2-2. Present status and policy of steel industry

India's crude steel production in 1985/86 reached 11.36 million tonnes, the highest production ever recorded, but it is still small in view of steel demand and affected by low productivity. On the other hand, India has the population of 760 million at present, which is expected to increase to close to one billion by 2000, and besides it is implementing the Seventh Five Year Plan starting from 1985, under which it is planned to improve social capital and develop and modernize both agriculture and industry fields, and there is unlimited demand for steel which forms basic materials.

Under such condition, India imports annually about 10% of domestic steel demand from abroad and absolute shortage of steel supply from domestic production continues. If the increase of demand in future is taken into consideration, it is certain that the demand and supply gap will expand more by 2000.

Low productivity has been pointed out as one of major problems faced by Indian steel industry and the following given as its causes:

(1) Delay in expansion plan of steel plants under the Sixth Five Year Plan,
(2) Low capacity utilization rate,
(3) Shortage of high grade raw materials -
Use of high ash domestic coal resulting in low productivity in iron making sector -
(4) Shortage of electric power, and
(5) Unstable operation condition due to deterioration of raw materials quality and lack of proper stock control of products, etc.

This is well recognized by those related to the steel industry and the solution of those matters is made an important subject of steel policy under the Seventh Plan as well as that up to 2000.

In particular, improvement of productivity was made the main object in the period of the Seventh Plan ending 1990, and improvement of iron and steel technology taken up as one of the steps. At Tata Iron & Steel Co. for instance, the first phase modernization plan including improvement of technology up to iron making was already completed and now under the Seventh Plan modernization of rolling departments is to be implemented as Phase II projects.

In addition, study is being made on introduction of integrated on-line process control system to steel plants, and Bhilai Steel Plant was selected as model plant for computerized operation. By introducing computers at Bhilai it is aimed that production is increased by 10% and energy consumption reduced by 10%.

It is also expected that research organizations play an important role in improving technology. One is Scientific Advisory Committee which deals with all technological matters related to iron and steel and gives advice and suggestion to the Government. Another is Research and Development Centre in SAIL, where a laboratory complex was installed recently.

Another important policy for improving productivity in the period of the Seventh Plan is to maximize production by modernization of existing facilities. Initially investment of Rs.139.4 billion was planned for modernization of steel industry under the Seventh Plan, but eventually it was cut to less than a half of that, Rs.64.2 billion, because of the financial difficulties. The details are given in the table on the next page. No new projects such as construction of new steel plants are proposed in the Seventh Plan and major projects are mainly modernization of existing steel plants including replacement of out-of-date facilities with modern and efficient facilities. The modernization plant of IISCO Burnpur Works, the subject of this F/S, reflects the above policy.

Table 2.2.1 Outlay for Department of Steel
Seventh Plan (1985-90)

(Million rupees)

Organization/Project/Scheme	Outlay
Iron and Steel:	
1. Bhilai Steel Plant	9,063
2. Bokaro Steel Plant	7,740
3. Durgapur Steel Plant	6,880
4. Rourkela Steel Plant	6,742
5. Alloy Steel Plant	942
6. Salem Steel Plant	161
7. Indian Iron and Steel Company Ltd. and IISCO Stanton	2,151
8. R & D Centre	904
9. Central Marketing Organization	480
10. Corporate Office and Management Training Institute	180
11. Visveswaraya Iron and Steel Ltd.	512
12. Vizag Steel	25,000
13. Sponge Iron India Ltd.	318
14. Metallurgical and Engineering Consultants (India) Ltd.	80
15. Hindustan Steel Works Construction Ltd.	247
16. Bharat refractories Ltd.	460
17. Metal Scrap Trading Corporation	100
18. New Steel Plants	100
19. Loan to State Governments -Tenughat and Mahanadi Projects	140
(Sub-total)	(62,201)
Ferrous Minerals:	
20. National mineral Development Corporation	1,453
21. Kudermukh Iron Ore Co., Ltd.	185
22. Manganese Ore (India) Ltd.	188
23. Mineral Development Board	50
24. Loan to Karnataka for water supplies	125
(Sub-total)	(2,000)
Total	64,201

Source: Seventh Five Year Plan 1985-90

In addition to the modernization of existing integrated steel plants, the Government of India is much interested in the importance of mini-mills because they have flexibility in marketing, advantage of small-scale production, and they can contribute considerably to specific local communities. Especially at present India is short of scrap and the fear of uncertainty of scrap supply is expected to continue in future as well. Therefore efforts are being made to expand steel production by electric furnaces which use coal-based sponge iron as raw materials. The Government of India has de-licensed new construction of the above DR plants. As a result, construction of a new 1.2 million tonne DR plant was approved and registered in March 1985, and the capacity of DR sponge iron production in India reached 6 million tonnes/ year at present. At present two 210,000-tonne plants are in operation and three 400,000-tonne plants are under construction. Besides, the Government has established Coal Linkage Committee to promote coal supply to DR plants.

As above, the Government places much expectations on the role of mini-mills based on sponge iron-electric furnace operation with a view of reducing the demand and supply gap in future and considers utilization of mini-mill operation in small-scale steel plants with capacity up to one million tonnes a year. However, those concerned with integrated steel plants indicated that there are some problems in the quality of present mini-mill products, and it is necessary to solve these problems before promoting increase of mini-mills in future.

In the above are outlined the problems facing the Indian steel industry and the thought of the Government in coping with them and the steel policy it is going to take in future However, the Seventh Five Year Plan itself started in 1985 and the steel policy for the coming five years or its long-range strategy up to 2000 was not yet definite at the time

when JICA mission visited India in June-July 1986. It could be seen that the Government of India has a strong desire to push on the modernization plan as soon as possible and even from now in order to catch up on the delay in modernization to date. The Government of India and SAIL indicated their enthusiasm toward implementation of early modernization of IISCO's Burnpur Works by receiving from the Japanese steel industry the first-rate iron and steel technology as well as knowledge in the world.

2-3. Related laws

In India, the Government is charged with a role to give guidance on economic management, and key industries are to be developed on the responsibility of the Government.

Economic laws are enacted on such lines, and given below is an outline of the following laws which are considered most important among the economic laws.

Monopolies and Restrictive Trade Practice Act, 1969
Industries (Development and Regulation) Act, 1951
Industrial Policy Resolution, 1956
Essential Commodities Act, 1955
Foreign Exchange Regulation Act, 1973
Customs Act, 1962
Imports and Exports (Control) Act, 1947

Basically those laws have a strong hue of control, but entering the 1980's, some easing of regulation is observed in part in relation to expansion of business and promotion of high technology industries.

(1) Monopolies and Restrictive Trade Practice Act, 1969

The law provides regulation on monopolies and prohibits monopolies and restrictive trade practice to prevent concentration of economic power to the detriment of public interests. An outline of the law is as follows.

a. Concentration of economic power

- Category of enterprises coming under the regulation
  A. Undertaking with assests of Rs.200 million or more
  B. Dominant undertaking with assets of Rs.10 million or Rs. 1 crore.

(Note: "Dominant undertaking" is defined as an enterprise who, with its affiliated companies, produces, supplies, distributes or has under its control one third or more of a commodity or supplies or has under its control one third or more of services provided.)

- Regulation of business expansion (issue of new stock, construction and expansion of facilities)

  When an undertaking belonging to Category A or B is going to increase its share in production, supply, distribution or control of a commodity, or its share in supply of services to 25% or more through business expansion, such expansion has to be filed with and approved by the Central Government. The government will investigate whether such expansion brings about excessive concentration of economic power to the detriment of public interests.

- Approval of incorporation of an enterprise

  When an enterprise belonging to Category A is to be incorporated, such incorporation must be filed with and approved by the government in advance. Criteria for the government's approval are same as those for business expansion.

- Approval of amalgamation

  Amalgamation of enterprises which come, or will come, under the regulation must be filed with and approved by the government in advance.

- Approval for a director to hold directorship in other enterprises

  A director of an enterprise under the regulation must not be elected as a director of other enterprises without approval of the government.

- Dissolution of an enterprise engaged in respective trade practice

  If activities of an enterprise coming under the regulation interfere with public interests, or resulted, result or may result in monopolies or restrictive trade practice, the Central Government can refer investigation for issuing order for dissolving the enterprise to the Monopolies and Restrictive Trade Practice Commission (hereinafter called "Commission") and dissolve the enterprise as a result of the investigation.

b. Monopolistic trade practice

  If it considers that a monopolistic enterprise is engaged in monopolistic practice, the Central Government can refer its investigation to the Commission and if justified by the investigation, take foreclosing measures including restriction of production and supply and fixing of prices.

  Undue increase of price and undue retraint on supply, distribution (incl. selling and purchasing) and on supply of service are considered monopolistic practice to the detriment of public interests.

  (Note: "Monopolistic undertaking" is defined as an enterprise who produces, supplies, distributes or has under its control one half or more of a commodity, or supplies or has under its control one half or more of service. There are one or two such enterprises.

c. Restrictive trade practice

  Any trade agreement whose contents hinder, distort or restrict, or may hinder, distort or restrict free competition by whatever method must be notified to Registrar of Restrictive Trade Agreement. The Com-

mission, if referred, may investigate such agreement and if warranted, order it to be stayed or corrected.

(2) Industries (Development and Regulation) Act, 1951

This law is the most important law in providing guidance and regulations for private sector in Planned Economy system. An outline of the regulations of this law is given below.

- Registration of existing enterprises in designated industries is obligatory. Metallurgical, fuel, transport, industrial machine industries are designated by the Government decree.
- Incorporation of a new undertaking or production of new products in the designated industries need industrial license of the Central Government.
- A large-scale expansion and change of business place of a registered undertaking need industrial license of the Central Government.
- Before issuing the license, the Central Government may make investigation and give suitable instructions to the undertaking.
- Should the undertaking fail to comply with the instructions, the government may requisition or manage such undertaking.
- The Central Government is empowered to regulate sale price, distribution, transport, disposal, acquisition, possession and consumption as to products related to designated industries.

Any undertakings, domestic or foreign, who enter the businesses of designated industries or expand such businesses under Industries (Development and Regulation) Act are obliged to file an application with Licensing Commission for industrial license.

(3) Industrial Policy Resolution, 1956

This resolution forms a law which divides industries into three categories and controls them accordingly.

The three categories are:

- First category:
  17 types of industry such as arms, nuclear energy, iron and steel, coal, aviation, railway transport, electric power, etc., for future development of which the state is exclusively responsible. Except those whose incorporation as private enterprises is already authorized, only the state can establish undertakings in those industries.

- Second category:
  12 types of industry such as fertilizers, road and marine transport, machine tools, etc. The state takes initiative in establishing undertakings in such types of industry and they will be gradually nationalized.

  Existing private undertakings in those industries are requested to complement the state's effort.

- Third category:
  Any and all industries other than the above.
  Their future development is left to private sector.

In accordance with the Industrial Policy Resolution, many types of industry have been nationalized so far and state enterprises established.

In iron and steel sector, Tata Iron and Steel Co., Ltd. operates as a private company, but the state tightened regulations on its products in 1979.

(4) Essential Commodities Act, 1955

The Essential Commodities Act is a law which regulates production, supply, distribution, trade and commercial transaction of specified materials to ensure interests of general public.

The law enumerates as important materials iron and steel and finished steels, petroleum and petroleum products, coal, paper and others, and regarding items specified as important materials, it provides that the Central Government has an extensive regulating power.

Major contents of such regulating power are as follows:

- Regulation of production and manufacture
- Control of purchasing and selling prices
- Control of storage, transport, distribution, disposal, acquisition, use or consumption
- Sale and delivery of stock to the government

Items regulated under the Essential Commodities Act are reviewed from time to time.

(5) Foreign Exchange Regulation Act, 1973

- The highest managing agency is Ministry of Finance of the Central Government, and daily management is conducted by Reserve Bank of India in accordance with instructions of the Ministry.
- Foreign exchange transaction is conducted by Reserve Bank of India and authorized dealers licensed by the Bank.
- Currencies used for foreign settlements are divided into convertible account currencies for the Western countries and bilateral account currencies for the East Europe countries, U.S.S.R. and North Korea. India has special settlement agreements with Afghanistan, Bangladesh, Egypt and Sudan.

(6) Customs Act, 1962

- Taxes imposed on imports include import duties, countervailing duties and surtax (special tax to cover the national finance deficit).
- Import duties are imposed either ad valorem or specific, whichever higher duty applied.
- The base for assessment of ad valorem duty is C.I.F. price, but to prevent the customs duties from being reduced by declaring import prices lower than actual, market price at home and abroad of each merchandise is studied beforehand to set a legal price, based on which customs duty is imposed.
- Tariff rates were established in 1975 and tariff items are classified according to Customs Cooperation Council Nomenclature.

(7) Imports and Exports (Control) Act, 1947

An outline of Imports and Exports (Control) Act is as follows:

a. Exports

- Items, export of which is promoted, can be exported freely, but those under export control are subject to export licence.
- Types of export licence include Quota Licensing, New Comer's Licensing, Limited Free Licensing, Free Licensing, Ad-hoc Licensing and Open General Licensing.

b. Imports

- Import policy is decided considering requirement of domestic economy, condition of foreign exchange and others and announced at the beginning of each fiscal year. The import policy gives priority to import of items necessary for achieving the economic plan.

- The government's import licences are required for almost all items of import. Those exempted from the licences are imports on government's accounts, relief items, replacement of defective part of imports and raw materials for specified export industries. Those exempted from the licences to a certain extent are gift books, travellers' luggage and sample goods.
- There are two types of import licences, Open General Licence and Individual Licence.
- Items, import of which is prohibited, are largely products which can be manufactured from raw materials obtainable at home, but import is permitted of those items which are not available at home and exported as part of exports.
- Items, import of which is absolutely prohibited, are those which compete with products of small-scaled domestic industries, and their import is not allowed in any case for protection of those industries.
- Foreign exchange used in the settlement of imported goods is allotted in accordance with the government's import policy. Importers are to present copies of import licences to foreign exchange banks to receive allocations of foreign exchange and make the settlement by either opening letters of credit or making remittance against sight drafts.
- In line with a policy to nationalize trade with a view of increasing import restriction, improving efficiency of trade and ensuring supply of important goods, the major part of imports is handled by state enterprises.

2-4. Related organizations

(1) Ministry of Steel and Mines

The steel industry in India is under the control of Ministry of Steel and Mines. The Ministry consists of Department of Steel and Department of Mines. Department of Steel controls steel companies and those enterprises which handle ferrous minerals covering iron ore and ferruginous manganese ore, refractories, steel structures, and Department of Mines enterprises handling aluminium, copper, zinc, gold and others.

Besides control of those enterprises, Department of Steel has organizations such as the office of Iron and Steel Controller who controls the market as an intermediary between suppliers and users and Mineral Development Board. Department of Mines has similar organizations under it.

Under the Minister, there are Secretaries in charge of steel and mines, respectively, and Joint Secretaries who assist Secretaries.

IISCO who is the principal of this feasibility study and its parent company, Steel Authority of India, Ltd. (SAIL) are public enterprises under the control of Department of Steel.

The chart on the following page gives the state undertakings and organizations under Department of Steel.

MINISTRY of STEEL AND MINES

- Department of Steel (Iron and Steel, Ferrous Minerals)
  - Steel Authority of India Ltd. (SAIL)
  - Indian Iron and Steel Co., Ltd. (IISCO) (A subsidiary of SAIL)
  - IISCO Ujjain Pipe and Foundry Co., Ltd. (A subsidiary of IISCO)
  - Vijayanagar Steel Ltd.
  - Visveswaraya Iron and Steel Ltd.
  - Vizag Steel
  - Sponge Iron India Ltd.
  - Metallurgical and Engineering Consultants (India) Ltd. (MECON)
  - Hindustan Steel Works Construction Ltd.
  - Bharata Refractories Ltd.
  - Metal Scrap Trade Corp.
  - Ferro Scrap Nigam Ltd.
  - National Mineral Development Corp.
  - Kudremukh Iron Ore Co., Ltd.
  - Bolani Ores (India) Ltd.
  - Manganese Ore (India) Ltd.
  - India Fire Bricks and Insulation Co., Ltd.
  - Others
  - The Office of the Iron and Steel Controller
  - Mineral Development Board
  - Others

- Department of Mines
  - Bharat Aluminium Co.
  - National Aluminium Co., Ltd.
  - Hindustan Copper Ltd.
  - Hindustan Zinc Ltd.
  - Bharat Gold Mines Ltd.
  - Mineral Exploration Corp.
  - Others
  - Indian Bureau of Mines
  - Aluminium Research, Design an Development Corp.
  - Others

Source: Ministry of Steel and Mines "Report 1985-86, Department of Steel"
Seventh Five Year Plan 1985-90

Fig.2.4.1 Undertakings and Organizations under the Ministry of Steel and Mines

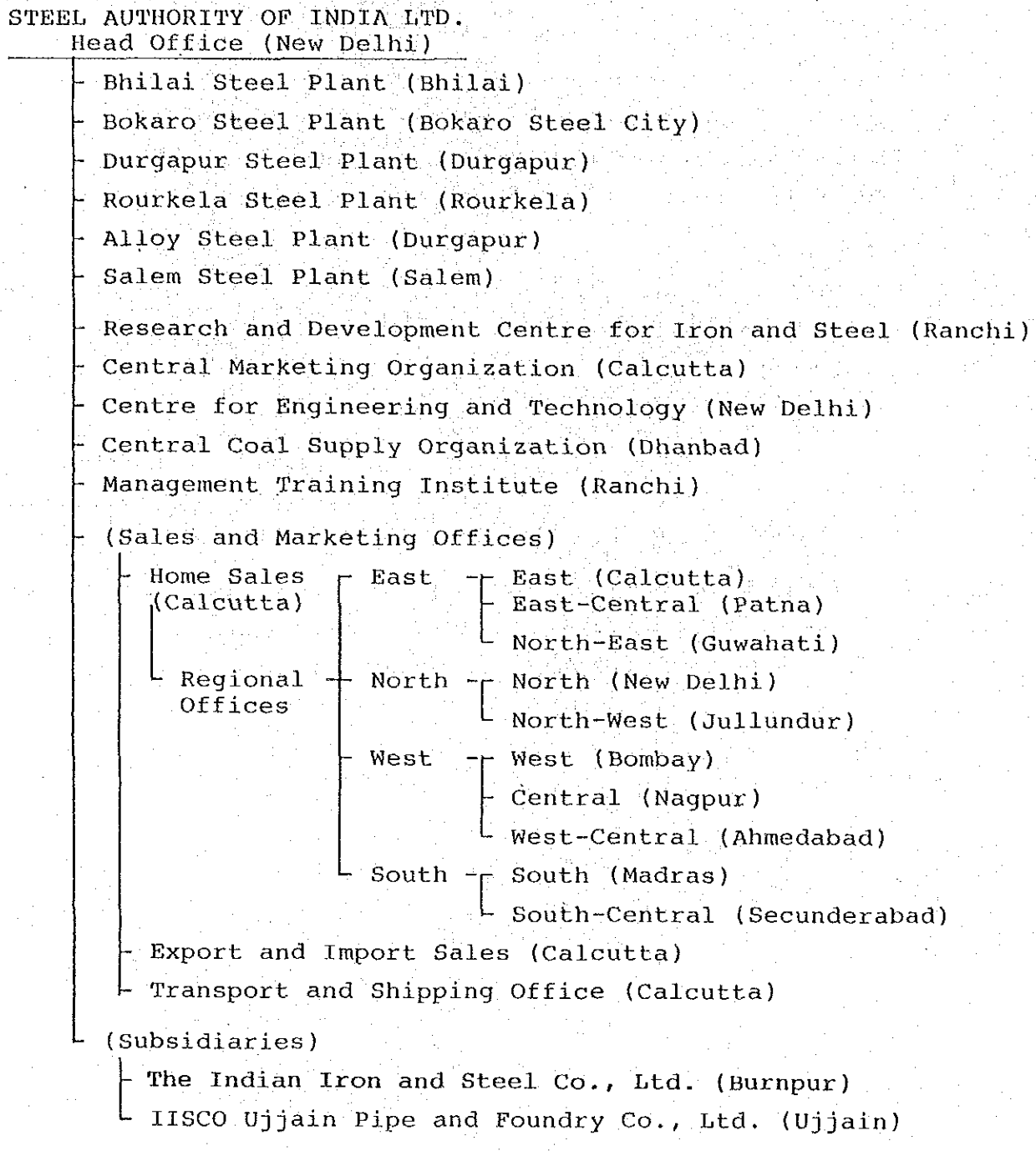
(2) Steel Authority of India Ltd. (SAIL)

SAIL is a state undertaking under the control of Ministry of Steel and Mines and the largest corporate entity and the biggest industrial company in India with assets worth Rs.6,000 crores and employees of more than 250,000.

SAIL operates directly integrated steel plants at Bhilai, Bokaro, Durgapur and Rourkela and also a research and development centre, engineering centre and management training centre, and its marketing outlets are located at several key positions throughout the country.

In its organization, the Chairman directs the Board of Directors, who are in charge of steel plants, finance, personnel, research and development, sales or projects.

The chart on the following page shows the organization of SAIL, covering steel plants, research centre, sales offices and subsidiaries such as IISCO.



Source: SAIL "Annual Report 1984-85"

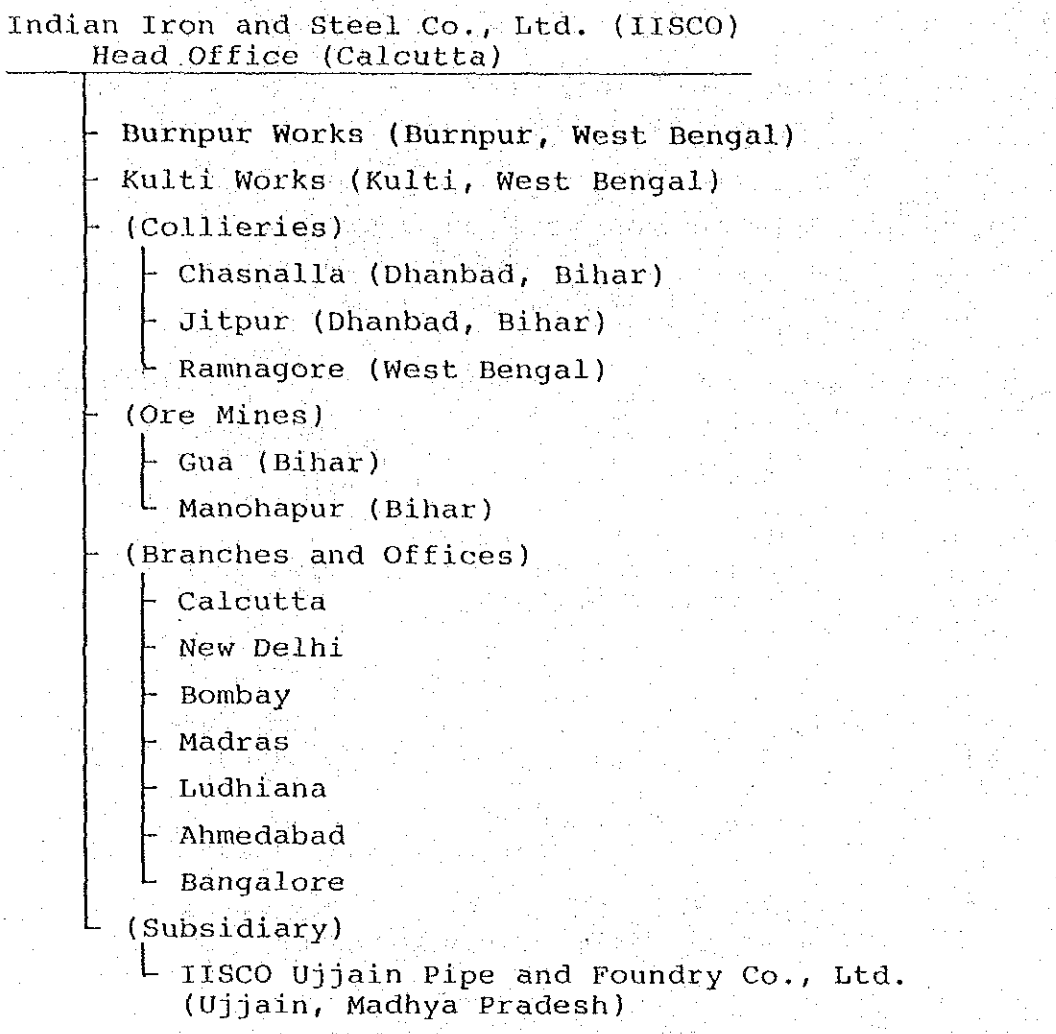
Fig. 2.4.2 Organization of SAIL

(3) Indian Iron and Steel Co., Ltd. (IISCO)

IISCO operates an integrated steel plant (Burnpur), a spun pipe and foundry plant at Kulti, collieries at Chasnalla, Jitpur and Ramnagore, iron ore mines at Gua and Manohapur (Chiria) as well as branch offices all over India. In addition, it has a 100% subsidiary, IISCO Ujjain Pipe and Foundry Co., Ltd.

As the organization and personnel, etc. are discussed in detail in another section, a brief history of IISCO will be described below.

1870	Kulti Works established
1875	Production by blast furnace began at Kulti.
1910's	Steel produced at Kulti
1918	IISCO incorporated
1922	Blast furnaces started up at IISCO Burnpur Works
1936	IISCO amalgamated Kulti Works.
1939	Production of steel began at IISCO Burnpur Works.
1945	Production of cast iron pipe began at Kulti.
2nd half of 1950's	Burnpur Works expanded Kulti Works expanded, but iron making facilities removed
1964	IISCO, in collaboration with Messrs. Stanton and Staveley in England, consolidated IISCO Ujjain Pipe and Foundry Co., Ltd. as a subsidiary, which is now 100% owned by IISCO.
1972	The Government of India succeeded the management of IISCO.
1976	The Central Government bought IISCO shares from individual shareholders and IISCO became one of public sector undertakings.
1979	The entire IISCO shares transferred to SAIL and IISCO became a 100% subsidiary of SAIL.



Source: IISCO "Annual Report 1984-85" and others

Fig. 2.4.3 Organization of IISCO

Chapter 3

Steel demand and supply

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3. Steel Demand and Supply

3-1. Present condition of steel demand and supply

3-1-1. Steel supply

The Indian steel industry has a long history beginning in 1875 when Bengal Iron Co. constructed two blast furnaces at Kulti.

In 1907 the first large-scale steel plant in India was established as Tata Iron & Steel Co. (TISCO) and by 1939 the crude steel production capacity of India reached one million tonnes/year. Since 1950's, state owned steel plants were constructed successively and the progress of steel industry was accelerated in India.

In the second half of 1970's, the industry established the crude steel production capacity of 10 million tonnes and the crude steel production in 1985/86 recorded the highest in its history of 11.36 million tonnes. However, the growth rate for the recent five years (1979/80-1984/85) was as low as less than 2.0% a year.

Table 3.1.1 Trends of Ingot Steel Production in India

(Unit: 1,000T)

1970/71	6,302	1975/76	8,251	1980/81	9,385
71/72	6,410	76/77	9,656	81/82	10,764
72/73	6,954	77/78	9,765	82/83	11,023
73/74	6,633	78/79	10,067	83/84	10,433
74/75	7,142	79/80	9,807	84/85	10,647
				85/86	11,361

Annual growth rate of crude steel production in India (%)

1974/75 - 1979/80 : 6.5

1979/80 - 1984/85 : 1.7

1974/75 - 1984/85 : 4.1

Source; Statistics for Iron & Steel Industry in India, SAIL

In operation now in India are 6 integrated steel plants including five plants under SAIL (Bhilai, Durgapur, Rourkela, Bokalo and IISCO's Burpur) and one private plant (TATA), and crude steel production of those six plants in 1985/86 was 9.15 million tonnes, accounting for about 80% of the total production of India. In terms of actual capacity, steel-making capacity of the five steel plants of SAIL totalls 8.55 million tonnes and that of TATA is 2.2 million tonnes, their total being 10.75 million tonnes accounting for 82% of the total actual capacity in the entire India (13.15 million tonnes).

Table 3.1.2 Ingot Steel Production Performance of Integrated Steel Plants

(Unit: 1,000T)

	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86
Bhilai	2,041	2,115	2,130	1,837	1,998	2,363 (3,000)
Durgapur	741	930	952	806	760	867 (920)
Rourkela	1,165	1,203	1,144	1,088	1,119	1,198 (1,400)
Bokaro	923	1,792	1,829	1,681	1,925	1,993 (2,650)
IISCO Burnpur	609	600	624	543	444	570 (580)
SAIL Group	5,479	6,640	6,679	5,955	6,246	6,991 (8,550)
TISCO	1,874	1,956	1,946	1,973	2,050	2,160 (2,200)
Total	7,353	8,596	8,625	7,928	8,297	9,151 (10,750)

Source: Report 1985-86 Development of Steel, Ministry of Steel & Mines MSM

Note: Figures in parenthesis show available capacity in 1985/86.

Of the above integrated steel plants, TATA shows a very high capacity utilization rate and Durgapur and Burnpur show the lowest rate.

Table 3.1.3 Capacity Utilization Percentage of Ingot Steel Making by Works in 1985/86

(Unit: %)

Bhilai	75	Bokaro	78
Durgapur	54	IISCO Burnpur	56
Rourkela	65	TATA	96

Source: Report 1985-86 Development of Steel, MSM

Note: Nominal capacity was used as basis for calculation of capacity utilization percentage.

In addition to the above integrated steel plants, there are a great number of electric furnace steelmakers, or so-called mini-mills in India. Already there are 1,196 mills which have industrial licenses, of which 159 are in operation with rated capacity of 4.7 million tonnes/year. Their actual capacity is 2.4 million tonnes/year reflecting the short supply of electric power and scrap materials. Crude steel production by electric furnaces was estimated to be 2.3 million tonnes in 1985/86.

Moreover, rerollers have a considerable weight in the production of bars and rods. The number of rerollers in India as of 1980 totalled 1,061 and they had rated capacity of 20.68 million tonnes. But their capacity utilization is said very low and only about 20%.

Table 3.1.4 Production of Steel Items by Mini-Mills during 1982-83 to 1985-86 (Apr.-Jan. 86)

(Unit: 1,000T)

Year	Mild Steel	Medium/ High Carbon	Alloy Steel	Total
1982-83	1,590	276	368	2,234
1983-84	1,674	368	382	2,424
1984-85	1,620	321	389	2,330
1985-86 (Apr.-Jan.)	1,641	226	286	2,153
1985-86 (Estimated)	2,092	311	397	2,800

Source: Report 1985-86 Development of Steel, MSM

Table 3.1.5 Production of Steel Items by Re-rollers during 1982-83 to 1985-86 (Apr.-Dec.85)

(Unit: 1,000T)

Year	Rolled Products
1982-83	1,630
1983-84	1,852
1984-85	2,136
1985-86 (Apr.-Dec.85)	1,704

Source: Report 1985-86 Development of Steel, MSM

In addition, there are wire drawers in India, and major ones number 72 units with capcity of 870,000 tonnes/year and small ones 600 units with capacity of 800,000 tonnes/year. Besides, there are a number of cold rollers with 59 units of narrow strip mills with capacity of one million tonnes/year. But due to shortage of hot coils, their production is forced to be much lower than the capacity.

Reflecting the above condition of supply by type of steelmakers in India, production by products in 1985/86 is as shown on the table on the next page.

Table 3.1.6 Production by Products in 1985/86

(Unit: 1,000T, %)

Product	Production
Wire rods & bars	4,534 (46.6)
Shapes	1,261 (13.0)
Heavy & medium plates	1,225 (12.6)
HR sheets & coils	1,304 (13.4)
CR sheets & coils	436 (4.5)
Galvanized sheets	172 (1.8)
Tinplates	167 (1.7)
ERW/SW pipes	65 (0.7)
Electrical sheets	61 (0.6)
Others	498 (5.1)
Total finished steel	9,723 (100.0)

Source: SAIL

As seen from the above table, wire rods and bars, and shapes account for about 60% of the total production and the weight of flat rolled products is still very low.

Installed capacity by mill (rated capacity) in 1985-86 and available capacity by product (actual capaicty) in the same year in India are as shown below.

Table 3.1.7 Installed Capacity by Mills in India

(Unit: 1,000T)

Wire rod mills	790	Cold rolling mills	1,340
Bars & rod mill & light section mills	4,600	Galvanizing plants	248
		Tinplate plants	310
Medium section mills	360	Electrical sheet mill HR	85
		Large dia. pipe plant	130
Heavy section mills including rail mills	900	Liquid steel	17,600
		Hot metal	14,300
Plate mill	1,330		
Hot strip mill	5,060		

Source: SAIL

Table 3.1.8 Available Capacity by Product in India

(Unit: 1,000T)

Wire rods	790	HR elctrical sheets	80
Bars	3,511	CRGO/CRNO sheets	35
Shapes	1,366	Railway products	572
Heavy & medium plates	840	Others	19
HR sheets & coils	2,375	Total finished products	10,731
CR sheets & coils	660	Semis	-
Galvanized sheets	227	Crude steel	13,150
Tinplate	171	Hot metal	11,646
ERW/SW pipes	85		

Source: SAIL

3-1-2. Steel demand

As an indication of steel consumption level in India, the trend of apparent crude steel consumption is shown below.

Table 3.1.9 Trends of Apparent Steel Consumption in India

(Unit: 1,000T)

1970/71	5,797	1975/76	6,973	1980/81	10,856
71/72	7,060	76/77	7,929	81/82	13,265
72/73	7,921	77/78	8,677	82/83	12,925
73/74	7,199	78/79	10,077	83/84	11,040
74/75	8,091	79/80	10,080	84/85	10,971
				85/86	13,449

Table 3.1.10 Growth Rates of Apparent Crude Steel Consumption and GNP (%)

	ASC (A)	GNP (B)	A/B
1974/75 - 79/80	4.5	3.9	1.154
1979/80 - 84/85	1.7	5.3	0.321
1974/75 - 84/85	3.1	4.6	0.674

Source: SAIL & Economic Survey 1985-86

Although the apparent steel consumption since the end of 1970's remained above 10 million tonnes, the level may be said very low for India's land area and population. ASC per capita in 1985/86 is only about 18 kg, which is among the lowest in the world. Such low steel consumption level is reflected also in the fact that the elasticity coefficient of ASC as against GNP has been below 1.0 during the past ten years.

Of finished steels consumed, steels used in construction such as bars, wire rods and shapes have high weights and those three account for 55% of the total consumption. On the other hand, consumption of flat products and pipes is much lower than long products, indicating slow industrialization of manufacturing industry in India. Moreover, India depends heavily on import for supply of high value added products.

Table 3.1.11 Apparent Consumption of Steel Products in 1985/86

(Unit: 1,000T)

Wire rods	4,616	(82)	Galvanized sheets	189	(17)
Shapes	1,350	(89)	Tinplate	236	(69)
Heavy & medium plates	1,490	(265)	ERW/SW pipes	148	(83)
			Electrical sheets	108	(47)
HR sheets & coils	1,461	(157)	Others	502	(4)
CR sheets & coils	659	(223)	Total finished steel	10,759	(1,036)

Note: Figures in parentheses show imports.

Source: SAIL

3-1-3. Steel demand and supply balance

The present demand and supply balance of finished steel by kind of product calculated from the above steel demand and supply in India is as shown in the table below.

In India where efforts are being made to improve social capital, there is a considerable demand and supply gap in bars, medium & light sections, demand for which is high for use in construction work, and also there is shortage of cold rolled sheets and coils, domestic production capacity of which is absolutely small.

Table 3.1.12 Demand & Supply Balance of Steel Products in India in 1985/86

(Unit: 1,000T)

	Demand	Available Capacity	Balance
Wire rods	725	790	+ 65
Bars & rods	4,127	3,511	-616
Small sections	1,045	845	-200
Medium sections	365	177	-188
Heavy sect. & rails	738	825	+ 80
Plates above 10 mm.	542	840	+298
GP/GC sheets	267	227	- 40
Tinplate	265	171	- 94
Electrical sheets	136	115	- 21
Large dia. pipes	80	85	+ 5
Equivalent HR coils	3,534	3,496	- 38
Equivalent CR coils	1,449	1,046	-403

Source: SAIL

3-2. Outlook of steel demand and supply in future

3-2-1. Outlook of steel supply

As already mentioned in Chapter 2 on steel policy, the Government of India places emphasis on expansion of capacity by utilizing most effectively existing steel plants by reason of its financial difficulties and no new large projects are planned in the Seventh Five Year Plan. Under such condition the Government is implementing a plan to expand the present production capacity of a little more than 13 million tonnes in terms of crude steel to 20 million tonnes or more by 1995-2000.

SAIL contemplates that the capacity expansion take place mainly at its existing steel plants and that if there occurs any shortage, it be satisfied by mini-mills. Therefore, it plans to accelerate expansion projects at major steel plants which showed some delay so far.

Expansion projects which aim at increasing capacity of both Bokaro and Bhilai Steel Plants to 4 million tonnes were originally planned to be completed in 1982/83, but there is delay and they are still under construction.

Present condition of expansion at major steel plants may be summarized as follows:

Bokaro:

It was planned to expand the present capacity of 1.7 million tonnes/year to 4 million tonnes. Under Phase I projects, expansion of coke ovens and sintering plant and construction of two 2,000 m^3 class blast furnaces and two BOFs with capacity of 3 million tonnes/year were completed by early 1986, and under Phase II projects construction is under way of 5-stand tandem 1420 mm cold rolling mill and galvanizing line with capacity of 170,000 tonnes/year. The CR mill and galv. line are

scheduled to be completed by September '87 and February '88. In addition, an oxygen plant required to attain production of 4 million tonnes of crude steel is now expected to be completed in mid-1988 at the earliest.

Bhilai:

Present capacity of 2.5 million tonnes/year is to be increased to 4 million tonnes. Phase I projects which include three 100-130T BOFs, slab and bloom C.C. and 3600 mm plate mill are scheduled to be completed by the middle of 1986. At present construction of No.9 coke ovens and No.7 blast furnace (2,000 m^3) is under way as Phase II projects and their completion is expected in early 1988.

Rourkela:

Construction of cold rolled electrical sheet mill is under way and already nonoriented sheet mill (35,000T/y) was completed and oriented sheet mill (37,500T/y) was originally scheduled to be completed by the end of 1985 but is not yet completed.

IISCO Burnpur Works:

Though the Works has nominal capacity of one million tonnes/year, its facilities are old and crude steel production is actually 0.5-0.6 million tonnes a year. In order to expand production capacity by modernization, it asked the Japanese government for the present F/S by JICA mission.

VIZAG:

At present the most modern integrated steel plant that specializes in long products and an only seaside steel plant in India is under construction. Its product mix includes bars, medium and light sections and wire rods. By reason of financial difficulties, this VIZAG plant had to give up a universal beam mill originally planned

and decrease the number of steelmaking shop from two with 5 units of 130-T BOFs to one shop with 3 units of 150-T BOFs. It was originally planned that Phase I (1.2 millioin tonnes/y) was to be completed in four years and Phase II (3.4 million T/y) in two more years, or in 1986 and 1988, respectively. But due to delay of the construction work, the completion of Phase I projects is now expected to be after 1988/89.

TATA:

Construction of a bar mill with capacity of 300,000T/y is under way and its completion expected in mid-1987.

In addition to the above expansion at major integrated steel plants, it is expected that capacity of mini-mills who use DR sponge iron as raw materials will be expanded to help fill the demand and supply gap as mentioned above.

In the above are given expansion plans under the Seventh Five Year Plan and thereafter and their progress. SAIL has compiled steelmaking capacity in India after the expansion as above.

Table 3.2.1 Steelmaking Capacity by Steel Plant (Available Capacity)

(Unit: 1,000T)

	1986/87	1989/90	1994/95
Bokaro	2,650	4,000	4,000
Bhilai	3,000	4,000	4,000
Rourkela	1,400	1,400	2,300
Durgapur	920	1,150	1,658
Burnpur	580	600	1,000
SAIL Total	8,550	11,150	12,958
VIZAG	0	700	3,000
TATA	2,200	2,432	2,432
Others	2,400	2,800	3,500
Total	13,150	17,082	21,890

Source: SAIL

As there are no plans to increase the capacity of the 1994/95 stage, the capacity in 2000 is expected to be same as that in 1994/95.

In the meantime, production capacity by kind of product up to 1994/95 as compiled by SAIL is as follows:

Table 3.2.2 Production Capacity by Kind of Product (Available Capacity)

(Unit: 1,000T)

	1986/87	1989/90	1994/95
Wire rods	790	790	1,640
Bars	3,511	4,261	5,586
Shapes-Large	344	400	400
Medium	177	313	1,210
Small	845	1,226	1,513
Heavy & medium plates	840	1,330	1,428
HR sheets & coils	2,375	2,107	2,627
CR sheets & coils	660	1,650	1,650
Galvanized sheets	227	418	443
Tinplate	171	258	310
ERW/SW pipes	85	130	130
HR electrical sheets	80	85	85
CRGO/CRNO sheets	35	73	73
Railway products	572	621	670
Others	19	18	18
Total finished steel	10,731	13,680	17,783

Source: SAIL

3-2-2. Outlook of steel demand

Considering the population and land area of India as well as social and economic progress expected in future, it may safely be said that there is unlimited room for growth of demand for all kinds of steel products. However, the growth of steel demand within the period of the Seventh Plan and to 2000 may be affected by the pace of progress of the Government's economic development plan, namely the speed of expansion of social capital and industrialization.

SAIL prepared an outlook of demand for steel by kind of product up to 2000 and provided it to the JICA mission. It was basically a result of macroscopic demand forecast incorporating economic growth rate in the Seventh Plan (annual growth rate of 5%). Though details of forecast by demand sector are not provided by SAIL, their view may be outlined as follows:

Steel consumption in construction sector will increase rapidly in future. A big growth of demand for steel from electric power development can be expected, increasing 30% in next five years. And automotive sector also is expected to increase demand for flat products.

Among the finished steels in the outlook up to 2000, demand of long products will show faster growth than flat products generally to 1990, but thereafter flat products will show faster growth than long products.

Methodology used by SAIL in its demand forecast may be summarized as follows:

i) To remove the effect of stock fluctuation, actual consumption as non-explanatory variable is subjected to three-year moving average.

ii) Regression formula uses steel consumption as non-explanatory variable and GDP excluding agriculture as explanatory variable, with data covering 14 years from 1970-71 to 1984-85.

iii) As the future value of GDP, the Seventh Five Year Plan is assumed to be achieved as planned.

iv) Consumption of finished steels obtained by the above forecasting formula is to be divided among demand sectors. In this case, weight of each sector in the consumption during the past ten years is taken into consideration, and besides, any change in economic structure expected in future is incorporated in the calculation.

v) Regression formula: $Y = AX^B$ where

Y = Non-explanatory variable (Steel consumption)

X = Explanatory variable (GDP excl. agriculture)

A = Constants or invariables

B = Regression coefficient

Correlation coefficient: 0.9

Table 3.2.3 Demand Forecast by Products in India

(Unit: 1,000T)

	Demand				Annual Growth Rate (%)		
	1986-87	1989-90	1995-96	2000-2001	89-90/86-87	95-96/89-90	2000-2001/95-96
I Bars/Rods, Wire Rods, Light Sections	5,897	7,115	9,870	12,545	6.5	6.8	4.9
1. Wire rods	725	790	1,075	1,380	2.9	6.4	5.1
2. Bars & rods	4,127	5,135	7,185	9,220	7.6	6.9	5.1
3. Small sec.	1,045	1,190	1,610	1,945	4.4	6.2	3.9
II Medium Sections	365	440	550	670	6.4	4.6	4.0
III Heavy Sections & Rails	738	800	880	995	2.7	1.9	2.5
1. Heavy sec.	248	310	390	465	7.7	4.7	3.6
2. Rails	490	490	490	530	0	0	1.6
IV Plates above 10 mm	542	690	1,040	1,425	8.4	8.6	6.5
V Plates 5-10 mm	660	730	1,080	1,485	3.4	8.1	6.6
VI Hot Rolled Coils, Sheets, Strips & Skelps	1,689	1,915	2,840	3,905	4.3	8.2	6.6
1. HR sheets below 5 mm		430	580	750	-	6.2	5.3
2. HR coils/ skelps		1,485	2,260	3,155	-	8.8	6.9
VII Cold Rolled Sheets/ Coils	816	970	1,550	2,220	5.9	9.8	7.4
VIII GP/GC Sheets	267	365	490	600	11.0	6.1	4.1
1. GP sheets	N.A.	200	260	325	-	5.4	4.6
2. GC sheets	N.A.	165	230	275	-	6.9	3.6
IX Tin Plates	265	220	240	250			
X Electrical Sheets	136	165	250	350	6.7	8.7	7.0
1. HR electical sheets	N.A.	85	130	180	-	8.9	6.7
2. CR grain-oriented	N.A.	55	75	110	-	6.4	8.0
3. CR Non-oriented	N.A.	25	45	60	-	12.5	5.9
XI Large Dia. Pipes	80	120	170	265	14.5	7.2	9.3
XII Equivalent HR Coils	3,534	4,076	6,002	8,216	4.9	8.0	6.5
XIII Equivalent CR Coils	1,449	1,665	2,430	3,265	4.7	7.9	6.1
XIV Railway Materials other than Rails	160	160	160	170	-	-	-

Source: SAIL

3-2-3. Outlook of steel demand and supply balance

Steel demand and supply balance in 1990, 1995 and 2000 calculated on the basis of the outlook of steel demand and supply provided by SAIL is as follows:

Table 3.2.4 Gaps (-) & Surpluses (+) of Steel Products in India in 1986/87, 1989/90, 1995/96 and 2000/2001

(Unit: 1,000T)

	1986-87	1989-90	1995-96	2000-2001
Bars/Rods, Wire Rods, Light Sections:	- 751	- 838	- 1,131	- 3,806
Wire rods	+ 65	0	+ 565	+ 260
Bars & rods	- 616	- 874	- 1,599	- 3,634
Small sections	- 200	+ 36	- 97	- 432
Medium Sections	- 188	- 127	+ 660	+ 540
Heavy Sections & Rails	+ 87	+ 100	+ 20	- 95
Heavy sections	+ 96	+ 10	+ 10	- 65
Rails	- 9	+ 10	+ 10	- 30
Plates above 10 mm	+ 298	+ 640	+ 388	+ 3
Plates 5-10 mm	N.A.	+ 650	+ 300	- 105
GP/GC Sheets	- 40	+ 53	- 47	- 157
Tinplates	- 94	+ 38	+ 70	+ 60
Electrical Sheets	- 21	- 7	- 92	- 192
HR electrical sheet	N.A.	0	- 45	- 95
CR grain-oriented	N.A.	- 18	- 38	- 73
CR non-oriented	N.A.	+ 11	- 9	- 24
Large Dia. Pipes	+ 5	+ 10	- 40	- 135
Equivalent HR Coils	- 38	+ 983	- 451	- 2,665
Equivalent CR Coils	- 403	+ 825	+ 100	- 735
Railway Materials other than Rails	- 50	- 21	+ 28	+ 18

Source: SAIL

From the above table it can be seen that despite the construction and start-up of VIZAG, expansion of capacity at Durgapur and TATA, and possible expansion of mini-mills, the growth of demand for bars and rods is big, and their short supply will further expand in future.

On the other hand, there are some gaps in supply of thin flat products at present, but in 1990 capacity will exceed demand reflecting higher utilization rate of existing hot strip mill and start-up of cold rolling mill and galvanizing line at Bokaro and others. However, in 1995, hot coils will be 450,000 tonnes short, and surplus of cold rolled coils will decrease. In 2000, there will be shortage of hot coils and cold coils amounting to 2.67 million tonnes and 740,000 tonnes, respectively. Capacity of plates exceeds the demand at present and will continue to do so in future as well.

Medium sections are short at present, but construction of mills at VIZAG will result in surplus after 1995.

In view of the above demand and supply balance up to 2000, considerable supply gaps are expected for bars/light sections and hot/cold sheets, and expansion of capacity of those products is considered necessary in future.

In drawing up a modernization plan for IISCO's Burnpur Works, the above demand and supply balance may suggest kinds of products to be selected for the Works.

Namely if products are to be selected for expansion of the capacity of Burnpur Works in view of the above demand and supply balance in India as a whole on the premiss that the Indian side undertakes the modernization plan (capacity expansion) of the Works as soon as possible, priority should be placed on capacity expansion of bar & section mill.

In the meantime, shortage of hot coils will occur in 1995, but the deficit is 450,000 tonnes, and if a hot strip mill is constructed at the time, there will be a big surplus. The deficit in 2000 is 2.6 million tonnes, but if modernization of Burnpur Works is planned on the premiss that a hot strip mill is scheduled to be completed by then, the Burnpur Works has to postpone modernization to that timing. Besides,

the investment required for a hot strip mill is far bigger than a bar mill, and it can safely be said such plan makes it difficult to return the Works to sound and profitable management.

In any case, if it is the basic condition that Burnpur Works is to be modernized while utilizing existing facilities more effectively and that the modernization is to be over in the period 1990 to 1995, the products to be selected for the Works will be limited to bars and sections as suggested by the above demand and supply balance.

3-3. Distribution routes

Distribution of finished steels in India is summarized as follows: Namely, large users such as defence, power and railways (industries belonging to Status Group "A" under the national industrial policy) are allocated steel annually by the Joint Plant Committee (JPC). Small users (Small Scale Industries Corporations or SSIC) are allocated steel by the Iron and Steel Controller. Consumers other than the above have to register their requirements with main producers and their branch sales offices for supplies of all items.

Small Scale Units are normally to register their demand with their respective SSICs. However, small scale units who consumed 100 tonnes or more during any quarter during the past five years have been given option of receiving supplies either from main producers directly or through their respective SSICs.

SSICs are supplied steel at rebate by the main producers so that steel could be made available to the small scale industrial units at prices comparable to stockyard prices of the main producers. Presently SSICs get a rebate ranging from Rs.210 to Rs.300 per tonne excluding pig iron. But pig iron is generally supplied to SSICs directly from the plants on JPC plant price which is Rs.175 per tonne less than the stockyard price and SSICs sell pig iron to small scale units at the price corresponding to the main producers' stockyard price.

SAIL including IISCO have a network of 48 stockyards in India and also have 12 consignment agency yards and 69 other conversion agents/twisting yards throughout the country. On the other hand, TISCO has 11 stockyards and 87 other distribution outlets. Mini-mills, rerollers and others sell their products through their own networks.

Three year import policy for 1985-88, now in force, is more liberal than the previous import policy for 1984-85. Namly, the object of the current policy is to allow greater direct import to meet the requirements of industrial users. There has also been a change in the canalising agency for imports of iron and steel. The work of import handling has been shifted from SAIL to Minerals & Metals Trading Corporation of India Ltd. (MMTC). As automatic import licensing system is not adopted in India, import of all items which are not importable under Open General Licence or through the canalising agency has to be by issue of specific import licences.

Table 3.2.5 Apparent Steel Consumption by Products in India

(unit: '000 tonnes)

	1970-71				1971-72				1972-73				1973-74				1974-75				1975-76				1976-77				1977-78			
	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④
1 Wire Rods & Bars	1,761	5	139	1,627	1,986	119	14	2,091	2,326	70	5	2,391	2,698	90	7	2,781	2,847	103	34	2,916	2,464	48	253	2,259	3,151	26	742	2,435	3,285	33	436	2,882
2 Shapes	893	28	274	647	714	50	100	664	838	120	53	905	624	46	3	667	835	112	2	945	897	45	45	897	952	52	82	922	1,032	26	112	946
3 Heavy & Medium Plates	288	146		434	287	338		625	327	329		656	304	221		525	345	224		569	487	116		603	705	95	7	793	639	77	19	697
4 HR Sheets & Coils	628	69	3	694	592	281	1	872	704	178	3	879	434	185		619	530	262		792	670	61		731	1,053	27	9	1,071	1,002	32	92	942
5 CR Sheets & Coils	196	110		306	205	255		460	205	334		539	243	243		486	265	244		509	275	99		374	337	83		420	423	146	10	559
6 Galvanized Sheets	190	9		199	167	10		177	164	1		165	159	4	2	161	156	4		160	173	3	8	168	187	2	1	188	196	3	7	192
7 Tin Plates	133	49		182	114	64		178	116	46		162	35	62		97	30	48		78	48	56		104	54	36		90	59	65		124
8 ERW/SW Pipes													36			36	37			37	39			39	65			65	81		18	63
9 Electrical Sheets													39	22		61	51	49		100	50	19		69	43	26		69	61	50		111
10 Others	704	4	158	550	724	20	163	581	644	6	10	640	340	11	25	326	354	13		367	318	3	16	305	400	6	116	290	494	7	76	425
11 Total Finished Steel	4,793	420	574	4,639	4,789	1,137	278	5,648	5,324	1,084	71	6,337	4.912	884	37	5,759	5,450	1,059	36	6,473	5,421	450	322	5,549	6,947	353	957	6,343	7,272	439	770	6,941
12 In Crude Steel Basis	5,990	525	718	5,797	5,986	1,421	347	7,060	6,655	1,355	89	7,921	6,140	1,105	46	7,199	6,812	1,324	45	8,091	6,776	563	402	6,937	8,684	441	1,196	7,929	9,090	549	962	8,677
	1978-79				1979-80				1980-81				1981-82				1982-83				1983-84				1984-85				1985-86			
	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ③	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④	Production ①	Imports ②	Exports ③	ASC ④
1 Wire Rods & Bars	3,617	40	255	3,402	3,420	27	29	3,418	3,870	46	27	3,889	4,267	236		4,503	3,996	424		4,420	3,876	19	10	3,885	3,612	35	87	3,560	4,534	82		4,616
2 Shapes	964	77	48	993	797	225		1,022	882	362		1,244	816	368		1,184	939	692		1,631	980	173		1,153	1,088	48	49	1,087	1,261	89		1,350
3 Heavy & Medium Plates	657	169		826	670	420		1,090	612	233		845	850	418		1,268	869	389		1,258	709	352		1,061	775	128	2	901	1,225	265		1,490
4 HR Sheets & Coils	1,038	104	13	1,129	908	176		1,084	882	230		1,112	1,348	395		1,743	1,224	129	11	1,342	1,195	65	15	1,245	1,323	199		1,522	1,304	157		1,461
5 CR Sheets & Coils	447	233	26	654	354	222	11	565	306	424	22	708	423	483		906	426	172		598	380	185		565	439	298		737	436	223		659
6 Galvanized Sheets	195	163	6	352	186	56		242	153	82		235	198	60		258	213	83		296	166	21		187	181	16		197	172	17		189
7 Tin Plates	111	82		193	99	31		130	81	39		120	97	50		147	89	103		192	125	20		145	142	23		165	167	69		236
8 ERW/SW Pipes	88	—	15	73	94		6	88	72			72	80			80	86			86	62			62	57			57	65	83		148
9 Electrical Sheets	74	60		134	68	31		99	69	42		111	79	36		115	37	69		106	56	48		104	72	55		127	61	47		108
10 Others	342	5	41	306	323	3		326	318	31		349	370	38		408	409	2		411	425			425	424			424	498	4		502
11 Total Finished Steel	7,533	933	404	8,062	6,919	1,191	46	8,064	7,245	1,489	49	8,685	8,528	2,084		10,612	8,288	2,063	11	10,340	7,974	883	25	8,832	8,113	802	138	8,777	9,723	1,036		10,759
12 In Crude Steel Basis	9,416	1,166	505	10,077	8,649	1,489	58	10,080	9,056	1,861	61	10,856	10,660	2,605		13,265	10,360	2,579	14	12,925	9,968	1,103	31	11,040	10,141	1,002	172	10,971	12,154	1,295		13,449

Source: SAIL

Table 3.2.6 Present and Future Production Capacity by Products and by Works

(unit: '000 tonnes)

	SAIL																		VIZAG			PRIVATE ENTERPRISES									GRAND TOTAL		
	BOKARO			BHILAI			ROURKELA			DURGPUR			BURNPUR			SUB-TOTAL						TATA			OTHERS			SUB-TOTAL					
	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95	'86~'87	'89~'90	'94~'95
1 Wire Rods				400	400	400										400	400	400	—	—	850	—	—	—	390	390	390	390	390	390	790	790	1,647
2 Bars				180	180	180				175	245	280	149	175	175	504	600	635	—	210	350	327	771	771	2,680	2,680	3,830	3,007	3,451	4,601	3,511	4,261	5,586
3 Shapes																																	
3-1 Large Sized				215	250	250							129	150	150	344	400	400	—	—	—	—	—	—	—	—	—	—	—	—	344	400	400
3-2 Medium Sized				—	—	—				140	160	207	37	100	100	177	260	307	—	—	850	—	53	53	—	—	—	—	53	53	177	313	1,210
3-3 Small Sized				320	320	320							37	175	175	357	495	495	—	218	360	58	83	83	430	430	575	488	513	658	845	1,226	1,513
4 Heavy & Medium Plates				495	950	950	245	280	378							740	1,230	1,328				100	100	100				100	100	100	840	1,330	1,428
*5 HR Sheets & Coils	1,575	1,496	1,496				350	137	600	110	110	160	47	60	60	2,082	1,803	2,316				229	231	231	64	73	80	293	304	311	2,375	2,107	2,627
*6 CR Sheets & Coils	420	1,390	1,390				240	260	260							660	1,650	1,650							(140)	(160)	(200)	(140)	(160)	(200)	660 (880)	1,650 (1,810)	1,650 (1,850)
7 Galvanized Sheets	—	170	170				145	160	185				40	40	40	185	370	395				42	48	48				42	48	48	227	418	443
8 Tin Plates	—	(TMBP Coils) 100	100				85	150	150							85	250	250							86	108	160	86	108	160	171	(*) 258	(*) 310
9 ERW/SW Pipes							85	130	130							85	130	130													85	130	130
10 HR Electrical Sheets							20	35	35							20	35	35				60	50	50				60	50	50	80	85	85
11 CRGO/CRNO Sheets							35	73	73							35	73	73													35	73	73
12 Railway Products				465	500	500				59	89	138	16	—	—	540	589	638							@ 32	@ 32	@ 32	@ 32	@ 32	@ 32	572	621	670
13 Others																						19	18	18				19	18	18	19	18	18
14 Total Finished Steel	1,995	3,156	3,156	2,075	2,600	2,600	1,205	1,225	1,811	484	604	785	455	700	700	6,214	8,285	9,052	—	428	2,410	835	1,354	1,354	3,682	3,713	5,067	4,517	5,067	6,421	10,731	13,680	17,783
15 Semis	125	—	—	525	553	553	20	—	—	266	333	594	70	—	102	1,006	886	1,249	—	192	246	906	666	666	—	—	—	—	—	—	—	—	—
16 Total Saleable Steel	2,120	3,156	3,156	2,600	3,153	3,153	1,225	1,225	1,811	750	937	1,379	525	700	802	7,220	9,171	10,301	—	620	2,656	1,741	2,020	2,020	—	—	—	—	—	—	10,731	13,680	17,783
17 Crude Steel	2,650	4,000	4,000	3,000	4,000	4,000	1,400	1,400	2,300	920	1,150	1,658	580	600	1,000	8,550	11,150	12,958	—	700	3,000	2,200	2,432	2,432	2,400	2,800	3,500	4,600	5,232	5,932	13,150	17,082	21,890
18 Hot Metal	3,250	4,585	4,585	2,890	4,080	4,080	1,350	1,350	2,480	1,150	1,250	1,808	820	900	1,400	9,460	12,165	14,353	—	1,200	3,400	2,000	2,300	2,300	(+) 186	(+) 186	(+) 186	2,186	2,486	2,486	11,646	15,851	20,239

Source: SAIL

Notes: * Saleable HR and CR Coils indicate the balance quantities after feeding the downstream units for further-processing in respective plants.

( ) *These have been accounted in the HR coils from main plants, hence not include in column total.*

(+) Assessed.

@ From Railway's Banalore Wheels & Axle Plant.

Bars & Rods and Light Sections can change depending on order pattern.

(*) TMBP Coils adjusted in saleable steel.

Table 3.2.7 Demand, Available Capacity and Gaps/Surpluses for Steel Products in 1986~2000-2001 in India

'000 tonnes

	Demand				Available Capacity				Gaps (–)/Surpluses (+)				Remarks
	1986-87	1989-90	1995-96	2000-2001	1986-87	1989-90	1995-96	2000-2001	1986-87	1989-90	1995-96	2000-2001	
I Bars/Rods, Wire Rods, Light Sections	5,897	7,115	9,870	12,545	5,146	6,277	8,739	8,739	–751	–838	–1,131	–3,806	
1. Wire Rods	725	790	1,075	1,380	790	790	1,640	1,640	+65	0	+565	+260	
2. Bars & Rods	4,127	5,135	7,185	9,220	3,511	4,261	5,586	5,586	–616	–874	–1,599	–3,634	
3. Small Sections	1,045	1,190	1,610	1,945	845	1,226	1,513	1,513	–200	+36	–97	–432	
II Medium Sections	365	440	550	670	177	313	1,210	1,210	–188	–127	+660	+540	
III Heavy Sections and Rails	738	800	880	995	825	900	900	900	+87	+100	+20	–95	
1. Heavy Sections	248	310	390	465	344	400	400	400	+96	+10	+10	–65	
2. Rails	490	490	490	530	481	500	500	500	–9	+10	+10	–30	
IV Plates above 10 mm.	542	690	1,040	1,425	840	1,330	1,428	1,428	+298	+640	+388	+3	
V Plates 5-10 mm.	660	730	1,080	1,485	N.A.	* 1,380	* 1,380	* 1,380	N.A.	+650	+300	–105	* Capacities of Shearing Lines
VI Hot Rolled Coils, Sheets, Strips & Skelps	1,689	1,915	2,840	3,905									
1. Hot Rolled Sheets below 5 mm.		430	580	750									
2. Hot Rolled Coils/Skelps		1,485	2,260	3,155									
VII Cold Rolled Sheets/Coils	816	970	1,550	2,220									
VIII GP/GC Sheets	267	365	490	600	227	418	443	443	–40	+53	–47	–157	
1. GP Sheets	N.A.	200	230	325	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	
2. GC Sheets	N.A.	165	490	275	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	
IX Tin Plates	265	220	240	250	171	258	310	310	–94	+38	+70	+60	
X Electrical Sheets	136	165	250	350	115	158	158	158	–21	–7	–92	–192	
1. HR Electrical Sheets	N.A.	85	130	180	80	85	85	85	N.A.	0	–45	–95	
2. CR Grain-Oriented	N.A.	55	75	110	35	37	37	37	N.A.	–18	–38	–73	
3. CR Non-Oriented	N.A.	25	45	60		36	36	36	N.A.	+11	–9	–24	
XI Large Dia. Pipes	80	120	170	265	85	130	130	130	+5	+10	–40	–135	
XII Equivalent HR Coils	3,534	4,076	6,002	8,216	3,496	5,059	5,551	5,551	–38	+983	–451	–2,665	
XIII Equivalent CR Coils	1,449	1,665	2,430	3,265	1,046	2,490	2,530	2,530	–403	+825	+100	–735	
XIV Railway Materials other than Rails	160	160	160	170	110	139	188	188	–50	–21	+28	+18	

Source: SAIL

Chapter 4

Outline of IISCO

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4. Outline of IISCO

For the present F/S, namely for making a study of modernization plan of IISCO's BURNPUR Works, it is indispensable to study actual condition of not only the Works but ore mines at GUA and CHIRIA, CHASNALLA colliery and foundry at KULTI under the control of IISCO and also study actual condition of integrated steel plants at Bokaro, Bhilai, Durgapur and Rourkela under the control of SAIL and of private steel companies including not only integrated steel mills represented by TISCO but a great number of mini-mills which form a big factor to support Indian steel industry. Observing actual condition of BURNPUR Works alone would lead to one-sided and incomplete modernization plan.

Through thoughtfulness of the key officers of IISCO, the survey team could, though time was short, visit and study all of IISCO except CHASNALLA colliery, all steel plants of SAIL but Rourkela and TISCO.

The team visited also Amrit Steels Ltd.,one of mini-mills.

Thus every effort was made by the team to make correct judgement in F/S in respect of facilities, equipment, organization, personnel and productivity in particular.

4-1. BURNPUR Works

As discussed in Location condition in Chapter 5-9, IISCO is blessed with good location condition in iron ore, coal and manpower and has a long history being established in 1918.

To help understand the present condition, review of its history will be made briefly along with the period when its production facilities were put into operation.

In the beginning the company produced only pig iron and existing No.1 and No.2 500-m^3 blast furnaces were started up in 1922 and 1924, respectively.

Compared to the blast furnaces, construction of 225-T open hearth furnaces began much later in 1937, but the first tapping of steel took place successfully by the end of 1939. The four units in the first step were all put into commercial operation by 1940.

Various rolling mill facilities were, of course, started up at almost same period as the steelmaking facilities were completed. Namely, in 1939 and 1940, the following mills began production.

1939: 40" Blooming mill
18" Light structural mill
34" Heavy structural mill
1940: Sheet mill

Since then, facilities were expanded over again and the present BURNPUR Works was completed. Namely,

1958: No.4 1170-m^3 blast furnace
1959: No.6 225-T open hearth furnace
1960: Merchant & rod mill

As seen above, BURNPUR Works was once a proud, dignified integrated steel plant in the wide plains of West Bengal.

Duplex steelmaking process consisting of bessemer converters and open hearth furnaces which can be found nowhere in the world today is still used in BURNPUR Works, but considering its location, background and markets, the process must have been the best for the Works.

These days at the end of the 20th century, the scale of integrated steel plants has expanded from 5-6 million T/Y to

10 million T/Y throughout the world, but in the middle of this century a steel plant with capacity of one million T/Y was a large integrated steel plant in its own way.

However, in the age of rapid progress in steelmaking technology, in particular since 1950s, the Works neglected necessary replacement and remodelling of facilities (in the aspect of hardware) and introduction of new technologies (in the aspect of software). As a result, the Works now is very obsolete and deteriorated as described in Chapter 5-1 through 5-9.

It is considered therefore that there is not much time left for modernization of the Works.

On June 14, 1972, management of IISCO was transferred to the Government and became a subsidiary of SAIL in 1978.

Table 4.1.1 shows existing main facilities of BURNPUR Works. Fig. 4.1.1 shows the present layout of the Works and Fig. 4.1.2 shows location map of the Works.

Table 4.1.1 Main Facilities of BURNPUR Works

1. Coke ovens

	Startup	No. of ovens	In operation as of July 1986
No.7 Coke oven battery	1950	72	52 ovens
No.8 -"-	1957	78	Under repair
No.9 -"-	1958	78	26 ovens
No.10 -"-	1982	78	49 ovens

*Dimensions of oven: 4450 mmH x 12750 mmL x 420-480 mmW

2. Blast furnaces

No.1 Blast furnace	1922	500 m^3 (Rebuilt 1977)
No.2 -"-	1924	-"- (Rebuilt 1966)
No.3 -"-	1958	1170 m^3
No.4 -"-	"	-"-

3. Steelmaking furnaces

3-1. Bessemer converters: 25T x 3
Dead mixers : 900T x 2
*No.1 bessemer converter was started up in 1945.

3-2. Open hearth furnaces: 225T x 6
Dead mixers : 900T x 2
*No.1 O.H. furnace was started up in 1939.

4. Rolling mills

4-1. Blooming mill: Started up in 1939
Soaking pit : 32 holes
Rolling mill : 2-Hi reversing x 1
1066/941 mm x 2438 mm

4-2. Heavy structural mill: Started up in 1939
Reheating furnaces : 2 units
Roughing stand : 2-Hi reversing x 1
1220/965 mm x 2286 mm
Intermediate stand : 2-Hi reversing x 1
1220/965 mm x 2286 mm
Finishing stand : 2-Hi reversing x 1
1220/965 mm x 2286 mm

Table 4.1.1 (Cont'd)

4-3. Light structural mill: Started up in 1939

Reheating furnaces	:	2 units
Roughing stands	:	3-Hi x 2 584/482 mm x 1524/1372 mm
Intermediate stand	:	3-Hi x 1 584/482 mm x 1372 mm
Finishing stand	:	3-Hi x 1 584/482 mm x 762 mm

4-4. Sheet mill: Started up in 1941

Reheating furnaces	:	2 units (For roughing & finishing)
Roughing stands	:	3-Hi x 2 813/521 mm x 1575/1372 mm
Finishing stands	:	2-Hi non-reversing x 4 813 mm x 1113/1168/1270/1420 mm

Cold rolling mill
Annealing furnace
Acid pickling bath
Hot dip galvanizing line x 4

4-5. Sheet bar and billet mill: Started up in 1953

Roughing stands	:	2-Hi horizontal x 1 vertical x 1 806 mm x 457/1220 mm
Intermediate stands	:	2-Hi horizontal x 2 vertical x 2 648/706 mm x 381/1220 mm
Finishing stands	:	2-Hi horizontal x 4 518/566 mm x 558/813 mm

4-6. Merchant and rod mill: Started up in 1960

Reheating furnace	:	One unit
Roughing stands	:	2-Hi horizontal x 7 vertical x 2 343/421 mm x 152/800 mm

Table 4.1.1 (Cont'd)

Intermediate stands: 2-Hi horizontal x 4
vertical x 2
330/413 mm x 152/610 mm

Finishing stands : 2-Hi horizontal x 8
330/(257-278) mm x 520/610 mm

5. Power generator

5-1. Boilers: No.1 Boiler started up in 1939
14 units with total steam generation of 639 T/h

5-2. Steam turbines: No.1 Turbine started up in 1939
4 units with total power generation of 60 MW
They are medium-pressure turbines of 22.5 kg/cm^2
and consist of 10 MW x 2 and 20 MW x2.

6. Blowers

6-1. Steam turbine blowers: No.1 blower startup in 1928
Steam is supplied from Boilers in 5-1 above at
22.5 kg/cm^2 and 390 ^oC of medium pressure.

6-2. Blast furnace blowers: 4 units
For No.1 & No.2 BF 2 units, each 1700 $Nm^3/min.$
For No.3 & No.4 BF 2 units, each 2685 $Nm^3/min.$
Bessemer blowers : 2 units 850 $Nm^3/min.$
For common use : 1 unit 2685 $Nm^3/min.$

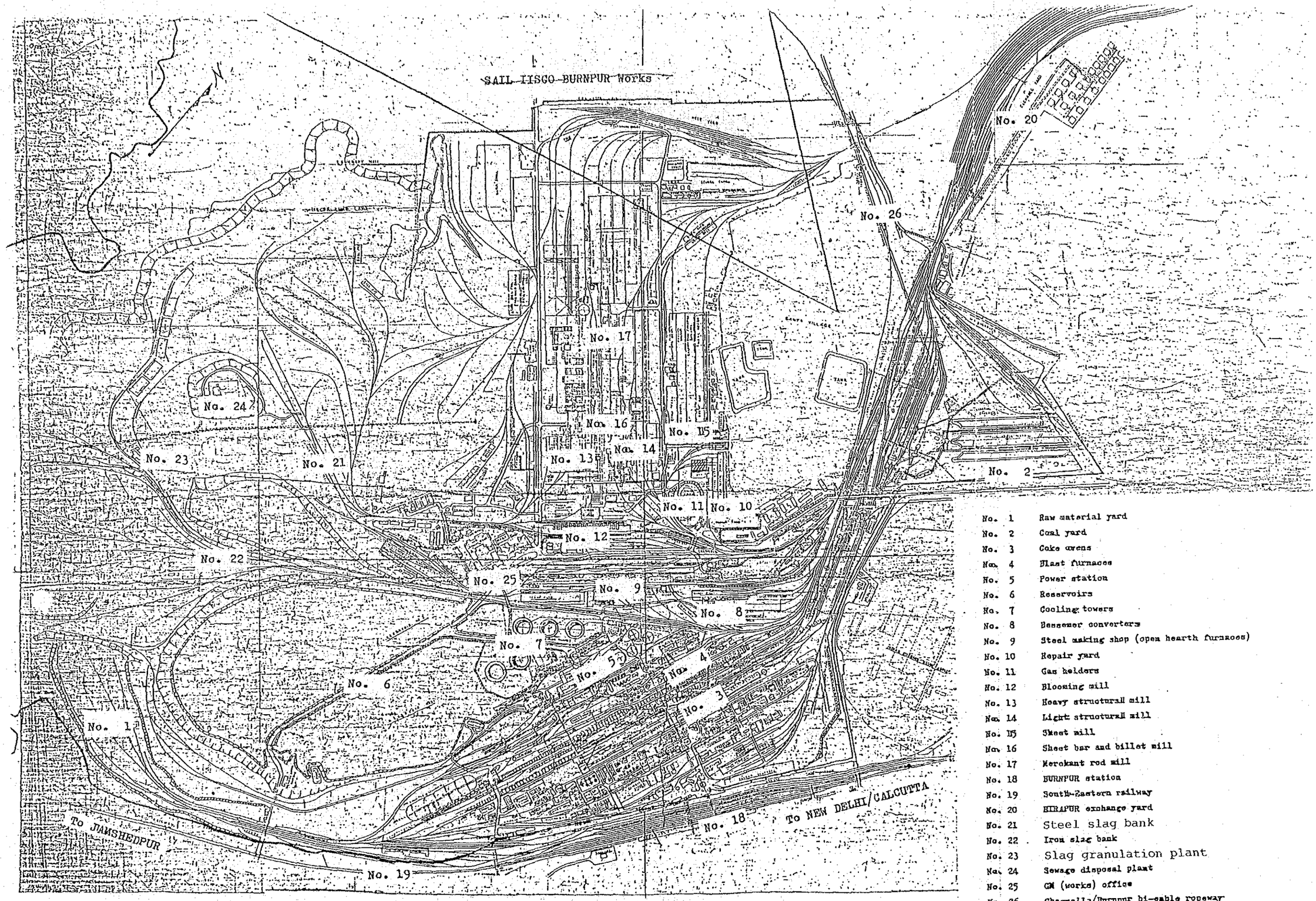

Fig. 4.1.1 Layout of BURNPUR works

No. 1	Raw material yard
No. 2	Coal yard
No. 3	Coke ovens
No. 4	Blast furnaces
No. 5	Power station
No. 6	Reservoirs
No. 7	Cooling towers
No. 8	Bessemer converters
No. 9	Steel making shop (open hearth furnaces)
No. 10	Repair yard
No. 11	Gas holders
No. 12	Blooming mill
No. 13	Heavy structural mill
No. 14	Light structural mill
No. 15	Sheet mill
No. 16	Sheet bar and billet mill
No. 17	Merchant rod mill
No. 18	BURNPUR station
No. 19	South-Eastern railway
No. 20	HIRAPUR exchange yard
No. 21	Steel slag bank
No. 22	Iron slag bank
No. 23	Slag granulation plant
No. 24	Sewage disposal plant
No. 25	GM (works) office
No. 26	Chasmalia/Burnpur bi-cable ropeway

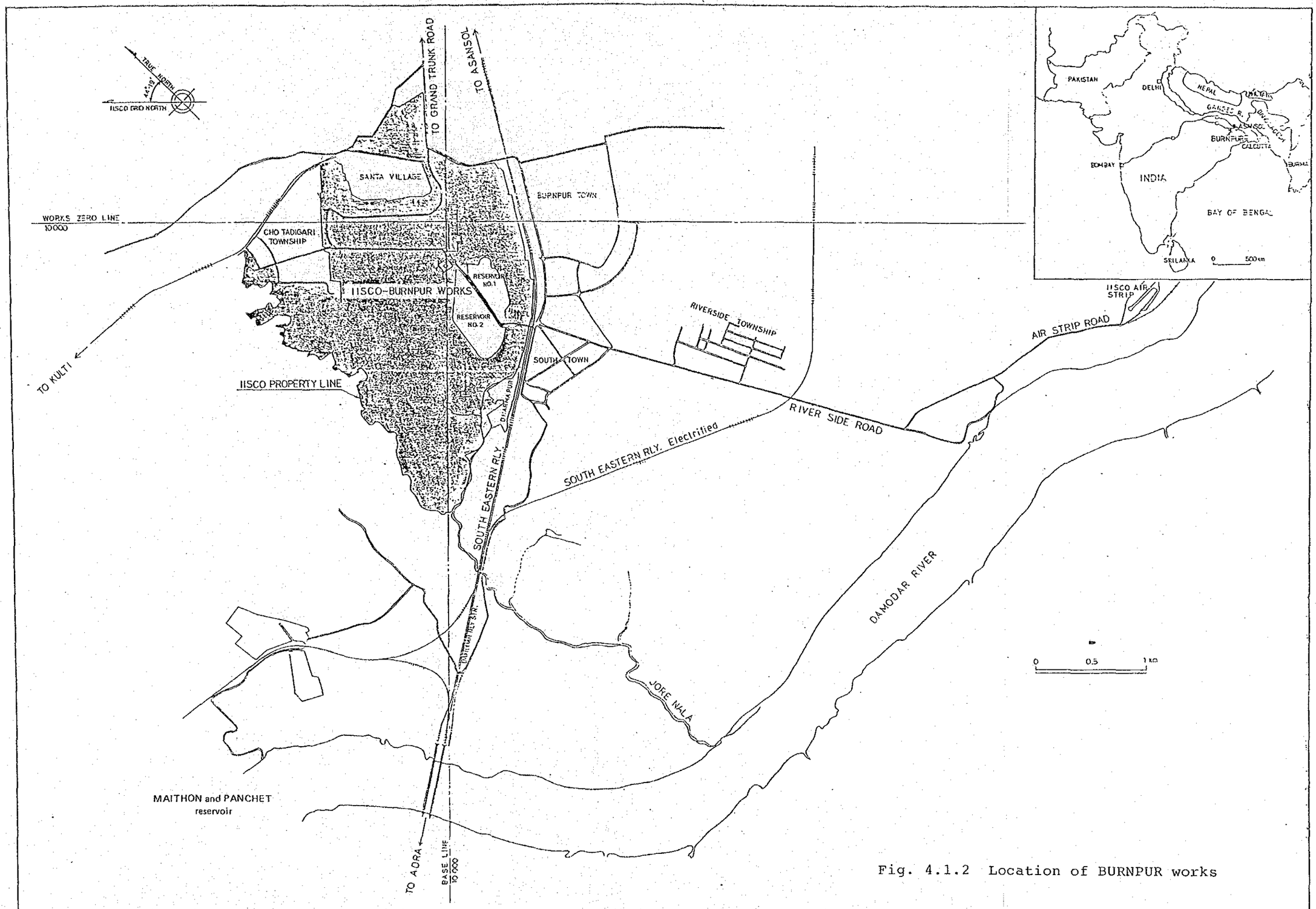

Fig. 4.1.2 Location of BURNPUR works

4-2. KULTI foundry

KULTI foundry located about 17 km west of BURNPUR boasts a history longer than BURNPUR Works and KULTI in West Bengal State may be called the birthplace of modern steel industry.

Bengal Iron Works established in 1870 began production by 1875. There still remain the foundations of mini steel works including those of 20T blast furnace which is very "cute" from the present common sense and others, retaining strongly some of its splendor in the past.

Since its blast furnace was closed in 1939, the foundry has been receiving the material from BURNPUR Works and producing the following, which are very important equipment and spare parts for BURNPUR Works.

Spun pipe shops
General casting shop
Light casting shop
Steel foundry
Non-ferrous foundry
Heavy mechanized foundry
Pattern shop
Machine shops
Laboratory

Nominal capacity of the above facilities is said to be 260,000 T/Y, but actual production in 1962 was a little more than 224,000 T.

From BURNPUR Works, it receives not only cold pig but coke oven gas and electric power. (Its location relative to BURNPUR Works is as though an integrated steel plant and a foundry are in the same area, as illustrated by the fact that in the past it received pig iron in molten condition and not cold pig from BURNPUR Works.)

4-3. Iron ore mines

4-3-1. GUA mine

GUA mine located in Bihar State, 267 km southwest of BURNPUR, is an iron ore mine equipped with large and modern facilities with estimated reserves of 233 million T (1969).

The mine has mechanized mining and treating facilities and adequate transportation capacity, and its nominal production capacity is 2.4 million T/Y (with two-shift working). The production in recent years is as follows:

(Unit: 1,000 T/Y)

	Lump	Fines	Total
1980	761	1,403	2,164
1981	819	1,271	2,090
1982	872	1,266	2,138
1983	825	916	1,741
1984	720	810	1,530
1985	873	869	1,742

Quality of lump ore is as follows:

Fe : 60 $\pm$ 1%
SiO_2 : 1.5 $\pm$ 1%
Al_2O_3 : 4.5 $\pm$ 1%

4-3-2. CHIRIA mine

CHIRIA mine located about 21 km deep into the hinterland from MANOHARPUR (Bihar State), 290 km southwest of BURNPUR is the largest iron ore mine in Asia with estimated reserves of 2 billion T (1978).

Different from GUA mine, this mine depends upon manual work 100% and besides being deep in the interior, transport of ore is difficult, and so its nominal production capacity is only 300,000 T/Y.

The production by the mine in recent years is as follows:

(Unit: 1,000 T/Y)

	Lump
1980	240
1981	256
1982	263
1983	243
1984	228
1985	281

Quality of lump ore is as follows:

Fe : 62 ± 1%
SiO_2 : 1.5 ± 1%
Al_2O_3 : 3.5 ± 1%

The task for this CHIRIA mine lies in overall increase of capacity firstly by mechanization and secondly by modernization of transportation. At any rate, this is a virgin forest and mountain of iron ore and its future is beyond all assumption.

4-4. Collieries

Three collieries owned by IISCO lie on huge coal fields extending broadly in both West Bengal and Bihar States.

4-4-1. CHASNALLA colliery

CHASNALLA colliery located in 20 km distance from DHANBAD 85 km west of BURNPUR has estimated reserves of 50 million T. (to 475 m underground)

4-4-2. JITPUR colliery

JITPUR colliery is located 12 km southeast of CHASNALLA and has estimated reserves of 20 million T.

4-4-3. RAMNAGORE colliery

RAMNAGORE colliery is located only 14 km from BURNPUR and has estimated reserves of 12 million T.

4-4-4. Transportation of coal

Apart from RAMNAGORE colliery located close to BURNPUR, transportation of coal by rail or truck from CHASNALLA and JITPUR collieries is difficult, and so instead of railway, ropeway system is employed as below.

(1) JITPUR - 9 km - Treating facilities at CHASNALLA
200 T/h

(2) CHASNALLA - 54 km - BURNPUR
400 T/h

Railway networks and ropeway networks installed as means of transportation of coal in the collieries around DHANBAD are really a thrilling sight.

However, as mentioned in Chapter 1, the period that the survey team could spend at BURNPUR area was limited, and so the team could not visit and make firsthand study of the above three collieries except observing the ropeway networks from a distance.

4-5. Organization and personnel, etc.

(1) Organization

Though IISCO is under the control of SAIL, it has its own Board of Directors. The company is operated by Managing Director who represents the company and is charged with full responsibility for it. The organization of IISCO is as shown below.

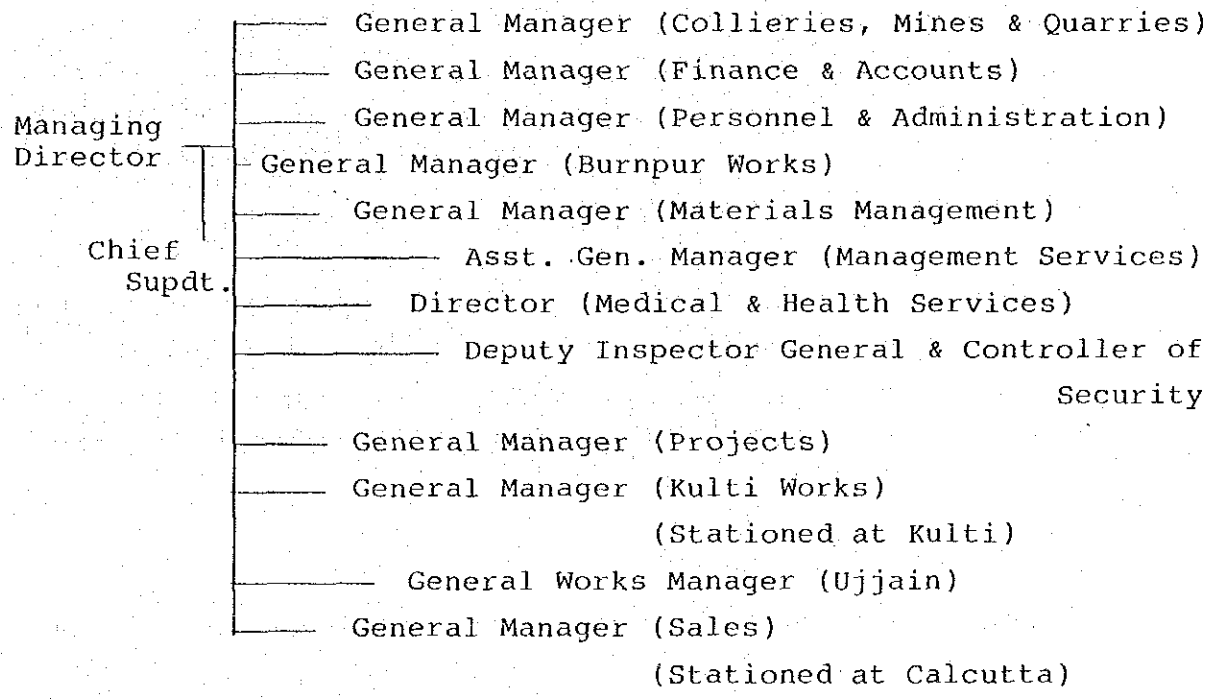

Fig. 4.5.1 Organization Chart of IISCO

Except those in charge of Kulti Works and sales, General Managers are permanently stationed at Burnpur Works.

Among geneal managers, General Manager-Works ranks the highest and is helped by four Deputy General Managers charged with the responsibilities in iron & steel, mills, maintenance and service zones.

Deputy General Manager (Iron & Steel Zone) is in charge of coke ovens, by-products, blast furnaces, open hearth furnaces and bessemer converters; Deputy General Manager (Mills or Finishing Zone) of blooming, billet, merchant, structural, sheet mills and roll shops; Dy. General Manager (Maintenance) of maintenance and repair of facilities and equipment, power generation and distribution, water supply, civil engineering services and refractories; and Dy. General Manager (Services) of motive power, transportation, technical administration and production planning & control, etc.

General Manager (Collieries, Mines & Quarries) is helped by a deputy general manager, an assistant general manager and chief superintendents, who are charged with the responsibilities in mining, maintenance, prospecting, education, etc.

(2) Nomenclature of employees

Nomenclature of IISCO's employees is designated same as that of SAIL, IISCO's parent company. Employees are divided broadly into two groups of "Executive" and "Non-executive".

The highest ranking of Executives is General Manager in line job, followed by Deputy Gen. Manager, Asst. Gen. Manager, Chief Superintendent, Superintendent, Manager, Deputy Manager, Asst. Manager, Junior Manager and Management Trainee.

The highest ranking in Non-executives is Special Staffs; they are posted in every department but do not belong to any trade unions. In staff jobs it is followed by Clerical Staff,

Second Staff, Muster Roll and Others in that order. "Others" includes all employees whose position and job cannot clearly be classified and comprises teachers, apprentices, trainees and labour pool not belonging to Executive.

Table 4.5.1 shows the relation between Scale Code used as the basis for salary and wage system and post designation and category.

Table 4.5.1 Nomenclature of employee

I Executives

Scale Code	Designation .
E-8	General Manager (Works) General Manager
E-7	Deputy General Manager
E-6 (b)	Assistant General Manager
E-6 (a)	Chief Superintendent
E-5	Superintendent
E-4	Manager
E-3	Deputy Manager
E-2	Assistant Manager
E-1	Junior Manager
E-0	Management Trainee

Source: SAIL <Promotion Policy and the Rules for Promotion for Executives>

IISCO, Personnel & Administration

II Non-Excecutives

Category	Scale Code	
Special Staff		
Clerical Staff	A-4 A-3 A-2 A-1	Ministerial & Others
Second Staff	M-7 M-6 M-5 M-4 M-3 M-2 M-1	Highly Skilled & Supervisory
Muster Roll	O-16 O-15 O-14 O-13 O-12	Highly Skilled & Supervisory
	O-11 O-10 O- 9 O- 8 O- 7 O- 6	Skilled
	O- 5 O- 4 O- 3 O- 2 O- 1	Semiskilled Unskilled

Category	
Others	C.S.A. (Confirmed student apprentice) C.T.A. (Commercial trade apprentice) S.O.T. (Super operative trainee) S.N.O. (Super numerary operative) Sub-staff Ex-apprentice Labour Pool

Source: NATIONAL JOINT COMMITTEE FOR THE STEEL INDUSTRY
<Memorandum of Agreement 1983>
IISCO <Operational Statistics 1985-86>
IISCO, Management Services

(3) Personnel

Table 4.5.2 shows change in the total number of employees at IISCO. The number of employees at Burnpur Works hit the peak in 1984, but showed a declining trend in 1985 and 1986 as new employment of non-executives was reduced. The employment at Gua Ore Mines is kept at about 1,500.

The employment at Burnpur Works as at the end of March 1986 numbered 24,323, which is divided into Executive and Non-executive, Works Personnel and Non-works Personnel by department as shown in Tables 4.5.3 through 4.5.5. As seen in other integrated steel works in India, Burnpur Works also has close relation with regional development of inland areas, and its positioning of personnel is characterized by the fact that about 1,000 of its employees are assigned to Town management, about 700 to medical services and even 28 to aviation dept.

Departments where 1,000 or more of works personnel were posted include coke oven & by-product, blast furnace, steel melting shop, rolling mills, sheets mills, refractories, traffic, etc. and as the largest department there is Maintenance departments. Maintenance depts. employed about 7,500 in mechanical, electrical and civil maintenance, but a number of personnel were assigned to maintenance at blast furnace and rolling mills depts.

Table 4.5.6 shows distribution of Non-executive, works personnel at Burnpur Works among departments and by unskilled & semiskilled, skilled & highly skilled, supervisory, ministerial and others and that of contract labour totalling 4,630.

Table 4.5.2 Manpower statistics for IISCO as a whole (as on 31st March)

Unit	1981	1982	1983	1984	1985	1986	Remarks
Burnpur Works	22,052	22,534	24,669	25,041	24,791	24,323	Including Management Trainees, Student/Trade Apprentices.
Kulti Works	7,142	7,086	6,994	6,896	6,758	6,581	
Ujjain Works	472	488	520	544	562	558	
Ore Mines (Gua alone)	3,028 (1643)	2,835 (1493)	2,840 (1512)	2,791 (1474)	2,805 (1516)	2,728 (1477)	
Collieries	8,463	8,442	8,367	8,311	8,253	8,146	
Calcutta & Branch Offices	609	645	652	614	617	601	
GRAND TOTAL	41,766	42,030	44,042	44,197	43,786	42,937	

Source: <IISCO Operational Statistics>

Table 4.5.3 Manpower statistics for BURNPUR Works as a whole (as on 31.3.1986)

Unit	Executive									Non-Executive						Grand total	Remarks
	E-8	E-7	E-6(b)	E-6(a)	E-5	E-4	E-3	E-2/ E-1	Total	Special Staff	Second Staff	Clerical Staff	Muster Roll	Others	Total		
Non-works Personnel	3	4	4	9	22	48	107	222	420	65	567	1,100	1,397	986	4,115	4,535	
Works Personnel	1	4	5	16	34	79	172	404	715	18	2,672	312	15,856	194	19,052	19,767	
Management Trainee (Technical)									21							21	
Total	4	8	9	25	56	127	279	626	1,156	83	3,239	1,412	17,253	1,180	23,167	24,323	

Source: IISCO Operational Statistics 1985-86

Table 4.5.4 Departmentwise/Gradewise non-works personnel for BURNPUR Works (as on 31.3.1986)

Unit	Executive									Non-Executive						Grand total	Remarks
	E-8	E-7	E-6(b)	E-6(a)	E-5	E-4	E-3	E-2/ E-1	Total	Special Staff	Second Staff	Clerical Staff	Muster Roll	Others	Total		
1. Materials		1			2	7	12	32	54	5	24	169	227	24	449	503	- G
2. Medical				1	2	16	23	51	93	4	234	40	294	43	615	708	3 shift (indoor)G (outdoor)
3. Finance	1		2	1	2	1	5	37	49	11	10	468		75	564	613	- G
4. Personnel (including sports)	1		1	1	2	1	15	21	42	9	30	32	1	62	134	176	- G
5. Town					1	1	2	9	13		95	33	829	36	993	1,006	( ) G
6. Training				1	2		2	3	8	8	4	1	10	6	29	37	- G
7. Data Processing Center				1		1	2	15	19		10	38		7	55	74	2 shift -
8. Education								4	4			212		32	244	248	- G
9. Legal & Estate						1	1		2	2	2	12	2	7	25	27	- G
10. General Administration							3	1	4	3	1	14		36	54	58	- G
11. Managing Director's Section & Hindi Cell		1			1		3	5	10	2	2	7		2	13	23	- G
12. Order					1		1	2	4	1		34		9	44	48	- G
13. Sales							1	2	3						--	3	- G
14. Aviation		1			1		1	2	5	4	9	3	6	1	23	28	- G
15. Security				1	1			5	7	7	55	6		622	690	697	3 shift -
16. Vigilance/Intelligence						1		2	3	1	11	2		8	22	25	- G
17. Contracts					1	2	1	2	6	1		6		2	9	15	- G
18. Project Engineering Development Department	1	1	1	3	6	17	35	29	93	7	80	23	28	14	152	245	- G
Total	3	4	4	9	22	48	107	222	420	65	567	1,100	1,397	986	4,115	4,535	(G=general shift)

Source: ditto

Table 4.5.5 Departmentwise/Gradewise works personnel of BURNPUR Works (as on 31.3.1986)

Department	Executive									Non-Executive						Grand Total	Working Condition
	E-8	E-7	E-6(b)	E-6(a)	E-5	E-4	E-3	E-2/ E-1	Total	Special Staff	Second Staff	Clerical Staff	Muster Roll	Others	Total		
1. General Manager's Organisation	1	4	4		1			1	11						---	11	- G
2. Coke Ovens & By-Products				1	3	8	9	34	55	1	165	11	1,575	8	1,760	1,815	S > G
3. Blast Furnace				1	3	4	14	25	47	1	141	10	1,174	6	1,332	1,379	S > G
4. Melting Shop					2	4	21	55	82	2	118	9	1,082	11	1,222	1,304	S > G
5. Rolling Mills				2	2	9	9	20	42	2	321	66	1,820	17	2,226	2,268	S > G
6. Sheet Mills				1	2	4	8	5	20		144	19	1,385	8	1,556	1,576	S > G
7. Mechanical Maintenance				2	5	16	34	65	122	2	573	55	4,009	65	4,704	4,826	S < G
8. Electrical Maintenance				2	3	8	19	54	86	1	216	12	976	3	1,208	1,294	S < G
9. Civil Maintenance						4	4	10	18		77	22	1,249	5	1,353	1,371	S < G
10. Capital Repair					1	2	2	5	10						---	10	- G
11. Power Engineering				1	2	3	5	27	38	1	119	7	639	9	775	813	S > G
12. Refractories				1	1	1	7	14	24		65	10	922	7	1,004	1,028	S > G
13. Planning Cell (non-executive including Air Con.)				1	1	4	4	1	11	1	34	19	18	11	83	94	- G
14. Metallurgical Laboratory				1	3		10	18	32		210	12	154	7	383	415	S = G
15. Production Planning & Controll					1		4	12	17	3	11	14		7	35	52	S < G
16. Energy & Economy						2	4	16	22	1	114	6	51	2	174	196	S < G
17. Transportation				1		1	7	8	17	2	244	29	732	16	1,023	1,040	S > G
18. Scrap & Salvage				1			2	3	6	1	25	4	18	4	52	58	- G
19. Safety					1	1		5	7		8	2		2	12	19	S < G
20. Raw Materials					1	2		2	5		3	2		4	9	14	S < G
21. Air Conditioning						1	1		2						---	2	- G
22. Tele Communication						1		1	2						---	2	S < G
23. Garage						1		2	3		84	2	52		138	141	S < G
24. Industrial Engineering			1	1	2	3	8	21	36			1		2	3	39	- G
Total	1	4	5	16	34	79	172	404	715	18	2,672	312	15,856	194	19,052	19,767	(S=shift G=general shift)
	Management Trainee (Technical)								21						---	21	
									736						19,052	19,788	

Source: ditto

Table 4.5.6 Non-executive personnel by type of skill for BURNPUR works (as on 1.4.86)

	Unskilled & Semiskilled			Skilled & highly skilled			Supervisory			Ministerial and others			Grand Total	Contract Labour
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total		
A) PRODUCTION DEPARTMENTS														
1. Coke Oven & By-product	480	69	549	1023	--	1023	169	--	169	12	--	12	1753	91
2. Blast Furnace	401	43	444	730	--	730	137	--	137	10	--	10	1321	292
3. Steel Melting shop	586	40	626	459	--	459	123	--	123	10	--	10	1218	85
4. Rolling Mills & Sheet Mills	977	28	1005	2202	--	2202	478	--	478	86	--	86	3771	--
B) MAINTENANCE DEPARTMENTS														
1. Mech. Maint.	1464	33	1497	2629	--	2629	645	--	645	59	--	59	4830	401
2. Elect. Maint.	336	3	339	636	--	636	215	--	215	11	1	12	1202	--
3. Civil Maint.	407	66	473	135	--	135	52	--	52	9	--	9	669	415
C) SERVICES DEPARTMENTS														
1. Power Engg.	195	13	208	441	--	441	116	--	116	8	--	8	773	180
2. Refractories	541	52	593	338	--	338	60	--	60	10	--	10	1001	313
3. Traffic	107	2	109	591	--	591	197	--	197	21	--	21	918	304
4. Laboratories	42	4	46	113	--	113	211	--	211	12	1	13	383	30
5. Permanent Way	520	50	570	83	--	83	20	--	20	6	--	6	679	42
6. Others	81	13	94	62	--	62	221	--	221	46	10	56	433	1083
D) ADMINISTRATIVE DEPARTMENTS														
1. Accounts	77	2	79	--	--	--	20	--	20	489	28	517	616	--
2. Personnel	54	10	64	--	--	--	12	1	I3	36	4	40	117	--
3. Materials & Purchase	205	4	209	38	--	38	24	--	24	167	7	174	445	122

(continued)

	Unskilled & Semiskilled			Skilled & highly skilled			Supervisory			Ministerial and others			Grand Total	Contract Labour
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total		
4. Security & Fire	39	3	42	575	--	575	55	--	55	13	--	13	685	NIL
5. Others	56	18	74	2	--	2	35	--	35	101	10	111	222	3
E) CONSTRUCTION DEPARTMENTS														
1. P.E.D.D.	15	--	15	4	--	4	12	--	12	16	2	18	49	898
2. Drawing Office	5	--	5	--	--	--	30	18	48	5	2	7	60	--
3. C.E. (Town)	10	--	10	8	--	8	20	--	20	4	--	4	42	--
F) TOWN & MEDICAL														
1. Town	502	71	573	291	--	291	96	--	96	32	1	33	993	363
2. Medical	176	118	294	38	--	38	156	81	237	45	1	46	615	11
3. Others	3	5	38	--	--	--	47	--	47	166	56	222	307	97
GRAND TOTAL	7309	647	7956	10398	--	10398	3151	100	3251	1374	123	1497	23I02	4630

Source: IISCO Management Services

To observe personnel condition in more details, the age structure of Executive in the entire IISCO and that of Non-executive at Burnpur Works are given in Tables 4.5.7, 4.5.8. Incidentally, Non-executive at Burnpur Works, 50 to 60 years old, numbered 4,311.

Table 4.5.9 shows change in intake of officers at IISCO during the period from 1982 to 1985 Fiscal Year, which shows a considerable decrease in trainees at both technical and administration but fairly constant number in doctors and in manager in finance.

Table 4.5.10 shows educational profile of Non-executive, works personnel at Burnpur Works in main departments. As the number of employees with low schooling accounts for fairly high percentage of the entire personnel of the company, full consideration should be given to education and training plan in the F/S for the modernization project.

Incidentally, Conduct Discipline and Appeal Rules, 1977, distributed among IISCO's Executives prohibits employees from taking advantage of their position and influence to employ their relatives and others.

Table 4.5.7 Age-wise distrubution of Executives of IISCO
(As on 1.6.85 Inclusive of all units and management trainecs)

Grade \ Age	18-22	22-27	28-32	33-37	38-42	43-47	48-49	50	51	52	53	54	55	56	57	58	59	60	Total
E-8	-	-	-	-	-	-	1	1	1	2	-	1	1	-	-	-	-	-	7
E-7	-	-	-	-	-	-	2	1	-	1	-	2	-	-	-	-	1	1	8
E-6(b)	-	-	-	-	-	5	1	-	2	1	-	2	1	1	-	-	1	-	14
E-6(a)	-	-	-	-	2	3	8	1	2	4	6	2	2	3	2	1	-	1	37
E-5	-	-	-	1	7	33	7	3	4	7	6	4	5	3	3	4	1	-	88
E-4	-	-	-	5	36	40	28	8	7	7	10	6	5	10	5	6	2	4	179
E-3	-	-	13	117	102	75	15	9	10	12	10	12	7	11	15	5	8	3	424
E-2/E-1 /E-0	-	324	205	109	91	102	48	12	5	7	3	15	9	12	8	4	4	9	967
Total	-	324	218	232	238	258	110	35	31	41	35	44	30	40	33	20	17	18	1724

Source: IISCO Management Services

Note: Out of 1724, 783 will retire at the age of 60
941 will retire at the age of 58
(agreed in 1978)

Table 4.5.8 Age-wise distribution of Non-executives of BURNPUR works (as on 1.6.85)

	18-22	23-27	23-32	33-37	38-42	43-47	48-49	50	51	52	53	54	55	56	57	58	59	60	Total
HIGHLY SKILLED & SUPER-VISORY	25	70	214	463	622	880	512	227	195	124	141	117	141	118	164	146	157	67	4383
SKILLED	106	207	927	1368	1361	1493	604	201	137	112	137	164	155	155	151	166	140	73	7657
SEMI-SKILLED & UN-SKILLED	1074	1662	2230	1851	1295	749	402	100	155	74	76	70	55	52	47	79	75	64	10110
MINISTER-IAL AND OTHERS	15	66	167	297	249	185	74	34	17	17	18	27	33	23	29	32	25	21	1329
TOTAL	1220	2005	3538	3979	3527	3307	1592	562	504	327	372	378	384	348	391	423	397	225	23479

Source: IISCO Management Services

Grade 01 - 05 Unskilled/Semiskilled
06 - 011 Skilled
012 - 016 } Highly Skilled
M1 - M7 }
A1 - A4 Ministerial Others

Out of 23479, 18309 will retire at the age of 60
5170 will retire at the age of 58
(agreed in 1978)

Table 4.5.9 Intake of officers

Sl. No.	Category	1982-83	1983-84	1984-85	1985-86	Total
1.	Management Trainee (Technical)	87	107	24	12	230
2.	Management Trainee (Administration)	9	13	---	1	23
3.	Junior Manager (Finance)	8	8	5	8	29
4.	Security Officer	1	---	3	---	4
5.	Horticulture	1	---	---	---	1
6.	Sportsmen	---	1	---	---	1
7.	Hindi Officer	---	---	---	1	1
8.	Doctors	12	4	18	19	53
9.	Law Departments	---	1	---	---	1
10.	Dependants of deceased executives	---	---	1	---	1
	Total	118	134	51	41	344

Source: IISCO, Management Services

Table 4.5.10 Educational profile of Non-executive by selected department (as on June 1986)

Name of Department.	Number of Employees.	No formal schooling.	Read upto Class VII (7 years of schooling)	Read upto Class X (8-10 years of schooling)	Secondary School Pass/ H.S.Pass (10-12 years of schooling.	Graduate & above (2-3 years after schooling)	Technical qualification		
							I.T.I./ Trade Apprent.	3 years Diploma (3 years after schooling)	A.M.I.E. (5 years after schooling)
COKE OVENS	1706	268	558	469	308	98	--	5	--
BLAST FURNACES	1310	205	433	362	245	54	5	3	3
STEEL MELTING SHOP	1197	223	232	346	261	118	3	13	1
ROLLING MILLS	2202	243	508	499	747	173	22	10	--
SHEET MILLS	1527	301	901	140	125	52	2	6	--
MECHANICAL MAINTENANCE	4614	705	745	1649	1281	172	16	43	3
Total	12,556	1,945	3,377	3,465	2,967	667	48	80	7

Source: IISCO, Management Services

Note: A.M.I.E. = Associate members institute of engineers

(4) Management-Labour relation

Memorandum of Settlement

In India, managements and workers in the steel industry has set up National Joint Committee for the Steel Industry to agree upon the matters common to the Indian steel industry as a whole. The management side consists of senior staffs in charge of personnel and administration in SAIL, steel works under SAIL and private companies such as Tata Iron & Steel Co. while the workers side consists of steel representatives from the central union, INTUC (Indian National Trade Union Congress), two communistic organizations, AITUC (All India Trade Union Congress) and CITU (Centre of Indian Trade Union) and HMS or ILA (Hind Mazdoor Sabha or Indian Labour Association) as well as representatives for the unions at individual steel works.

Table 4.5.11 shows names of the unions at Burnpur Works and Gua Ore Mines, etc., and of national unions to which they belong. When the F/S mission from JICA made interviews with local officials in June and July, 45 to 50% of workers at Burnpur Works belonged to INTUC, 5% to AITUC, 25-30% to CITU, 5% to ILA and about 10% to no unions.

Memorandum of Settlement made by the National Joint Committee is renewed every four years (it being valid from September 1 to August 31 four year later), and it was renewed in 1982 and expired August 31, 1986. Each Works exchanges Memorandum of Settlement with unions every four years based on the National Joint Committee's Memorandum.

At IISCO also, such memorandum is exchanged between the company and unions at each unit of Burpur Works, Kulti Works and Gua Ore Mines.

The contents of the Memorandum covers such matters as related to wages, housing, allowance for commutation, etc., severance pay, education, contract labour, medical services, bonus pay, and welfare, etc.

Table 4.5.11 Names of the union operating in BURNPUR works and ore mines

Names of the Union:	Affiliated to National Trade Union Organization
Burnpur Works	
1. Asansol Iron & Steel Workers' Union:	Indian National Trade Union Congress
2. United Iron & Steel Workers' Union:	All India Trade Union Congress (Communist Party of India-C.P.I.)
3. ABK Metal & Engineering Workers' Union:	Centre of Indian Trade Union (Communist Party of India-C.P.I., Marxist)
4. Burnpur Ispat Karmachari Sangh:	Bharatiya Mazdoor Sangh (Indian Labour Association)
5. Iron Steel & Engineering Workers' Union:	Hind Mazdoor Sabha (Indian Labour Association)
Ore Mines	
1. Gua Mines Workers' Union,:	Indian National Trade Union Congress

Source: IISCO Management services

(5) Working condition

Work shift at Burnpur Works is divided into two, namely "Shift Working" and "General shift". Plant workers work under combination of shift working and general shift and employees at administrative and other non-plant offices under general shift only.

Shift working consists of 7-team 3-shift system on one cycle of seven weeks. Working hours are 8 hours each shift; from 6 a.m. to 2 p.m. for "A" shift=Day shift; from 2 p.m. to 10 p.m. for "B" shift=Afternoon shift; and from 10 p.m. to 6 a.m. for "C" shift=Night shift. There is a holiday a week, working hours totalling 48 hours a week.

Under general shift, Sunday is holiday and working hours are 48 hours a week for plant workers who work from 8 a.m. to 5 p.m. with lunch break of one hour from 1 p.m. to 2 p.m. on weekdays, and 41.5 hours for employees at administrative and other non-plant offices who work from 9 a.m. to 5:30 p.m. with lunch break from 1 p.m. to 2 p.m. Monday through Friday and from 9 a.m. to 1 p.m. Saturday.

At Gua Iron Ore Mines, shift working is same as that in Burnpur Works, but general shift differs slightly; working hours from 7 a.m. to 4 p.m. with lunch break from noon to 1 p.m. for mine workers, totalling 48 hours a week, and from 7:30 a.m. to 5 p.m. with lunch break from 12:30 a.m. to 2:30 for employees at administrative and other non-plant offices, totalling 45 hours a week.

The table on the next page shows shift cycle for Burnpur Works.

Table 4.5.12 Shift cycle for BURNPUR works

1st Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	AD	AD	AD	AE	AE	AE	BE
2-10	BE	BE	BF	BF	BF	CF	CF
10- 6	CF	CG	CG	CG	DG	DG	DG
OFF	G	F	E	D	C	B	A

2nd Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	BE	BE	BE	BF	BF	BF	CF
2-10	CF	CF	CG	CG	CG	DG	DG
10- 6	DG	DA	DA	DA	EA	EA	EA
OFF	A	G	F	E	D	C	B

3rd Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	CF	CF	CF	CG	CG	CG	DG
2-10	DG	DG	DA	DA	DA	EA	EA
10-6	EA	EB'	EB	EB	FB	FB	FB
OFF	B	A	G	F	E	D	C

4th Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	DG	DG	DG	DA	DA	DA	EA
2-10	EA	EA	EB	EB	EB	FB	FB
10-6	FB	FC	FC	FC	GC	GC	GC
OFF	C	B	A	G	F	E	D

5th Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	EA	EA	EA	EB	EB	EB	FB
2-10	FB	FB	FC	FC	FC	GC	GC
10-6	GC	GD	GD	GD	AD	AD	AD
OFF	D	C	B	A	G	F	E

6th Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	FB	FB	FB	FC	FC	FC	GC
2-10	GC	GC	GD	GD	GD	AD	AD
10-6	AD	AE	AE	AE	BE	BE	BE
OFF	E	D	C	B	A	G	F

7th Week

SHIFT	S.	M.	T.	W.	T.	F.	S.
6-2	GC	GC	GC	GD	GD	GD	AD
2-10	AD	AD	AE	AE	AE	BE	BE
10-6	BE	BF	BF	BF	CF	CF	CF
OFF	F	E	D	C	B	A	G

Note:

Sequence of Rotation for 3 Shift Working in this Scheme is:-

from DAY SHIFT (6 a.m. to 2 p.m.)
to NIGHT SHIFT (10p.m. to 6a.m.)

and

from NIGHT SHIFT (10p.m. to 6a.m.)
to AFTERNOON SHIFT (2 p.m. to 10p.m.)

Source: IISCO, Burnpur works

Incidentally, according to Factory Act, 1948, which is applied to Burnpur Works, working hours are set 48 hours a week max. and 9 hours a day max. and annual leave with wages is set one day per 20 days or 30 days a year max.

(6) Labour laws

The labour laws applicable to IISCO's Burnpur Works are as follows:

Laws dealing with working conditions:

The Factory Act, 1948

Laws dealing with wages and bonus:

The Payment of Wages Act, 1936

The Payment of Bonus Act, 1965

Laws dealing with Social Security:

The Workmen's Compensation Act, 1923

The Payment of Gratuity Act, 1972

Laws dealing with industrial relations:

The Trade Union Act, 1926

The Industrial Employment (Standing Orders) Act, 1946

The Industrial Disputes Act, 1947

Laws dealing with contract labour:

The Contract Labour (Regulation & Abolition) Act, 1970

The labour laws applicable to Gua Ore Mines are same as those to Burnpur Works except that working condition at the Mines is regulated by the Mines Act, 1952.

(7) Index of labour productivity

The following table shows change in production of crude steel per man year at integrated steel plants in India from 1981-82 to 1984-85 Fiscal year.

Table 4.5.13 Labour Productivity-Integrated Steel Plants 1981-82 to 1984-85

(Tonnes per man year)

	Plant	1981-82	1982-83	1983-84	1984-85
1	Works Personnel				
	Bhilai Steel Plant	71	71	63	69
	Bokaro Steel Plant	77	72	63	69
	Durgapur Steel Plant	38	39	34	31
	Rourkela Steel Plant	47	44	42	43
	Indian Iron & Steel Company Limited	34	34	28	22
	Tata Iron & Steel Company Limited	62	64	64	68
2	Works and Administration Personnel				
	Bhilai Steel Plant	63	63	55	61
	Bokaro Steel Plant	63	62	55	60
	Durgapur Steel Plant	34	35	31	28
	Rourkela Steel Plant	42	40	38	39
	Indian Iron & Steel Company Limited	30	30	25	20
	Tata Iron & Steel Company Limited	56	58	58	61

Method: Production of ingot steel including equivalent of Saleable Pig Iron assuming one tonne of Saleable pig iron equal to 0.25 of Ingot Steel divided by total number of personnel in position.

Source: SAIL "Statistics for Iron & Steel Industry in India"

Among the steel plants under SAIL, production of crude steel per man year at IISCO (Burnpur Works) was lowest since the 1981 Fiscal Year for Works Personnel and also Works and Administration Personnel. Next lowest plants were Durgapur and Rourkela, and the other two, Bhilai and Bokaro, were at a level of 60 to 70 tonnes same as TISCO, a private company.

IISCO's labour productivity in the 1984 Fiscal Year was very low at close to 20 tonnes, but this was mainly caused by the decrease in pig iron production due to the trouble in coke ovens in the year and the productivity returned to about 20 tonnes in the 1985 F.Y. as the coke ovens resumed operation.

The following table showed the percentage of personnel expenses in sales at SAIL, IISCO and TISCO.

Table 4.5.14 Percentage of Personnel Expenses in Sales

(Unit: %)

	81/82	82/83	83/84	84/85
SAIL	13.5	14.0	14.4	13.2
IISCO	23.7	25.3	29.5	33.9
TISCO	18.0	17.7	19.1	16.7

Note: Personnel expenses is shown as Employees Remuneration & Benefits at SAIL and IISCO and Payments to & Provision for Employees at TISCO.

Sources: SAIL, IISCO Annual Report and
SAIL "Statistics for Iron and Steel Industry in India"

The percentage of IISCO is higher than that of SAIL and TISCO and shows an increase from year to year, and for the 1984 F.Y., it reached 34%, more than double that of SAIL and TISCO, because of decrease in the tonnage sold (due to fall in production).

Precise comparison in the productivity cannot be made without detailed analysis of comparison in average ages of employees, employment policy, product mix, etc., but the low productivity of IISCO (Burnpur Works) basically results from lack of sintering facilities, outdated facilities and duplex process in steelmaking with bessemer-open hearth furnaces.

Table below shows the years when iron making and steel-making facilities at integrated steel works of SAIL and IISCO were constructed.

Table 4.5.15 Year of Completion of Blast Furnace, Open Hearth Furnace and Converter at Integrated Steel Works of SAIL and IISCO

Steel Plant	Blast Furnace	Open Hearth Furnace	Converter
SAIL:			
Bhilai	1959-71	1959-67	1984-85
Bokaro	1972-85	-	1974-84
Durgapur	1959-67	1960-69	-
Rourkela	1959-67	1959-60	1959-67
IISCO:			
Burnpur	1922-58	1939-59	1945- (Bessemer)

Source: SAIL "Statistics for Iron & Steel Industry in India"