PRE-FEASIBILITY REPORT

By

M/s Ramgarh Sponge Iron Pvt. Ltd.

Expansion of sponge iron plant of 90,000 TPA to 2,25,000TPA, Additional installation of 4 x 15 Ton Induction furnace for production of 1,76,400 TPA Billet production, 30 MW Captive Power Plant & Rolling for production of 1,50,000 TPA TMT Bar.

At

Village: Hosir, Po: Dadi,
District: Hazaribagh, Jharkhand

Chapter –1
Executive Summary

M/s Ramgarh Sponge Iron Pvt. Ltd. [hereinafter being referred to as "The Company"], have proposed to setup the integrated steel & power plants at Village:- Hosir, P.O. Dadi, District Hazaribagh, State Jharkhand. The brief description of the project includes:

- Expansion in the exiting sponge Iron Plant of capacity from 90,000 TPA (1 x 300 TPD) to 2,25,000 TPA with additional installation of 1x 100 TPD and 1 x 350 TPD DRI kiln.
- Installation of 4x15 Ton capacity induction furnaces with production capacity 1,80,000 TPA
- Installation of 3x6/ 11m radius billet caster for production of 1,76,400 TPA billet.
- Installation of 1 x500 TPD rolling mill for production of 1,50,000 TPA TMT bar.
- Power generation through Waste Heat Recovery from 4 x 100 TPD & 1x350 TPD DRI Kilns by installing 16 MW power plant and installation of 14 MW AFBC boiler for utilization of char.

The facilities are planned with prime objective of (a) recovering all sensible heat from the by product flue gas from sponge iron unit (b) harnessing power from 100% utilization of another byproduct Dolo Char (c) use of generated power for further value addition i.e. Induction melting

The existing project is running on CTO granted vide no. JSPCB/HO/RNC/CTO-2012080/2018/ 976 dated 11.06.2018 by Jharkhand State Pollution Control Board for production of 3 x 100TPD sponge iron plant.

At present the employment generation for the project is 130 no. The additional estimated manpower requirement for the proposed project is 530 numbers making the total employment post projects is 660

Project location is Village Hosir, P.O. Dadi, District Hazaribagh, State Jharkhand. The Google Map coordinates are as follows:

Coordinate	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Latitude	23˚42'40.47" N	23˚42'38.56" N	23˚42'38.06" N	23˚42'33.26" N	23˚42'30.93" N	23˚42'29.86" N	23˚42'33.14" N
Longitude	85˚24'5.69"E	85˚24'11.46"E	85˚24'19.61"E	85˚24'22.84"E	85˚24'18.21"E	85˚24'11.54"E	85˚24'5.60"E

The plant site is connected through Giddi Naya More road at a distance of 0.5 Km from the plant Boundary. This road connects to NH 33 which runs at a distance of about 12 km away from the plant boundary. The project site is located at a distance of 12 Km from Kuju railway station. Nearest City is Kuju at a distance of 12 Km and Ramgarh at a distance of 25 Km from the project site. The capital city Ranchi is at a distance of 70 km from the project site.

Total land available for existing and expansion is 22.2157 acres. Total water requirement for the project will be 2735.50 KLD and for the proposed expansion project the water will be sourced from Damodar River through surface pipeline to be laid after due permission of the department.
Power requirement for the proposed expansion project will be 30 MW and sourced from the captive power plant.

The estimated cost for the proposed project for will be Rs. 346 Crores.

Chapter 2
Introduction of the Project/ Background Information

2.1 BRIEF DESCRIPTION OF THE NATURE OF THE PROJECT

M/s Ramgarh Sponge Iron Pvt. Ltd. [hereinafter being referred to as "The Company"], have proposed to setup the integrated steel & power plants at Village:- Hosir, P.O. Dadi, District Hazaribagh, State Jharkhand. The brief description of the project includes:

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The facilities are planned with prime objective of (a) recovering all sensible heat from the by product flue gas from sponge iron unit (b) harnessing power from 100% utilization of another by product Dolo Char (c) use of generated power for further value addition i.e. Induction melting

Background of the Project

The existing project is running on CTO granted vide no. JSPCB/HO/RNC/CTO-2012080/2018/ 976 dated 11.06.2018 by Jharkhand State Pollution Control Board for production of 3 x 100TPDsponge iron plant.

Company and Director's Profile:

M/s Ramgarh sponge Iron Pvt. Ltd. is private limited company carrying out business in production of sponge Iron. The group has a long experience in mineral mining and trading. The company has been promoted by a group of experienced business man who are presently engaged in manufacturing and trading of various products.

Directors:
Mr. Mahabir Prasad Rungta
Mr. Ravindra Marla

2.2 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY AND OR REGION

AN OVERVIEW OF STEEL SECTOR- GLOBAL SCENARIO

(Source: Ministry of Steel, Government of India)

In 2017, the world crude steel production reached 1690 million tonnes (mt) and showed a growth of 4% over 2016. China remained world's largest crude steel producer in 2017 (832 mt) followed by Japan (105 mt), India (101.4 mt) and the USA (82 mt). World Steel Association has projected Indian steel demand to grow by 7.5% in 2018 and by 7.3% in 2019 while globally, steel demand has been projected to grow by 3.9% in 2018 and by 1.4% in 2019. Chinese steel use is projected to grow by 6% in 2018 and show nil growth in 2019. Per capita finished steel consumption in 2017 is placed at 212 kg for world and 523 kg for China by World Steel Association. The same for India was 69 kg in 2017. There is tremendous scope for expansion of domestic steel industries to cater to the need of domestic market and for exports. India is endowed with good quantity and quality of iron ore and non coking coal required for steel making through sponge iron route.

Domestic Scenario

The Indian steel industry has entered into a new development stage, post de-regulation, riding high on the resurgent economy and rising demand for steel. Rapid rise in production has resulted in India becoming the 2nd largest producer of crude steel during the current year (2018) so far, from its 3rd largest status in 2017. The country is also the largest producer of sponge iron or DRI in the world and the 3rd largest finished steel consumer in the world after China & USA. In a de-regulated, liberalized economic/market scenario like India the Government's role is that of a facilitator which lays down the policy guidelines and establishes the institutional mechanism/structure for creating conducive environment for improving efficiency and performance of the steel sector. In this role, the Government has released the National Steel Policy 2017, which has laid down the broad roadmap for encouraging long term growth for the Indian steel industry, both on demand and supply sides, by 2030-31. The said Policy is an updated version of National Steel Policy 2005 which was released earlier and provided a long-term growth perspective for the domestic iron and steel industry by 2019-20. The Government has also announced a policy for providing preference to domestically manufactured Iron & Steel products in Government procurement. This policy seeks to accomplish PM's vision of 'Make in India' with objective of nation building and encourage domestic manufacturing.

In 2017-18, production of total finished steel (alloy + non alloy) was 126.85 mt, a growth of 5.6% over last year. Production of Pig Iron (through Blast Furnace Route) in 2017-18 was 5.73 mt, a decline of 45% over last year. India was the largest producer of sponge iron in the world. The coal based route accounted for 79% of total sponge iron production (30.51 mt) in the country in 2017-18. Data on production of pig iron, sponge iron and total finished steel (alloy/stainless + non alloy) are given below for last five years and April-November 2018-19 (prov.)

Indian Steel Making Capacity (in million tons) – Source: Joint Plant Committee, GoI

Category	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19##
Pig Iron	8.35	10.23	10.24	10.34	5.53	3.94
Sponge Iron	22.87	24.24	22.43	28.76	30.51	19.62
Total Finished	99.38	104.58	106.60	120.14	126.85	85.96

2018-19 data is for 8 months Apr-Nov'18 (Provisional)

India's economic growth is contingent upon the growth of the Indian steel industry. Consumption of steel is taken to be an indicator of economic development for any country/ region in the world. While steel continues to have a stronghold in traditional sectors such as construction, housing and surface transportation, special steels are increasingly used in engineering industries such as power generation, petrochemicals and fertilizers. India occupies a central position on the global steel map, with the establishment of new state-of-the-art steel mills, acquisition of global scale capacities by players, continuous modernization and up gradation of older plants, improving energy efficiency and backward integration into global raw material sources.

Government Initiatives

Some of the other recent government initiatives in this sector are as follows:

- An export duty of 30 per cent has been levied on iron ore (lumps and fines) to ensure supply to domestic steel industry.

- Government of India's focus on infrastructure and restarting road projects is aiding the boost in demand for steel. Also, further likely acceleration in rural economy and infrastructure is expected to lead to growth in demand for steel.

- The Union Cabinet, Government of India has approved the National Steel Policy (NSP) 2017, as it seeks to create a globally competitive steel industry in India. NSP 2017 envisages 300 million tonnes (MT) steel-making capacity and 160 kgs per capita steel consumption by 2030-31.

The Ministry of Steel is facilitating setting up of an industry driven Steel Research and Technology Mission of India (SRTMI) in association with the public and private sector steel companies to spearhead research and development activities in the iron and steel industry at an initial corpus of Rs 200 crore (US$ 30 million).

Road ahead

India is expected to overtake Japan to become the world's second largest steel producer soon. The National Steel Policy, 2017, has envisaged 300 million tonnes of production capacity by 2030-31. In 2018, steel consumption of the country is expected to grow 5.7 per cent year-on-year to 92.1 MT*. Further, India is expected to surpass USA to become the world's second largest steel consumer in 2019*. Huge scope for growth is offered by India's comparatively low per capita steel consumption and the expected rise in consumption due to increased infrastructure construction and the thriving automobile and railways sectors.

Going forward, growth in India is projected to be higher than the world average, as the per capita consumption of steel in India, at around 52 kg, is well below the world average (170 kg) and that of developed countries (400 kg). Indian demand is projected to rise to 300 million tonnes by 2025. Steel production capacity in India is expected to touch 170 million tonnes by 2020. While Greenfield projects are slated to add 30 million tonnes, brownfield expansions are estimated to add 50 million tonnes to the existing capacity of 90 million tonnes. Steel is manufactured as a globally tradable product with no major trade barriers across national boundaries to be seen currently. There is also no inherent resource related constraints which may significantly affect production of the same or its capacity creation to respond to demand increases in the global market. Even the government policy restrictions have been negligible worldwide and even if there are any the same to respond to specific conditions in the market and have always been temporary. Therefore, the industry in general and at a global level is unlikely to throw up substantive competition issues in any national policy framework. Further, there are no natural monopoly characteristics in steel. Therefore, one may not expect complex competition issues as those witnessed in industries like telecom, electricity, natural gas, oil, etc.

2.3 DEMAND AND SUPPLY GAP

Demand for steel has always been in rise and remained high without any slump is last 5 decades

The Growth Profile has been as follows

(i) **Steel** : The liberalization of industrial policy and other initiatives taken by the Government have given a definite impetus for entry, participation and growth of the private sector in the steel industry. While the existing units are being modernized/expanded, a large number of new steel plants have also come up in different parts of the country based on modern, cost effective, state of-the-art technologies. In the last few years, the rapid and stable growth of the demand side has also prompted domestic entrepreneurs to set up fresh green field projects in different states of the country. Crude steel capacity was 137.97 mt in 2017-18, up by 7.6% over 2016-17 and India, which emerged as the 2nd largest producer of crude steel in the world in 2018 so far, as per provisional production data released by the World Steel Association, has to its credit, the capability to produce a variety of grades and that too, of international quality standards.

(ii) **Sponge Iron:** India, world's largest producer of sponge iron (2017, prov.), has a host of coal based units located in the mineral-rich states of the country. Over the years, the coal based route has emerged as a key contributor and accounted for 79% of total sponge iron production in the country. Capacity in sponge iron making too has increased over the years and stood at 49.6 mt (2017-18). -

2.4 EXPORT POSSIBILITY

Iron & steel are freely exportable. India emerged as a net exporter of total finished steel in 2016-17 and 2017-18. Data on export of total finished steel (alloy/stainless + non alloy) is given below for last five years and April-November 2018-19 (prov.):

Indian steel industry : Exports of Total Finished Steel (in million tonnes)
Source: Joint Plant Committee

2013-14	2014-15	2015-16	2016-17	2017-18	2018-19*
5.99	5.59	4.08	8.24	9.62	4.08

*provisional for Apr-Nov period.

Steel exports are at 25-28% of total finished steel production in the global market and in India it is only 11-12%, there is a huge potential for Indian steel exports to grow in the coming years. While more exports enlarge the scope of operation of the producers and expose it to the vagaries of stiff competition in the global market, the experience can be replicated in the domestic market. The lessons learnt in areas of quality specifications, maintaining strict delivery schedules, loading and stevedoring and above all fixing of competitive prices out of strong negotiation are crucial take away for the domestic markets.

The export basket, which was heavily loaded with plates a decade ago, currently comprises both long and flat products. This unmistakably indicates a qualitative transformation of Indian steel industry. The technological up-gradation of the old mills and superior technology of the new mills have enabled Indian steel industry to attain a distinctive mark in the global market. It is heartening to note that apart from major steel producers, a few medium and small enterprises have also participated in the export of alloy and SS, billets, **TMT bars**, wire rods, GP/GC sheets and pipes. Alloy/SS **TMT** and wire rods have been exported by medium-scale private steel producers. After some semblance of normality in the Euro crisis,

2.5 DOMESTIC/EXPORT MARKETS

2.5.1 DOMESTIC MARKETS

As per the report of the Working Group on Steel for the 12th Plan, there exist many factors which carry the potential of raising the per capita steel consumption in the country, currently at 59.2 kg to 160kg by 2030. These include among others, an estimated infrastructure investment of nearly a trillion dollars, a projected growth of manufacturing from current 8% to 11-12%, increase in urban population to 600 million by 2030 from the current level of 400 million, emergence of the rural market for steel currently consuming around 10 kg per annum buoyed by projects like Bharat Nirman, Pradhan Mantri Gram Sadak Yojana, Pradhan Mantri Awaas Yojana among others.
Major Objectives of the National Steel Policy 2017 are as follows:

a) To attract investments in Indian steel sector from both domestic and foreign sources and facilitate speedy implementation of investment intentions on board so far so as to reach crude steel capacity level of 300 million tonnes by 2025-26 to meet the domestic demand fully.

b) To ensure easy availability of vital inputs and necessary infrastructure to achieve a projected production level of 275 million tonnes by 2025-26.

While the demand for steel will continue to grow in all sectors like automotive, steel tubes and pipes, consumer durables, packaging and ground transportation, specialized steel in hi-tech engineering industries such as power generation, petrochemicals, fertilizers etc, maximum thrust will be on infrastructure sectors like construction and housing. The new airports and railway metro projects will require a large amount of steel.

The demand for Sponge Iron had risen significantly in recent years. The growth curve of Sponge Iron has always remained higher than the growth curve of finished steel for past 2 decades. This is because more than 60% of steel making capacity addition is through the Secondary (& DRI route). Technological up-gradation and growing scarcity of Coking Coal will keep this trend for immediate and long term horizon.

2.5.2 EXPORT MARKETS

Indian steel exporters have now targeted Italy, Belgium, Poland, Spain and Turkey as major centres (27% of total exports) for bars and rods, CRC, GP/GC, plates, HRC, alloy/SS. The neighbouring markets in Bangladesh, Sri Lanka, Nepal and Myanmar importing billets/slabs, bars/rods, structurals, HRC and CRC from India account for around 15% of total steel exports. The SE Asian markets of Indonesia, Thailand and Malaysia importing semis, GP/GC, HRC, structurals, CRC, alloy/SS from India account for 11% of total steel exports. In the Middle East, Indian exports cater to UAE and Saudi Arabia (9% of total exports) for semis, bars and rods, HRC, CRC and GP/GC sheets, alloy/SS. While USA (4% of total exports) imports bars/rods and GP/GC from India, Vietnam (9% of total exports) has emerged an important destination for Indian exports of bars/rods and HRC.

2.6 EMPLOYMENT GENERATION (DIRECT AND INDIRECT) DUE TO THE PROJECT

At present the employment generation for the project is 130 no. The additional estimated manpower requirement for the proposed project is 530 numbers making the total employment post projects is 660
The details of employment generation for the proposed project will be as below:

Unit	Existing	Proposed
Existing Sponge Iron Plant	130	150
Power Plant		100
Steel Melting Shop		160
Rolling Mill		120
Total	**130**	**530**

Indirect employment generation is expected to be more than 1200 persons

Facilities for the Employees:

The following facilities will be provided for the employees in the plant premises:

1. Administrative building and technical office

2. Construction office and store
3. Time and security office
4. First aid and rest room
5. Canteen and welfare center
6. Toilet and changing Room
7. Parking area

Chapter – 3
PROJECT DESCRIPTION

3.1 TYPE OF THE PROJECT

M/s Ramgarh Sponge Iron Pvt. Ltd. [hereinafter being referred to as "The Company"], have proposed to setup the integrated steel & power plants at Village:- Hosir, P.O. Dadi, District Hazaribagh, State Jharkhand. The brief description of the project includes:

- Expansion in the exiting sponge Iron Plant of capacity from 90,000 TPA (1 x 300 TPD) to 2,25,000 TPA with additional installation of 1x 100 TPD and 1 x 350 TPD DRI kiln.
- Installation of 4x15 Ton capacity induction furnace with production capacity 1,80,000 TPA
- Installation of 3x6/ 11m radius billet caster for production of 1,76,400 TPA MS Billet.
- Installation of 1 x500 TPD rolling mill for production of 1,50,000 TPA TMT Bar.
- Power generation through Waste Heat Recovery from 4 x 100 TPD & 1x350 TPD DRI Kilns by installing 16 MW power plant and installation of 14 MW AFBC boiler for utilization of char.

3.2 LOCATION OF THE PROJECT

Project location is Village Hosir, P.O. Dari, District Hazaribagh, State Jharkhand. The Google Map coordinate are as follows:

Coordinate	A	B	C	D	E	F	G
Latitude	23˚42'40.47"N	23˚42'38.56"N	23˚42'38.06"N	23˚42'33.26"N	23˚42'30.93"N	23˚42'29.86"N	23˚42'33.14"N
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The plant site is connected through Giddi- Naya More Road at a distance of 0.5 Km from the plant Boundary. This road connects to NH 33 which runs at a distance of about 12 km away from the plant boundary. The project site is located at a distance of 12 Km from Kuju railway station. Nearest City is Kuju at a distance of 10 Km and Ramgarh at a distance of 25 Km from the project site. The capital city Ranchi is at a distance of 70 km from the project site.

The project has a good raw material linkage from different mines of Joda- Barbil region for Iron ore and CCL for coal requirement of the plant. The location map showing the project site attached as **Annexure1**

The site is well in accordance with the guidelines issued by MOEF. The following are the salient features of the site.

(a) Nearest habitation is at Hosir at a distance of about 0.8 Km.

(b) The land has been acquired by the company

(c) There are no National Parks, Wild life Sanctuaries and Bird Sanctuaries within 10 Km radius.

(d) Topography of the land is more or less flat without many undulations.

(e) No clearance of vegetation is required thus there will not be any Soil erosion.

(f) No habitations within the site. Hence rehabilitation & resettlement are not involved.

(g) No forest land is involved in the existing plant or in proposed expansion.

LAND USE STATEMENT
Total land available for existing and expansion is 22.2157 acres. The details of land specification has been given as **Annexure 2.** The land use break up for the existing and proposed unit is as below:

Sl. No	Type of use	Area (in acres)
1	Plant area (Existing and Expansion)	9.7157
2	Administrative office and other	1.0
3.	Road and Paved area	1.50
4.	Storage and Solid waste handling area	2.50
5.	Green belt	7.50
	Total	**22.2157**

The layout plan showing the existing and proposed plant has been given in **Annexure 3.**

3.3 DETAILS OF THE ALTERNATE SITES

In order to achieve Synergy of Operations and to avoid overhead expenses for multiple units, no alternative site has been considered.

3.4 SIZE OR MAGNITUDE OF OPERATION

3.4.1: UNIT Details

Proposed project is for expansion of existing Sponge Iron Plant from 90,000 TPA DRI production to 2,25,000 TPA DRI production and installation of 4x15 Ton Induction Furnace for 1,76,400 TPA billet production and 30MW Captive Power generation using sensible heat of DRI gas in waste Heat Recovery Boilers and utilizing char, produced as by-product in DRI Kiln in AFBC Boiler, supplemented with Coal & 1x500 TPD Rolling Mill with Production of 1,50,000 TPA TMT Bar.

Capacities and Facilities of existing plant and proposed plant are as follows:

UNITS	EXISTING UNITS		PROPOSED UNITS		FINAL CONFIGURATION	
	UNIT	PRODUCTION ON TPA	UNIT	PRODUCTION TPA	UNIT	PRODUCTION TPA
Sponge Iron Plant – 90,000 TPA						
DRI KILNS	3x100TPD	90,000	1x100 TPD And 1x350TPD	1,35000	4x100TPD And 1x350 TPD	2,25,000
Steel Melting Shop – 1,76,400 TPA MS Billets						
INDUCTION FURNACE	---	---	4x15 Ton	1,80,000	4x15 Ton	1,80,000
BILLET CASTER	---	----	3x6/11 m radius	1,76,400	3x6/11 m radius	1,76,400

3.4.2: Raw Material & Other Inputs Required

Sl. No	Item	Requirement in TPA			Source and Transportation
		Existing	Proposed	Total	
Sponge Iron Unit					
01	Iron ore	1,44,000	2,16,000	3,60,000	Mines of Odisha and Jharkhand –by rail rake and by road
02	Non Coking coal	1,17,000	1,75,000	2,92,000	CCL by road, Rail rake
03	Dolomite/Limestone	2700	4050	6750	Chattishgarh by Road
Power plant (WHRB)					
04	Hot Flue gas	4 x 2500 Nm3/ hr from ABC of DRI Kilns (4x100T) and 1 x 100000 Nm3/hr from ABC of DRI kiln of 1 x 350 T			
Power plant (AFBC)					
	Item	Composition per unit of Fuel	Requirement MT per day		Requirement Mt per Year
05	Char (CV -2000 Kcal/ Kg)	0.40	244.00		73200
06	Char (CV -5000 Kcal/ Kg)	0.60	146.00		43800.00
Steel melting Shop					
	Name of Raw material	Qty. Required per metric ton of production (MT)			Total qty Required per annum
07	Sponge Iron	1.0			180000 TPA
08	Scrap	0.24			43200 TPA

3.5 MANUFACTURING PROCESS

3.5.1 DRI KILN BASED SPONGE IRON PLANT

Sponge iron, also known as "Direct Reduced Iron" (DRI) and its variant Hot Briquetted Iron (HBI) have emerged as prime feed stock which is replacing steel scrap in EAF/IF as well as in other steel-making processes. It is the resulting product (with a metallization degree greater than 80%) of solid state reduction of iron ores or agglomerates (generally of high grade), the principal constituents of which are metallic iron, residual iron oxides, carbon and impurities such as phosphorus, sulphur and gangue (principally silica and alumina). The final product can be in the form of fines, lumps, briquettes or pellets. This project envisages sponge iron production in forms of fines, lumps and/or pellets.

Direct reduction processes available can be broadly grouped under two categories based on the type of reductant used. These are:

- Solid based processes
- Gas based processes

Since the project is situated close to major Coal mines of India and there is no availability of Gas in the vicinity, the project is envisaged "Coal based" which is a solid based process.

Solid Based Processes

From amongst various solid based processes, only a few have attained commercial significance. Most of the processes such as SL/RN, KRUPP-CODIR, DRC, TDR, SIIL, JINDAL, OSIL, Popuri utilise rotary kiln for reduction whereas Kinglor Metor process utilises an externally heated vertical retort.

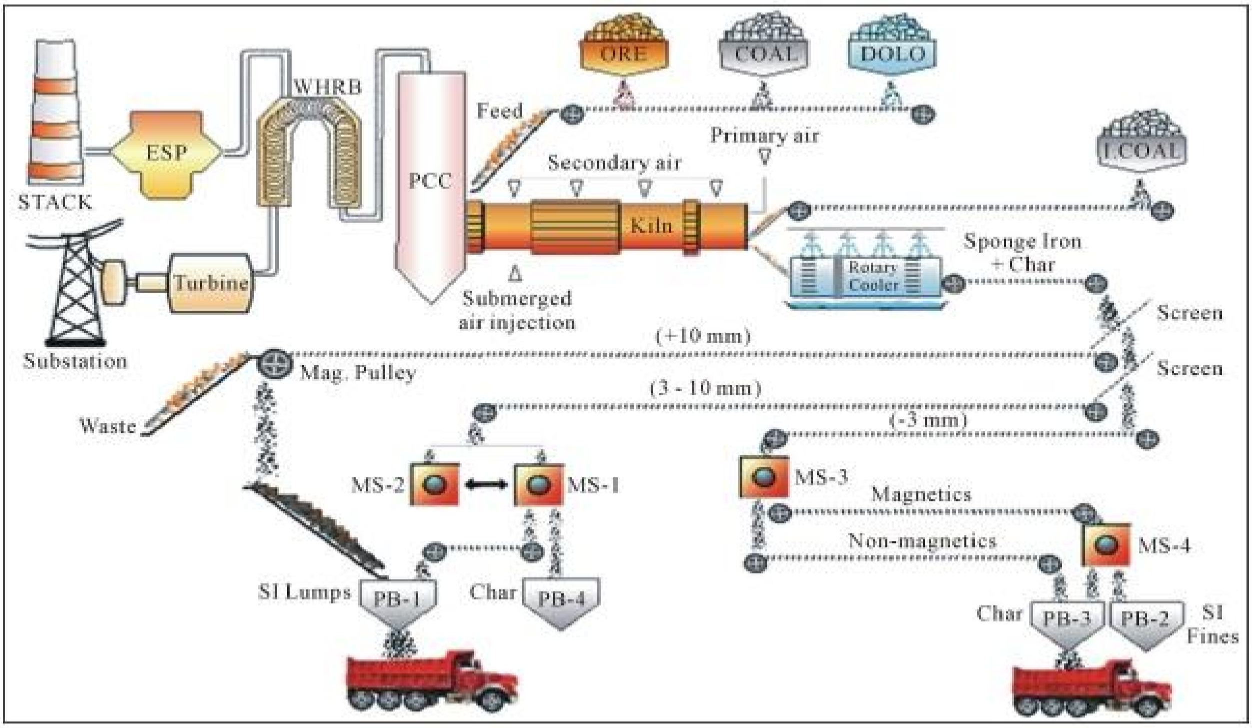
The project will utilize Rotary Kiln based facility for production.

Process Technology

In this project reduction will be conducted in a refractory lined rotary kiln. The kiln of suitable size, inclined at 2.5 % slope and dynamically resting on four support stations will be used. The transport rate of materials through the kiln can be controlled by varying its speed of rotation. There are inlet and outlet cones at opposite ends of the kiln that are cooled by individual fans. The kiln shell will be provided with small sampling ports, as well as large ports for rapid removal of the contents in case of emergency or for lining repairs. The longitudinal positioning of the kiln on its riding rings will be controlled hydraulically.

Calibrated raw materials like Iron ore, Coal and Dolomite shall be metered and fed into the high end of the inclined kiln which is also termed at inlet end. A portion of the finer size of coal will be slinged into or injected pneumatically through the outlet end of the kiln. The raw material burden fed through inlet end first passes through a pre-heating zone where coal de-volatilization takes place and iron ore is heated to pre-heating temperature for reduction.

The schematic layout of a DRI Plant is given below:



Temperature and process control in the kiln are carried out by installing suitable no. of air injection tubes made of heat-resistant steel spaced evenly along the kiln length and counter current to the flow of raw materials. Tips of the air tubes are equipped with special internal swirlers to improve uniformity of combustion.

A central burner located at the kiln discharge end is used with HSD or LDO for heating the cold kiln during start up. After initial heating, the HSD/LDO supply is turned off and the burner is used to inject air for coal combustion.

The kiln temperatures are measured with fixed thermocouples and Quick Response Thermocouples (QRT). Fixed thermocouples are located along the length of the kiln so that temperatures at various sections of the kiln can be monitored. Fixed thermocouples, at times may give erratic readings in case they get coated with ash, ore or accretion. In such cases QRT are used for monitoring the kiln temperatures.

The product (DRI) is discharged from the kiln at about 1000°C. An enclosed chute at the kiln discharge end equipped with a lump separator and an access door for removing lumps transfers the hot DRI to a rotary cooler. The cooler is a horizontal revolving cylinder of appropriate size. The DRI is cooled indirectly by water spray on the cooler outer surface. The cooling water is collected in troughs below the cooler and pumped to the cooling tower for recycling along with make-up water.

Solids discharged to the cooler through an enclosed chute are cooled to about 100°C without air contact. A grizzly in the chute removes accretions that are large to plug up or damage the cooler discharge mechanisms. The product is screened to remove the plus 30mm DRI. The undersize – a mix of DRI, dolo char and coal ash are screened into +/- 3mm fractions. Each fraction passes through a magnetic separator. The non-magnetic portion of each fraction is Char and it is suitable for combustion in AFBC based Boilers . The magnetic portion of each fraction is DRI or Sponge Iron which can be used directly for steel making.

The kiln waste gases at about 850-900°C pass through a dust settling chamber where heavier dust particles settle down due to sudden decrease in velocity of gases. The flue gases then pass through an after burning chamber where un-burnt combustibles are burnt by blowing excess air. The temperature of the after burner chamber, at times, is controlled by water sprays. The burnt gases will then pass through a down duct into a waste heat recovery based boiler where the sensible heat in the flue gas will be used for generating steam for power production and in the process the flue gas temperature will be brought down. Then it will pass through pollution control equipment namely Electrostatic Precipitator (ESP) where balance dust particles will be separated. Then the gas is let off into the atmosphere through stack via ID fan.

Reaction mechanism

In solid based processes, the non-coking coal and iron ore which are at intimate contact start reacting at the prevailing temperature.

There are two major temperature zones in the kiln. The first pre-heat zone is where the charge is heated to 900 – 1000°C. The second metallization zone is held fairly constant at 1000-1050°C. The charge into the kiln consists of a mixture of iron oxide lump, fluxes such as limestone and/or dolomite (amount depending of sulfur content of the coal) and medium volatile non-coking coal. In the pre-heating zone, the moisture is driven off first, and then the hydrocarbons and hydrogen evolve by thermal decomposition of the coal.

As the combustible gases rise from the bed of solid material, a portion of the gases is burnt in the free board above the bed by controlled quantities of air introduced through the air tubes. As the kiln rotates, the primary mode of heat transfer is by radiation to the tumbling charge and subsequently by internal solids mixing and renewal of the exposed bed surface.

In the pre-heat zone, the reduction of iron oxide proceeds only to ferrous oxide (FeO) (Equation I).

$Fe_2O_3 + CO = 2\ FeO + CO_2$ .... (I)

Final reduction to metallic iron occurs in the metallization zone by reaction of CO with FeO to form CO_2 and metallic iron (Equation II).

$FeO + CO = Fe + CO_2$ .... (II)

Most of the CO_2 reacts with the excess solid fuel in the kiln and is converted to CO according to the Boudouard reaction (Equation III).

$CO_2 + C = 2\ CO$ .... (III)

Coals with higher reactivity are preferred as they provide rapid conversion of CO_2 to CO, thereby maintaining reducing conditions in the kiln metallization zone. The highly endothermic reaction of coal with CO_2 prevents the bed from over-heating and attaining high temperature that could lead to melting or sticking of the charge.

High coal reactivity decreases the reduction zone bed temperature but increases the relative capacity. Desired bed and gas temperature in the freeboard can be achieved with high reactivity fuels even with very high throughput rates.

Air admitted to the ports below the bed in the pre-heat zone will burn some of the gases that otherwise leave the kiln un-burnt to improve fuel consumption

The major plant facilities for the Sponge Iron plant envisaged are as follows:

- Day bins
- Rotary Kiln & Cooler
- Central Control Room
- Product processing and product storage
- Off gas system including waste heat recovery power generation

There will be one day bin building for the kilns. The day bin building will have bins for meeting raw material required for kiln. This bin will have the storage facility for iron ore, feed coal, dolomite etc.

This hot Sponge Iron will be transferred to rotary cooler. In rotary cooler the material will cool from 1000^0C to 100^0C in cooler by spraying of cooling water at outer side. The material after discharge from the cooler is dropped on to the cooler discharge conveyor. A diversion chute is provided at the head end of this conveyor for diversion of the material in case of break down in the production separation. The material is then sent to the product separation system consisting of double deck screen, where the material is screened to 0-3mm and 3-20 mm size fractions. The oversize i.e. +20 mm obtained is small quantity and taken to the floor or diverted to the sponge Iron bin. The 0-3 mm sized fraction is called the fines and the non magnetic char get separated and are fed to the respective bins through the chutes and conveyor. The

coarser fraction is similarly separated by another magnetic separator and fed to respective bins. The magnetic fraction is called the sponge iron lumps and the non magnetic as char, which is un burnt coal.
The gases, which flow in the contour current direction of the material, go to the dust – setting chamber where the heavier particles settle down. The particles are continuously removed by the excess air available. The gases are at high temperature ad have lot of heat energy which will be utilized in WHRB for power generation. The hot gases after heat recovery boiler get cooled at 200˚C. The gases are then scrubbed and let of to the atmosphere at 80˚C through the chimney.

3.5.2 STEEL MELTING SHOP

In Steel Melting Shop (SMS), Sponge Iron will be melted along with melting scrap and fluxes to make pure liquid steel and then to mould it in required size billets. The SMS will consist of following equipment and subassemblies:

3.5.2 (a) Induction Furnace:

Induction Furnaces is a device to melt the charge material using electrical power. We shall use Core less Medium Frequency 6000kW rated dual crucible Induction Furnaces in the proposed unit. It consists of Crucible lined with water cooled induction coils, Electrical system to give controlled power to induction coil, Hydraulic tilting system, Heat exchanger to cool the circulating water, water softener for generating soft water, furnace transformer, Power Factor improvement system and surge suppressor. The melt rate achieved shall be 11tons per hour excluding charging time, tapping time and de-slagging time.
Coreless induction furnaces have been used in the ferrous industry for over 50 years and are now one of the most popular means of melting and holding ferrous materials. Induction melting had dramatic growth during the 1960s based on line frequency technology, and later with the large-scale introduction of medium frequency power supply during the 1980s. Making of mild steel in the induction furnace was first experimented during early 1980s and it gained popularity when the production of sponge iron utilizing coal based process of rotary kilns became popular.
The principle of induction melting is that a high voltage electrical source from a primary coil induces a low voltage, high current in the metal (secondary coil). Induction heating is simply a method of transfer of the heat energy. Two laws which govern induction heating are (i) electromagnetic induction, and (ii) the joule effect.
Coreless induction furnace comprises a relatively thin refractory crucible encircled by a water cooled copper coil excited from a single AC supply. When the coil is energized, the fluctuating axial magnetic field causes a current to flow in electrically conducting pieces of charge material within the crucible. The power induced in the charge depends on the physical properties of the material, the flux linking it and its geometric shape. Dependent on the resistivity of the material being melted, the coreless induction furnace converts electrical energy to heat the charge at an efficiency of between 50 % and 85 %, although furnace efficiency is further reduced by thermal losses from radiation from the melt surface and conduction through the furnace lining.
The role of carburizer during steelmaking in the induction furnace is to remove oxygen from the sponge iron which is present in the form of FeO and to provide carbon pick up in the liquid steel to the desired level. Petroleum coke and anthracite coal are two popular carburizers being used during steelmaking in the induction furnace. However carbon input in the bath through pig iron or cast iron scrap is more desirable in order to have better recovery of carbon. Other carburizers which can be used are metallurgical coke, iron carbide and metallurgical silicon carbide (63 % silicon and 31 % carbon). Silicon carbide is normally charged with scrap and has the advantages of (i) faster absorption, (ii) acts as an de-oxidizer, and (iii) improves lining life.

An accurate calculation of the necessary charge -mix based on material analyses, and a precise weight determination and metering of charge materials and additives (carburizer and additives) are basic prerequisites for minimizing melting times and power needs besides ensuring proper composition of the liquid steel.

Pollution Control Measures The Induction Furnace Unit shall be equipped with (a) Helmet type swivelling Hood for suction of gases to a suitable Bag Filter through two cyclones (b) There shall be additional suction hoods mounted on the walls and roof of the Induction Furnace shed to suck up extra fumes and fumes released during tapping operations.
The steps involved in operation of induction furnace are shown in Figure below.

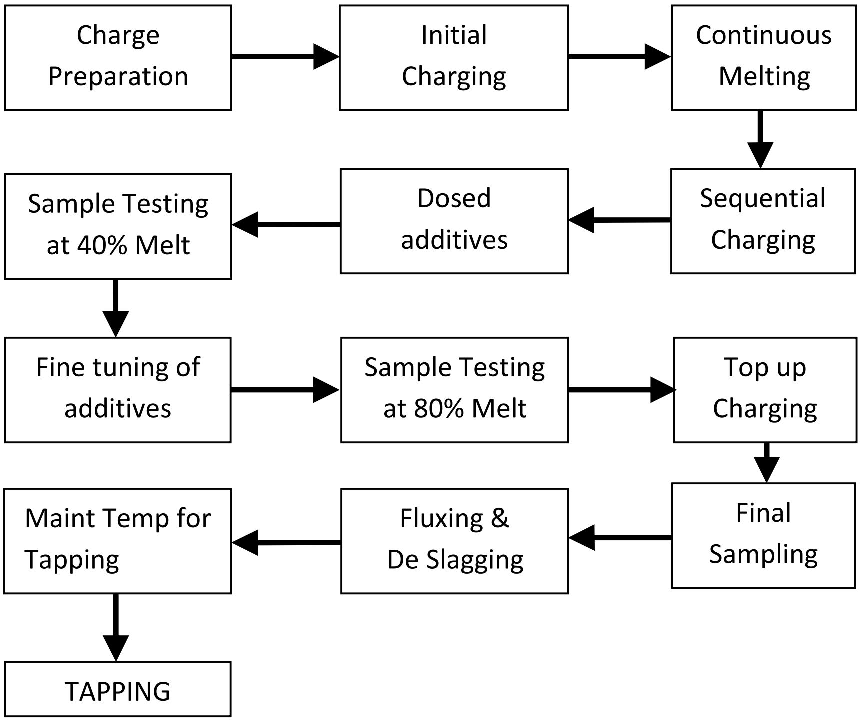


Figure : Stages of operation during steelmaking in an induction furnace

Charge preparation and charging

Energy consumption is significantly increased by incorrect charging practices. The worst practice is to charge a small amount and wait for melting to occur before adding further material. The best practice is to add charge to the level of the top of the power coil and to top up as the charge sink downs. The raw materials are required to be weighed and arranged on the operating floor near the furnace before starting a heat. The raw materials to be charged are stored in suitable containers and are to be ready for charging by the chosen method. The carburizer and additives are to be weighed accurately and handled properly to avoid wastages during handling.

The maximum size of single piece of metal/scrap is to be less than 0.4 times the diameter of the furnace crucible. It avoids problem of bridging. Further each charge of metal/scrap is to be around 10 % of the volume of the furnace crucible. Also, it is to be ensured that there is practically no sharp edges since this can damage the refractory.

Medium frequency coreless furnaces are operated without a sump (heel). Charging method to be adopted is mechanical. For magnetic materials such as steel scrap, cast iron, pig iron and mill returns, overhead crane fitted with electromagnet is used for direct charging of the furnace. Sponge iron will be charged through mechanical conveyors fitted with weigh feeders for proper metering / dozing.

Melting and slag removal

The material is charged into the empty furnace up to the upper edge of the furnace coil. When the electrical power supply is switched on, a voltage is induced in the charged material, which causes strong eddy currents. Due to the high electric current and the resistance of the material, the material is heated up to the point of melting. The melting material settles together, and the furnace can be recharged with more material. In medium frequency furnaces, the material is not charged into the liquid bath, but onto the still solid material.

Due to sponge iron in the charge, the oxygen present in the sponge iron in the form of FeO, reacts vigorously with carbon in the liquid bath and improves heat transfer, slag metal contact and homogeneity of the bath.

For smoothening of the melting operation, periodical removal of slag is required as it gets solidifies on top of the liquid bath and hinders further melting of the sponge iron. Sponge iron can be added directly into the liquid metal when the stirring action accelerates the transfer of heat to it and promotes the melting. Care is needed to ensure that there is enough liquid pool before adding sponge iron. Irrespective of charging mode, sponge iron is always charged after initial formation of molten pool (i.e. hot heel) by melting of steel scrap. Melting of sponge iron is greatly influenced by factors like carbon content of the liquid bath and degree of metallization of sponge iron. Carbon content of the liquid bath reacts with unreduced iron oxide content of the sponge iron giving evolution of CO and CO2 gases from liquid bath i.e. carbon boil takes place, which results into subsequent removal of hydrogen and nitrogen gases, ultimately producing clean steel.

Carbon boil occurs at slag metal interface by the reaction

$$3\ FeO + 2C = 3\ Fe + CO + CO2.$$

Carbon content in the liquid bath is to be kept at a proper level in order to maintain appropriate carbon boil during the melting period. The amount of carbon required (C, in kg) to reduce the FeO content of the sponge iron is given by the equation

$$C = 1.67\ [100 - \%\ M - \{(\%\ Slag\ /100) \times \%\ Fe\}].$$

Here, M is degree of metallization and Fe is amount of iron in the slag.

Carbon in the form of anthracite or petroleum coke is normally added throughout the metallic charging period to improve mixing and reduce the amount of trim additions to be made to the fully molten bath. Metal losses to the slag for metallic charge materials depend upon the physical size of the component and their quality, but are normally less than 5 %, with a fair proportion of this loss being due to spillage and splash during the de-slagging and pouring operations. However, in this Project as Slag Crusher and Magnetic Separator is employed, any metal escaping through slag shall be recovered and fed back to the Induction Furnaces.

Making the heat ready, tapping and emptying the furnace

When the liquid filling level has reached around the upper edge of the coil, the sample is taken and the material for the final analysis is added to the furnace. This material is now melted, and the melt brought up to a temperature of 80 deg C to 100 deg C below the tapping temperature. When the tapping ladle is ready, the furnace is skimmed and brought up to the tapping temperature. In the case of medium frequency furnaces, 2 to 5 minutes are needed for this activity. The liquid temperature is measured with a dip

thermocouple. Before tapping a small amount of ferro-alloys are charged in the furnace so as to avoid any boiling action during tapping.
In the teeming ladle the required amount of ferro-alloys and carburizer (if required) is put in the ladle bottom and the metal is tapped.

Process control and automation

The project envisages all the modern concepts for control of all of the functions taking place so that a detailed knowledge of quality of liquid steel and costs can be collected. Computers and programmable logic control (PLC) devices in control systems of varying degrees of complexity are to be installed. These systems will perform several functions which can be classified under the headings of (i) process automation, (ii) process monitoring, (iii) information display and recording, and (iv) interfacing with other furnaces and control systems.

Process automation

The most advanced automation systems will be deployed to control the steelmaking cycle from the selection of charge materials to the tapping of the liquid steel and also interface with other management systems. For functioning, these systems will collate information on charge weight, time and power input. The charge weight is obtained from load cells or input from the operator while time is known from the internal clock of the device which is reset at the start of the each heat. Power is derived from the voltage and current measurements for the furnace coil. The energy input is then calculated and compared with a set value which is determined from the experience of the manufacturer with similar furnaces and can be altered by the operator to suit the individual case. When the set value is reached the furnace is automatically switched off and the charge is molten at around the target temperature. Measurement of these parameters will be ensured reasonably accurate, however variation in the charge and how it lies in the furnace results in varying induced energy so that the temperature obtained varies between the heats. The next stage will be to superheat the metal to the set tapping temperature which will be achieved by accurate dip measurement of the liquid metal, with the result either being directly fed to the control system.

Between melting and superheating, the metal will be de-slagged, sampled and composition altered to meet specification. If required, the control system will hold the temperature at any set value by calculating the optimum power level to do it. In this way an accurate control will be kept on the energy supplied, avoiding high energy cost and excessive temperature.

The control systems will also be used for other automatic operations such as (i) cold starting furnace, and (ii) sintering of a new lining. In these cases temperature data is provided by thermocouples and the system controls the temperature by varying the power input.

Process monitoring

While controlling the steelmaking operation, the system will also monitor the auxiliaries such as water, hydraulics, power supply and fume extraction system. When a problem occurs, an alarm display will alert the operator. A long term record can be kept of the coil current and its trends at a particular voltage as any increase can indicate lining wear. Hence, the system can provide the operator an indication when the refractory needs replacing.

Information display and recording

The control system will provide the information and the more complex systems do it at all levels from operator to management. A visual display unit (VDU) will give information on energy consumption, power, temperature and metal weight in the furnace during melting, holding and superheating. The data will be frequently shown in a graphical form to assist in reading the information. There will be different menu screens for different functions such as (i) to indicate alarms, (ii) to fit the lining, or (iii) to tap. A slave monitor will duplicate the display away from the furnace platform. For production of 17600 TPA billet, it is proposed to install 4 no. of 15 T capacity Induction furnaces.

Production Capacity:

Description	Unit	Capacity
Billet production	Tons/ Annum	1,76,400
Liquid Steel production	Tons/ Annum	1,80,000
Operating days	Days/ Annum	300
Liquid Steel	Tons/ day	600
Tap to tap time	Min	130-140
No of heats (Each Furnace)	Per day	10 Approx
Furnace capacity (each furnace)	Tons	15
No of furnace sets	No	4

3.5.3 Continuous Casting Machine (CCM):

CCM will be used to continuously cast the liquid steel in required cross section and in length. It consists of Tundish, Mould, Bow with withdrawal mechanism, straightening mechanism and cooling bed, hydraulic system for withdrawal mechanism, water pumps and cooling towers for water spray on the withdrawn section as well as on the cooling bed. Dummy bar will be provided to start the casting. Tundish is a rectangular vessel, lined with refractory and having discharge nozzle with pneumatically operated gate. A stand is erected over the CCM where the ladle is stationed for discharging the liquid into CCM. Mould is made of copper with water cooled jacked surrounding it to keep cool. Its cross-section in the bottom is of the size of which billet is to be drawn. Initially the dummy for of the same size is kept inserted. When the liquid steel is poured in the mould, the dummy bar is drawn slowly, so that the liquid steel in partially frozen state comes out of the mould. Water spray nozzles are installed to spray water over the just drawn billet to cool it further and to harden the skin of the drawn billet. There will be 4 nos. of 15 T Induction Furnaces in the SMS plant.

The idea of 4 Induction Furnaces is conceptualized ***to achieve sequential casting*** so that heat/ energy loss due to a cold Tundish can be avoided and moreover this will also reduce end/tail cuts and to avoid re-melting of them thereby avoiding further energy loss.

MS Billets of sizes 100mm x 100mm will be casted in Continuous Casting Machine.

3.5.4 ROLLING MILL

The Rolling Mill will consist of primarily 4 distinct sections.

(a) Billet reheating furnace

(b) The Rolling Mill itself – the set of rollers.

(c) The TMT Box

(d) The product handling system

3.5.4(a) Billet Reheating Furnace

Ideally billets should be directly fed into Rolling Mill to prevent cooling and waste of energy in reheating. However thorough calculations reveal that due to various reasons, the surface temperature of some billets may drop below the desired temperature of 950^0C-1000^0C while reaching the Mill. Principal reasons being deployment of a normal speed caster CCM (as high speed caster will require higher capacity or more numbers of Induction Furnaces beyond that planned here). Also RM Operations inevitably needs to be paused periodically for maintenance & other purposes and the billets arriving from SMS during that period need to be re-heated to maintain their temperature profile.

To counter such disruptions and also to avoid temperature fluctuations of the billets, they will be fed into the reheating furnace while still in hot condition. This will ensure temperature stabilization and uniformity while reducing fuel consumption by 70% to 80% at the same time.

To achieve this feat (fuel saving of 70% minimum) a pusher type furnace has been envisaged. The furnace will be end charging. It will have single row charging facility. The furnace will be heated with FO. The furnace combustion system will comprise of air blowers, FO storage, supply and preheating system and other associated facilities. The product of combustion will leave the furnace at charging end and exhausted through underground flue tunnel and passed through a metallic tubular recuperator before finally let off to a self-supporting steel chimney of sufficient height.

A set of PLC instrument will be used for maximum fuel saving through temperature optimization and smooth operation of the furnace.

3.5.4 (b) Rolling Mill

A straight type mill has been envisaged for the plant. The stands will be grouped into Roughing, Intermediate and Finishing groups. Roughing group will have 4 (four) stands, Intermediate group will have 8 (eight) stands and Finishing group will have 8 (eight) stands.

Roughing group of stands will be driven by one motor. 4 nos. of Intermediate stands will be driven by two motors and balance 4 nos. will be driven by a separate motor. Each stand of finishing group will be driven by single motor. Necessary guides and troughs will be provided at entry and exit of mill stands. Automated tilting, drop type tilter and feeding arrangement will be provided in roughing group of stands. Repeaters will be provided in roughing / intermediate stands as necessary.

The motors used shall be DC motors with thyristorized controls for Power conservation. Similarly Cardan shafts shall be used to couple motor shafts with Roller shafts for better energy efficiency.

Provision shall be kept for one wire rod outlet which will have 4 stand blocks driven by a single motor through gear box. Provision for Coil forming and handling of coil shall also be provided.

Design provision has also been made for introduction of slit rolling facility in future to roll 8 mm, 10 mm & 12 mm rebars in two strands.

3.5.4 (c) TMT Box

The rebars discharged from the mill will pass through a rapid water quenching system comprising cooling pipes with high pressure water nozzles for rapid water quenching. At the cooling pipes the bar skin temperature will be reduced to about 600^0C. The core of the bar still remains hot. This entrapped heat tempers the bar. This thermo-mechanical treatment of the bars increases tensile strength without adversely effecting weld ability and elongation properties. This process eliminates requirement of cold twisting of bars for production of rebars.

The TMT Box will be fitted with state of the art PLC system for regulation of water flow depending upon section rolled, temperature of inflow and outflow water and for regulating water pressure. The TMT Box shall be designed in such a manner to achieve Fe 500+ and Fe 550 grade TMT rebars.

3.5.4 (d) Product Handling Section

A flying shear, to cut the products to cooling bed length will be located immediately after the TMT. This shear will divide all products to cooling bed lengths. Rake type cooling beds have been envisaged to receive the rolled product. Cooling bed will be provided with incoming and outgoing roller tables. One cold shear will be provided to cut the bars coming out of cooling bed into commercial length of 6 to 12 m. The bar products will be formed into bundles and will be strapped by strapping machine automatically.

The finished products will be removed by overhead EOT crane and stored in the storage area or dispatched through road vehicles.

3.5.5 POWER PLANT

Total power generation for the proposed power plant is taken as 30 MW using steam turbine generator set. Production of steam required for power generation is proposed from following sources:

- Installation of Five nos. of waste heat recovery system generators cable of producing 10T/H steam each from the hot flue gases produced by existing 3x100 TPD and 1 x 350 TPD DRI Kiln.
- Installation of AFBC type boiler for steam generation using waste char as fuel supplemented by coal firing to the extent required. Capacity of boiler is proposed as 63 T/h of 30 MW power

Details of power generation is as below:

Sl. No	Particulars	Capacity
1	With steam from WHRB	16 MW
2	With steam from AFBC	14 MW
	Total Power generation	30 MW

Waste Heat Recovery Steam Generators

Waste kiln has a waste gas volume of 22,000 to 25,000 Nm3 discharged at 850 to 900˚C. The gas is presently being cooled in a gas cooler to a temperature about 180˚C and then cleaned in an ESP and then discharged by ID fan into the atmosphere through chimney.

Now it is proposed to utilize this hot gas in WHRB for power generation. The Waste Heat Recovery System Generator (WHRSG) is comprises of an Evaporator, Super – heater in two (2) sections and an economizer which bring down the temperature from 850 to 900˚C and produce 10-11 TPH steam at a pressure of 66 Ata and 490˚C.

Technological details:

The technological features if the WHRSGs shall be as below:

Type: Single drum water tube with radiant chamber

Type of water circulation: Natural circulation

The boiler pressure parts shall consists of water wall system of fin welded membrane construction, super – heater stage I, super – heater stage II, Spray type De- super heater between the super heater stages to control the steam super heat temperature to 490 ±5˚C, Economizer, Steam drum, Riser and down corner. The steam drum, the water shall be received from economizer outlet header. The steam drum is sized to have adequate steam space and water space. The steam drum is equipped with internals, which remove the water particles from the saturated steam, before enters into the super heater.

Steam generated from the furnace water walls is taken to the steam drum through series of riser tubes. The water wall bottom headers receive the water from the drum through a series of down comers. The entire super heater heats the saturated steam from the steam drum by absorbing the heat from the flue gas to the required temperature.

3.6 RAW MATERIAL REQUIREMENT

S.NO.	ITEM	REQUIRMENT (TPA)			SOURCE AND TRANSPORTATION
		Existing	Proposed	After Expansion	
1	Iron-Ore	1,44,000	2,16,000	3,60,000	From mines in Odisha & Jharkhand-by Rail rake and by road.
2	Non- Coking Coal	1,17,000	1,75,500	2,92,500	From various mines of CCL-by Rail rake or road.
3	Dolomite/Limestone	2,700	4050	6750	From Chhattisgarh by Road
Railway Sidings - Kuju at 10 km, Barkakana at 29 km, Bhurkunda at 14 km and Gola at 48 km.					

3.7 WATER REQUIREMENT AND ITS SOURCE

Water requirement for the existing and expansion project is as below:

Units	Final Installed Capacity	Water requirement Existing m^3/ day	Water requirement Expansion m^3/day	Total Water requirement m^3/day
DRI Plant	750 TPD	225.00	337.50	562.50
SMS with CCM	588 TPD	--	120.00	120.00
Power Plant	30 MW	--	1980.00	1980.00
Rolling Mill	500 TPD	--	50.00	50.00
Drinking & Domestic		6.0	10.0	16.0
Plantation and		2.0	5.0	7.0

Dust suppression				
Total		**133.00**	**1502.5**	**2735.50**

Water requirement for the existing project is now sourced from ground water. However, for the proposed expansion project the water will be sourced from Damodar River through surface pipeline to be laid after due permission of the department. Application has been made to DVC for the same.

3.8 WASTEWATER GENERATION & ITS MANAGEMENT

- There will be no effluent generation in the DRI plant, SMS, Rolling Mill as closed circuit cooling system will be adopted.
- Effluent from power plant will be treated and after ensuring compliance with CPCB norms, it will be utilized for dust suppression, ash conditioning, slag quenching and for greenbelt development.
- Sanitary waste water will be treated in septic tank followed by sub-surface dispersion Trench. Dual septic tanks shall be used for recovery of manure from human wastes, thereby ensuring zero ill effect on environment.

The details of waste generation and management plan has been given as below:

Sl. No	Units	Nature of waste	Quantity in TPA	Utilization
1.	DRI Process	Char	58092	Use as fuel AFBC power plant
2.	DRI APCs	Fines & dust	18900	Re use in process
3.	WHRB ESP (16MW)	Fly ash	44000	Sale to Fly ash brick manufacturing Unit
4.	SMS & CCM	Slag	37500	Sale to Slag processing units & used for road making
5.	CPP (14 MW) AFBC ESP	Bottom ash & Fly ash	8925 35700	Bottom ash for road construction Fly ash for brick & cement manufacturing
6.	Rolling Mill	Mill scales	3900	Reutilized in SMS

3.9 POWER REQUIREMENT

The plant electrical system will have a 33kV outdoor- type substation. It will have one incomer with CT, PT, Surge arrestor, isolators etc. It will have five outgoing feeders. The power supply through furnace transformer will be supplied to furnace whereas power supply through Aux. Transformer will be used for EOT crane operation, CCM operation, furnace auxiliaries, pumps for cooling water lighting etc.

Units	Existing Consumption (in MW)	Proposed Consumption (in MW)	Total Consumption (in MW
DRI Sponge	1.0	3.75	4.75
SMS & CCM		18.40	18.40
CPP Auxiliary		3.00	3.00
Rolling Mill		2.50	2.50
Misc. Requirement		1.35	1.35
Total	1.0	29.00	30.00

Power will be initially sourced from JSEB for construction / erection and preliminary work. Presently 1 MW load has been sanctioned. Latter on power will be sourced through the CPP as it will be commissioned simultaneously with the other units. After the installation the power requirement will met through its captive power plant.

Chapter – 4
SITE ANALYSIS

4.1 INFRASTRUCTURE

For establishment and successful operation of plant, it is imperative to ensure availability of the following infrastructure:

- Availability of raw coal & iron ore and its proximity to the plant to reduce cost of transportation. The unit enjoys close proximity to major raw material sources. The iron ore mines of Orissa and Jharkhand are near the project site. Coal will be sourced from CCL.
- Road / Rail head connection so that the raw materials and products can be easily and economically transported. The nearest Rail head is just 12 kms away from the plant which is ‘currently used by the plant for its raw material sourcing.
- Availability of water: Water will be sourced from River Damoder and application has been made for sourcing of water from DVC.
- Power Source: Initially power is sourced from JSEB (1 MW) and latter after installation of captive power plant power will be sourced from its captive unit (30 MW)
- Adequate land for the plant, storage of raw material and products & disposal of waste material.
- The land is devoid of forest land, agricultural land and habitation

4.2 CONNECTIVITY

The proposed site is well connected with Road network. The following table gives brief regarding connectivity of the proposed site:

Sl. No.	Major Road/ Rail head	Distance in kms
01.	National highway (NH 33) Hazaribagh –Ranchi	12 km
02.	Nearest railway station Kuju	12 km
03.	Connecting road (Giddi- Naya More Road)	0.5 Km

Chapter – 5
PLANNING BRIEF

5.1 PLANNING CONCEPT

M/s Ramgarh Sponge Iron Pvt. Ltd., have proposes brown-field expansion of its existing Sponge Iron unit at Village Hosir, P.O. Dadi, Dist: Hazaribagh, Jharkhand . The proposed configuration of the project is as below:

- Expansion in the exiting sponge Iron Plant of capacity from 90,000 TPA (1 x 300 TPD) to 2,25,000 TPA with additional installation of 1x 100 TPD and 1 x 350 TPD DRI kiln.
- Installation of 4x15 Ton capacity induction furnace with production capacity 1,80,000 TPA
- Installation of 3x6/ 11m radius billet caster for production of 1,76,400 TPA MS Billet.
- Installation of 1 x500 TPD rolling mill for production of 1,50,000 TPA TMT Bar.
- Power generation through Waste Heat Recovery from 4 x 100 TPD & 1x350 TPD DRI Kilns by installing 16 MW power plant and installation of 14 MW AFBC boiler for utilization of char

Key factors that would facilitate successful and timely project implementation are:

- Proper choice of technology and machinery supplies
- Adequate diligence in formulating the technical concept and system design/ selection of plant
- Establishment of an efficient system for project planning and monitoring including reporting procedure for progressive review and coordination
- Customization of project execution as per the suitability of the promoter.

The key features of the project includes:

1. Zero Wastage: There is No Wastage. Waste Products or By Products of one Process is used as the Input / Output of another Process.

2. Energy Efficiency: Energy efficiency is a key measure both for the Environment and for the Industry itself to remain competitive. No stone is left unturned while in the planning stage to tap, conserve and use/ re-use energy at every possible stage. The plant will utilize its captive power for the total operation of the plant.

Based on the above guiding principles the following has been planned meticulously

(a) 100% usage of sensible heat in the flue gases from Sponge Iron Kilns by routing them through WHRB for Power Generation.

(b) 100% usage of Dolo Char – a by product from Sponge Iron Kilns in AFBC Boilers for Power generation.

(c) 100% utilization of waste heat and heat from burning of Dolo Char by meticulous configurations / couplings of AFBC and WHRG Boilers.

(d) 100% utilization of solid wastes from all processes for meaningful value creation. Like wet scrapper sludge from kilns and accretion from the kilns, slag from Induction furnace and 100% fly ash shall be used for brick manufacturing.

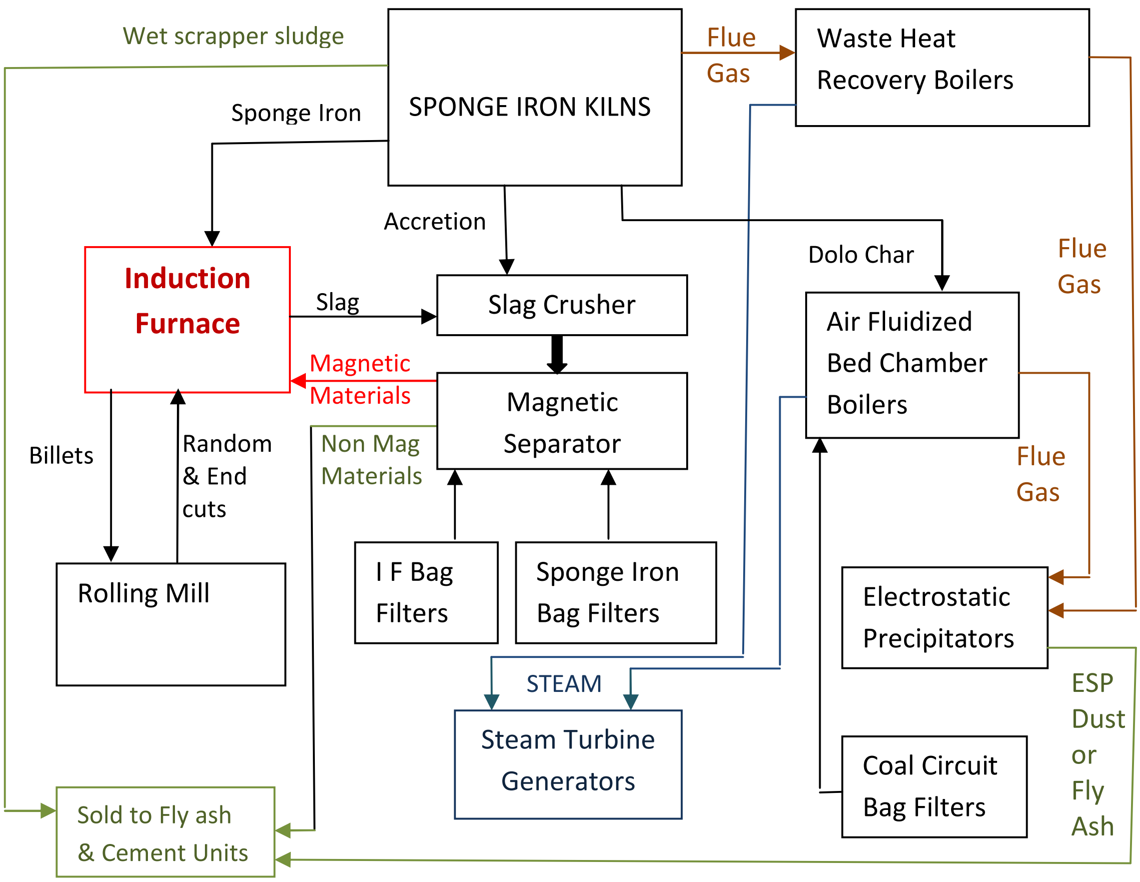
(e) Zero wastage of valuable iron metal as both Induction Furnace slag and Sponge Iron Kiln Accretions by granulation & magnetic separation. Mill Scales, end cuts and in plant scrap to be melted in Induction Furnaces.

(f) 100% recycling of water in the processes. The RO wash off water will also be used for dust suppression. There shall be zero effluent discharge from the plant.

(g) 100% utilization of Power from waste heat and Dolo-char combustion for in-house use ensuring minimal transmission and distribution losses. No power will be sourced from the grid for the proposed expansion.

The capacities of various plants and processes are arrived at keeping in view above planning parameters.

The plan execution can be summarized in the following schematic diagram.



5.2 Advantages of the project

The project is conceptualized in accordance to (a) the present challenge of minimizing Green House Gas (GHG) emissions from core sector of industries like steel, power, mining etc and (b) Bare minimum impact on environment in terms of solid, liquid and gaseous emissions. It is known that, India is not having coking coal therefore it largely depends on imported stock of coking coal to meet out the coke requirement of blast furnaces, which drains valuable foreign currency of the nation. During last 15 years of industrial growth largest capacity addition had been in steel making through sponge iron route, which was quite successful in bailing out the nation from wrath of costly Coking Coal import if these facility would have not be created. However, the sponge iron industry also faced a great limitation of good quality coal from the non-coking coal mines in the country due to which the energy efficiency of these sponge iron plants were badly affected and therefore the financial viability also got badly affected. It is a known technological limitation in sponge iron making process that poor quality coal results in to faster accretion in the kiln resulting in to poorer capacity utilization and frequent breakdowns. To overcome this, the Project Proponents are contemplating blending of high grade imported non Coking Coal with the domestic Coal in the ratio 1:1 to obtain proper blend, attain better energy efficiency and minimize pollution due to high ash content in domestic coal if used alone. This Project thus replaces import of costly Coking Coal entirely by half its quantity of non Coking Coal which is again cheaper by half on prices.

The other advantages of this Project can be enumerated as below:

a. Absolute Value addition project by gainful utilization of wastes and converting intermediate products into End-use product.

b. Improved productivity of the existing process.

c. Reduced operation cost due to sharing of infrastructures and manpower with existing unit reducing overhead by almost 30%.

d. Since the materials handling is similar to existing operation, synergy of activities will bring economies to the unit.

e. Dedicated and experienced workforce already available.

f. Ready market for the finished products. Easy accessibility to the thriving markets of Jharkhand, Odisha, Madhya Pradesh, Bihar, AP and Chhattisgarh form another major location advantage factor.

g. Technology is not new and has already been successfully time tested for decades in number of plants.

h. Proximity to Raw Material sources (Coal & Iron ore) thereby minimal transportation and impact on environment and infrastructure.

i. Employment generation in Rural / Semi Urban area along with improvement in socio economic status of population around the Project site.

5.3 POPULATION PROJECTION

THE PROJECT DOES NOT ENVISAGE ANY SIGNIFICANT CHANGE IN POPULATION IN ITS VICINITY

5.4 LAND USE PLANNING

Project location is Village: Hosir, P.O: Dadi, District - Hazaribagh, State- Jharkhand. Total land available for existing and expansion is 22.2157 acres. The details of land specification has been given as Annexure 1. The land use break up for the existing and proposed unit is as below:

Sl. No	Type of use	Area (in acres)
1	Plant area (Existing and Expansion)	9.7157
2	Administrative office and other	1.0
3.	Road and Paved area	1.50

4.	Storage and Solid waste handling area	2.50
5.	Green belt	7.50
	Total	**22.2157**

5.5 AMENITIES / FACILITIES

Facilities like canteen, rest room has already been provided in the existing plant as basic facilities to workers. Further expansion/ capacity augmentations are proposed.

Chapter – 6
PROPOSED INFRASTRUCTURE

6.1 INDUSTRIAL AREA (PROCESSING AREA)

The main plant area comprises of DRI Kilns, Furnace sheds, Rolling mill area, raw material storage and product storage etc. Presently there are 2 nos. of 100 MT & 60 MT road weighbridges in the plant which shall be sufficient to take care of increased volume. The proposed processing area comprises of raw material handling plant, DRI kiln, Boiler area, TG house, Condenser, Cooling tower, induction furnace, CCM, Road and infrastructure.

6.2 RESIDENTIAL AREA (NON PROCESSING AREA)

There is no proposal for residential colony as the required manpower will be sourced from the nearby locality. Non processing area will comprise of facilities within the premises such as store and administrative block, road, & yard and vacant area.

6.3 GREEN BELT

More than 1/3rd of total land availability is reserved for plantation i.e. greenery.

Greenbelt development plan

• Local DFO will be consulted in developing the green belt.

• Greenbelt of 33% of the area will be developed in the plant premises as per CPCB guidelines.

• 15 m wide greenbelt is being maintained all around the plant.

• The tree species to be selected for the plantation are pollutant tolerant, fast growing, and wind firm, deep rooted. A three tier plantation is proposed comprising of an outer most belt of taller trees which will act as barrier, middle core acting as air cleaner and the innermost core which may be termed as absorptive layer consisting of trees which are known to be particularly tolerant to pollutants.

6.4 SOCIAL INFRASTRUCTURE

Social infrastructure will be developed as per need based in the Villages of the close vicinity of the project. A proper CSR plan will be prepared and implemented in the nearby villages based on the social need.

6.5 CONNECTIVITY

The proposed site is well connected with Road network. The following table gives brief regarding connectivity of the proposed site:

Sl.	Major Road/ Rail head	Distance in kms

No.		
01.	National highway (NH 33) Hazaribagh –Ranchi	12 km
02.	Nearest railway station Kuju	12 km
03.	Connecting road (Giddi-Naya More Road)	0.5 Km

6.6 DRINKING WATER MANAGEMENT

It is estimated that 10 KLD of water will be required for domestic purpose during operation of proposed project. About 0.745 cusec water will be sourced from River Damodar which flows just 8 km away from the plant. However one extra Bore Well shall be maintained as standby to meet exigencies. Permission for sourcing of water has been obtained for the proposed expansion project.

6.7 WASTEWATER GENERATION & ITS MANAGEMENT

• There will be no effluent generation in the DRI plant, SMS & Rolling Mill as closed circuit cooling system will be adopted.

• Effluent from power plant will be treated and after ensuring compliance with CPCB norms, it will be utilized for dust suppression, ash/ slag conditioning and for greenbelt development.

• Sanitary waste water will be treated in septic tank followed by sub-surface dispersion trench.

- **There shall be a Rain Water/ Storm Water harvesting pond of about 2 Acres at the lower end (South West end) to conserve all rain water/ storm water**

Chapter – 7
REHABILITATION & RESETTLEMENT (R & R) PLAN

No rehabilitation and resettlement is required for the proposed project.

Chapter – 8
PROJECT SCHEDULE & COST ESTIMATES

8.1 PROJECT SCHEDULE

M/s Ramgarh Sponge & Iron Pvt Ltd has initiated to get clearance from the statutory bodies. The site selected and land for the proposed project is an industrial land and no additional land required to establish the project.
The consent required under Air, Water Act will be obtained from JSPCB giving details of the process involved.
As the land belongs to non forest land so no clearance under the Forest Act is required.

Project implementation Schedule:
The project schedule includes various activities like civil works, engineering, procurement, erection and commissioning. It will be imperative to complete many activities before the zero date and soon afterward include:

- Basic engineering
- Clearance from statutory authorities
- Land acquisition
- Preparation and issue of tender document for major technological units.
- Placement of order for major technological units.
- Final Tie-up
- Finalization of terms with overseas agencies if any.

The schedule of implementation of the project is as below:

Particulars	Start	Completion
Civil work	Zero date	04 months
Placement of orders	1 month	06 months
Fabrication	2 months	14- 16th month
Electrical installation	8 months	20-22 month
Trial production		23rd month
Commercial Production		24th Month

8.2 PROJECT COST

The estimated cost for the proposed project for will be Rs. 246 Crores. Break up as follows:

Sl. No.	Facility	Existing Cost in Rs. Crores	Proposed Cost in Rs. crores
01	Land and site development	0.80	--
02	Office building, Shed, Civil work etc	1.06	3.00
03	Plant & Machinary (including pollution control measures)	45.14	271
04	Contigencies	--	25.00
	Total	47	299.00
Final Cost (Existing + Expansion)			346.00

Chapter – 9
ANALYSIS OF PROPOSAL

9.1 FINANCIAL AND SOCIAL BENEFITS

With the implementation of the proposed project, the socio-economic status of the local people will improve substantially. Apart from direct earnings for the local people employed, there shall be avenues for secondary trade and business in the area. The land rates will improve in the nearby areas due to the proposed activity. This will help in upliftment of the social status of the people in the area. Educational institutions will also come-up and will lead to improvement of educational status of the people in the area. Annual health check-ups shall be conducted by us and the medical facilities will certainly improve due to the proposed project.

9.2 SOCIO-ECONOMIC DEVELOPMENTAL ACTIVITIES

The management is committed to uplift the standards of living of the villagers by undertaking following activities / responsibilities as the part of Corporate Social Responsibility.

- Skill Development

  Since inception of the activities of the company, a policy has been made to appoint trainees in each department to provide skill improvement trainings. Sponge Iron and Steel is becoming a booming sector in India and is in need of huge manpower. Upon completion of the project, facilities will be created to impart vocational and internship training to students of nearby engineering, science and polytechnic institutes.

- Health & hygiene

  The company wishes to conduct annual health check up camps for the nearby villages on regular basis as part of its CSR activities.

- Drinking water

  Company will install solar based RO purifier in nearby villages as part of its CSR activities.

- Education for poor

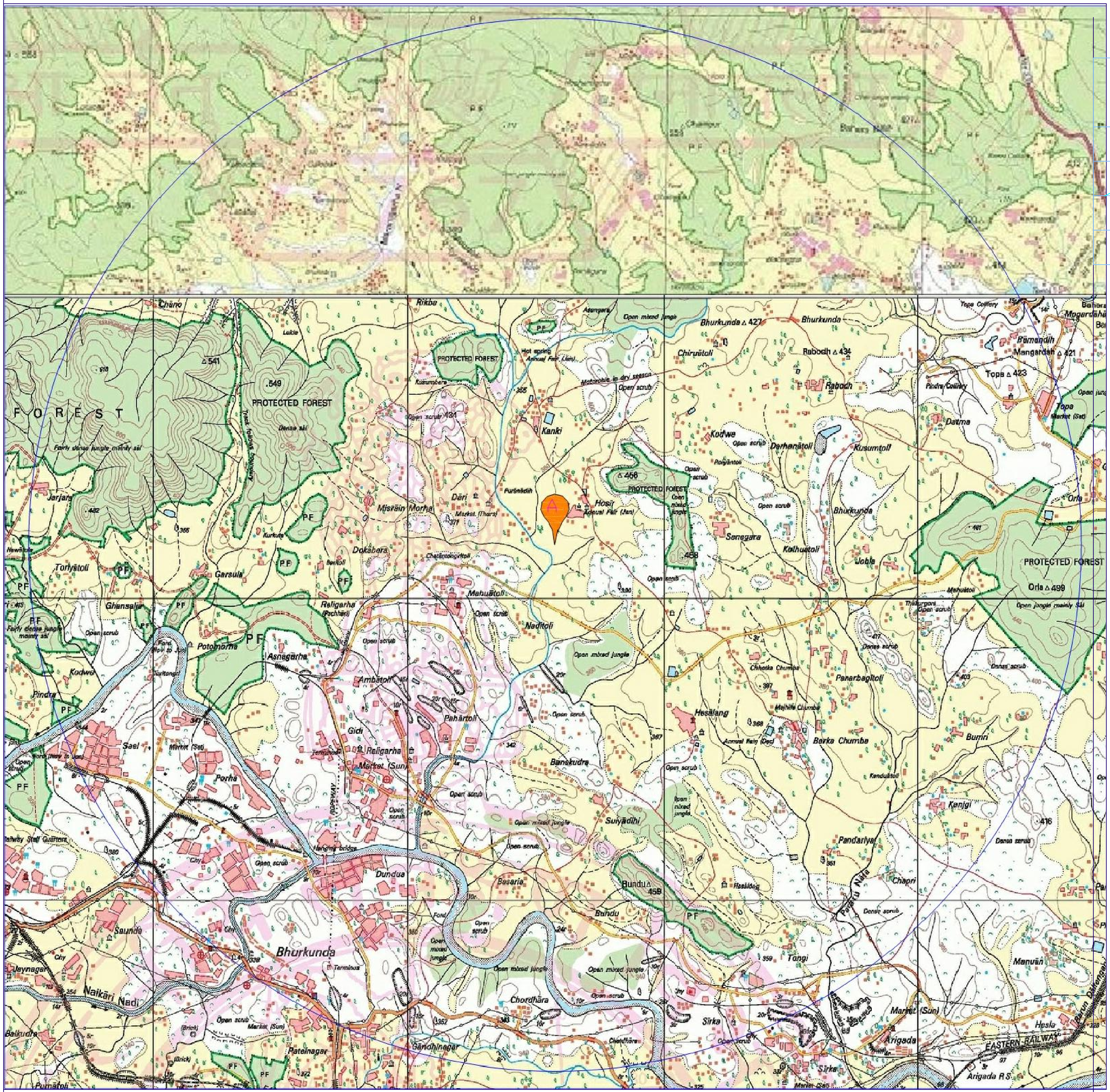
  Company will fix scholarships for meritorious and poor students in the nearby villages as part of its CSR activities.

- Village roads

  Company will undertake periodic repairs and maintain plantation on both sides of the village roads joining the plant and running adjacent to plant boundaries as part of its CSR activities.

- Lighting

  Company will install solar based street lamps at prominent places of the nearby villages as part of its CSR obligations.



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Project Site	
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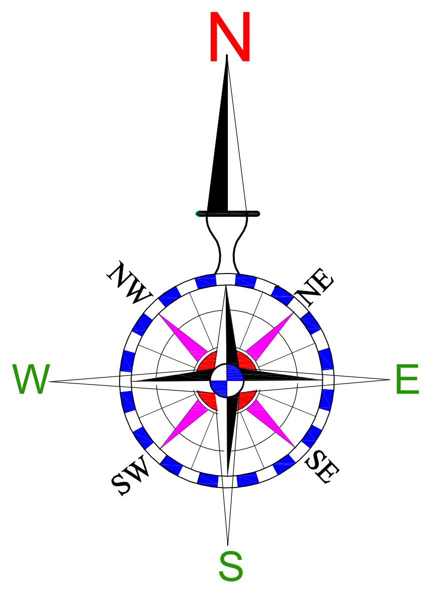
River/ Nala	
Village Location	
PF Boundary	



LOCATION MAP

RAMGARH SPONGE IRON PRIVATE LIMITED

Village:- Hosir, P.O. Dari, District Hazaribagh, State Jharkhand

Prepared By: Kalyani Laboratories Pvt. Ltd.

Ref. Toposheet No. F45B5 & F45 B6

DETAILS OF LAND ACQUIRED BY RAMGARH SPONGE IRON PVT. LTD. IN VILLAGE MAUJA : HOSIR , THANA NO.- 08, P.S – GIDDI, DIST – HAZARIBAGH IS AS UNDER : -

SR. NO.	KHATA NO.	PLOT NO.	AREA (IN ACREs)
1	75	1442	0.02
2	75/2	1475/1	1.04
3	75/2	1393/1	0.91
4	75/2	1442/1	0.20
5	75/2	1376/1	0.16
6	75/2	1476/1	0.60
7	12	1379	$0.34^{2/3}$
8	31	1473	0.19
9	31	1472	$0.21^{1/3}$
10	12	1379	$0.17^{1/3}$
11	31	1473	0.095
12	31	1472	$0.10^{2/3}$
13	12	1379	$0.34^{2/3}$
14	31	1473	0.19
15	31	1472	$0.21^{1/3}$
16	31	1394	1.54
17	31	1374	0.61
18	31	1474	0.47
19	12	1379	$0.17^{1/3}$
21	31	1473	0.095
22	31	1472	$0.10^{2/3}$
23	12	1382	2.11
24	12	1380	0.58
25	12	1383	0.80
26	12	1375	0.32
27	31	1383	0.90
28	75	1393	0.63
29	75	1477	0.36
30	31	1383	1.10
31	75	1477	0.11
32	31	1384	0.08
33	12	1375	0.32
34	76	1393	0.24
35	76	1393	0.23
36	75	1393	0.15
37	55	1381	0.21
38	55	1381	0.105

39	55	1381	0.105
40	55	1381	0.105
41	75	1376	0.20
42	75	1477	0.05
43	55	1381	0.21
44	75	1393	0.045
45	75	1393	0.015
46	40	1470	0.65
47	75	1477	0.64
48	25	1469	1.54
49	25	1469	1.03
50	25	1471	0.21
51	75	1477	0.64
52	25	1471	0.32
53	25	1469	0.06
54	25	1457	$0.8^{2/3}$
55	25	1458	0.03
56	25	1459	$0.02^{1/2}$
57	25	1460	$0.25^{1/2}$
58	25	1461	$0.21^{2/3}$
59	25	1462	$0.01^{1/2}$
60	25	1463	$0.01^{1/3}$
61	25	1464	$0.06^{1/3}$
62	25	1466	$0.05^{1/3}$
63	25	1467	0.07
64	25	1501	0.06
65	25	1469	1.23
Total			**22.2157**

Q5 :- Plant lay out plan with configuration. (existing & expantion)

Ans