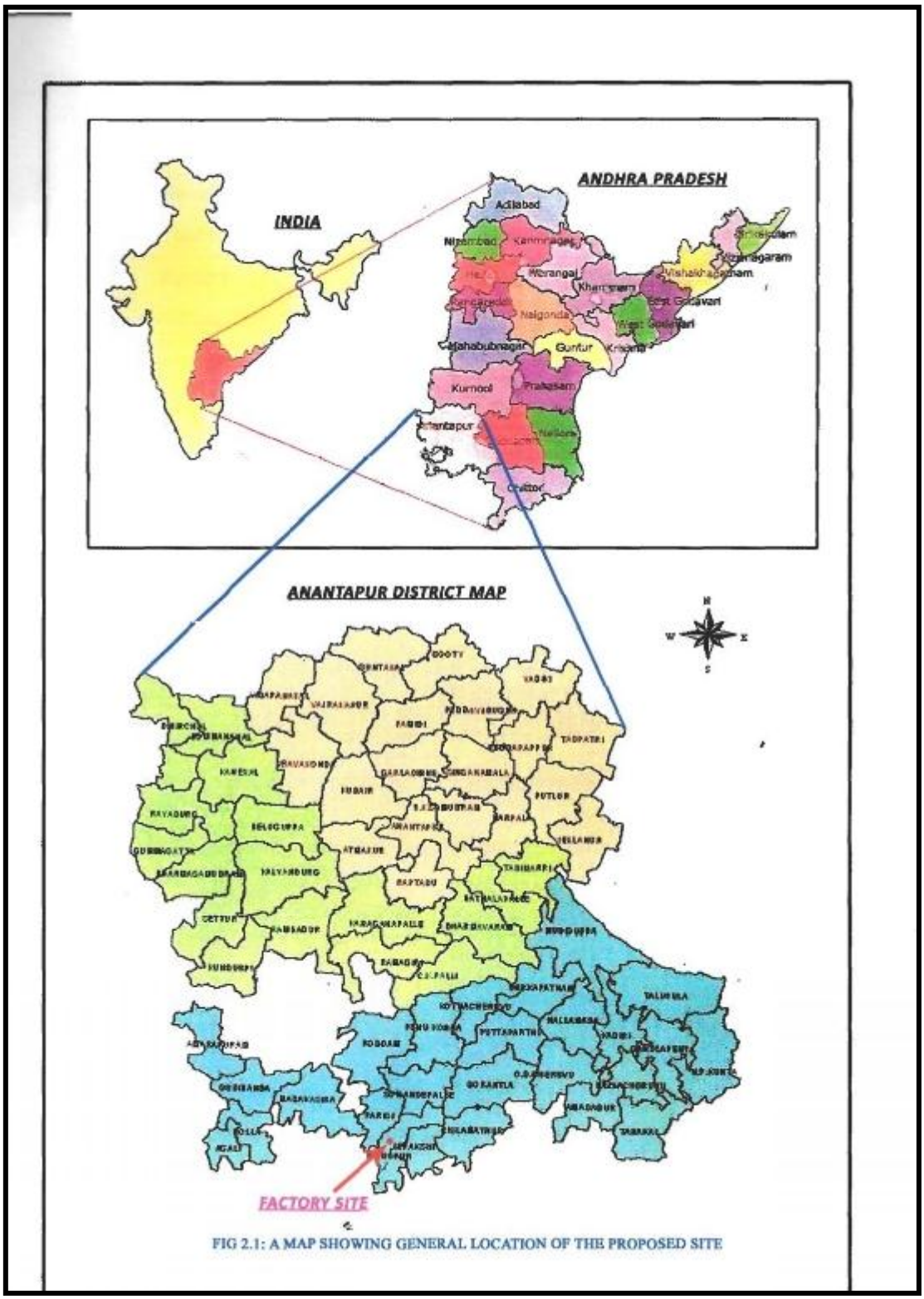
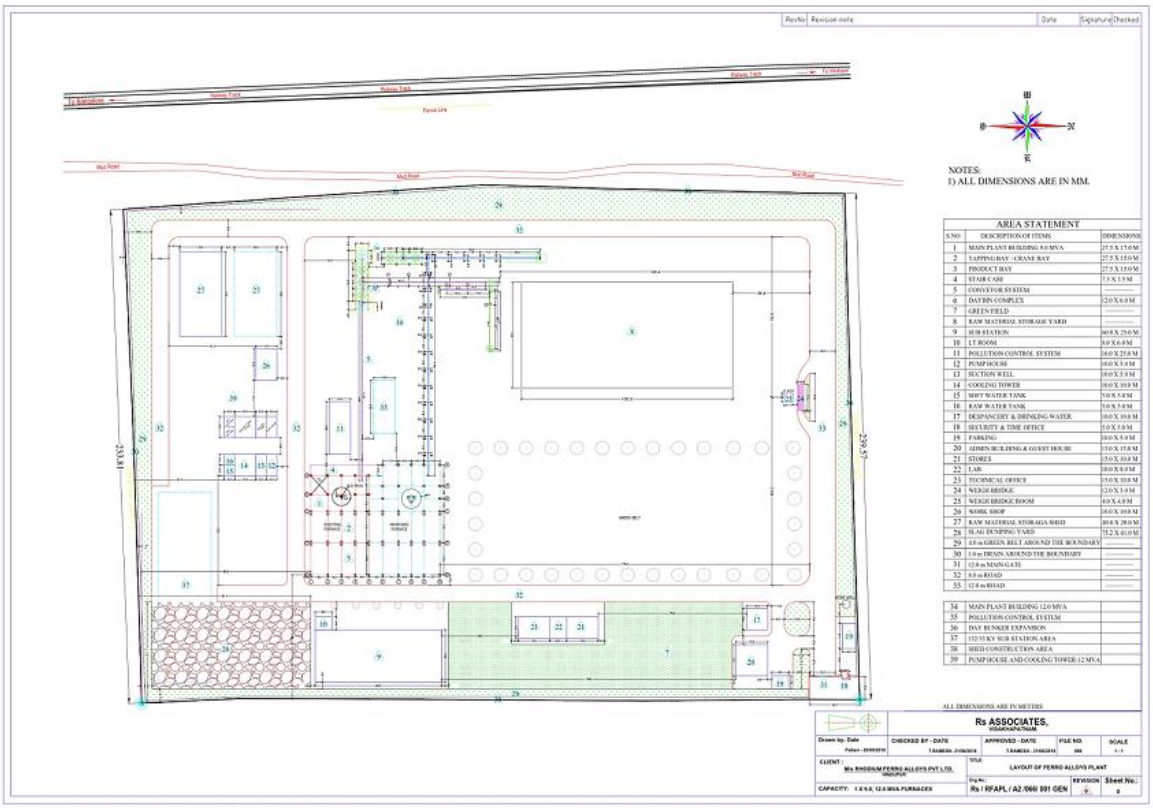


FIG 2.1: A MAP SHOWING GENERAL LOCATION OF THE PROPOSED SITE

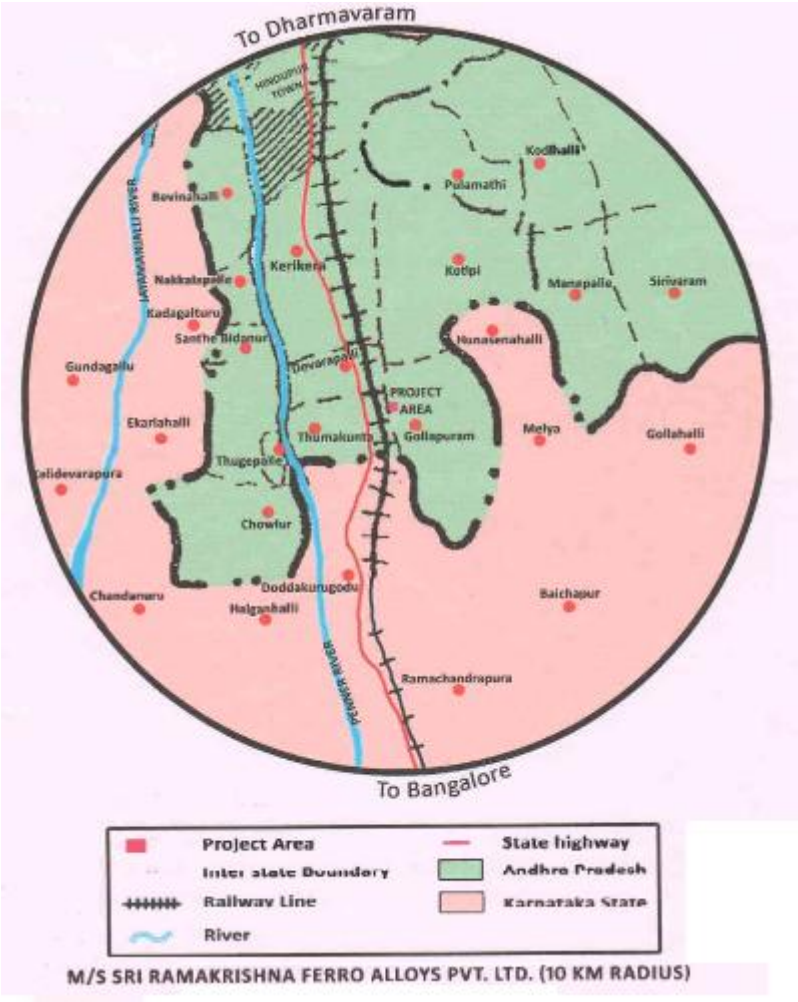
Layout plan of Existing and proposed Ferro Alloys Unit



Since the company proposes to install an additional 2 x 7.5 Mva Submerged Arc Furnace for increase in production capacity of its Ferro Silicon -15 TPD / Silico Manganese – 30 TPD /Ferro Manganese- 40 TPD to Ferro Silicon -50 TPD / Silico Manganese – 90 TPD /Ferro Manganese- 120 TPD within its existing premises, **no additional land is required.**

There is no ecologically sensitive place like national park, sanctuary, biosphere reserve, heritages sites, and archaeological monuments, defence installation, health resorts, scenic beauty etc., in and around 10Kms radius of the site. There is no of migratory animals within this project site. The site satisfies the criteria stipulated by the Ministry of Environment & Forest, Government of India for setting up of Industries.

The proposed project site is located in 5th and 6th plots of Industrial park/Area, APIIC, Gollapuram Village, Hindupur Mandal, Ananthpur District, A.P



GOOGLE IMAGE OF THE PROJECT SITE

6. SILICO MANGANESE / FERRO SILICON PROCESS DESCRIPTION OF THE PLANT

Silico Manganese Process:

Silico Manganese (Si Mn), as the name suggests, is a ferro alloy with high contents of manganese and silicon. It is made by heating a mixture of oxides like manganese oxide (MnO_2), Silicon dioxide (SiO_2), and iron oxide Fe_2O_3, with carbon in furnace. They undergo a thermal decomposition reaction. It is used as a de-oxidizer and an alloying element in steel.

Manufacturing Process:

Silico Manganese is an alloy of manganese and iron with additions of Silicon, Carbon, and several other various elements. The Silico Manganese & Ferro Manganese are alloys of manganese and iron with additions of Silicon, Carbon and several other various elements. The Ferro alloys can be divided into various grades depending upon the content in the alloy.

Manganese Ore is the basic material having the major constituents of the alloy viz. Iron and manganese. Different type of manganese ores is blended to achieve an appropriate manganese iron ratio used for the furnace charge. Coke is used as a reductant and quartz as an additional agent. The raw materials are charged into a furnace where they are smelted by electric power supplied through three carbon electrodes. The alloy and the slag produced in the furnace are tapped at regular intervals. The specifications of Silicon Manganese produced will conform to Indian Standard.

Electrode Paste, Casing/Ms Items, Oxygen Lance and Refractories:-

The Soderberg electrodes are formed in suite by charging electrode paste of suitable compressive strength, electrical conductivity, porosity and apparent density, into mild steel cylindrical shell provided with inner ribs for reinforcement. There is a continuous consumption of both electrode paste-casing sheets/MS Items.

The other consumables of the process include Oxygen Lancing pipes and Oxygen used for opening the furnace tap-holes, and the refractories for the lining of pans / runners used for alloy collection.

The Process:–

Standard Silico Manganese is smelted at about 1700-1800°C. A conventional Submerged Electric Furnace achieves this. The three carbon electrodes, partially submerged in the charge, are supported on hydraulic cylinders for upward and downward movements to maintain the desired electrical conditions in the furnace.

The body of the furnace is cylindrical in shape, and is lined with firebricks, silicon carbide bricks and carbon tamping paste. Two tap-holes are provided at 120°. Apart for draining out both the molten alloy and the slag, during the repair works of one of the tap holes the other will function as standby.

The raw materials are thoroughly mixed in the proper proportion before being charged into the furnace. Manual poking rods or stoker car are used for stoking the charge on the furnace top. As the charge enters the smelting zone, the alloy formed by chemical reactions of the oxides and the reluctant, being heavy gradually settles at the bottom. The slag produced by the unreduced metal oxides and the flux, being relatively lighter, floats on the alloys surface.

At regular intervals the furnace is tapped. The tap hole is opened by Oxygen lancing pipe and after tapping is completed, it is closed by clay plug. The liquid Silicon manganese and the slag flow the C.I. Pan. The slag being lighter overflows from the C.I. pan and is taken into the sand mould.

The alloy cake from C.I. pan is removed and broken manually with hammer to required lump size.

The slag produced in the process, generally freed from ferro alloys after cooling are sent to the slag dump.

Source:

The main raw material required for manufacture of Silico Manganese is available from the mines of Manganese ore India Ltd, Nagpur and also from private mine owners in Visag, Andhra Pradesh, Nagpur, Hyderabad, Bellary etc. Coal and coke required for manufacture are available in and around Andhra Pradesh and Karnataka, in sufficient quantity.

Ferro Silicon Process:

Ferro Silicon is an alloy called silicon (Si 02) with small percentage of Aluminum (Al2 03) and many other elements. The Ferro silicon is used for manufacturing different variety steels for different uses.

Manufacturing process:

The Ferro Silicon is manufactured in electric operated submerged arc furnace the manufacturing process of Ferro Silicon can be broadly classified into four steps.

a) Blending of raw materials

b) Charging and smelting in the arc furnace

c) Tapping and cooling of molten materials

d) Breaking, Cleaning and packing.

a) Blending of Raw Materials:

Quartz, Charcoal and M.S. scrap are mixed in the required quantity and lifted to the charging platform with the help of the lifting arrangements. The raw materials are generally mixed in the following proportion in terms of weight.

Quartz	-	53%
Charcoal	-	35%
M.S Scrap	-	12%

b) Charging of raw materials

The blended raw materials are charged to the furnace with the help of hoist and charging chutes at a regular interval. In the furnace three carbon electrodes are partially submerged in the charge, which are supported by hydraulic cylinders for upward and down ward movements. The electrodes help in maintaining desired electric conditions in the furnace. The chemical reaction starts at a temperature of 1600 C to 1700 C. In the reaction zone of the furnace the silica reacts with the reductants and after reaction, a mixture of iron and silicon trickles down and gets collected at the bottom of the furnace crucible. The impurities present in the form of molten slag are collected in vessel.

c) Tapping and cooling

Three tap holes are provided at the bottom of the furnace for tapping both molten alloys and slag. During repair work of the Tap hole functions and the other works as standby. As the charge enters the smelting zone, the alloy formed by chemical reactions of the oxides and the reductants, being heavy, gradually settles at the bottom. At regular intervals of 2 to 2.5 hours the furnace is tapped. The tap hole is opened by Oxygen lancing pipe and after tapping is completed, it is closed by clay plugs. The liquid Ferro silicon is collected in the tapping pot and cast on the dressed sand beds for solidification and cooling.

d) Breaking cleaning and packing

After solidification the cakes are broken manually with help of hammer's to reduce into the required lump sizes after being removal of undesired particles if any, like slag contents etc. After cleaning and breaking, laboratory test is conducted for checking quality and composition. Finished goods are then packed in either jute bags/ P.P. bags ready for dispatch

Material Requirement

The specific consumption and quantities of raw materials / consumables for an annual production of 50 TPD of Ferro Silicon and 90 TPD of Silico Manganese are shown in the table

Quantity of Incoming Materials:

Sl.No	**Materials**	**Existing**			**Proposed**	
Ferro Silicon		Specific Consumption /Ton	Consumption Per Day	Consumption Per Annum	Consumption Per Day	Consumption Per Annum
1	Quartz	1800KG	27.0 tons	8910.0 t	63 tons	20790.0 t
2	Coke	1100KG	16.5 tons	5445.0 t	38.5 tons	12705.0 t
3	M.S Scrap	200KG	3 tons	990.0 t	7 tons	2310.0 t

S.No	Materials	Existing			Proposed	
Silico Manganese		Specific Consumption /Ton	Consumption Per Day	Consumption Per Annum	Consumption Per Day	Consumption Per Annum
1	Manganese Ore	1500KG	45.0 tons	14850.0 t	90 tons	29700.0 t
2	Mn Slag	1000KG	30.0 tons	9900.0 t	60 tons	19800.0 t
3	Quartz	250KG	7.50 tons	2475.0 t	15 tons	4950.0 t

Quartz

Quartz is the cheapest raw material. This is also purchased and stored for two months operation. The ore component of the charge for making Ferro Alloys are material having a high content of silica such as quartz, quartzite * chalcedony. Since aluminum & phosphorus are detrimental impurities in the charge, the lower contents of the same will ensure lesser slag & consequently lesser loss of electric energy.

Coke/Coal

Plenty of coke and Coal are available in and around the plant site and the same is purchased locally. The storage stock of two months is envisaged. The ideal reducer for production of Ferro Silicon and Silico manganese should have low ash content, high electric resistance, a low content of volatile & a high strength of lumps on heating. Certain grades of anthracite & coke may be applicable for the purpose but mainly in combination with other reducers, because they are liable to cracking on heating. The most common reducer is coke /coal i.e., fines remaining from the screening of furnace.

M.S.Scrap

It is available from several sources in Andhra and other states. The material could be brought by road to plant site. Storage of two months requirement of the scrap is considered which is more than adequate. Other raw materials & Consumables via, Casing sheets, Oxygen lancing pipes, Oxygen, M.S rounds are available from local sources.

Electrode Paste, Casing, Oxygen and Lancing Pipe

The soberer electrodes are formed inside by charging electrode paste of suitable compressive strength, electrical conductivity. Porosity and apparent density into mild steel cylindrical shell provided with inner ribs for reinforcement. There is a continuous consumption of both electrode paste and casting sheets.

The other consumables of the process include Oxygen and Lancing pipes used for operating the furnace tap holes.

Storage & Internal Transport

Plant storage and handling of materials is represented in the flow - chart. (Enclosed) purchasing raw materials viz., Coke I Coal, Electrode paste and Quartz are stored separately in their respective stock yards. The raw materials are pre-weighed in the form of batch before taking into Charge bins located in furnace 2nd floor through 3 ton capacity Hoist. The cut - off gates are operated to take charge, mix into furnace through chutes.

Alloy Handling

The alloy is tapped at regular intervals and collected in dressed beds. The alloy cakes after solidification removed. The cakes are broken into required size, weighed and packed in gunny bags for dispatch.

Miscellaneous Handling

The electrode paste, casing sheets, lancing pipes and oxygen are stored in the general stores and tapping bay

7. MAIN BUILDING AND PRODUCTION FACILITIES

Furnace Building

The furnace building consists of furnace aisle and tapping aisle. The entire building is designed on structural steel to withstand the temperature condition and normal vibrations caused by the furnace and the equipment operations. The side cladding and roofing consists of corrugated AC Sheets. The furnace aisles have three floors at suitable levels. First and second floor have RCC slabs and the third is made of fabricated MS grills. The ground floor has the furnace mounted on RCC foundation, Tapping aisles has 10 T Capacity crane for hand ling the hot alloy and slag along with the product in which breaking, segregating and packing activities are planned.

Power Receiving Station

The main power receiving station is located about 500M appx. from the furnace building and consists of a regular Masonry building to house Breakers, Replay panel and other equipment. A fenced open yard is provided to accommodate the 33kv Sub-station as per IE norms.

Pump House

A pump house built up of masonry structure is located about 300 M from the furnace building. It consists of two ground level reservoirs for raw and treated water. A water treatment plant and a cooling tower are located near the reservoirs

Equipment

The main production facilities include the furnace body, electrode assembly, electrode hoisting and regulation, slipping mechanism, secondary bus bar, water-cooling system, furnace transformer and control & instrumentation panels.

Furnace Body

The furnace body consists of welded steel shell plates and stiffeners. Bottom of the shell is flat and rests on a set of parallel beams. The shell is lined with firebricks and carbon tamping paste. The two tap holes are made of silicon carbide blocks surrounded by silicon carbide bricks. Tapping spouts projects out of the shell and consists of structural steel frame

Hood & Chimney

The hood is provided over the furnace to collect flue gases and discharged to the chimney. A tall chimney is provided to release the gases into atmosphere during the short periods of by pass by the pollution control plant. A collection duct is connected to the chimney for leading the gases to pollution control plant

Electrode Assembly

Electrode assembly consists of water cooled copper contact clamps with pressure rings. Suspension mantles, slipping collars, bus tubes and cooling water pipes. Three such electrode assemblies are provided, each housed a Soderberg self-baking electrode.

Electrode Regulation

The electrode assembly is supported on two hydraulic cylinders for raise and lower operations. The movements are controlled by electric signaling and Hydraulic operating system

Electrode Slipping

Slipping operation of electrodes at regular intervals, depending on the consumptions, are effected by means of two mechanically controlled and hydraulic operated collars

Furnace Transformer

The Furnace Transformer is provided in a separate dust protected room on the furnace floor. The capacity of transformer is 7.5 MVA x 2 and the primary having a line voltage of 132/33 KV and is provided with on load tap changer to obtain a range of voltage at the electrodes

Secondary Bus Bars

Power is fed from Furnace Transformer to the Contact clamps and Electrodes by means of water cooled copper tubes arranged in a manner which keeps reactance at minimum. The bus tubes terminate at the furnace hood and are connected to a set of copper flexible. Water cooled copper tubes take off from these flexible up to the electrode contact clamps, making a delta connection

Instrumentation and controls

Metering and Control equipment of the furnace are located in a control room on the furnace floor. The equipment consists of electrode control desk. Tap changes control panel, switch Gear control panel, Metering and Relay panels, Slipping Panels and MCC for Furnace auxiliaries.

Alloy Collection Arrangement

Tapping platform is provided at a suitable level near the furnace shell towards the tapping aisle. After the tapping, metal and slag are led on a sand dressed runner up to dam. The preliminary plant lay-out is furnished in the drawing.

8. UTILITIES: POWER AND WATER REQUIREMENT

POWER REQUIREMENT

Required 21500 KVA of power from Andhra Pradesh electricity board

Connected Load

In addition to the 21000 KVA high tension load of the furnace, it requires auxiliary load of 500 KVA

Plant Connected Load:

Sl.No	Load	Power Factor	Estimated Motors hp	Kva	Existing Connected Load in kw	Proposed Connected Load
1	Furnace	0.80	-	6500.0	4800.00	15000.00
2	Furnace equip	0.80	215.0	200.0	160.00	160.00
3	Water pumps	0.80	100.0	100.0	80.00	80.00
4	Miscellaneous Workshop Laboratory	0.80	75.0	70.0	56.00	56.00
5	Pollution plant	0.80	86.0	80.0	64.00	64.00
6	Plant lighting	0.90	--	50.0	45.00	45.00
	Total		476.0	6500	5205	20205

After taking into account has stand by motors also the maximum load on the grid is estimated at 21500KVA. But after correcting the power factor by installing capacitors the maximum demand of the plant will be 20205 KVA

Tariff

The subsidiary power cost of the Andhra Pradesh state electricity board of maximum demand of 21500 KVA and above is Rs 5.70 approximately per unit including Demand and fuel adjustment costs.

Receiving and Distribution of Power

A schematic power distribution drawing which is enclosed gives the proposed plant load requirement. Auxiliary power transformer of 500 KVA is provided to take care of all plant auxiliary loads 132/33 KV Shunt capacitor banks totaling 1750 KV AR are provided to improve power factor from 0.8 to 0.99 on the grid. All high tension equipment, power and control cables, motor controls distribution boards etc. will be chosen from reputed manufacturers utilizing the latest technology obtain dependable service in operation.

Plant Lighting

Suitable lighting schemes are planned for operational areas, yards, roads and buildings with appropriate energy efficient lamps & fittings

Emergency Power

A 625 KV A diesel generating set is provided for supplying LT power to various critical areas like cooling water pump, crane and lighting to take care of on process work during main power supply failure

WATER REQUIREMENT

Water is mainly needed for cooling various furnace components and furnace transformer oil, drinking and other uses. Requirement of plant water is given below

Requirement of Water

Sl.No	Description	In circulation	Existing / Proposed Make-up/day	Proposed Make-up/day
1	Furnace and Transformer Cooling	66 Cu.M/Hour	16 Cu.M/day	140Cu.M/day
2	Drinking and Miscellaneous	8 Cu.M/day	8 Cu.M/day	20 Cu.M/day
			24 Cu.M/Day	**160Cu.M/day**

1% loss in the cooling tower is assumed which is replenished daily by makeup water.

Water Source

The additional requirement of the water has been proposed to supply by APIIC for the full requirement of 214 Cu.m of water per day since the required quantity is very much on lower side

Storage

A 40 Cu.M ground level water storage tanks are proposed for the collection of raw water and two 100 Cu.m tanks are provided for treated and return water storage. Total storage thus will be 240 Cu.m which would be sufficient for about a week day's requirement of the plant

Treatment

A water softening plant is proposed to restrict the hardness below 20 PPM. The water treatment plant of 5 Cu.m Capacity on 8 hours operation is considered.

Recirculation

Detailed scheme on water system is given in drawing. Treated cold water pumped from the cold storage tank by means of two 40 HP Pumps is proposed and one among two acts as a stand by. A water manifold is provided on the furnace floor to feed Furnace components & Transformer. The hot water is collected in M.S. tray provided in the manifold and taken to cooling Tower located near pump house. The hot water, after getting cooled, is returned to cold water tank for further circulation.

Emergency Tank:

A 40 Cu.M emergency water tank are proposed on the third floor of the furnace building to provide cooling water supply for furnace during power interruption.

Drinking Water:

An overhead water tank capacity of l0 Cu.M provided for feeding drinking and other services.

ANCILLARY FACILITIES:

Compressor:

A compressor of 50 Cu.M / Hr capacity at 7 Kg/Sq.M is proposed to meet the air requirement of about 40 Cu.M/hr by various systems and cleaning purpose

Workshop

A mechanical workshop is proposed to meet furnace & auxiliary equipment maintenance, fabrication of electrode casings and small scale fabrication needs of the plant. A Lathe, Punch, Press, Shearing Machine, Welding Transformer & Rectifier, and Grinders, etc., are planned.

Laboratory:

A fully equipped chemical laboratory for the inspection, analysis and quality control of incoming raw materials and the product is envisaged. Main facilities provided include spectra - colorimeter, carbon determinator, analytical balances and moisture determinator.

9 ENVIRONMENTAL POLLUTION PREVENTION AND CONTROL

This chapter covers

- The genesis of pollution
- Principal sources of pollution
- The nature of pollution
- Proposed measures required for meeting the prevailing statutory requirements of gaseous emissions waste water discharge characteristics, noise level etc
- For environmental management purpose in connection with the installation of integrated steel plant

The Ferro Alloys Plant consists of following steps in its production:

1) Blending of Raw materials
2) Charging of raw materials into the furnace
3) Tapping and cooling
4) Breaking ,Cleaning and Packing

Air Pollution Aspects

Sources and Types of environmental pollutants released

Section / Units	Feed materials & fuels	Operations	Pollutants	Recipient	Form of Pollution
Raw Material Blending	Quartz coal coke M.s Scrap and other ingredients	Blending	Dust	Air	Air Pollution
Alloy Melting Furnace	Hot Alloys Ferro Silicon Silico Manganese Alloys	Alloy making refining and casting into slabs	Heats Dusts	Air	Air Pollution
			Particulate Dusts Laden Water	Guard Pond	Water pollution
Tapping And Cooling	Liquid Alloy	Mould formations and casting of alloy slabs	Heat and Fumes	Air	Air Pollution
			Noise	Work zone	Noise Pollution
Breaking cleaning and Packing	Alloy Castings	Breaking and packing	Dust	Air	Air Pollution
			Noise	Work zone	Noise Pollution

Emissions from Ferro Alloy Furnace

I) Gas Flow = 75750Nm3/Ton & 15625Nm3

2) Dust concentration - 5.04Kgs/Ton & 8.6Kgs/ ton

Characteristics of furnace gas

It is a silica fume and is non-crystalline silica. It is a powder with particle size of 0.1 to l Micro meter. The components of fumes are SiO_2 (95.1%), Fe2O3 (0.6%), CaO (0.19%), MgO (0.53%), K2O (0.90%), Na2O (0.5%), Mn ($315.4X10^{-6}$), Co ($77, 9X10^{-6}$) and Ni ($4.5X10^{-6}$)

Choice of Control Equipment

The dust in Ferro Alloys is highly resistive and thus use of electro-static precipitator is limited.

Wet collector in the form of high energy ventury scrubber is used often but at the cost of large quantity of water, sludge removal system and high power consumption. The off gas containing carbon monoxide (CO) is exhausted from the furnace through a two stage ventury scrubber. The system is equipped with device to control the furnace pressure so that constant volume of gas always passes through the scrubber.

Fabric filter is mostly being used for cleaning Ferro alloy furnace gas. A low ratio filter with reverse air cleaning is more in use with glass bags

DESIGN DATA FOR BAG FILTERS

DESCRIPTION		UNIT	SPECIFICATIONS
DESIGN DATA			
	Application		Fumes from SAF
	Gas Volume	Am3 / hr	205000
	Temperature	^{0}C	130
	Dust Load	gm/Nm3	2-3
TECHNICAL DETAILS			
	Type		OFF Line, Pulse Jet Type
	Model		MAT B 15182 x 8
	Access		Top
	Bag Size	Mm	ø 152 x 4550 L
	Filter Area	M^2	3164
	Filtration Velocity	m/min	1.22 (Net)/1.08 (Gross)
	Pressure Drop	Mm WC	175-225
	Filter Bags		Polyester, NWNF antistatic

Liquid Wastes

The Liquid waste generated from the integrated Steel manufacturing process is

1) Non –process discharge
2) Process contact Water discharge
3) Sanitary sewage

The cooling water blow down from furnace is about 3 - 4 m3/day. This is stored in guard pond for removal of suspended solids and the used for tree plantation

Sanitary Sewage

The Sanitary waste water is discharged is 4.5m3/day. This waste water is used in septic tank followed by soak/pit.

Water pollution Control Measures

- Zero discharge into outside the factory premises
- Rainwater harvesting & ground water recharging by recharge structure for conservation of water
- Cooling tower downs are separately treated with standard process and the treated effluent are recycled to an extent of 70- 75% excess treated effluent are stored in guard pond for further secondary use in the plant.
- Sanitary sewage is treated by septic tank followed by soak-pit
- Efforts would be reuse and re-circulate the water to the extent possible
- Storm water/Garland drains would be provided and are linked to the guard pond.

Solid Wastes

Solid Waste Generation Utilization and Disposal

Unit	Nature of solid waste	Quantity(t/day)	Utilization/Disposal
Alloy melting shop	Alloy melting slag	0.525 (Fr Si) 28.62 (Si Mn)	Cooled for easy handling and used for Road material
Cleaning Process Rejects	Rejects	1.6	Recycled into production Process
Lead acid batteries	Discharged batteries	10-15 No/year	Manufacturers/approved vendors
Air pollution control measures	Dust	9.225 (Fr. Si) 9.18 (Si Mn)	Brick and Cement manufacture/land filling

Noise Pollution

Noise Pollution Levels in various sections of the Plant

1) Blending of Raw Materials 80-85 dB(A)
2) Furnace Zone 85-90 dB(A)
3) Tapping and Cooling 70-75 dB(A)
4) Breaking cleaning and Packing - 90-95dB(A)

Noise Pollution Control Measures

- Technical Specs are Designed for equipment for less noise generation
- Dynamic balancing and vibration damping by suitable mounting mechanism and proper grouting
- Separate housing/enclosures for high noise machines
- Green belt development around each unit
- Road side tree plantations
- Ear plugs for those working at high noise area

Other Means of Environment Management

Green Belt Development

33 % of the green belt is maintaining and have at least 10 meters wide green belt all around the plant site by planting suitable species of evergreen and broad leaves type. Plantation is also envisaged on both sides of the plant road. Adequate tree plantations will substantially abate the dust pollution, filter the polluted air, reduce the noise and ameliorate the plant environment. Where tree plantations will not be feasible, the unpaved land shall be covered with grass and small height bushes in order to avoid soil erosion.

Green Belt Plan (33% of the site area)

- At plant boundary
- At Road Side
- Around various utility building / units

Pollution Monitoring

Necessary provisions would be made for routine monitoring of stack emissions, quality, and Noise level, water gravity as required by the regulations and for monitoring environment management as implemented.

Environmental Monitoring

The emission levels from the stack and the ambient air quality around the power plant will be periodically monitored. Further, the effluent quality and noise levels will also be regularly monitored. The instruments and the equipment necessary for monitoring will be made available in the plant laboratory

Plant Safety and Industrial Hygiene measures

The two aspects need to be given due attention at the time of detailed engineering, meeting all the prevalent regulations of factory act and recommendations made by the regulating authority. Fire hydrants, for extinguisher at vulnerable points within the plant boundary have been envisaged. No fire tender provisions have been considered, as this would be made available from local authorities. A first aid unit has to be considered for the operating and maintenance personnel. All the necessary safety kits like hand gloves, gumboots, aprons, helmets etc need to be provided. Proper sanitation facilities, rest room, adequate plant lighting is also envisaged for the proposed project

Pollution control Regulations

Under the relevant provisions of environment (protection)act 1986 and rules there under, the ministry of Environmental & forests, Government of lndia (MOEF) and its nodal agency Central Pollution Control Board (CPCB), Government of India has been empowered to frame the pollution control regulations as and when necessary for environment protection and for health and safety of the people. The concerned state Pollution Control Board(SPCB) is required to enforce all such national regulations and any other site specific Regulation as stipulated by SPCB which are mandatory under the 'relevant provisions of the water(prevention & control of pollution) Act, 1974 and The Air (prevention &control of pollution)Act 1982 upon the operator of the industry.

Drainage System:

The effectiveness of the drainage system depends on proper cleaning of a drainage pipes / Channels. Regular Checking is being done to see that none of the drains are clogged due to accumulation of sludge / sediments. The clogged drains are cleaned as soon as possible, preferably the same day. The catch-pits linked to the storm water drainage system from the raw materials handling arrears are regularly checked and cleaned to ensure their effectiveness. This checking and cleaning is rigorous during the Manson season, especially if heavy rains are forecasted.

The prevailing Regulations pertaining to Operation of a sponge iron Plant are as follows:

Air borne emissions

Air borne emissions form the plant shall be of such quality that the ground level concentrations of those air borne pollutants in the surrounding areas (say, within 10km aerial coverage) would remain within the limits as presented in following table.

National Standards of Ambient Air Quality

Airborne pollutant		Industrial (Mg/m3)	Residential rural & Other areas (Mg/m3)	Sensitive areas (Mg/m3)
SO2	Annual average	80	60	15
	24 hrs average	120	80	30
NOx	Annual average	80	60	15
	24 hrs average	120	80	30
Suspended particular matters(SPM)	Annual average	360	140	70
	24 hrs average	500	200	100
Respirable dusts i.e particle size below 10 microns	Annual average	120	60	50
	24 hrs average	150	100	75
Carbon monoxide	8hrs	5mg/cum	2mg/cum	1 mg/cum
	1hrs	100 mg/cum	4 mg/cum	2 mg/cum

Source: CPCB's Notification in the Gazette of India dated 20.5.94

The allowable dust pollution in the closed working Zone is dependent of free silica content of the dust. The following limits apply for lime dust, iron ore dust and coal dusts:

Coal dusts (less than 5 percent quartz) -2mg/cu m

Other dusts (less than 1 percent quartz) - I 0 mg/cu m

The allowable emissions of particular dusts from the stacks to the atmosphere is within 50 mg /Nm3.The regulation does not stipulate any emission values S02 and NOx, which need to be controlled only by effective dispersion through tall stacks:

Permissible Noise Levels

Duration per day. H	Sound level dBa slow response
8	70
6	72
4	95
3	97
2	100
1 ½	102
1	105
1 /2	110
1 /4	115

The allowable noise emissions would be such that the ambient noise level outside the plant boundary would remain within the following limits:

	Reqd. B (A)	
	Daytime	Nighttim
Industrial area.	75	70
Commercial area ..	65	55
Residential area	55	45
Silence Zone.	50	40

Source: MOEF's Gazette Notification dated 26th December 1989

Effluent discharge characteristics

General standards for discharge of liquid effluents to be maintained and as given in the next page

Inland surface water

1.	Temperature(^{o}C)	shall not exceed 50C above the receiving water temperature
2.	PH	..5.5 to 9.0
3.	Total suspended solid (mg/1)	..100
4.	Oil and Grease (mg/1)	..10
5.	Phenolic compounds (mg/1)	..1.0
6.	Iron as (fe) (mg/1)	...3.0
7.	Bio-assay 100% effluent	..90% survival of fish after 96 hrs in

Source: MOEF's Notification dated 19.5.1993

10. PROPOSED PROJECT IMPLEMENTATION SCHEDULE

Site Preparation:

As the project is proposed within the existing site within 17.79 acres there is any requirement for preparation of Boundary wall, Making of Roads, Drainage and Sewerages etc.,

Civil and Structural Works:

Major civil works include column footings, foundations, RCC slabs, concrete flooring etc., in the furnace buildings and storage tanks etc. A concrete work of 300 Cu.M estimated for the civil works.

Fabrication and erection of about 190 T of steel is involved in the structural works of furnace Buildings and pollution control plants. It is proposed to appoint a civil engineering supervisor for the supervision of all civil and structural work. All necessary structural steel will be purchased from Andhra Pradesh. A structural contractor will be appointed to undertake necessary fabrication and Erection works. A separate civil engineering contractor will take up the civil works of the plant.

Procuring Equipment:

The estimated equipment cost is furnished & all the parts of the furnace being procured indigenously. The indigenous equipment 33 KV switchgear & Transformer has longer delivery periods of 6 months. It is, therefore, proposed to release orders on this equipment early. Other equipment and systems will be ordered in a manner which suits the erection schedule. For all these equipment's technical specification and reliable sources are readily available through Consultants.

Erection of equipment :

For the erection of major plant equipment, it is proposed to appoint an errection contractor experienced in similar jobs to work under the supervision of company's engineers as per the guidance of consultants. The furnace systems will be erected under the overall supervision of consultants and suppliers. Furnace lining needing a closer attention will be undertaken departmentally by the company. Masons and skilled workers required for tamping the furnace hearth will be employed on Temporary basis for a month's for this work

Tendering

Tenders will be called for all power, water systems and other utilities and orders will be placed on competent manufacturers I suppliers. Errection work of the power equipment will be entrusted to separate contractors with proven experience and valid license for electrical works. The work of laying the in-plant piping will be given to a suitable contractor

Construction Facilities

It is estimated that 250 KVA power at 415 V will be required during the plant construction for Welding, lighting, concrete mixers etc. A temporary power supply from state electricity Board will be obtained for the purpose till the Main switch gear is energized. Drinking and miscellaneous water supply will be arranged through in house Bore Wells. The administrative building and the general stores will be constructed with the commencement of Site works to provide proper storage and office facilities

Construction and Co-ordination:

A group of qualified technical personnel under a project Manager will be at the plant site during construction period and provide necessary supervision and project co-ordination

Construction Schedule

The overall schedule of the project is shown in the form of a bar chart in drawing. The completion period from start of site preparation to the commissioning is estimated to take about 21 months

Volume of Construction

The approximate volume of major items of construction work involved in Ferro Alloy Plant is given in Table Below

Table: Volume of Construction for Major Items

		Integrated Steel Plant
Item	Unit	Apx. Quantity
Excavation	Cu.m	15,100
Concrete of all types	Cu.m	1,050
Reinforcement	Ton	105
Structural Steel Work	Ton	1500
Roof and Sheeting	Sq.m	15,000

The above quantities are based on the preliminary information of site conditions, preliminary designs, preliminary layouts and types of equipment proposed for the Ferro Alloy Plant. During the engineering stage, the actual quantities may vary depending upon the selected equipment, finalized building and shop layouts

Requirement of Construction Materials

The approximate Requirements of major construction materials have been estimated on the basis of the quantum of work indicated in the above Tables and are given below:

Requirement of Major Construction Materials

		Ferro Alloys Plant
Item	Unit	Apx. Quantity
Cement	Ton	360
Coarse aggregate	Cu.m	670
Fine aggregate	Cu.m	350
Reinforcing Steel	Ton	120
Structural steel	Ton	1400
GCS sheets	Sr.m	14500

The tentative construction schedule is shown in the form of a bar chart. The schedule is prepared on the basis of estimated quantum of work to be executed and the envisaged time required for the manufacture, delivery and installation of major equipment.

In order to meet the time-frame for civil and structural work, it would be necessary to pour about 230 Cum of concrete per month and to Fabricate and erect about 23 tons of structural steel work per month during the peak construction period at site.

Therefore, in order to ensure the completion of construction of the total Ferro Alloy plant, adequate resources will have to be mobilized and resourceful and experienced contractors will have to be appointed

In addition, order for procurement of the major process equipment, plant electric and others, which are long delivery items, have to be initiated immediately after the 'go-ahead'. The preparation of specifications for equipment pertaining to the utility and power systems can be taken up only after the receipt of certified data from the equipment suppliers

Similarly, the preparation of foundation drawings for some of the units such as Ferro Alloy furnace, Casting Platforms, cooling platforms, breaking, cleaning and Packing platforms can be commenced only after the certified equipment load data are furnished by equipment suppliers. Hence, it will be necessary to obtain the requisite certified equipment data from the suppliers according to the time frame indicated in the construction schedule

Major milestones after placement of firm orders

The major milestones after placement of firm orders as shown in the tentative construction schedule are summarized in the implementation schedule given in the next pages

Construction Materials

It is envisaged that cement, reinforcing steel and structural steel materials sheets will be procured by the company and issue a to the contractors free of cost or at agreed recovery rates. For this, advance action has to be initiated by the company so that these materials are sufficiently stored in adequate quantity before commencement of the work at site. The contractors will procure all other construction materials.

Construction facilities

Construction facilities will mainly include providing construction water. Construction power, construction road and drainage, construction storages, construction and fabrication yard, construction lighting etc., it is envisaged that these work shall be done/ arranged by the company. The main construction facilities are described below

Construction water

The peak requirement of water during construction is estimated at about 50 cum per day. This requirement can be met from the bore well within the plant or from nearby river. The construction water will be supplied at one point within the plant to the contractors from where the contractors will lay pipe lines and draw water according to their requirements. Contractors will also construct storage tanks as may be required by them.

Construction Power

The power requirement for the construction activities such as civil work, site fabrication and errection of structural steel work, piping equipment erection area as well as yard lighting during the construction period, is estimated at about 250kVA.

All construction power will be supplied al 415/240 V separate 415/240 V power distribution boards will be installed in different areas within the plant site as required, for feeding construction power loads. The board will be fed from the power source available in the plant. Further construction, distribution & instillation of the switch boards etc. shall be arranged and maintained by the contractor.

Construction storages and yards

For the storage of cement, the company will make a covered storage available at site. Contractors would construct their own cement storages for storing cement after drawing requirements in phase from the company. The company in outdoor yards with proper security arrangement can store reinforcing steel and structural steel. The company may have to make arrangements for suitable equipment for handling of the steel materials in the yards.

For the storage of their coarse and fine aggregates and other construction materials as well as for the construction of temporary stores for cement, land at suitable locations at the plant site will have to be provided by the company to the contractors for their offices and fabrication and construction yard.

TRAINING

Training is a vital function for developing technologies and sustaining the developments made. It helps to attain high productivity and optimize costs. It is therefore necessary to take steps for training of the manpower recruited to operate and maintain the plant & equipment. Since training of personnel is time consuming, advance action in this regard is essential.

Training policy

An adequate training policy should be adopted at the outset aiming to fulfill the following objectives-

1. To improve the organizational effectiveness as a whole.
2. To achieve & maintain a high technological status.
3. To create awareness about cost effective operation.
4. To develop an understanding of the importance of teamwork and co-operation with other agencies concerned (eg. Operation & maintenance section, up & downstream processing units etc.)
5. To import necessary skills and knowledge appropriate for the key jobs and other jobs.
6. To provide opportunity to new recruits for involvement during erection & commissioning of the plant and equipment.
7. To development multiple disciplinary skills, safety consciousness and awareness about the importance of good housekeeping.

11. PROPOSED PROJECT COST ANALYSIS:

Capital Cost

For expansion installing and commissioning 15000 KVA furnaces producing 35 TPD of Ferro Silicon / 60 TPD of Silico Manganese / 80 TPD of ferro Manganese, a capital investment requirement of Rs.2500 lakhs is estimated. A summary of the estimated cost, means of finance and other financial details are furnished in continuation.

Estimated cost of the Project:

Sl.no	Item	Amount (In Rs Lakhs
1	Electrical	457.40
2	Furnace Plant & Machinery	287.00
3	Utility & Aux. Equipment	664.85
4	Furnace Building & Civil works	265.00
5	Misc. Fixed Assets	650.75
6	Pollution Equipment	175.00
	Total Project cost in Rs. lacs	2500.00

Means of Finance:

Sl.no	Item	As % of total project share capital	
1	Share capital Promoters	25%	625.00
2	Terms loans from Banks/Institutions	75%	1875.00

Cost Aspects of Project Components

Land & Site Preparation:

Work of site preparation includes of all works like leveling, making of in-plant roads, sewages, water drains, digging for foundation and plant boundary, fence work is included in total plant civil work

Civil and Structural works

Civil works consist of furnace complex, product yard, equipment foundations water storage tanks and ancillary building like Control room, workshop and laboratory, outdoor sub - station, Pump house, stores and ablution block.

The structural works include the main building frames of furnace complex. Crane gantry (Tapping) building, roof and side claddings etc. The total cost of the civil and structural works is estimated at Rs. 390.70 lakhs

Furnace Plant and Machinery:

The steel purchased will be fabricated covering furnace shell, complete electrode assemblies, Hood & chimney, chutes & bins, water cooling system etc., The other machinery of the project is hydraulic system, furnace lining, Charge handling equipment, storage bunkers, laboratory etc all are available indigenously. The estimation includes equipment erection charges of contractors utilized for erection, supervision and commissioning. Total cost of plant & Machinery other equipment has estimated of Rs. 154.38 lakhs.

Electrical

Electrical includes 132/33kv system, LT & Control panels other utilities of the project include the cost of supply and erection of a furnace transformer of 132/33 KV, 800 V power distribution and control Equipment, plant lighting, water pumps, plant piping, cooling tower compressed air machineries, and pollution control plant. Other equipment, include 10T crane, 3T Hoist, Work shop Equipment, weigh scales, 30T weigh bridge and storages for which a total cost of Rs 311.08 lakhs

Utilities

A sum of Rs.2I7.79 Lakhs has been provided for the expenses on compressor, mono-rail hoist, skip host, hydraulic power pack, loader, tipper, water softening plant, air blower, vibrating feeders, bending machine, cooling tower, weigh bridge, vibrating screen, diesel generator, Interest on term loan, other expenses etc

Misc. Fixed Assets

Miscellaneous item is estimated of Rs 42.55 lakhs for procuring springs, insulation material, machining item, conveyor belt, pipe line, etc.

Consultancy Design Errection & testing:

Being consultancy for plant machineries, electrical systems, fabrication works, execution of furnace & erection, 33kv sub station, installing of L.T work & cables, has been estimated to Rs 105.00

Preliminary Production Cost Estimate

Materials and power required per ton of Ferro silicon, to which have been added the costs of consumables, labour, stores, utilities, repairs, maintenance, material handling. The costs are summarized below in the table and the details in appendix

Variable Cost

Sl.No	Item	Kgs/ton	Unit cost in Rs	Cost in Rs. Per ton Fe.Si / Si Mn	Total Rs/T
1	RAW MATERIALS				
1.1	M.S Scrap	200	35000/T	7000.00	
1.2	Coal	1100	16000/T	17600.00	
1.3	Quartz	1800	3500/T	6300.00	
1.4	Electrode paste	25	35/kg	875.00	
1.4	MS casting sheet	3	65/kg	195.00	
1.4	MS Round	5	60/kg	300.00	32745.00
1.5	Oxygen (Cu.M)	5	30/Cu.M	150.00	
1.6	Lancing pipes(M)	5	65/m	325.00	
2	Power	8000KWH	5.69/Kwh	45520.00	45520.00
3	Utilities				
3.1	Water				
3.2	Raw material handling &			50.00	
	Preparation & Unloading	3.5 T/T	------	90.00	
3.3	Product handling & Preparation				
3.4	Product Transport				
3.5	(Internal)	1.0 T/T	30.00	30.00	545.00
3.6	Product breaking &	1.0 T/T	250.00	250.00	
	Chipping			125.00	
	Quality Control (Chemicals)				
4	FIXED COST				
	Repairs & Maintenance				1000.00
	Salaries & wages				3000.00
	Administrative Over				1000.00
	Heads Depreciation				1000.00
	Interest				1500.00
5	TOTAL COST OF THE PRODUCT				87310.00

Raw Materials

Entire requirement of Quartz, coke / coal, Dolomite, manganese ore, MS rod, Casing Sheet etc., will be purchased. The cost of Raw Material input is Rs. 32745.00 / M.T.

Power

Power is the major cost in the production. At the present charged tariff of Rs.5.69/KWH average, as for one ton of Ferro Silicon / Silico Manganese consume approximately 8000 KWH, the power cost works out to Rs.45520/T. This cost includes the smelting power, consumption in auxiliaries and pollution control equipment

Consumables

The cost of consumables has been included in raw Materials

Utilities

The make - up water of 184.cu.M per day estimated to cost Rs. 50.00/T of the product.

Raw Material Handling and Preparation

Raw material unloading internal transport of ores for screening and making collection, storage and transport are included in the cost of Rs. 90.00 / T for R.M handling works

Product Handling and Preparation

The Ferro silicon cakes after tapping and cooling are kept in Gantry building. The cakes are then broken to required size manually, segregated and screened. The lumps of alloy with slag contamination are further chipped. The saleable alloy is then weighed and sold. The unsaleable material with significant percentage of alloy is recycled to furnace.

The production cost of Rs. 250/ T estimated for the above activities including the handling, removal, packing and dispatch.

Quality Control:

The cost of Rs. 125/ T of alloy for quality control includes mainly the chemicals and other consumables used for the analysis

Repairs and Maintenance:

About Rs 1000/ T has been provided as repair and maintenance cost. Also added in the cost are the service costs on vehicles, building maintenance and other general service works like weigh bridge, air - conditioners etc. the working details are furnished.

Salaries and Wages:

Based on operational requirement of the plant a total strength of 90 personnel of envisaged. The Salaries & wages bill per month including statutory payments is estimated at Rs.3000 per ton have been provided.

Administrative Overheads:

Rs.1000 / T provided for administrative overheads including among other costs employees, welfare expense, insurance cover on machineries and material stocks and the overheads of the company's registered office.

Interests:

16% P.a. interest has been calculated both for the working capital loan and the term loan which works out to Rs. 1000 per ton. However this interest burden per ton will decrease per year upon repayment of term loan

Depreciation:

Rs.1000/MT (assumed) is the depreciation on equipment and buildings. Thus the total cost of Production works out to Rs. 87310 /MT Compared to the selling price of Rs. 95000 /MT by the company. This leaves a profit margin of Rs.7690 / T of production: Total variable cost per ton had been calculated above at Rs. 78810/MT

Profitability and Cash flow:

Alloy Price and Profitability

As seen in the production cost analysis the product shows a contribution of Rs. 7690/MT based in the prevailing selling price of Rs. 95,000 /MT. This is a realistic Price, particularly in view of high improved domestic market for the product. Thus the net contribution would be at 18% of the sale price. The annual sale turn over in the 3rd year is nearly Rs20.32 crores which is almost 10 times of the share capital proposed. A statement of profitability is given in table.. The calculation assumes 75 % production level during the first year, 80 % in 2nd year, 90 % 3rd year and 100% after 5th year onwards

Break Even Point:

Fixed Expenses	**7500**
Salary & wages	3000
Depreciation	1000
Administration	1000
Repair & maintained	1000
Interest	1500
Contribution:	
Sales	95,000
Less variable cost:	
Manufacturing Exp,	78810
Selling expenses	1000

1. Electrical:

S no	ITEM	UNIT	QTY	UNIT RATE	AMOUNT
				(Rs)	(Rs)
1	A)33KV SYSTEM				
1	33KV Isolator 630 amps	Nos	4	45000.00	180,000
2	33KV Lightning Arrestor	Nos	6	9500.00	57,000
3	33KV Current Transformer	Nos	12	29000.00	348,000
4	33kV Potential Transformer	Nos	3	29000.00	87,000
5	33KV Vacuum Circuit Breaker	Nos	4	285000.00	1,140,000
6	750 KVA Auxiliary Transformer 33KV *I* 440V	Nos	1	1150000.00	1,150,000
7	9 MVA Furnace Transformer	Nos	1	10500000.00	10,500,000
8	4500 KV AR, 33KV Capacitor Bank	Nos	1	765000.00	765,000
9	Battery station and charger	Nos	1	245000.00	245,000
10	HT & LT Power and Control Cables	Lot	1	Lump sum	1,800,000
11	Insulators, bus bar & hard ware	Lot	1	Lump sum	300,000
12	Structural items & hard ware	Lot	1	Lump sum	280,000
13	Earthling Material	Lot	1	Lump sum	180,000
II	B) LT & CONTROL PANELS				
1	Main LTDB	Nos	1	750000	750,000
2	Pump house panel	Nos	1	230000	230,000
3	3rd Floor panel	Nos	1	305000	305,000
4	4th Floor panel	Nos	1	325000	325,000
5	Control desk	Nos	1	225000	225,000
6	Pollution panel	Nos	1	430000	430,000
7	Raw material handling system panel.	Nos	1	325000	325,000
8	Feeders Panel	Nos	1	180000	180,000
9	AC & DC distribution boards	Nos	5	25000	125,000
10	VCB Control & relay panel	Nos	4	215000	860,000
11	132/33 KV TRANSFORMER CUM METERING BAY	Lot	1	Lump sum	1,51,43,100
12	132 KV BAY EXTENSION	Lot	1	Lump sum	98,09,900
	Total				**4,57,40,000**

2. FURNACE PLANT AND MACHINERY

				Supply Rate	
S no	ITEM	UNIT	QTY	UNIT RATE	AMOUNT
				(Rs)	(Rs)
1	Main Furnace building	M.ton	380	56,000	2,12,80,000
2	Finished goods shed	M.ton	30	56,000	16,80,000
3	A.C. Sheet Roofing &cladding	Sq.mtr	11500	499	57,40,000
	Total				**2,87,00,000**

3. UTILITY & AUXILARY EQUIPMENT:

				Supply Rate	
S. No	ITEM	UNIT	QTY	UNIT RATE	AMOUNT
				(Rs)	(Rs)
1	Furnace Shell	M.Ton	40	56,000	22,40,000
2	Hood				
	M.S	M.Ton	20	56,000	11,20,000
	S.S	M.Ton	3	3,27,000	9,81,000
3	Pressure rings				
	M.S	M.Ton	5	56,000	2,80,000
4	Mantles				
	M.S	M.Ton	15	56,000	8,40,000
	S.S	M.Ton	3	3,27,000	9,82,000
5	S.S cooling shield	M.Ton	6	3,27,000	19,62,000
6	Chimney & Ducting	M.Ton	24	56,000	13,44,000
7	Shipping Device	M.Ton	6	56,000	3,36,000
8	Casings	M.Ton	10	56,000	5,60,000
9	Charging bins & Chutes	M.Ton	9	56,000	5,04,000
10	Seal boxes	M.Ton	6	56,000	3,36,000
	Total				**1,14,85,000**

Refractory Lining in Furnace Sheet & Carbon paste:				**Supply Rate**	
S No	ITEM	UNIT	QTY	UNIT RATE	AMOUNT
				(Rs)	(Rs)
1	Refractory bricks & Silicon Carbide bricks	Lot	1	62,79,500	62,79,500
2	Carbon tamping paste	M.Ton	95	35,500	33,72,500
3	Cast able & Fire clay mortar	M.Ton	25	40,000	10,00,000
4	Electrode Carbon paste	M.Ton	56	33,000	18,48,000
	Total				**1,25,00,000**

UTILITY & AUXILARY EQUIPMENT

1	E.O.T. Double Girder Crane	Nos	1	31,50,000	3150000
2	Mono rail hoist	Nos	2	4,50,000	900000
3	Skip Hoist	Nos	1	13,50,000	1350000
4	Compressor	Nos	1	10,50,000	1050000
5	C1 Ladles & Pans	Lot	1	15,00,000	1500000
6	Loader	Nos	1	21,50,000	2150000
7	Tipper	Nos	1	14,50,000	1450000
8	Stocking Car	Nos	2	10,35,000	2070000
9	Hydraulic Power packs	Set	2	9,50,000	1900000
10	Main hoisting cylinders	Nos	6	85,000	510000
11	Slipping cylinders	Nos	21	11,500	241500
12	Purnps(Furnace cooling) along with Drive	Nos	2	2,85,000	570000
13	Water softener plant	Nos	1	1,25,000	125000
14	Air Blowers	Nos	5	1,34,700	673500
15	Vibrating Feeders	Nos	16	90,000	1440000
16	Bending machine	Nos	1	4,00,000	400000
17	Cooling Tower	Nos	1	9,50,000	950000
18	RMHS	Nos	1	28,00,000	2800000
19	GAS CLEANING	Nos	1	19,50,000	1950000
20	RM FEEDING	Nos	1	1,35,00,000	13500000
21	Weigh bridge 60 Ton Capacity	Nos	1	12,50,000	1250000
22	Vibrating Screen	Nos	1	3,50,000	350000
23	Pneumatic cylinders	Nos	9	10,000	90000
24	Diesel Generator	Nos	1	8,00,000	800000
25	PLC Based Batching & weighing system	Set	1	13,30,000	1330000
					42500000
	Total Utility & Aux Equipment				**66,48,50,000**

4. FURNACE BUILDING AND CIVIL WORK

				Supply Rate	
S. No	ITEM	UNIT	QTY	UNITE RATE	Amount
				(Rs)	(Rs)
1	Furnace building foundations	c ft	7000	345	24,15,000
2	Furnace Shell foundations	c ft	2500	370	9,25,000
3	Furnace building slabs	s ft	16700	315	52,60,500
4	Furnace control room	s ft	410	550	2,25,500
5	Hydraulic room	s ft	325	450	1,46,250
6	Transformer room	s ft	960	450	4,32,000
7	L.T Room	s ft	515	550	2,83,250
8	Compressor room & Work shop	s ft	1420	550	7,81,000
9	Tapping bay Civil Works	c ft	1500	325	4,87,500
10	Finished goods shed Foundations	c ft	1500	290	4,35,000
11	Finished goods shed Flooring	s ft	4800	240	11,52,000
12	R.M.H.S foundations	c ft	19000	215	40,85,000
13	Raw material sheds civil works	c ft	5600	345	19,32,000
14	Raw material sheds flooring	s ft	8150	235	19,15,250
15	Pump house	s ft	650	475	3,08,750
16	Water tank	c ft	3000	455	13,65,000
17	Laboratory	s ft	875	575	5,03,125
18	Stores building	s ft	1420	550	7,81,000
19	Weigh bridge	c ft	750	365	2,73,750
20	Administrative Building	s ft	1750	670	11,72,500
21	Security office	s ft	325	525	1,70,625
22	Plant Earthing	Nos	15	1050	15,750
23	Cable trenches	Mtrs	275	575	1,58,125
24	33KV Substation Civil Works	L.S	1	1276125	12,76,125
	Total				**2,65,00,000**

5. MISCELLANEOUS FIXED ASSETS

COPPER ITEM

				Supply Rate	
S no	ITEM	UNIT	QTY	UNIT RATE	AMOUNT
				(Rs)	(Rs)
1	Clamps	Kg	21000	625	1,31,25,000
2	Bus bar	Kg	16800	615	1,03,32,000
3	Terminals	Kg	9800	460	45,08,000
4	Cables	Kg	9600	460	44,16,000
5	Cable shoes	Kg	4000	460	18,40,000
6	Flexible	Kg	4790	460	22,03,000
7	Plates	Kg	5100	460	23,46,000
8	gas cleaning	Lot	1	Lumpsum	19,50,000
9	Springs	Lot	1	Lumpsum	5,45,000
10	Insulation material	Lot	1	Lumpsum	11,10,000
11	Machining Items	Lot	1	Lumpsum	38,50,000
12	Conveyor belt, pulleys, rollers & Accessories	Lot	1	Lumpsum	9,40,000
13	Conveyor drives(Motors & Gear boxes)	Lot	1	Lumpsum	18,20,000
14	Tapping	Lot	1	Lumpsum	1,30,00,000
15	Pipe line	Lot	1	Lumpsum	17,20,000
16	Hard ware (S.S & General)	Lot	1	Lumpsum	13,70,000
	Total 5				**6,50,75,000**

6. POLLUTION EQUIPMENT

				Supply Rate	
S no	ITEM	UNIT	QTY	UNIT RATE	AMOUNT
				(Rs)	(Rs)
1	Pollution Equipment	Lot	1	Lumpsum	1,75,00,000
	TOTAL PLANT COST				**25,00,00,000**