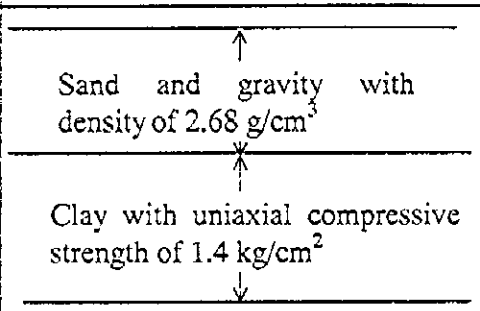
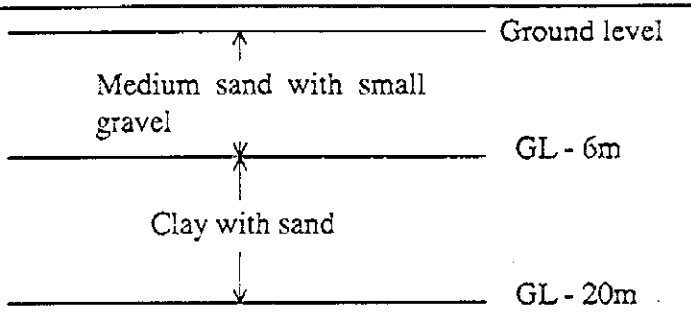
4. The infrastructure conditions of Mui Ron and Dung Quat

The infrastructure conditions of Mui Ron and Dung Quat are shown in Table 3-1.

Table 3-1 The site conditions of Mui Ron and Dung Quat

Category	Mui Ron	Dung Quat
1. Site & ground condition	 SPT(Standard Penetration Test) which is the most important information for soil properties has not been done yet.	 SPT(Standard Penetration Test) which is the most important information for soil properties has not been done yet.
2. Meteorological Condition	2.1 Weather Condition 2.1.1 Temperature a) Yearly average:(23 ～ 27)℃ b) Maximum in a year: (40.5)℃ c) Minimum in a year : (8.0)℃ 2.1.2 Rainfall a) Total amount of yearly rainfall:(2,000)mm/year b) Maximum in 24 hour:(150～200)mm/hour c) Yearly total amount : (1,600～3,400)mm 2.2 Marine Condition 2.2.1 Tide a)GL:(DL+0.7～1.0m),LWL:(DL+1m),HWL:(DL+1.9m) b)Information on Tidal Wave Maximum 3.2m 2.3 Earthquake None	2.1 Weather Condition 2.1.1 Temperature a) Yearly average :(25.7)℃ b) Maximum in a year: (41) ℃ c) Minimum in a year : (12.4)℃ 2.1.2 Rainfall a) Total amount of yearly rainfall :(2,287)mm/year b) Maximum in 24 hour: (200～250)mm/hour c) Yearly total amount (～)mm 2.2 Marine Condition 2.2.1 Tide a) GL:(DL+2.85m),LWL:(DL+0.4m),HWL:(DL+1.4m) 2.3 Earthquake None

Category	Mui Ron	Dung Quat
3. Electric power and water	3.1 Electric Power Supply a) Supply substation---Tachidien S/S b) Transformer capacity:(450)MVA c) Power supply substation (40) km from site 3.2 Water Supply for industrial water a) Song Rac reservoir capacity:(110 million)m^3 b) Supply point and location:(20)km from the site	3.1 Electric Power Supply a) Supply substation---Doc Soi S/S b) Transformer capacity:(450)MVA c) Power supply substation (7) km from site 3.2 Water Supply for industrial water 1)Tra Kbuc reservoir(Future plan) a) capacity : (170)m^3/s b) Supply point and location:(7)km from the site 2)Tra Bong reservoir(Future plan) a) capacity : (20)m^3/s b) Supply point and location : (2)km from the site
4. Infrastructure-transportation	4.1 Available road from route 1 to the site a) Route: (1) b) Distance: (6)km c) Road width: (3～4)m	4.1 Available road from route 1 to the site a) Route: (1) b) Distance: (Around 15)km c) Present road width: (3～4)m
5. Environment	5.1 Water Quality - Reservoir Cl^- 3.7mg/l NO_3^- 3.9mg/l PO_4^{2-} 1.4mg/l SO_4^{2-} 2.3 mg/l - River Cl^- 706mg/l NO_3^- 4.1mg/l PO_4^{2-} 2.0mg/l SO_4^{2-} 86.9mg/l Refer to Chapter Ⅳ Part 12.	5.1 Water Quality - Reservoir Cl^- 5.7mg/l NO_3^- 0.84mg/l PO_4^{2-} 0.41mg/l SO_4^{2-} 2.5 mg/l - River Cl^- 101mg/l NO_3^- -mg/l PO_4^{2-} -mg/l SO_4^{2-} -mg/l Refer to Chapter Ⅳ Part 12.

Category	Mui Ron	Dung Quat
	5.2 Noise Coastline / In the woods Leq 39.5dB / 40.2dB L5 41.8dB / 43.6dB L10 39.9dB / 42.5dB L50 36.5dB / 38.8dB L90 34.9dB / 36.1dB L95q 34.2dB / 35.3dB 5.3 NO_X and SO_X There is no problem in the effect of NO_X and SO_X emissions from the steel mill. Refer to Chapter Ⅳ Part 12.	5.2 Noise On the hill Leq 53.1dB L5 54.5dB L10 53.6dB L50 52.3dB L90 51.4dB L95q 51.2dB 5.3 NO_X and SO_X There is no problem in the effect of NO_X and SO_X emissions from the steel mill. Refer to Chapter Ⅳ Part 12.
6 . Unit price	6.1 Unit price 6.1.1 Electric power 700VND/kwh(Normal), 1,150VND/kwh(Peak) 400VND/kwh(Off peak) 6.1.2 Fuel LPG 6,900VND/kg Diesel oil 3,300VND/ℓ Heavy oil 1,700VND/ℓ 6.1.3 Water(industry) 1,000VND/m^3	6.1 Unit price 6.1.1 Electric power 700VND/kwh(Normal), 1,150VND/kwh(Peak) 400VND/kwh(Off peak) 6.1.2 Fuel LPG 6,900VND/kg Diesel oil 3,300VND/ℓ Heavy oil 1,700VND/ℓ 6.1.3 Water(industry) 1,000VND/m^3

Category	Mui Ron	Dung Quat
7. Estimated volume to be consumed in the new integrated steelworks (Production plan of 4.5 Mt/year)	7.1.1 Electric power 319MW/hr(Max.), 271MW/hr(Ave.) (Power plant capacity 150MW × 2unit) 7.1.4 Fuel COG 104.1×10^3 Nm^3/hr BFG 801.6×10^3 Nm^3/hr BOFG 46.6×10^3 Nm^3/hr Heavy oil 7.6 t/hr 7.1.3 Water(industry) Industry $101 \times 10^3 m^3$/day Potable $15 \times 10^3 m^3$/day Sea $1{,}050 \times 10^3 m^3$/day	7.1.1 Electric power 319MW/hr(Max.), 271MW/hr(Ave.) (Power plant capacity 150MW × 2unit) 7.1.4 Fuel COG 104.1×10^3 Nm^3/hr BFG 801.6×10^3 Nm^3/hr BOFG 46.6×10^3 Nm^3/hr Heavy oil 7.6 t/hr 7.1.3 Water(industry) Industry $101 \times 10^3 m^3$/day Potable $15 \times 10^3 m^3$/day Sea $1{,}050 \times 10^3 m^3$/day

5. Evaluation of each site

5.1 Evaluation of each site from viewpoint of short term basis (Table 3-2)

Table 3-2 Evaluation of each site from viewpoint of short term basis

	1.Mui Ron	2.Dung Quat
1. Initial cost difference of port	**Base** Remark: A certain amount of maintenance cost for dredging is required.	**- 7 million US$** Remark: - A certain amount of maintenance cost for dredging is required. - Main construction cost of port is not included. Dredging cost from -17m to -20m is included as the initial investment.
2. Initial cost difference of water supply	**Base** Remark : Existing	**± 0** Remark : Future plan, however reservoir construction cost is not required for water consuming industry.
3. Initial cost difference of electric power supply	**Base**	**- 20 million US$** Remark : One half of the required power from the new integrated steelworks can be supplied by the existing substation.
4. Initial cost difference of land preparation	**Base**	**+ 45 million US$**
Cost difference	**Base**	**+ 18 million US$**

5.2 Evaluation of each site from viewpoint of long term basis (Table 3-3)

Table 3-3 Evaluation of each site from viewpoint of long term basis

	1. Mui Ron	2. Dung Quat
1. Labor	**Satisfies criteria** Remark : Information obtained from the people's committee of KYANH district HATINH province.	**Satisfies criteria** Remark : Information obtained from DUNG QUAT industrial estate authority.
2. Accessibility to raw materials	**Base** Remark : Ore and coal are imported from foreign countries.	**Same** Remark : Ore and coal are imported from foreign countries.
3.Accessibility to market	**31 million US$/year** Remark : Transportation cost by ship, not including load/ unload/ land transportation cost	**26 million US$/year** Remark : Transportation cost by ship, not including load/ unload/ land transportation cost
Cost difference	**Base**	**- 5 million US$/year**

6. Evaluation of each site from viewpoint of IRR

Precondition for IRR calculation is as follows;

- The initial investment cost of infrastructure of Mui Ron site is US$18 million cheaper than that of Dung Quat site.
- Dung Quat site can save US$5 million/year of the product transportation cost to the market than Mui Ron site.

IRR calculation results of each candidate site is shown in Table 3-4.

Table 3-4 IRR calculation results of each candidate site

	Mui Ron	Dung Quat
IRROI (After tax)	**6.67%**	**6.71%**
IRROI (Before tax)	**7.57%**	**7.61%**
IRROE	**12.00%**	**12.91%**
Variable cost		
10%up	5.85%	5.92%
10%down	9.22%	9.24%
Operation fixed cost		
10%up	7.30%	7.34%
10%down	7.83%	7.87%
Total investment		
10%up	6.51%	6.55%
10%down	8.77%	8.81%
Slab import price		
10%up	7.27%	7.31%
10%down	7.88%	7.92%
Evaluation	No significant difference	

7. Consideration

1) From viewpoint of initial investment
There is no significant difference in initial investment between Mui Ron and Dung Quat sites. The difference of US$ 18 million should be considered as a small amount in view of the total capital expenditures required for the integrated steelworks.

2) From viewpoint of product transportation
Dung Quat site is more advantageous than Mui Ron site. US$ 5 million of transportation cost will be saved every year as far as the steelworks is operated.

3) From viewpoint of expansion possibility in the future
Mui Ron site is more advantageous than Dung Quat site. Because of the limited site space to eastern direction at Dung Quat site, the expansion work for additional installations will not be easy, if the integrated steelworks will need to expand its production capability in the future. On the other hand, Mui Ron site is easy to expand its production capability to the west, east and south directions, in case such expansion becomes necessary in the future.

Note: The general layout of Dung Quat is a preliminary layout. Comparison from technical viewpoint cannot be appropriate for the both sites at this stage.

Part 4 Recommendation

Section 1 Basic Information for Recommendation

1. Outline of macro-economic performance

Although various policies were undertaken for promoting economic reform and opening its market to foreign countries under the doi moi program which was introduced in 1986, the Viet Nam economy suffered from macro-economic instability from the start because of soaring inflation (an annual increase of three-digit per cent), stagnation of production, a big deficit of the current account, falling value of the currency, etc.

Further drastic economic policies were implemented to prompt the reform and try to put it back on track from 1988 to 1989, resulting in the improvement of the national economy through a recovery of agricultural production and the curving of inflation. However, the government still encountered a lot of difficulties.

Macro-economic management after the early 1990s has shown better performance enabling both stability and development at the same time. Figure 1-1 shows the GDP growth rates. GDP has been growing at over 8% p.a. in real terms since 1992. The annual inflation rate has decreased to the order of 10% or less since 1992 from much higher rates before 1991. The annual economic growth rate was 8.2% p.a. on average from 1991 through 1995, which greatly exceeded the target of the 1991-95 Five-Year Plan which was 5.5 - 6.5% p.a.

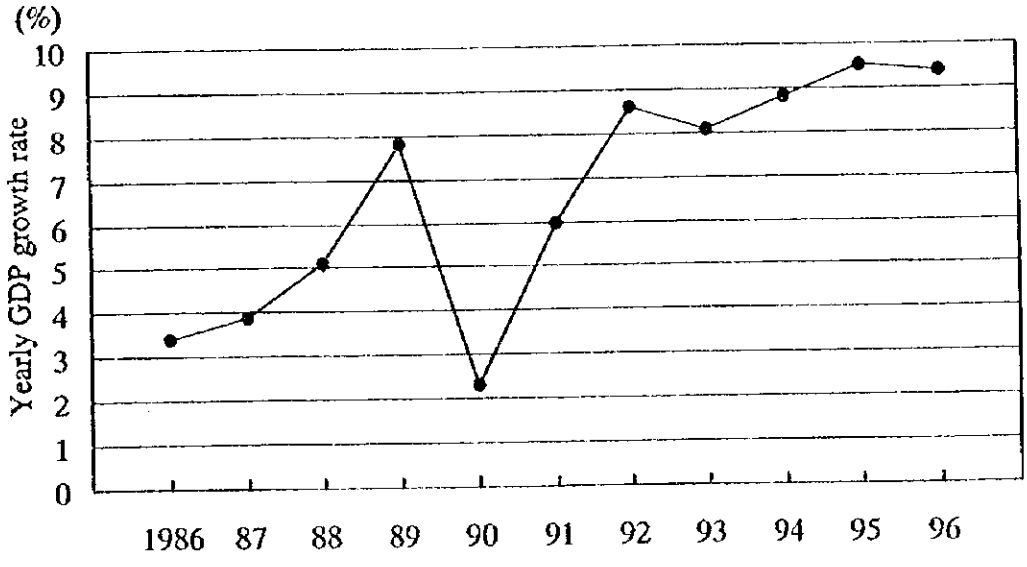


Figure 1-1 GDP growth rates

The average annual growth rates by industrial sector in the 1991-95 period were 4.5% for agriculture, 13.3% for industry and 12% for services. The industrial sector, which includes mining and construction sub-sectors, recorded the highest growth rate among the three sectors reflected by the boom of construction and oil & gas exploration and production.

Table 1-1 shows the GDP composition by industrial sector. The share of industry and services in GDP increased steadily, while that of agriculture decreased. The problem with the agricultural sector is that the work force engaged in it is considered over 70% of the total work force in Viet Nam, although it only accounts for about 30% of GDP.

It is noted that the output of the industrial sector surpassed that of the agricultural sector in 1995, so it can be said that Viet Nam is surely stepping toward becoming an industrial country from an agricultural country.

Table 1-1 GDP composition by industrial sector

(Unit: %)

Item	1990	1995
Agriculture, forestry & fishery	38.7	29
Industry	22.7	29.1
Services	38.6	41.9
Total	100	100

Source: General Statistical Office, VIIIth National Congress Documents

2. 1996-2000 Five-Year Plan

The 1996-2000 Five-year Plan was discussed in the VIIIth National Congress held in June 1996 and approved by the National Assembly held in November 1996.

To achieve the "accelerated industrialization and modernization which is described in the plan", the priority is put on selective development of heavy industry (energy and fuel, building materials, engineering, shipbuilding and repair, metallurgy (steel), chemicals) as well as development of the food processing industry, production of consumer and export goods, and electronics and information technology.

Table 1-2 shows the targets of GDP by the 1996-2000 Five-year Plan. By achievement of an average annual economic growth rate of 9-10%, the per-capita GDP in the year 2000 can be double that of the level of 1990.

As is experienced by many countries, the growth rate of agriculture, forestry and fishery is set comparatively low, although it is expected to steadily grow. By reflecting the high growth rates achieved in the 1991-1995 period, the industrial and service sectors are given higher growth rates at 14-15 and 12-13% p.a., respectively.

Table 1-2 Targets of GDP by the 1996-2000 Five-year Plan

	Av. growth rate (% p.a.)	GDP structure in 2000 (%)
GDP	9-10	100
Agriculture, forestry & fishery	4.5-5	19-20
Industry (incl. construction)	14-15	34-35
Services	12-13	45-46

The government has made various industrial development programs to boost production and upgrade technology as shown in Table 1-3.

Table 1-3 Production by the year 2000

Item	1996	2000
Oil and gas		
Crude oil (million t)	8.5	16
(BPD)	170,000	320,000
Gas (billion m^3)	0.73-1.1	3.7-4
Electricity		
Capacity (MW)	4,435	5,400
Supply (billion kWh)	14.6	30
Coal (million t of sorted coal)	9	10
Steel (million t)	1.0	2
Cement (million t)	7.5	18-20
Phosphate fertilizer (million t)*		1.2
Ha Bac urea plant (1000 t)*	110	350-400
Gas-sourced N-fertilizer (1000 t)*	-	600

*: Capacity

Source: Viet Nam's newspapers, magazines, etc. (figures in 1996)
VIIIth National Congress Documents (figures in 2000)

The total investment during 1996 - 2000 is planned to be US$41-42 billion which are planned to be made up by ODA and FDI (48%), and the domestic funds (52%). The investment in industry is planned to be US$18 billion or 43% of the total investment. Heavy industry, which accounts for 70% of the total investment in industry, is planned to get investment of US$13 billion which is equivalent to the investment of US$ 2.6 billion annually.

3. Present situation of industrial sub-sector

The development of industry greatly influences steel consumption in Viet Nam. The following industrial sub-sectors which have a big impact on steel consumption were described in the main report. The development of these industries is of vital importance in the development of the steel industry in the country.

1) Steel industry
2) Construction material manufacturing (steel)
   a) Steel structures
   b) Steel sheet processing
3) Cement
4) Heavy industry
5) Shipbuilding and repair
6) Automobiles
7) Home appliances
8) Metal processing
   a) Can with tin plating
   b) Freight containers
9) Plant construction

Section 2 Importance of Development of Steel Industry

1. Importance of steel industry in national economy

Figure 2-1 illustrates the relation of steel with investment and industry. The steel industry is closely related to capital investment and the manufacturing industry. Capital investment supported by economic growth not only requires large amounts of steel but also provides manufacturing facilities to produce automobiles, home appliances, ships, etc. which use a lot of steel. Steel is also used in buildings and infrastructures. Steel is indispensable in the development of the economy of a country.

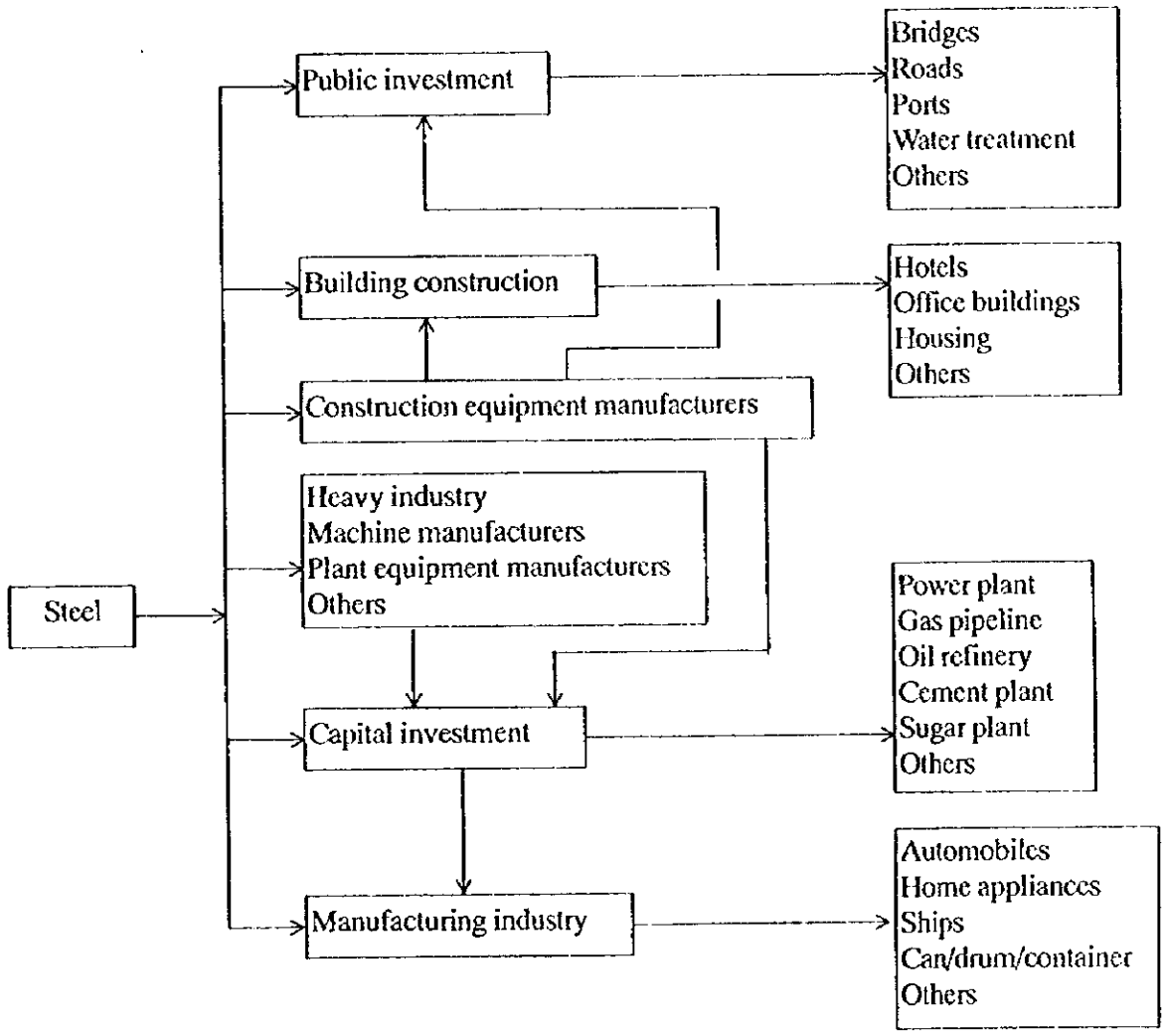


Figure 2-1 Relation of steel, investment and industry

Concerning the dependence of crude steel demand to final consumption in Japan (1985) excluding export, its dependence on private capital investment and public investment was 44% and 26%, respectively; domestic crude steel demand depended heavily on these two types of investment (70% in total). In other words, investment in plant and equipment (mainly by the private sector) as well as investment in infrastructures (mainly by the public sector) plays a quite important role in the development of the steel industry; only with these vital investments can the steel industry survive.

A similar tendency can be applied to Viet Nam. In order for the development of the steel industry, growth of private investment as well as public investment is of great importance. A big steel demand will be generated by such investment. The development of steel industry is necessary to make up most of the demand from the domestic production. The development of steel industry will contribute the improvement of employment, regional development, foreign exchange savings, development of relevant industries and upgrading of technology as well.

2. Present industrial policies for the steel industry by Viet Nam government

The government gives a steel industry development plan in the 1996-2000 Five-Year Plan as follows:

"To make investment to complete existing steel production lines and start construction of a number of steel mills, paying special attention to the production of steel products. Steel output is to reach 2 million tones in 2000. To prepare for the construction of the Thach Khe iron ore mine and of a large-scale steel complex."

In relation to the above, the following construction plans are under investigation:

- Three billet centers in the north, central and south with an annual production capacity at 300-500 thousand t each
- A scrap based integrated steel plant with the initial capacity at 1 million t/y (final capacity: 2 million t/y) as a short-term program
- An iron ore based integrated steel plant as a medium-and long-term program
- Development of Tack Khe iron ore mine and maximum use of iron ore at the above integrated steel plant
- Import of iron ore before Thak Khe iron ore is available and import of necessary tonnage of iron ore depending on the utilization rate of Thak Khe ore after the development
- A natural gas based DR plant with a capacity at 1 million t/y

There seems few industrial policies specific to the steel industry at present; however, general industrial policy has been applied to it. The general industrial policy encompasses the importance of FDI, protection of domestic products, etc. The quality of steel products is indispensable in the development of steel industry. The problems are the lack of national guidance on it and little concern about it by state enterprises.

3. Japanese industrial policies for the steel industry

3.1 Industrial policies for the steel industry for 20 years after World War II

The Japanese steel industry resumed its activities from the disastrous conditions left after World War II. In the late 1940s when Japan came back to the society of international economies, the Japanese steel industry not only suffered from a sharp decline of production but also lost its international competitiveness, and it could only export limited amounts of steel products depending on subsidies given in various forms from the government.

In 1949, in accordance with an order by the relevant occupation authorities, a series of policies was put into force to transform its economy from a controlled system to a market system, aiming at elimination of the budget deficit, designation of a unified (single) exchange rate, abolition of subsidies and economic control, etc. as main subjects.

In these processes, the steel industry was given the main targets of industrial policies set by the government and authorities concerned, resulting in the industry getting various protection and promotion measures. Especially, the Ministry of International Trade and Industry (MITI) put into force various policies which enabled the promotion of strategic resource distribution to the steel industry as the nucleus of heavy and chemical industries and, at the same time, promoted the inter-enterprise coordination aiming at a controlled investment as well as a stable price and production.

The various policies were put into force in the steel industry from the early 1950s to the early 1960s. It is considered that the policies were prepared aiming specifically at:

- industrial rationalization/modernization

- strengthening of international competitiveness based on performance of growth in macro-economy
- balance of enhanced international balance of payments; and
- full employment.

As mentioned above, the Japanese economy was transformed from controlled economy to market economy after 1949. The steel production was about 2 million and 3 million in 1948 and 1949, respectively. These Japanese situations have some similarities to Viet Nam's present steel industry in that:

- The Japanese economy was just transformed from a controlled economy to a market economy;
- Steel production volume was relatively small, say 2 and 3 million t in 1948 and 1949, respectively;
- Equipment was obsolescent and technology was outdated;
- Productivity was low (e.g.: 1/7 of that in the U.S. for blast furnace);
- Hourly wage was low (about 20% of U.S. wage); and
- The Japanese steel industry lost international competitiveness.

Such Japanese experiences are considered to be of some help for the preparation and enforcement of Viet Nam's industrial policies for the steel industry to be modernized.

For the purpose of achieving the immediate recovery of the steel industry from the early 1950s, the First Rationalization Program was put into practice under the General Plan on Rationalization Policy based on the report by the Industry Rationalization Council organized within MITI. Three Rationalization Programs were implemented as shown in Table 2-1.

Table 2-1 Outline of Steel Industry Rationalization Program

	1st Rationalization Program (1951-1955)	2nd Rationalization Program (1956-1960)	3rd Rationalization Program (1961-1965)
Preparation and implementation of the programs	- Policy making by the Council for Industrial Rationalization - Implementation by direct involvement of government	- Coordination and guidance by MITI	- Coordination by private steel mills
Features of the programs	- Giving importance to modernization of rolling facilities - Introduction of strip mill operation technology from ARMCO	- Modernization of rolling facilities - Focus on construction/ expansion of BFs and LD converters - Introduction of plant operation technology	- Continuous modernization of steel plants - Construction of integral steelworks at coastal industrial zones
Investment	128 billion yen (US$ 360 million)	546 billion yen (US$ 1.51 billion)	859 billion yen (US$ 2.38 billion)
Financing sources	- Japan Development Bank - Main (private) banks	- World Bank - Main (private) banks - EXIM Bank	- Main (private) banks - EXIM Bank
Development of infrastructures	Poor infrastructures, but small impact on the rationalization	Poor infrastructures; big impact on the rationalization (designation of "special harbors" and harbor development based on it)	Relief from bottle neck of infrastructures
Results of the rationalization	Inferior to US productivity	Catching up with US productivity	Ahead of US productivity

In order to surely realize the modernization of the steel industry during the program periods, the following laws and regulations were promulgated in the early stage of the First Rationalization Program:

- Supply of modernization capital by the government investment and loan program, especially loans of capital investment through Japan Development Bank (JDB)
- Application of a special depreciation system to specified machine facility (50% increase of depreciation for 3 years): 1951
- Exemption of import duties for important machines: 1951

- Special depreciation at 50% for the first year and exemption/reduction of property tax: 1952
- Deduction of export income in tax calculation: 1953
- Approval system for foreign technology license and allocation of foreign exchange to imports (practically imposing an import quota)

The objectives of the above policies included the following:

- Promotion of capital investment through the supply of strategic capital and tax reduction
- Promotion of export and upgrading of technology by tax reduction
- Introduction of strategic technology
- Protection from international competition

3.2 Preparation of industrial policy and industrial vision in Japan

3.2.1 Preparation of industrial policy

In Japan the Ministry of International Trade and Industry (MITI) has been deeply involved in Japan's industrial policy from its preparation to execution. The industrial policy by MITI's view can be summarized as follows:

The industrial policy, based on the principle of market economy, not only provides supplementary measures to solve the uncertainty of changing market situations such as pollution problems, trade conflicts, difficulties in promoting large-scale R&Ds and instability of energy supply, but also assists in the smooth transition of industry and transformation of labor by avoiding potential social conflicts.

The following measures are included in MITI's industrial policy:

- Regulation by law
- Supply of information to show future industrial vision and guidance
- Indirect actions to induce an advantageous tax system, and favorable financing and credits by governmental financing institutions
- Advice and guidance by MITI

The following should be taken into consideration for the successful industrial policies:

- Adoption of consistent standards for selection of industry to be promoted

- Establishment of targets to be accomplished by industry during the period of industrial policies
- Introduction of appropriate protection measures (specified duration)
- Introduction of appropriate promotion measures (specified duration)
- Protection and development of supporting industry
- Adoption of appropriate price for foreign exchange stability to keep or enhance competitiveness in international market

3.2.2 Preparation of industrial vision

Of importance for industrial policy making is the existence of a long-term industrial vision which can provide a basis for it. The industrial vision must have content which can give consensus of opinion of not only the people concerned but also of most people in the country. The industrial vision must declare a "common principal target" and state an "introductive guideline" to realize it.

In the past, the common principal target of Japanese MITI was "economical and industrial improvement to the levels of advanced countries in Europe and America". After its accomplishment now, a new industrial vision titled "Industrial and Trade Policy in the Year 19XXs" is now prepared every 10 years.

The final target for Viet Nam's industrial vision is stated in "Goals for the Periods to 2020 and 2000" in 1996 - 2000 Five-year Plan as follows:

"From now to the year 2020, we will strive strenuously to turn ours basically into an industrialized country."

Of importance is how the above principal target was planned. The positioning of the steel industry in the national economy as well as a statement of a steel industrial vision should have been discussed in it. The problem is that the reliability of statistics is sometimes questionable and rationalization of information networks is far behind the level necessary, causing difficulties to make a competent industrial vision. It is recommended that the authorities concerned should establish a system for making a comprehensive industrial vision.

4. Industrial policies of Korea and Taiwan

Table 2-2 makes comparison of the industrial policies between Japan, Korea and Taiwan before the 1980s. The industrial policies employed by Korea and Taiwan are outlined as follows:

1) Designated industries and industrial sub-sectors to be developed,

2) Provided various favorable treatments intensively within a limited time period,
3) Canceled or relieved regulations for assistance when they were not necessary,
4) Supported R&D, and
5) Specified the future industrial visions.

However, there were differences in the industrial policies between Korea and Taiwan: the former aimed at industrialization of heavy and chemical industries, while the latter utilized the vitality of private sectors.

Table 2-2 Industrial policies of Japan, Korea and Taiwan

	Japan	Korea	Taiwan
Leadership of government and cooperation of private sectors	Middle	High	Low
Main measures taken by industrial policie	Favorable treatments in financing and taxation	Favorable treatments in financing	Favorable treatments for state enterprises
Degree of favorable treatments	Low	High	Low
Source of industrial capital	Private savings	Foreign loan	FDI
Export-oriented behavior	Middle	High	High
Industrialization of heavy and chemical industries	Active, successful	Active, successful	Not active, not successful
Liberalization of trade and foreign capital	1960s-1970s	1980s	1980s

Source: TCI's in-house study paper (lecturer: S. Wakiyama)

Section 3 Recommendation

1. Necessity of industrial policies

Free competition is the basis of a market economy. If an industry which has not reached to a level of having enough capability to deal with it comes to face free competition, it is obvious that it will surely suffer from destructive damages. As for such an industry, it will need some reasonable measures of protection and promotion based on national industrial policies. It is noted that as industrial circumstances are changing dynamically, industrial policies have to change dynamically to cope with them. In addition, excessive protection measures for a long-term period tend to become vested rights, leading to interruption of healthy industrial development, and thus loss of international competitiveness. Therefore, industrial policies should specify the period valid for its application, and industrial policies which no longer meet the actual circumstances should be abolished or modified.

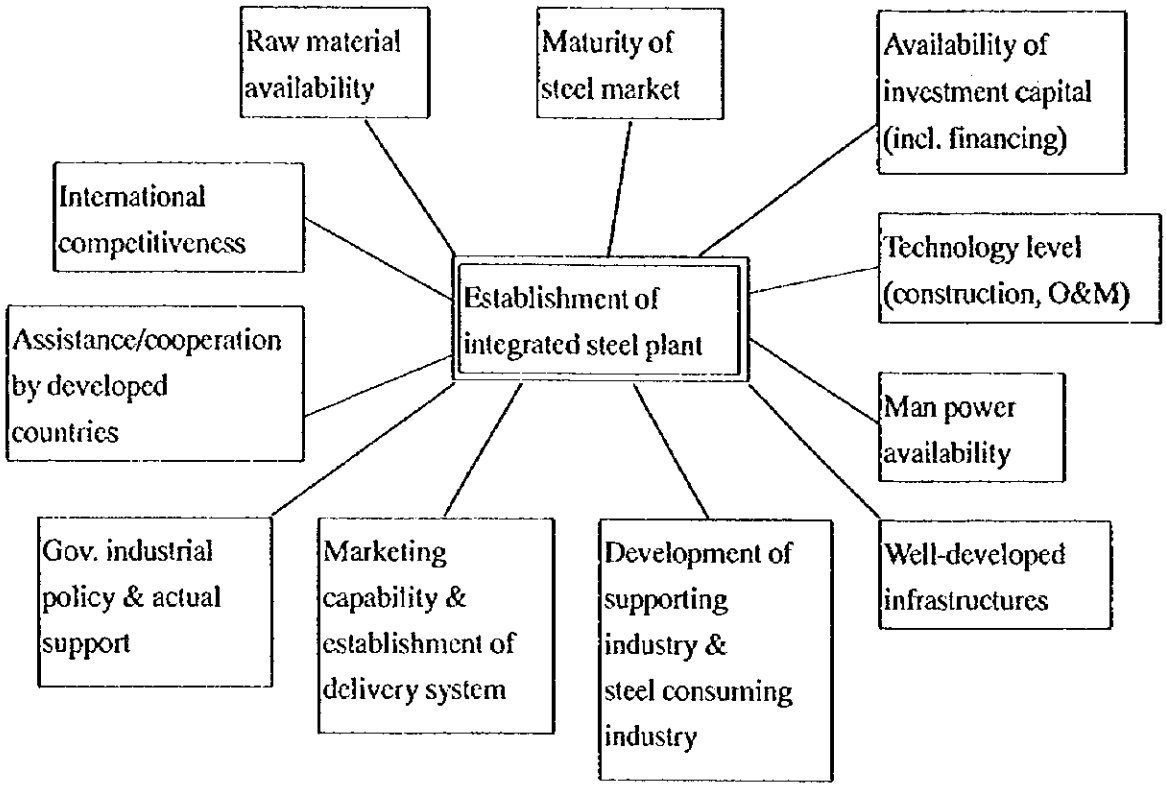
The conditions for establishment of an integrated steelworks is illustrated in Figure 3-1. Various conditions in various fields are necessary for it. It is considered that many of them have not reached to the required levels in Viet Nam, and it is necessary to upgrade them by implementing appropriate industrial policies.

Since the steel industry is related to various industries, the industrial policies for it will involve measures to promote these industries. Therefore, of importance is not only industrial policies for steel but also those of other related industry in general.

The following are necessary for planning industrial policies: (i) grasp of basic structures by industrial sub-sector, (ii) preparation of reliable statistics, and (iii) creation of institutional framework to be applied and a system to analyze the effects, etc. It is necessary to establish a system for preparation of industrial policies as well as develop human resources for it by the assistance from developed countries and/or international institutions.

2. International division of labor (vertical division of labor)

ASEAN countries try to promote the international division of labor within the ASEAN economic zone, aiming at efficient economic development within the zone. International division of labor consists of: (i) horizontal division of labor which enables production sharing for parts and components, and (ii) vertical division of labor which entirely relies on a certain product or major components to other countries. Since the latter might result in the loss of the corresponding industry, a thorough consideration is necessary for such an international division of labor (vertical division of labor) taking into account the comparative advantage of the country, the national interests, etc.



Source: Nippon Steel Corp.

Figure 3-1 Conditions for establishment of integrated steelworks

In considering the international division of labor in ASEAN countries under these circumstances, it is advisable that a deliberative council consisting of officers of MPI and MOI (in charge), related private enterprises, and academic circles be organized to make a future industrial vision, and then (based on it) to discuss and investigate the international division of labor which is considered to give the least adverse effect to the national economy.

Since the steel industry has been ranked as a strategic industry, it can not be considered at present that it will cease to exist.

3. Creation of steel demand

3.1 Encouragement of capital investment

Steel demand significantly depends on capital investment. While public investment can utilize not only government funds but also the finance of ODA and World Bank, capital investment will be mainly made by FDI. Therefore, further improvement of laws and regulations as well as speedy action with formalities is required.

3.2 Promotion of manufacturers' development and enforcement of local contents

Of importance for the development of the steel industry is to enhance a new steel demand. In order to make it possible, the following industries should be established in the country. Especially, the establishment of industrial sub-sectors which use flat products is indispensable. Application of industrial policy is necessary to increase local contents of parts and equipment for plant construction and machine assembly step by step.

1) Heavy industry/plant equipment manufacturing industry
2) Shipbuilding
3) Press processing industry
4) Machining industry
5) Casting and forging industry
6) Supporting industries for steel industry

4. Plan for capital investment in steel plants

4.1 Present plan of capital investment

- It is important to make and execute consistent steel industrial policy taking into account the steel supply and demand forecast of steel for the short- and middle/long terms. Especially, FDI licensing should be fully investigated to avoid double investments in similar plants which seem unnecessary so that potential double failures can be eliminated and limited capital can be effectively used.
- The capacities of existing EAFs are small, causing problems in term of inefficient raw material consumption, productivity, energy consumption, etc. Plant integration should be investigated, and promoted in the future.

4.2 Capital investment in integrated steelworks

- It is necessary that an integrated steelworks be established in the form of either a sole state owned enterprise or a joint venture with VSC and private company(s).
- The timing of integrated steelworks construction should be decided taking into account the steel supply and demand. It should be considered to firstly invest in downstream equipment such as rolling facilities etc. as have been experienced in other ASEAN countries.

5. Financing for integrated steelworks

It is essential to know how to finance the integrated steelworks proposed in the study, because its investment cost is estimated to be as large as half of Viet Nam's state budget or more.

5.1 Government capital

In Japan there is a governmental investment and financing system whose source of finance is based on various public funds such as postal savings and welfare pension plans collected through the governmental credit system to invest in or finance certain projects, according to a certain plan in order to accomplish the objective of national policy. During the rehabilitation and high growth periods after the War, much governmental funds were invested almost exclusively in modernization of basic industries such as steel making, electricity and coal mining to make up for the scarce private funds.

It is considered that there is no similar system to the Japanese one to support the

governmental investment and financing. It is supported by a part of the state budget as well as ODA loans and WB loans through the government. It is advisable to establish a similar system to the Japanese one in Viet Nam in the future.

5.2 Application of ODA funds and WB loans

It is a subject to be discussed whether ODA funds/WB loans can be applied to steel plant projects. It is recommended to raise the priority of steel plant construction among planned projects within ministries concerned so that the ODA fund/WB loans can be applied to it.

5.3 Issue of corporate bond and stocks

In case of the construction of integrated steelworks by JV, it is recommended that a system enabling issue of corporate bond and stocks of JV be established so as to raise construction capital by preparation of related laws and regulations.

6. Governmental assistance to support steel industry

6.1 Favorable treatments of taxation etc.

A vast amount of capital is required for construction of integrated steelworks. It greatly impacts not only on its finance but also on its manufacturing cost. Therefore, it is recommended that such advantageous treatment as specified in the present Foreign Investment Law etc. should be applied as much as possible to reduce the manufacturing cost.

6.2 Moderate protection and promotion for the time being

6.2.1 Improvement of present status

The present steel market is in an excessive over-supply situation, caused by ignoring the actual demand. As a result, domestic steel factories are suffering from low operation rates as well as a decline in products price and increase of stocks. Especially, the increase of stocks of raw materials and products including imported ones leads to an inefficient use of foreign currency as well as the degradation of stocks in quality caused by generation of rust etc., resulting in significant losses. For example, the stocks in 1996 are estimated to be 600 - 800 thousand tons including imported billets, whose value is estimated at more than

US$200 million and which is not yet mobilized in the national economy. It is advisable to take effective measures to enable the import quota system to become reasonably functional.

6.2.2 Maintenance of competitiveness of products in integrated steelworks

Introduction of policies might be necessary by taking some measures which could be accepted in ASEAN countries etc. for a limited period until the time when the domestic products come to be able to compete. Viet Nam is now in a position where it must respect AFTA's free trade concept by affiliation with ASEAN members; however, it is necessary that allowable protection and promotion measures should be investigated, thus considering a right balance between the industrial promotion by the national interests and AFTA's obligation.

7. Development of infrastructures for integrated steelworks

An integrated steelworks requires infrastructures of not only access measures on land (road and railway siding) but also port, electricity and industrial water supplies which will cost an enormous amount of money. Bearing all of this cost by a company means that the project itself will not be feasible.

The development costs for infrastructures should be independently considered and covered by the budget of the government and loans arranged by the government.

8. Introduction of advanced technology

Steel companies under VSC have maintained a far less advanced level in productivity, energy efficiency and unit consumption of raw material than steel companies in advanced countries. This means the waste of natural resources, leading to loss in the national economy. It is of importance to take necessary measures to develop technology for the establishment of energy conservation processes. At the same time, it is necessary to take steps for promoting the introduction of foreign technology as well as collection of technical information and public access to it.

9. Improvement of quality

Improvement of quality cannot be ignored if they want to enhance international competitiveness. There is a possibility that they will lose competition to not only foreign companies but also to a joint venture in the country which has already started manufacturing competitive quality products.

It is recommended that national quality standards should be established and measures

should be taken for quality assurance such as enforcement of mill sheet attachments to any products. The equipment cost to deal with it should be financially supported by donations or subsidies.

10. Reform of state owned enterprise

The reform of state owned enterprise is a crucial problem. The accomplishment of the reforms is an urgent matter for TISCO and SSC to compete with a joint venture such as VINAKYOEI. In addition, the rehabilitation plan proposed in the study report should be implemented as a part of the reform program.

11. Environmental preservation

It is a matter of course that any integrated steelworks should be controlled by environment laws and regulations in Viet Nam. In the construction of integrated steelworks, obligations should be given for undertaking of environmental assessment prior to the project implementation, and environmental guidances which conform to the steel plant should be designed.

Section 4 Financing for a Project in General

1. Flow of investment and loan

Figure 4-1 illustrates the flow of investment and loan in Viet Nam.

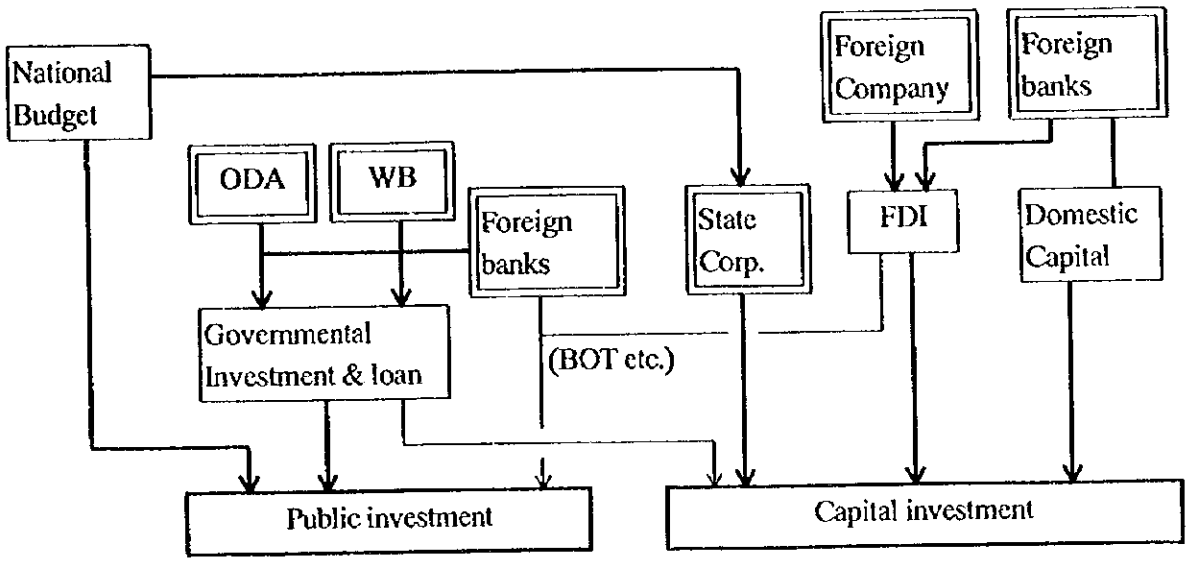


Figure 4-1 Flow of investment and loan in Viet Nam

2. Financing sources in general

Generally, there are financing sources which include less ODA elements as follows: (i) supplier's credit, (ii) buyer's credit, and (iii) project finance which solely relys on a cash flow of the project. In addition, there are such financing sources based on ODA as OECF's finance and World Bank's finance.

3. Case study

Figure 4-2 shows the scenarios for financing of an integrated steelworks project for the two following, typical scenarios:

- Scenario 1: The integrated steelworks is solely owned by a state owned enterprise (VSC).
- Scenario 2: The integrated steelworks is owned by a joint venture consisting of VSC, foreign partner(s) and people in a form of open stock.

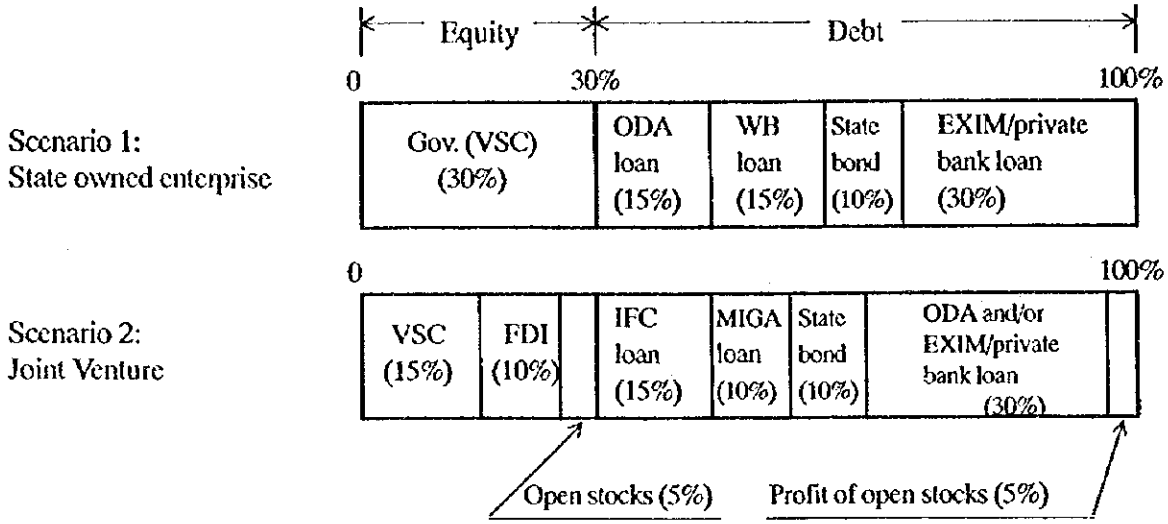


Figure 4-2 Scenarios for financing of an integrated steel plant project

It should be noted that these scenarios are conceptual ones and are based on neither actual negotiation nor discussions with authorities concerned and financing institutions. Therefore, how successful these scenarios maybe is not known at this stage.

3.1 Scenario 1

The government not only invests 30% of the investment cost but also issues a state bond equivalent to 10% of the investment cost. The remaining 60% is provided by cofinancing with ODA (15%), WB (IDA or IBRD, 15%) and EXIM/private banks (30%). The government guarantee is necessary for cofinancing.

3.2 Scenario 2

A joint venture consisting of VSC (15%), foreign partners (10%) and people in a form of open stocks (5%) makes up 30% of the investment cost. It is assumed that the stock market is established in Viet Nam and the stocks can be allowed open before the plant operation. The stocks could be sold at double the price of the face value. The remaining 70% is made up by the following:

- International Financing Corporation (IFC) loan: not exceed 25% of the overall financing requirement (70% x 0.25 = 17.5%→15%)

- Multinational Investment Guarantee Agency (MIGA) supported loan (10%)
- State bond (10%)
- ODA and/or EXIM/private bank loan (30%)
- Profit of open stocks (5%): no interest

Chapter IV Pre-feasibility Study Results for the Construction of the New Integrated Steelworks

Part 1 Introduction

Section 1 Preface

1. Preface

Study on the construction of the new integrated steelworks, which had been recognized as necessary in the master plan for the Vietnamese steel industry in 2010 prepared in Phase I of this project, was conducted as the work in Phase II.

Study was also carried out as the fourth site study to confirm the preconditions to the pre-feasibility study. Major preconditions and the scope of the pre-feasibility study are shown in Section 2 below.

The pre-feasibility study here aimed to investigate the impact of shifting the construction start timing for each equipment unit on the viability of the project based on an outline picture of the integrated steelworks drawn on an assumption that a more-detailed full-scale feasibility study would be conducted in the future.

In other words, the aim was to verify what conditions would be necessary to improve the viability of the construction of the integrated steelworks.

In recent years, a plan for the construction of an integrated steelworks attempted in South East Asia was aborted for the reason that the investment in the upstream process would affect the viability of the project.

Although it is necessary to watch carefully the future trend of economic growth and outlook and that of industrialization policies in Viet Nam, the full utilization of the information contained in the report of this pre-feasibility study is expected.

Section 2 Scope of the Pre-feasibility Study and Its Preconditions

1. Scope of the Pre-feasibility study and its preconditions

The pre-feasibility study was conducted with the following scope and preconditions.

1.1 Conceptual design of the new integrated steelworks
(1) Production scale and product mix
(2) Production process
(3) Raw material and fuel usage plan
(4) Equipment to be introduced, and its layout arrangement
(5) Organization and personnel
(6) Plant management plan
(7) Related facilities (infrastructure etc.)
(8) Environmental control equipment
(9) Construction process

1.2 Preconditions to production scale and product mix
Based on the master plan, the production of about 3,000,000 tons of flat products and about 1,000,000 tons of semi-products, i.e., billets, should be planned.

In consideration of equipment cost, the maximum width of hot-rolled sheet products should be 5-feet wide which will cover about 88% of the total domestic demand.

The maximum width of cold-rolled sheet products should be 1,300mm wide in consideration of the projected range of demand.

1.3 Preconditions to site selection
Study should be conducted on the assumption that the integrated steelworks would be constructed in Mui Ron. For the Dung Quat area, the impact of the difference in infrastructure around the site on the total construction cost is assessed and reflected in the viability of the project for comparison with Mui Ron.

1.4 Preconditions to construction process
The total demand for steel products in 2010 projected as a result of market study is regarded as appropriate. However, considering the timing of construction fund procurement, the completion time for each equipment unit is assumed as below.

Completion time for hot strip mill and cold strip mill: Early 2006
Completion time for No.1 BF and steelmaking equipment: Early 2010
Completion time for No.2 BF and related equipment: Early 2014

Project assessment will be carried out by estimating cost based on the above scope and preconditions.

Part 2 Summary of the Pre-feasibility Study

Section 1 Market Mix Projection

1. Steel demand projection

Based on the macroscopic and microscopic survey of the present and future industrial structure in Viet Nam, steel demand by steel type in Viet Nam is projected as shown in Table 1-1.

Table 1-1 Steel demand projection

(Unit: 1,000t)

Product		1996	2000	2005	2010
Non-flat products	Bar	470	770	1,190	1,520
	Wire rod	300	440	600	770
	Section	140	270	450	580
	Sub total (% of non-flat steel)	910 (70%)	1,480 (63%)	2,240 (54%)	2,870 (45%)
Flat products	Plate *	58	93	239	473
	Hot coil/sheet **	48	195	501	994
	Cold coil/sheet	65	177	454	899
	Galvanized sheet	139	228	388	659
	Tin plate	40	65	88	125
	Welded pipe	40	112	240	360
	Sub total (% of flat steel)	390 (30%)	870 (37%)	1,910 (46%)	3,510 (55%)
Grand total		1,300	2,350	4,150	6,380

* : Plate : thickness $\geq$ 6.0mm

** : Hot coil/sheet : thickness $<$ 6.0mm

Section 2 Production Scale and Product Mix

1. General

In this section, a summary of the production scale and product mix of flat products is given.
For more details, please refer to Sections 10, 11 and 12 , Part 14, Chapter IV.

1) The total flat product demand on slab basis in the future in Viet Nam classified by the final production process has been derived as shown in Table 2-1 using the market study results.

Table 2-1 Forecast of flat product demand by final production process (Slab basis)

(unit : 1000 t/y)

Year	Total Flat	Flat products						W.Pipe (92%)
		Plate mill (90%)	HSM (93%)	CSM (89%)	CGL (90%)	EGL (90%)	Tin/ TFS (84%)	
1996	434	64	52	73	142	12	48	43
1997								
1998								
1999								
2000	964	103	210	199	232	21	77	122
2001								
2002								
2003								
2004								
2005	2122	266	539	510	394	37	105	261
2006								
2007								
2008								
2009								
2010	3877	526	1069	1010	671	61	149	391

Note: Percentages shown under each process are the yield values of each product against slab.

The figures in the above table are converted to slab basis using the yield value of each process.
For example, the total demand of flat products in 2010 is 3,877,000 t/y on slab basis which is equivalent to 3,510,000 t/y on final product basis. (For details, refer to item 1.2 (1) on page IV-14-10-2)

2) Using the above Table 2-1, Table 2-2 "Maximum accessible demand for each process" has been prepared for the case that the max. width of HSM is 1600 mm.

Table 2-2 Maximum accessible demand for each process(slab basis)

(unit: 1000 t/y)

Year	Flat (Total)	HSM (Accessible)	CSM (Accessible)	CGL	ETL
1996	434	322	215	142	48
1997					
1998					
1999					
2000	964	769	431	232	77
2001					
2002					
2003					
2004					
2005	2112	1726	904	394	105
2006					
2007					
2008					
2009					
2010	3877	3345	1830	671	149

Various premises are used to prepare the above table.
For details of the premises, please refer to Page IV-16-10-7.

As shown in the above table, the maximum accessible amount of HSM products in 2010 is 3,345,000 t/y against 3,877,000 t/y of the total flat product demand.
This means that 532,000 t/y (3,877,000 - 3,345,000) are inaccessible by the HSM in NISW.

Out of the inaccessible 532,000 t/y of flat products, approx. 470,000 t/y are products wider than 1600 mm, and approx. 60,000 t/y are EGL products which will not be produced in NISW.

As for CSM , the inaccessible products are considered only those for EGL. For example, the max. accessible amount are 1,830,000 t/y against 1,891,000 t/y of the total demand.

As for the CGL and ETL products, it is presumed that all products will be accessible by the facilities to be installed in NISW.

2. Production scale and product mix of HSM plant

2.1 Production scale

The production scales of the HSM and finishing facilities are planned as follows:

1) Considering the maximum accessible amount(3,345,000 t/y) of flat rolled products shown in the previous page, the maximum capacity of HSM has been decided to be 3,225,000 t/y(96% of 3,345,000 t/y) to cover the total demand as much as possible within the achievable production capacity of the coil box type HSM which is considered most suitable for the new integrated steelworks.
The above 3,225,000 t/y on slab basis is equivalent to 3,000,000 t/y on product basis.

- Step 1 : 1,680,000 t/y(slab basis)
- Step 2 : 3,225,000 t/y(slab basis)

2) According to the product mix and the production flow(please refer to page IV-14-10-8 to IV-14-10-10 for details), the production scales of the finishing facilities are planned as shown in Table 2-3.

Table 2-3 Production scale of hot finishing facilities

	Step 1		Step 2	
	No.	Capacity 1000 t/y	No.	Capacity 1000 t/y
1 Hot skinpass mill	1	700	1	700
2 Hot shearing line	1	300	1	300
3 Hot plate cutting line	1	60	1	120
4 Hot slitting/recoiling line	0	0	1	240

Generally the demand for sheets, plates and small coils is considered very high in Viet Nam compared to that for as-rolled large coils.

Therefore in addition to the above finishing facilities, several finishing facilities will need to be installed at coil centers.

2.2 Product mix(including size mix) of HSM products

The product mix of future Viet Nam market has been prepared using various presumptions as described in Section 10, Part 14, Chapter IV.

1) The presumed product kinds of hot rolled products when delivered from HSM plant are shown in Table 2-4.

Table 2-4 Product kinds of hot rolled products

Product kinds	Production (product basis)
a) Hot coils for CSM in NISW	1,000,000 t/y
b) Hot coils for P/O products(*1)	200,000 t/y
c) Hot coils for re-rolling companies	600,000 t/y
d) Hot coils for pipe/forming companies	300,000 t/y
e) Hot coils for coil centers	300,000 t/y
f) Hot rolled sheets/plates	240,000 t/y
g) Hot rolled heavy plates(*2)	120,000 t/y
h) Hot slit/recoiled coils	240,000 t/y
Total	3,000,000 t/y

Note(*1): Some part of P/O products will be cut into sheets in HSM plant.
Note(*2): These are produced without coiling at down-coiler.

2) The presumed width distribution of flat products is shown in Table 2-5.

Table 2-5 Width distribution of all flat products

Width range	Ratio
- 1600 mm (5 feet)	88 %
1600 (5 feet) - 1900 mm (6 feet)	7 %
1900 (6 feet) -	5 %

Considering the above figures, the width of HSM has been decided to be 5 feet.

3) The thickness distribution of flat products narrower than 1600 mm is presumed as shown in Table 2-6.

Table 2-6 Thickness distribution of hot rolled products

Thickness range	Ratio
1.20 - 1.79 mm	6 %
1.80 - 5.99 mm	80 %
6.00 - 15.99 mm	10 %
16.00 - 32.00 mm	4 %

4) Product size range

Considering the above size mix, size ranges of each hot rolled product to be produced in NISW are planned as shown in Table 2-7.

Table 2-7 Product size range (Step 2)

Product kind/use	Thickness min. - max. (mm)	Width min. - max. (mm)
1 As-rolled hot coil	1.2 - 16.0	650 - 1600
2 Skinpassed hot coil	1.2 - 6.0	650 - 1600
3 Hot rolled sheet	1.2 - 13.0	650 - 1600
4 Heavy plates	9.0 - 32.0	900 - 1600
5 Hot slit/recoiled coil	1.2 - 9.0	650 - 1600
6 P/O coil and sheet	1.8 - 6.0	700 - 1350
7 Hot coils for TCM	1.8 - 6.0	700 - 1300

At Step 1 of the project the minimum thickness of hot rolled products is presently proposed to be 1.6 mm with 5 stand Finishing Mill (FM).

5) Steel grade distribution

Considering the data in South East Asia, the steel grade distribution classified by tensile strength is presumed as shown in Table 2-8.

Table 2-8 Steel grade distribution by tensile strength

Tensile strength (Nominal)	25 - 35 (kg/mm^2)	35 - 45 (kg/mm^2)	50 - (kg/mm^2)
Steel kind	Low carbon steel	Low or middle carbon steel	Low alloy steel
Typical standard in JIS and API	SPHC, SPCC SAPH 340	SS400, SM400 SAPH 400	SS490, SM490 API-5LX60
Composing ratio	70 - 75 %	20 - 25 %	5 %

3. Production scale and product mix of cold strip mill and metal finishing plant

Products of the cold strip mill plant and metal finishing plant decided from the market study are as follows.

1) Size range and typical size of products

Size ranges and typical sizes of each product are summarized in Table 2-9.

Table 2-9 Size range and typical size of products

	Size range (mm)		Typical size (mm)
	Thickness	Width	Thickness × Width
Pickled and oiled sheet (P/O)	1.8～6.0	610～1,350	2.8 × 1,100
Cold rolled steel sheet	0.35～1.6	610～1,300	0.9 × 1,000
Galvanized steel sheet	0.18～1.6	610～1,250	0.4 × 1,000
Tin plate	0.18～0.4	610～1,100	Products

2) Grade of products

The grades of products are summarized in Table 2-10.

Table 2-10 Grade of products

Products	Steel grade (JIS)
Pickled and oiled sheet (P/O)	SPHC, D, E SS400, SAPH 340, 400
Cold rolled steel sheet	SPCC SPCD SPCE
Galvanized steel sheet	SGCC SGCH
Tin plate	SPTE

3) Annual production

The annual production amount of each product is summarized in Table 2-11.

Table 2-11 Annual production of each products

(Unit: ton/y)

	Step 1		Step 2	
	Hot coil	Product	Hot coil	Product
Pickled and oiled sheet (P/O)	105,200	100,000	210,400	200,000
Cold rolled steel sheet	550,600	500,000	767,4000	700,000
Galvanized steel sheet	109,500	100,000	219,200	200,000
Tin plate	0	0	117,100	100,000
TOTAL	765,300	700,000	1,314,100	1,200,000

Section 3 Production Process and Balance

1. Flow of production processes

The production processes of the projected integrated steelworks are decided by considering the scale of production, situations of raw materials and investment efficiency.
The flow of production processes is shown in Figure 3-1.

2. Production balance

The projected integrated steelworks will be constructed in three phases. The production balances of the individual step are shown in Figures 3-2 ~3-4.

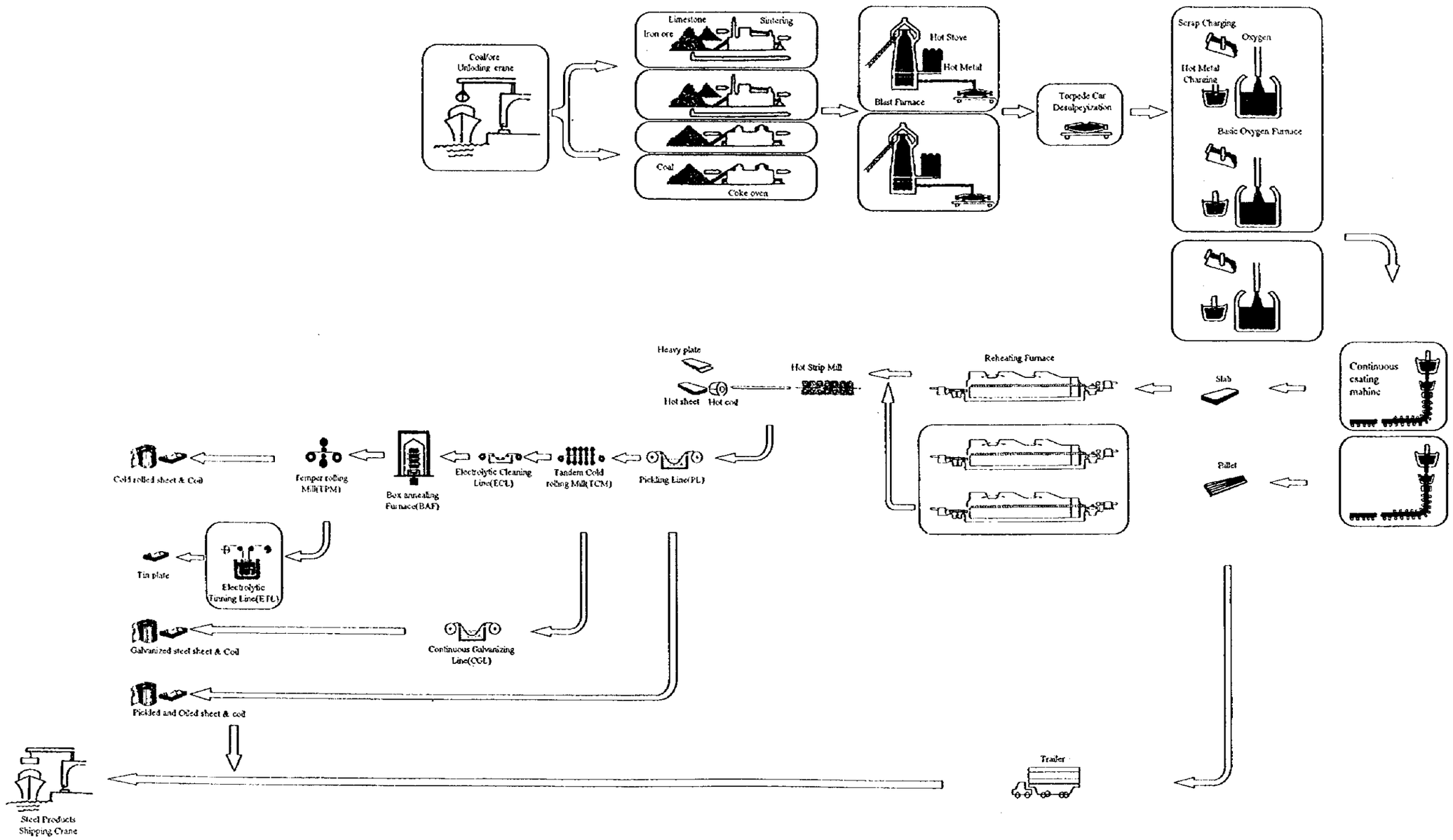


Figure 3-1 Flow of production process

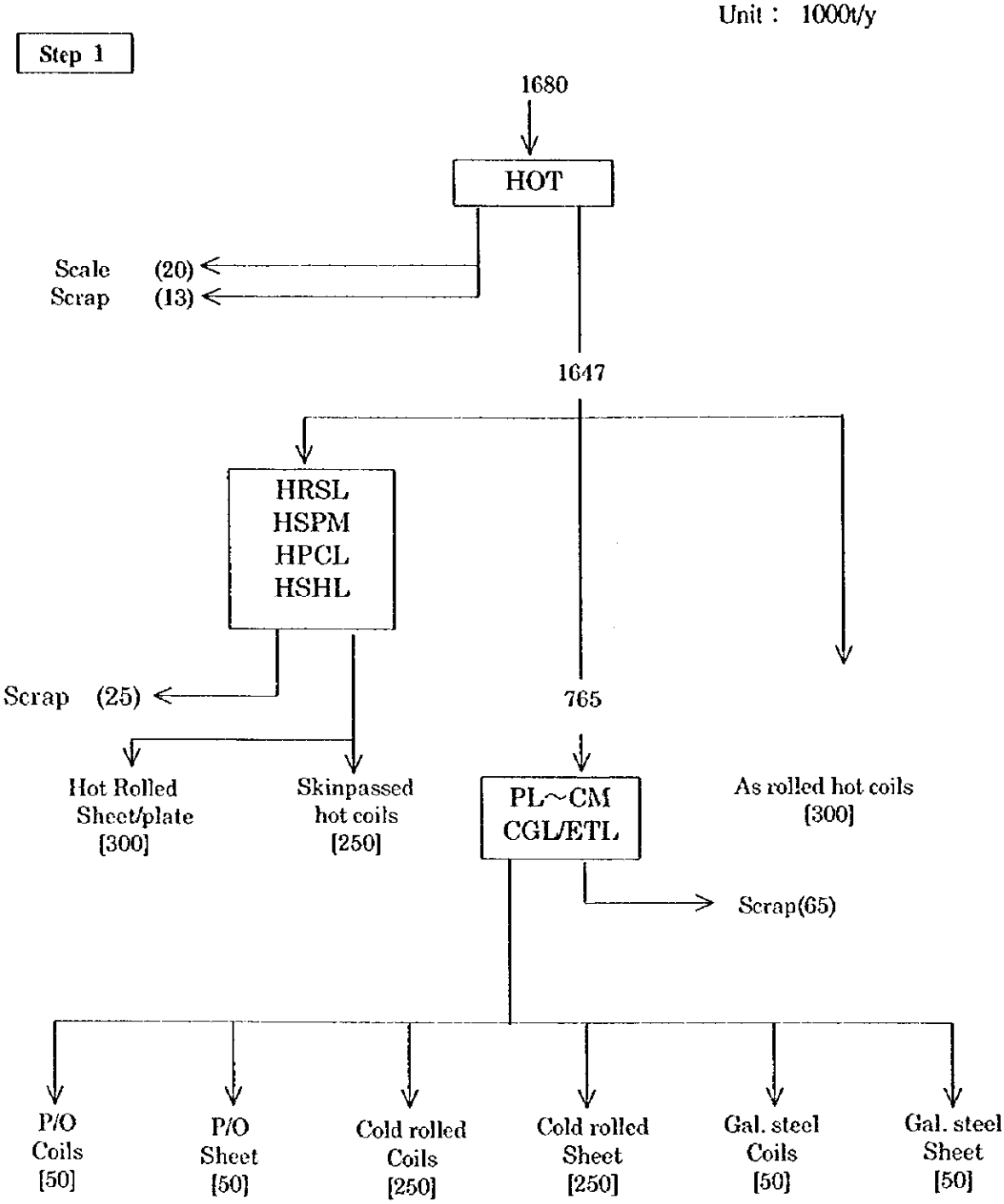


Figure 3-2 Material flow and material balance

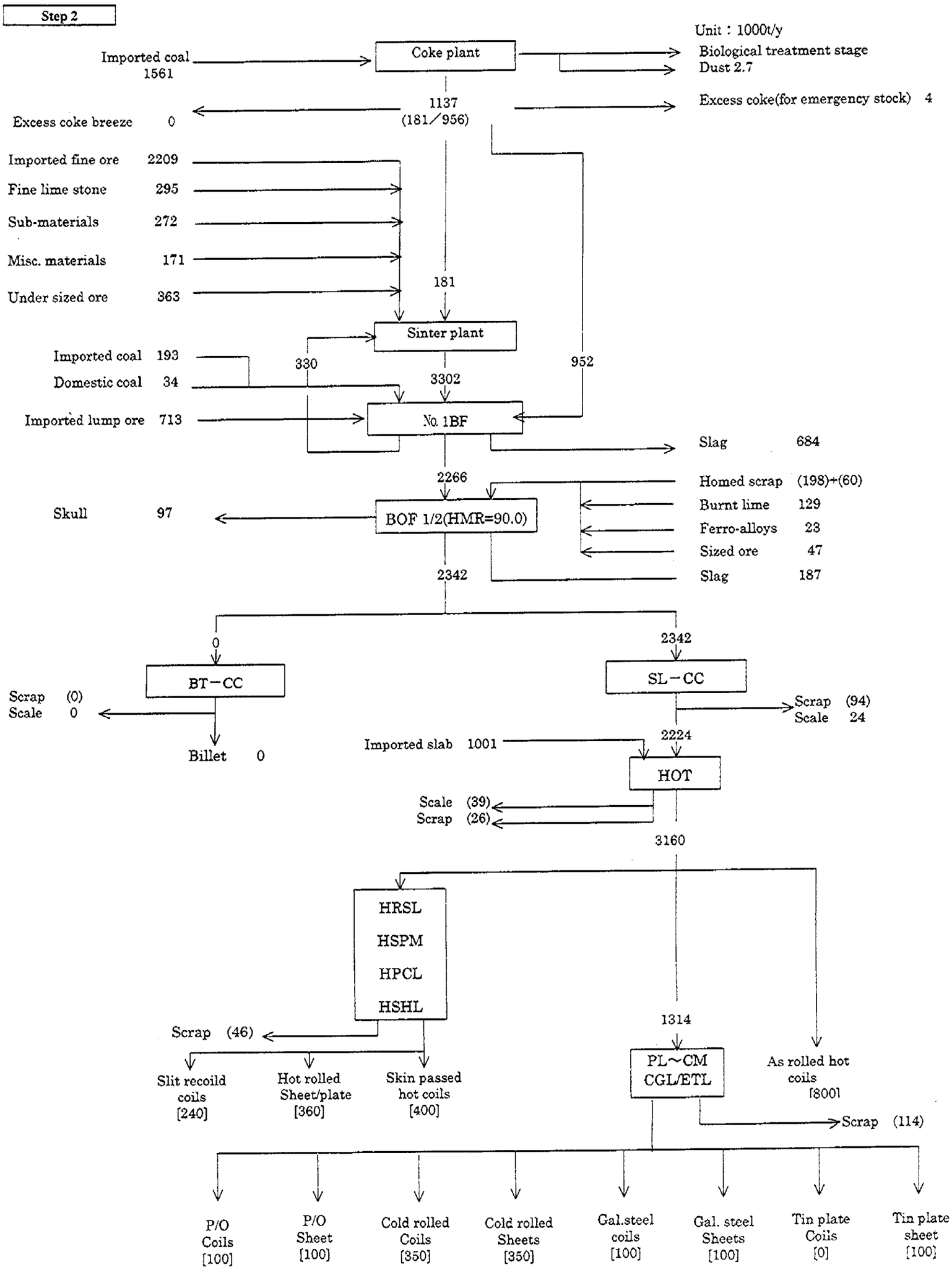


Figure 3-3 Material flow and material balance

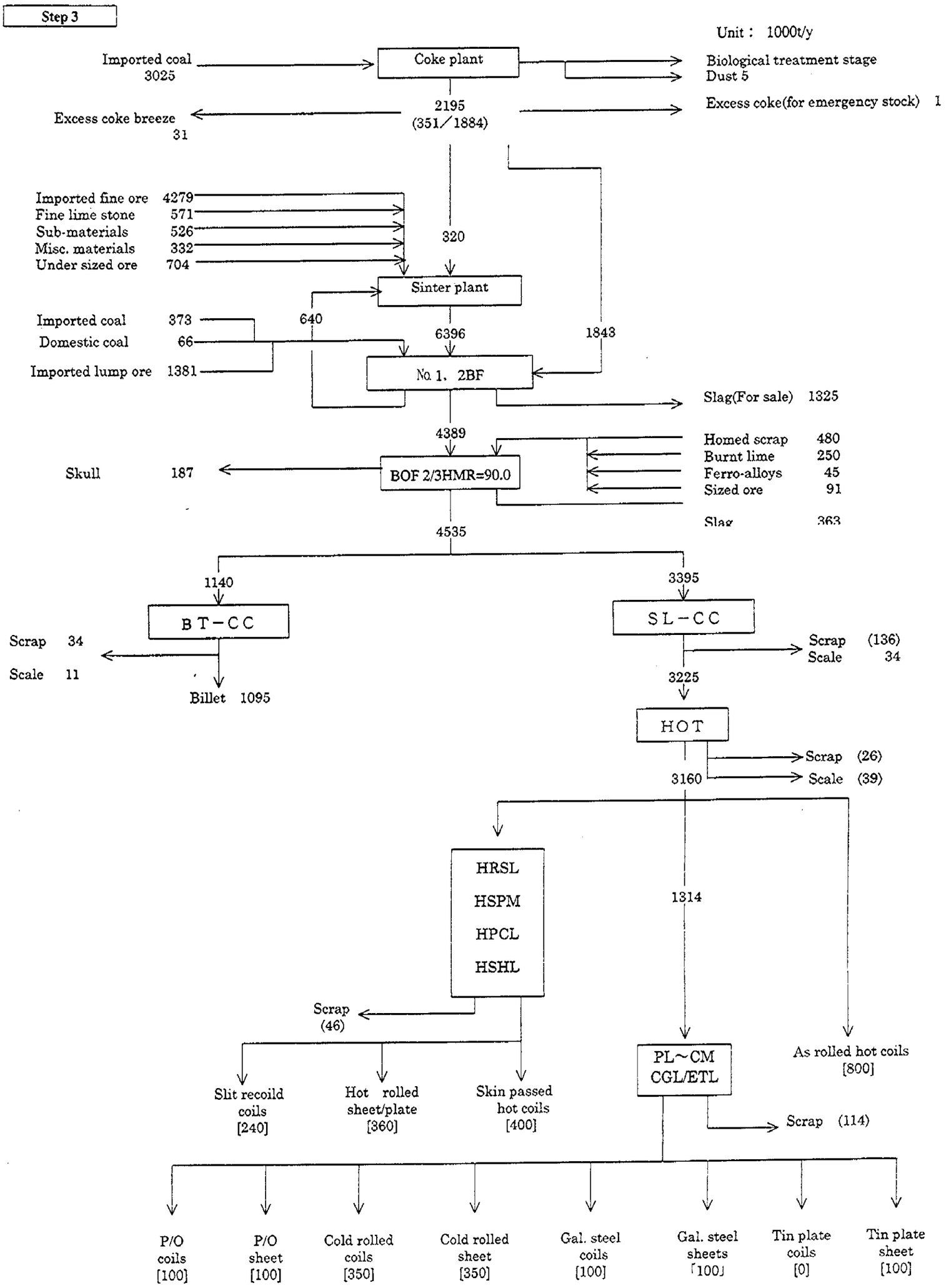


Figure 3-4 Material flow and material balance

Section 4 Outline of the Production Facilities

1. Main specification of the production facilities

Main specification of the production facilities is shown in Table 4-1.

Table 4-1 Main specification of production facilities

Facility	Step 1	Step 2 *	Step 3 *
Port and port facility	For steel products unloading crane Max. 30t x 3 sets Warehouse : 1 set	For raw materials unloading crane for ore & coal Max. 2000t/h 2sets Unloading crane for other materials 500t/h x 1set For steel products unloading crane Max. 30t x 2 sets	For raw materials unloading crane for ore & coal Max.2,000t/h 2sets For steel products unloading crane Max. 30t x 3 sets Warehouse : 1 set
Raw materials handling facility	----------	Raw material yard 40,000m^2x3 24,500m^2x3 Coal yard 21,000m^2x1 25,000m^2x3 Blending yard 24,500m^2x1 Yard equipment 1 set	Raw material yard 40,000m^2x1 24,500m^2x1 Coal yard 25,000m^2x3 Blending yard 24,500m^2x1 Yard equipment 1 set
Sintering plant	----------	Sinter machine type : DL effective area : 320 m^2x1 Desulfurizing plant : 1 set	Same as left
Coke plant	----------	Coke oven dimension : 6.5m^hx0.45m^wx 15.56m^lx120 By-product plant capacity : 150,000Nm^3/h	Same as left

Facility	Step 1	Step 2 *	Step 3 *
		Desulfurizing plant 150,000Nm^3/h x1	
Blast furnace plant	----------	Blast furnace 3,200m^{3}x1 Hot blast stove 3 sets Casting machine 1 set	Same as left
Lime calcining plant	----------	Kiln type : rotary kiln capacity : 500t/d 1 set	Same as left
Basic oxygen furnace plant	----------	Converter capacity:220t/heat 2 sets OG equip,:2 sets CAS-OB:1 set Deslagging equip. :1 set LD gas holder :1 set.	Converter capacity:220t/heat 1 set OG equip,:1 set CAS-OB:1 set Deslagging equip. :1 set LD gas holder ----------
Continuous casting plant	----------	SL caster 1st.x2 CCMx2sets casting size : 220mm^{t}x1.6m^w x10.4^l casting speed : 2.6 m/m	---------- BT caster 8st.x1 CCMx1set casting size : 150 sq.x12m^l casting speed : 3.5m/m
Hot strip mill plant	Hot strip mill capacity:1.7Mt/y Reheating furnace capacity:250 t/hx1	Hot strip mill capacity:3.25Mt/y Reheating furnace capacity:250 t/hx2	----------

Facility	Step 1	Step 2 *	Step 3 *
	Roughing mill reversing x 1 st. Finishing mill x 5 st.	Roughing mill reversing x 1 st. Finishing mill x 1 st.	
Cold strip mill & metal finishing plant	Tandem cold mill capacity : 0.74Mt/y Pickling line capacity : 0.79Mt/y CGL : 1 line (No1 CGL)	Tandem cold mill capacity : 1.05Mt/y Pickling line capacity : 1.3Mt/y CGL : 1 line (No2 CGL) ETL : 1 line	
Power receiving & distribution facility	Receiving station Main transformer 100 MVA x 2units Main substation 50MVA x 4 units	Receiving station Main transformer 150 MVA x 1unit Main substation 50 MVA x 4 units Emergency diesel generator : 1000kw x 1set	Receiving station Main transformer 150 MVA x 1unit Main substation 50MVA x 1 unit Emergency diesel generator : ----------
Power plant	---------	Boiler, turbine, generator capacity : 150Mw extracted steam:80t/h Demineralized water equipment 2 units	Boiler, turbine, generator capacity : 150Mw extracted steam:80t/h Demineralized water equipment ---------
BF blower plant	---------	Blast furnace blower capacity : 6,000Nm^3/hx2sets	Blast furnace blower capacity : 6,000Nm^3/hx1set
Air separation plant	---------	Air separation equipment capacity(oxygen): 33kNm^3/hx2 units capacity(nitrogen) 20kNm^3/h	Air separation equipment capacity(oxygen): 33kNm^3/hx1 unit capacity(nitrogen) 20kNm^3/h

Facility	Step 1	Step 2 *	Step 3 *
Fuel gas facility	---------	BFG holder 100km^{3}x1 unit COG holder 70km^{3}x1 unit Utilities piping 1 set	BFG/COG holder(combind use) 70km^{3}x1 unit Utilities piping 1 set
Water supply & sewerage facility	Reservoir in site 1 set For downstream plants facilities & main piping for industrial, potable water & sewerage 1set	For upstream plants facilities & main piping for industrial, potable water & sewerage 1set	
Intraworks transportation	Vehicle : 1 set	Locomotive tractive capacity : 65 t x 6 sets railway equipment: rail gauge:1422mm rail size:60 kg/m Torpedo car loading capacity : 250tx13 sets Vehicle : 1 set	Locomotive tractive capacity : 65 t x 6 sets railway equipment: rail gauge:1422mm rail size:60 kg/m Torpedo car loading capacity : 250tx13 sets Vehicle : 1 set
Intraworks telephone. Facility	Telephone exchange PABX capacity : 200lines PAX capacity : 1000lins Handset & communication line : 1 lot	Handset & communication line : 1 lot	Handset & communication line : 1 lot

Facility	Step 1	Step 2 *	Step 3 *
Central maintenance shop	Machining shop : 1 Fabrication shop :1 Vehicle repair shop : 1 Mechanical repair shop : 1 Electrical & instrumental repair shop : 1 Material warehouse: 1 set	Casting shop : 1 Forging shop : 1 Material warehouse: extension	---------
Testing & analysis facility	Analytical verification test:1 Product verification test:1 Environmental measurement test:1	Raw materials verification test:1 Special verification test:1	---------
Administration & common facility	Central office : 1 Motor pool : 1 Shipping warehouse 1 set	Shipping warehouse 1 set	

[Note] * Indicates additional equipment for each step

Section 5 Raw materials

1. Concept of raw materials supply

As described in Section 1, Part 3, Chapter Ⅲ all iron ore and coking coal will be imported for the New Integrated Steel Plant. Following is the recommendable concept to be applied to the way how to procure materials from the view point of stable supply, quality and price.

2. Iron ore

For sintering plant and blast furnace operation all iron ore is to be imported by ocean transportation.
To ensure a stable supply of iron ore it is advisable to select and maintain several sources.
It is assumed that there is no big change of supply and demand for iron ores in the near future and the proportion of iron ore imported from the various suppliers should be set out according to the present exporting level from each supplier.
This will keep the present stable balance between suppliers. It is assumed that in Viet Nam and the possible exporting countries there are no special factors to be taken into account such as reciprocity. The following are the present possibilities:

-India:
This is the nearest source of supply and has relatively low price ores with a high lump ratio but a relatively high aluminum content.
-Australia:
The source of supply is quite close and stable with the potential to supply lump ore in large quantities. Ore from some sources is limonite ore.
-Brazil:
The source of supply is far away with high ocean freight but low aluminum content.
-Canada:
The source of supply is far away with high ocean freight but low phosphorous content.

3. Coking coal

Coking coal should be imported mainly from Australia, Russia and China with a small portion of coking coal imported from USA to make the adjustment of fluidity more easy.
The proportions from these three countries should be about the same as at present exported by them to balance the demand, and to keep a manageable proportion of hard, semi soft and weak coking coal to maintain the coke quality required for the blast furnace operation.

4. Scrap

The domestic generation of scrap is very small and basically only return scrap will be available.

5. Auxiliary raw materials

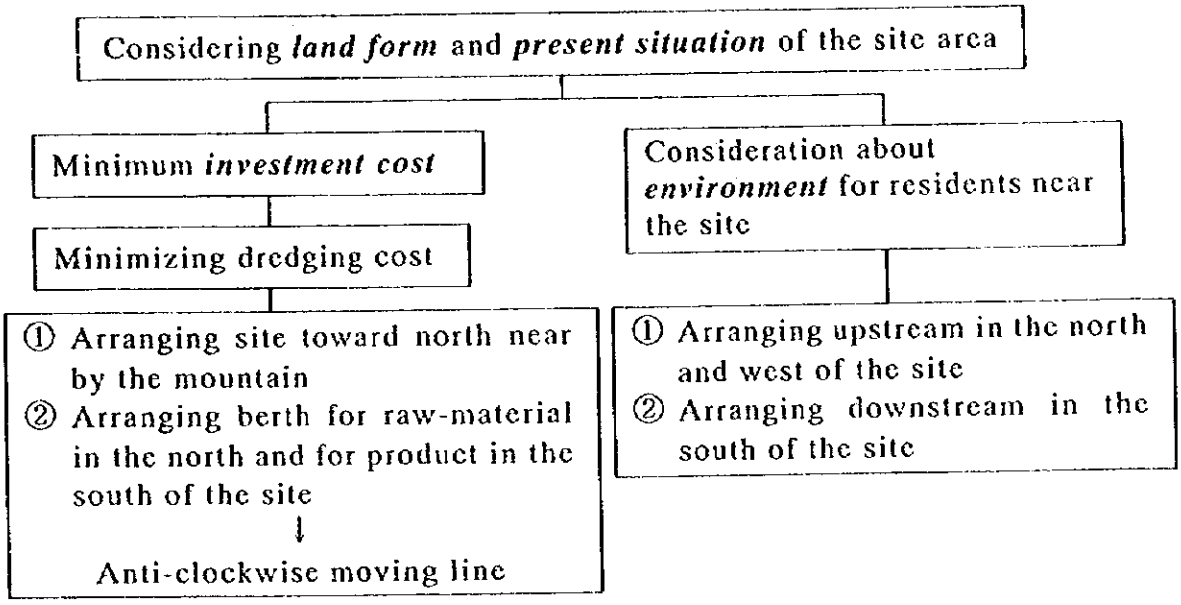
Limestone, dolomite and quartzite are mined in Viet Nam and can be supplied from domestic sources with sufficient quantities.

Serpentine is thought to exist in Viet Nam but the resource has not yet been developed. In any case dolomite and quartzite can be used as a substitute.

Section 6 Concept of General Layout for Mui Ron Site

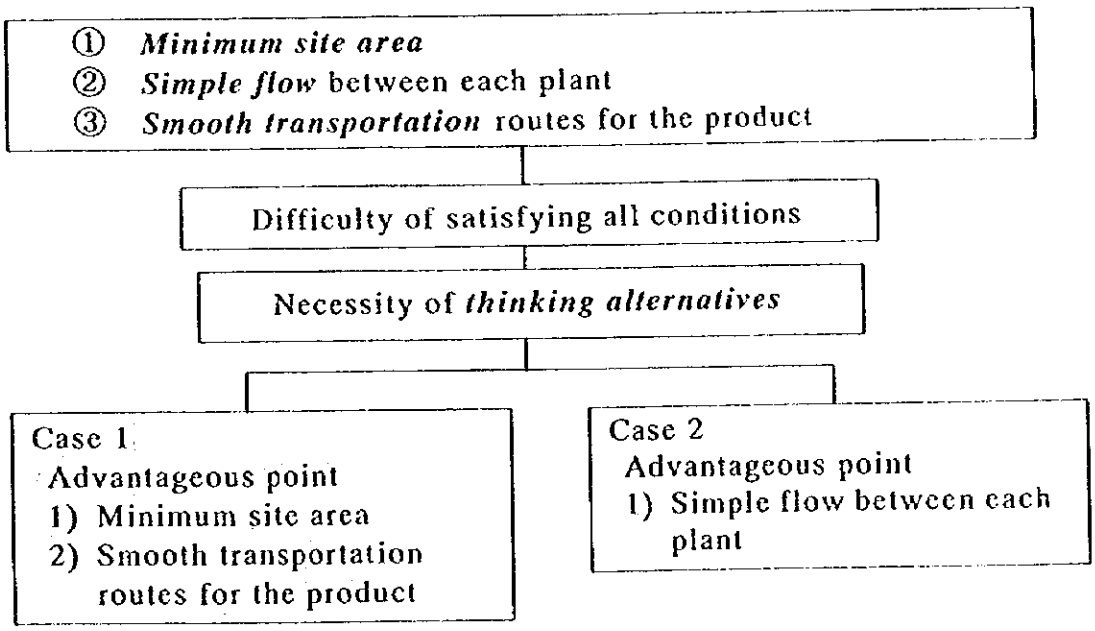
1. Site location and zoning of site

Concept of the site location and zoning of the site is shown below:



2. Allocation for each process

Concept of the site location and zoning of the site is shown below:



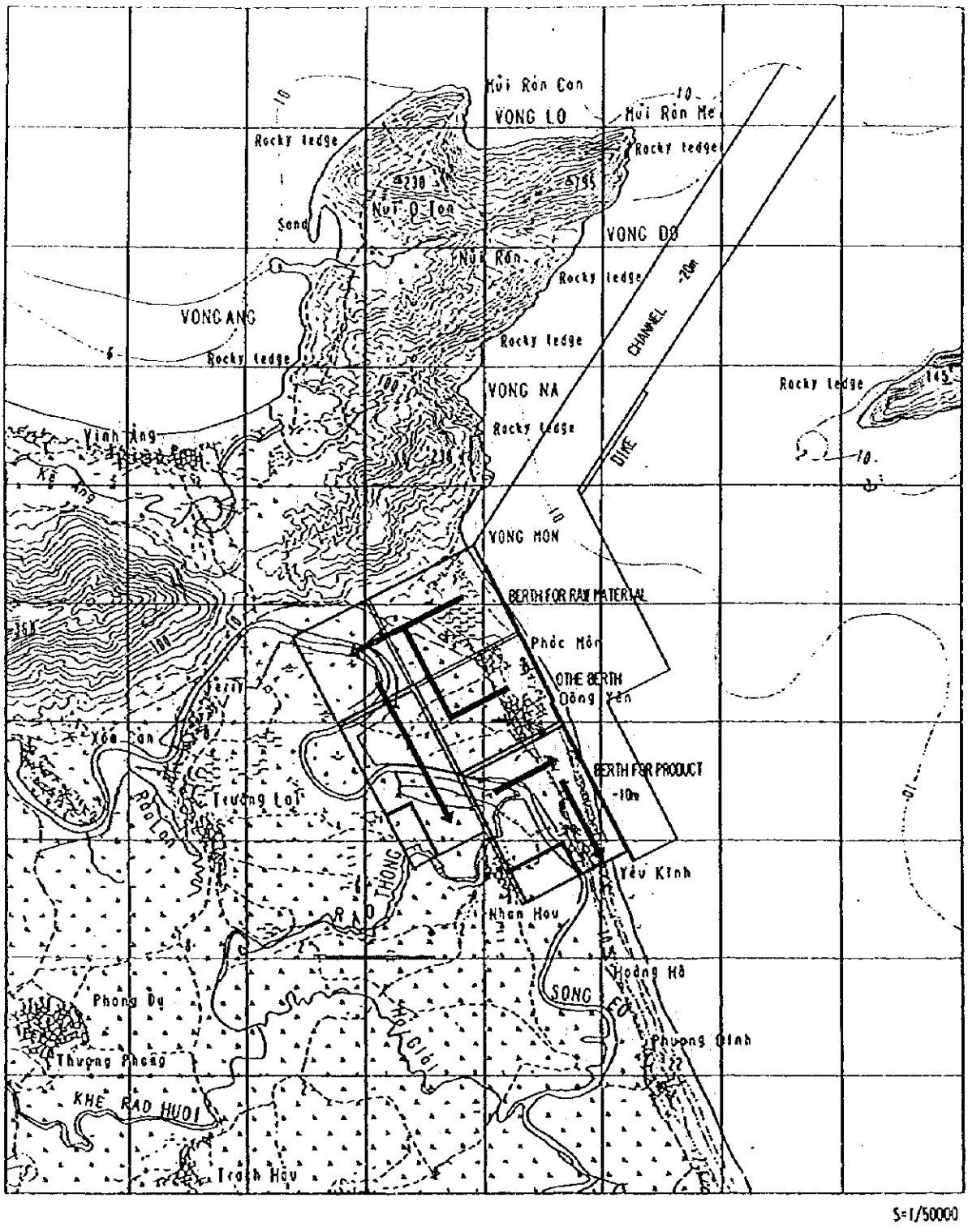


Figure 6-1 Case1-1 of general layout

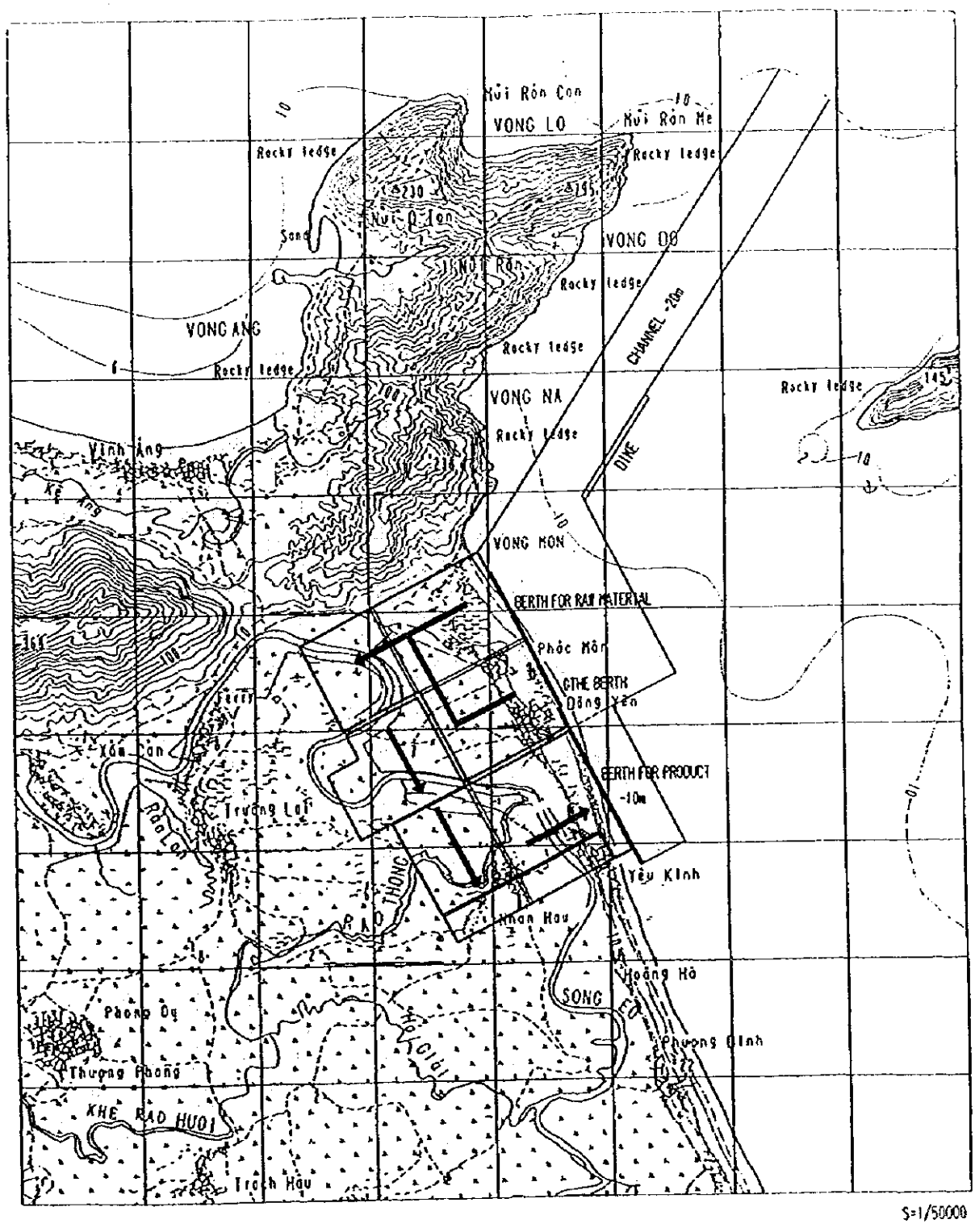


Figure 6-2 Case2-1 of general layout

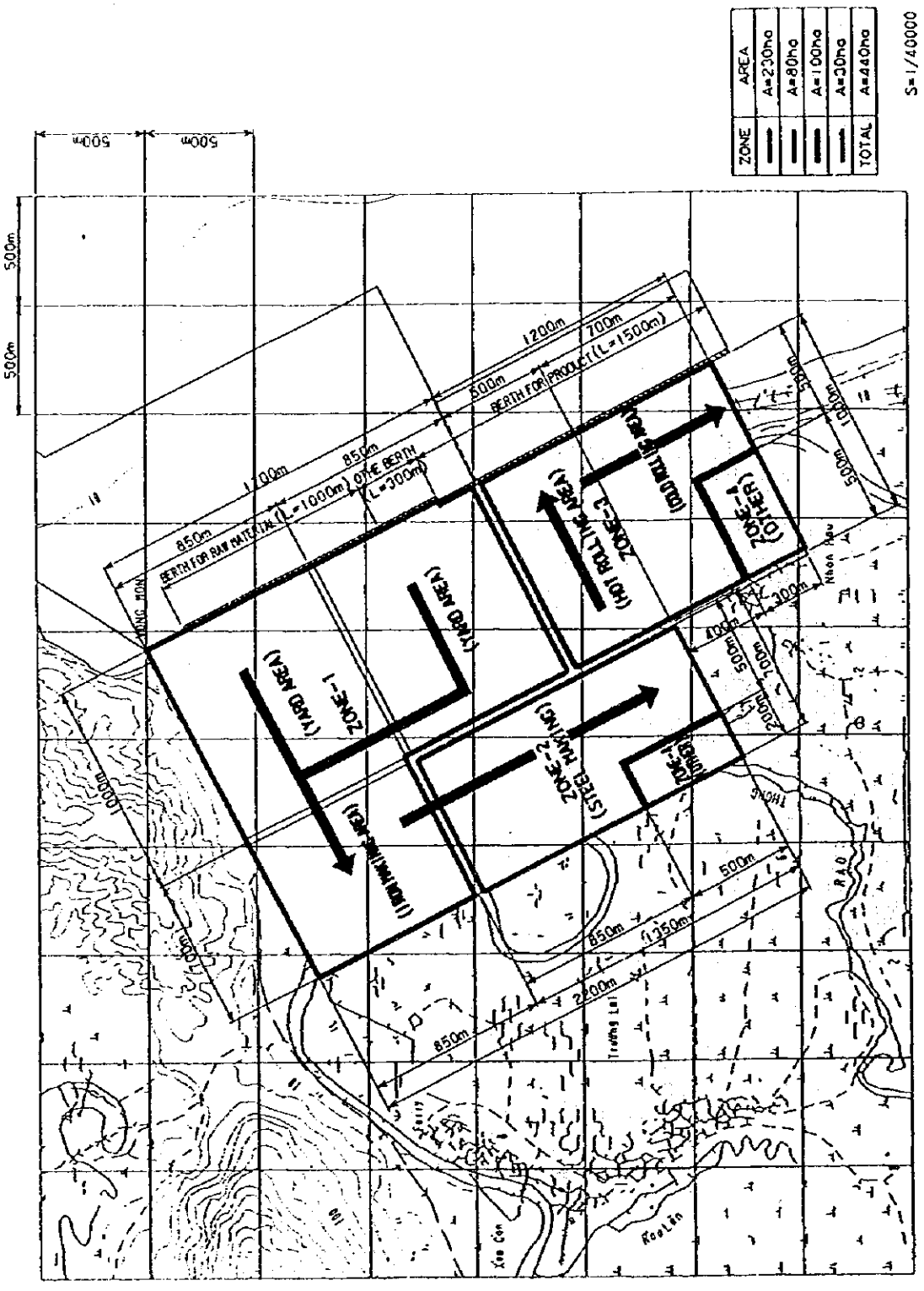


Figure 6-3 Case1-2 of general layout

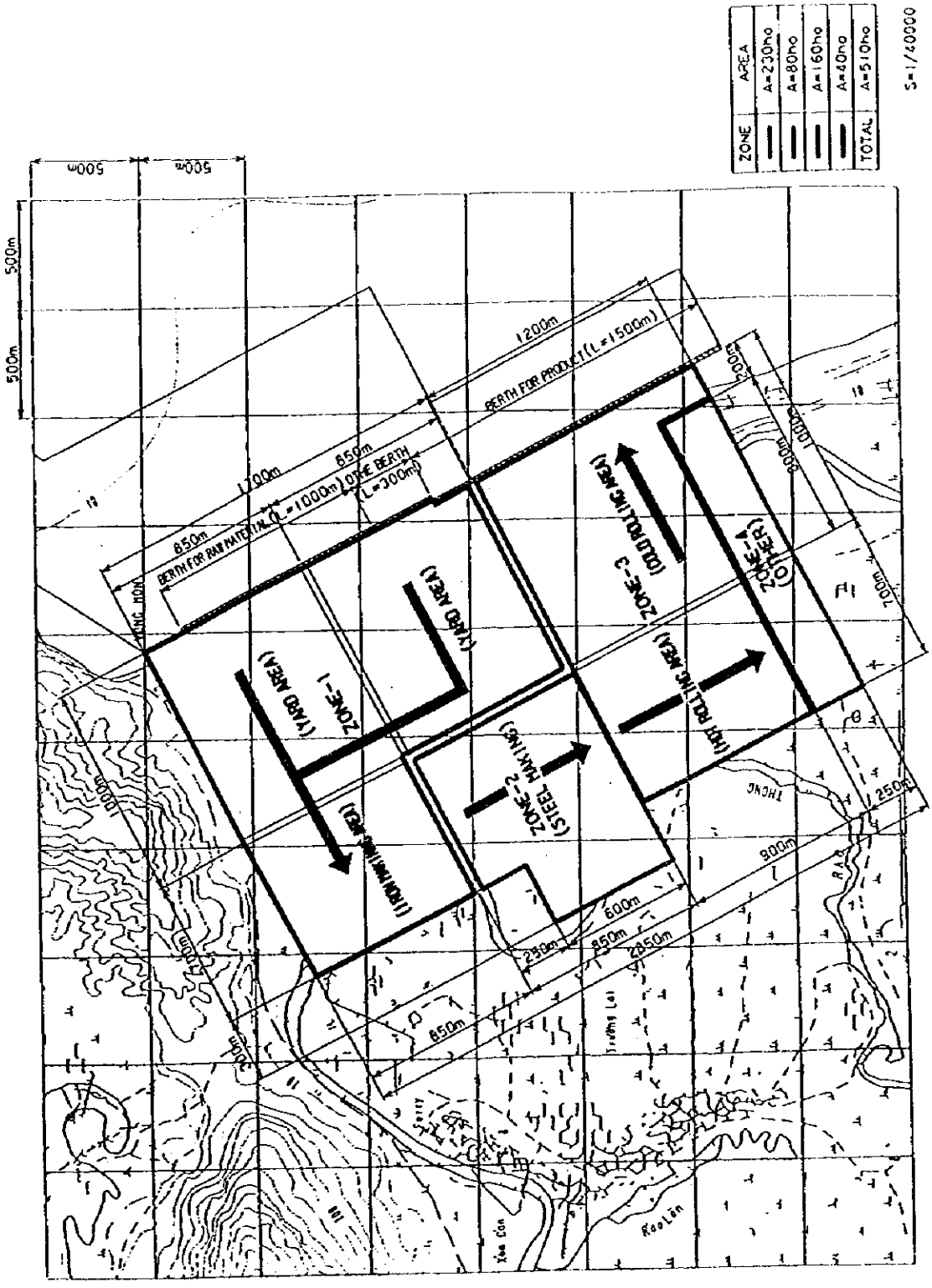


Figure 6-4 Case2-2 of general layout

3. General layout for Mui Ron site

The minimization of the investment cost is considered as the top priority for the selection, with the result that the layout of Case 1 is decided for this study.
Considering below mentioned items, the layout of plants and facilities concerned is shown in Figure 6-5.

- General layout is designed with the first priority given to the streamlined flow of raw and auxiliary materials, semi-product and finished products, etc.
- Production and auxiliary facilities are laid out so that equipment costs are reduced to the minimum.
- General layout is designed by giving utmost importance to the existing natural conditions and infrastructures.
- General layout is designed by giving consideration to the fact that the integrated steelworks will be completed in the third steps.
- General layout is designed by giving adequate consideration to future expansion.

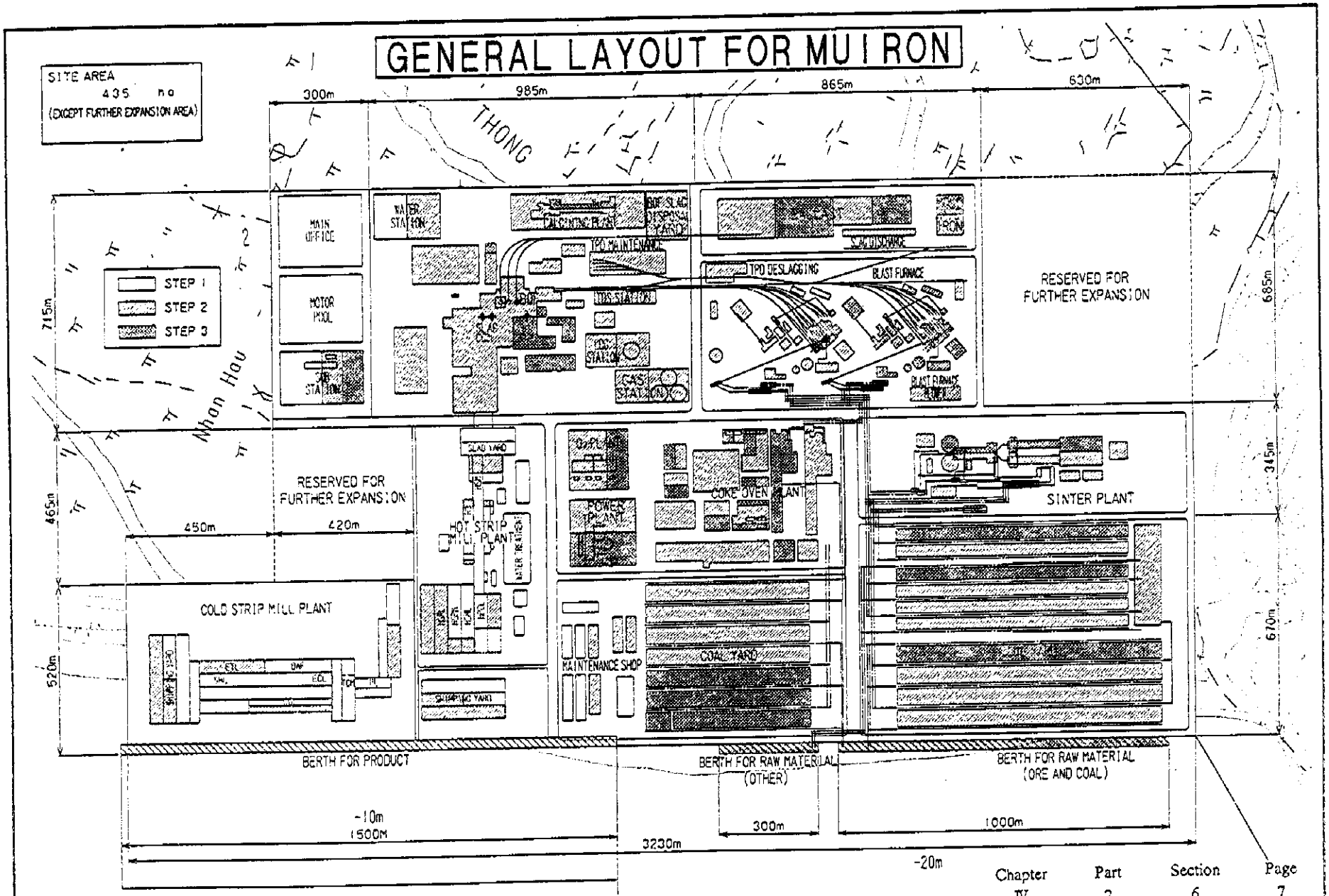


Figure 6-5 General layout for Mui Ron site

S=1/10000

Section 7 Construction Schedule

1. Construction schedule

1.1 Basic concept for construction schedule

The construction schedule described in this section covered from the start of basic design by the successful construction contractor to the start of operation.
The construction period for each unit of production equipment is generally determined by the feature of equipment itself, equipment scale, etc.
The basic concept of the construction schedule are described below.

- Preliminary work necessary for determining the supplier of each equipment unit before the construction schedule is not stated.

- In consideration of the transport situation in Viet Nam, unloading and transport of equipment and materials to the site for the construction of the integrated steelworks will be carried out from the product berth. From this purpose, the work for land development and product berth facility will precede other work.

- The construction process consists of three phases to the completion of the construction of an integrated steelworks.

- These three phases are first, the construction of hot strip mill and cold mill plant, second, the construction of one blast furnace, and, third, the construction of another blast furnace to establish a 2-blast furnace production structure.

- The production period for each equipment unit will necessarily by determined by the date planned for its start up.

General construction schedule is as follows.

1.2 Construction schedule

For general construction schedule refer to Table 7-1, and for each of the three phases, refer to Tables 7-2, 7-3 and 7-4.

Table 7-1 Construciton schedule

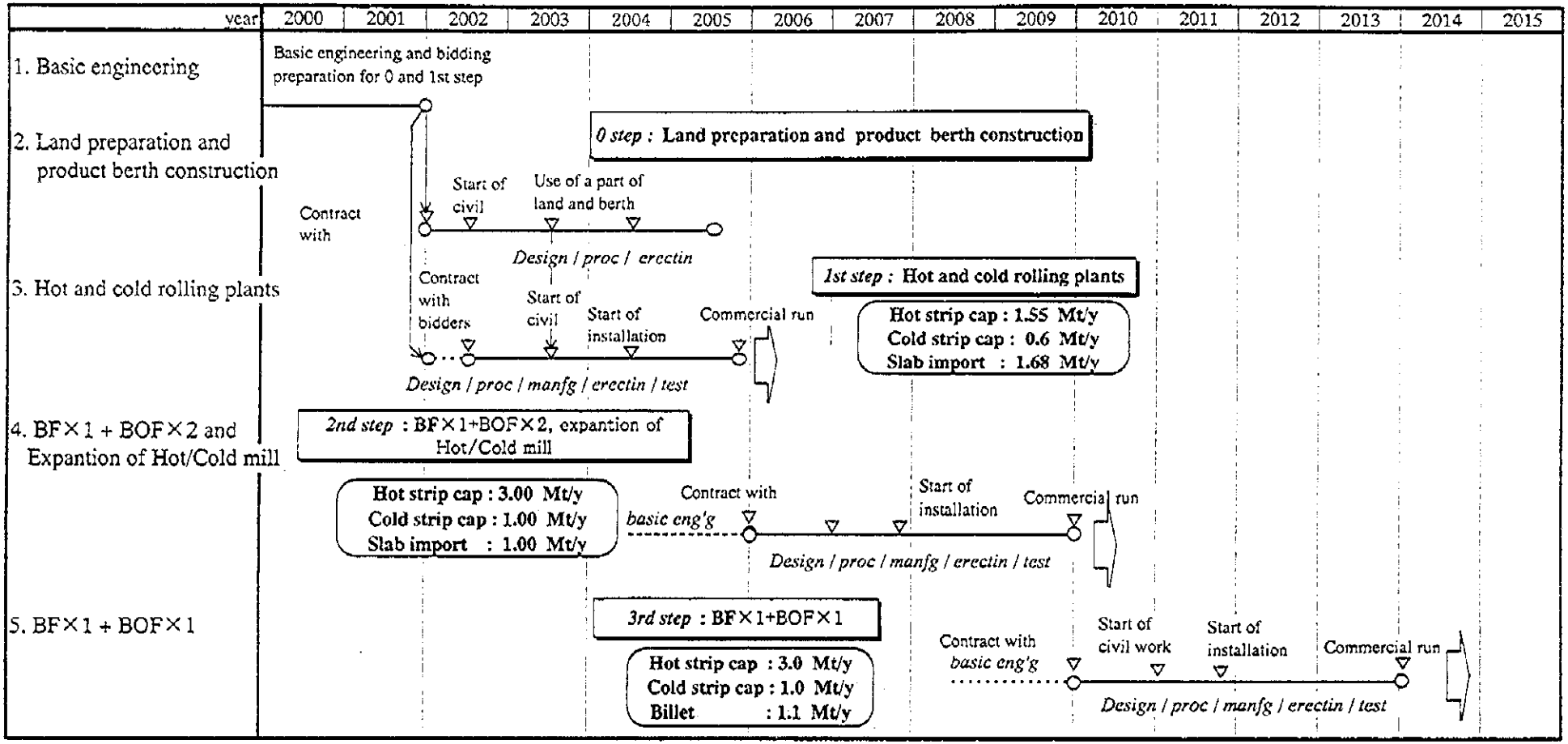


Table 7-2 Construction schedule (Step 0 & 1)

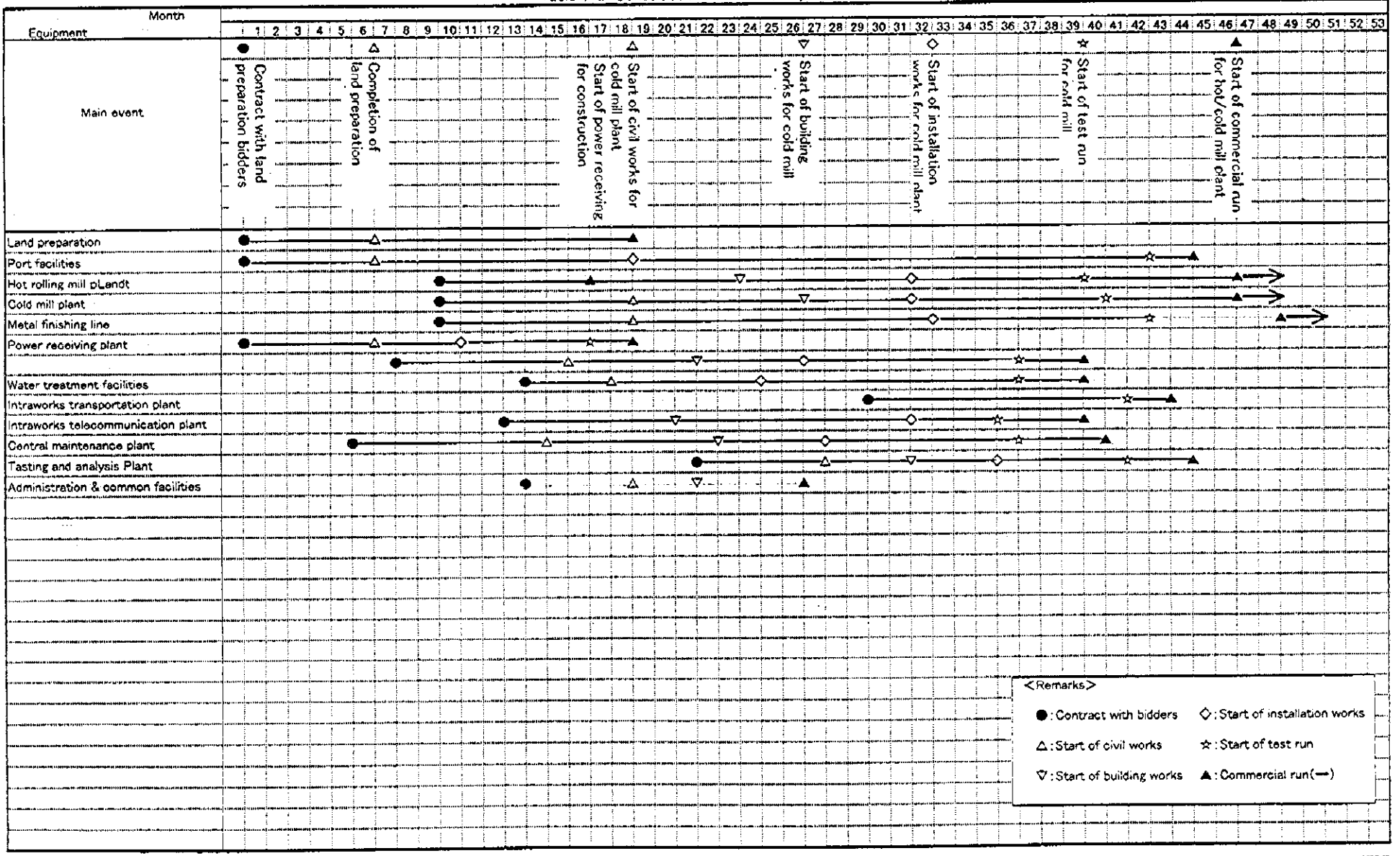


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Table 7-3 Construction schedule (Step 2)

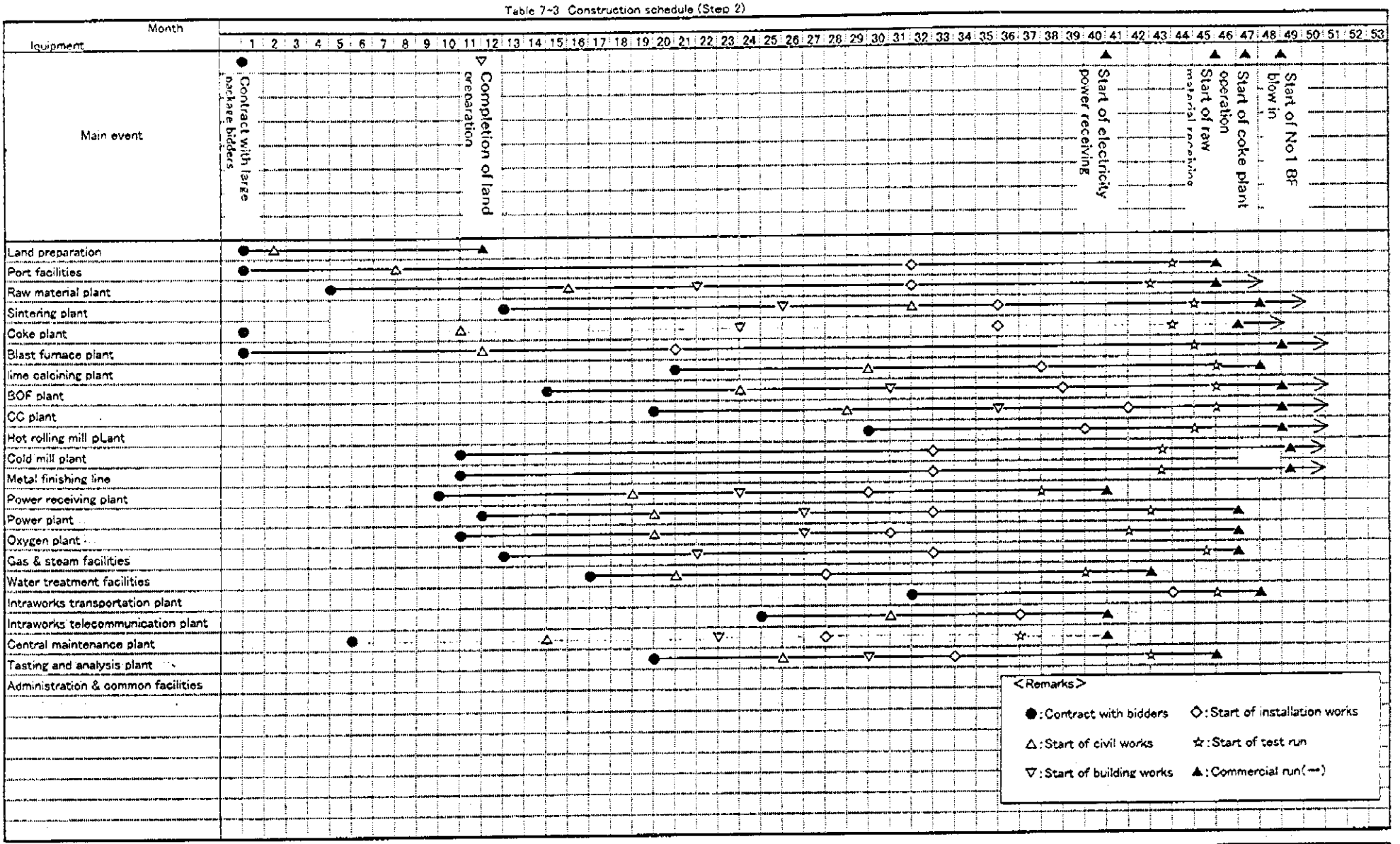

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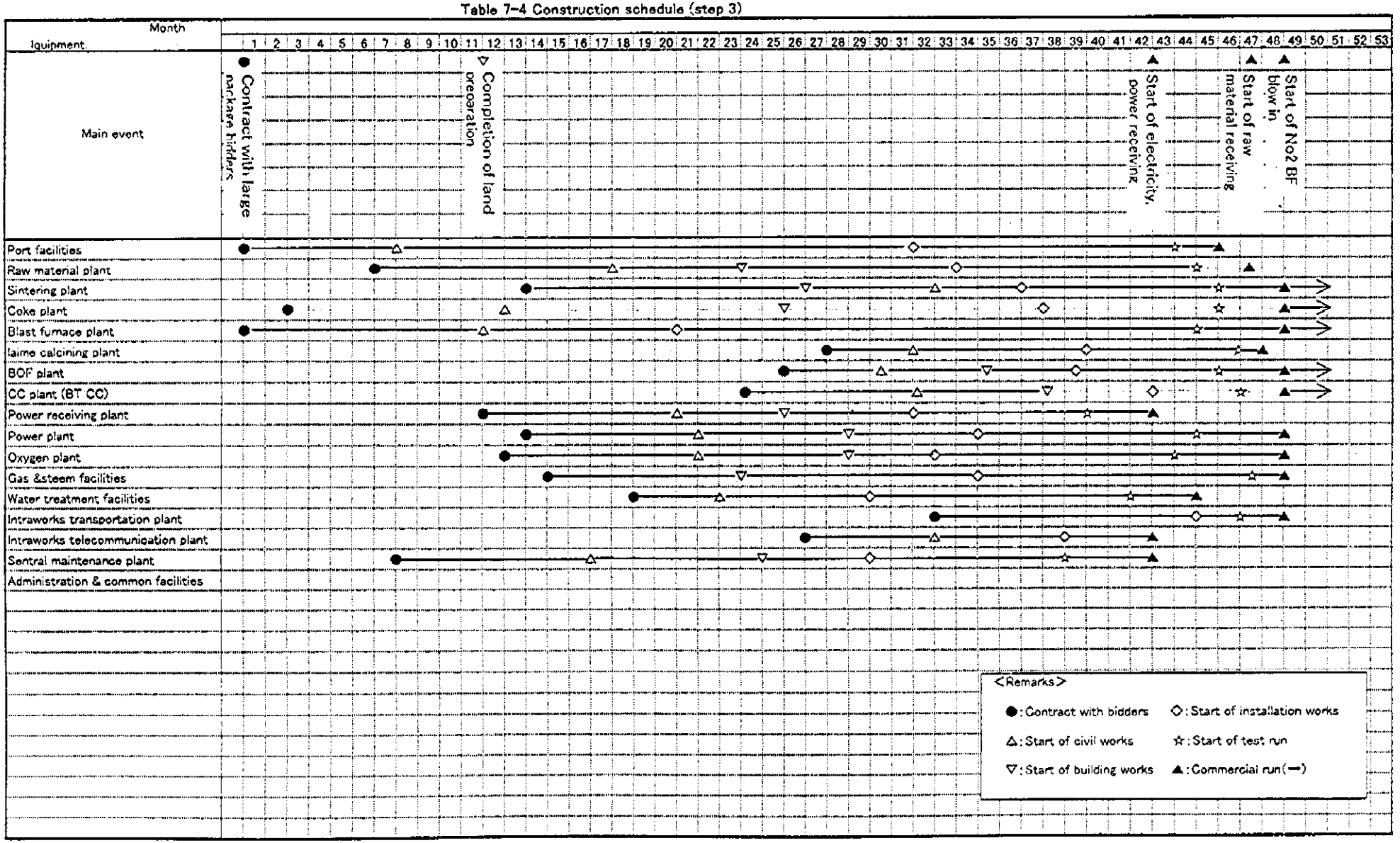
Table 7-4 Construction schedule (step 3)



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