Section 4 Financing for a Project in General

Contents

Page

1. Flow of investment and loan in Viet Nam

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

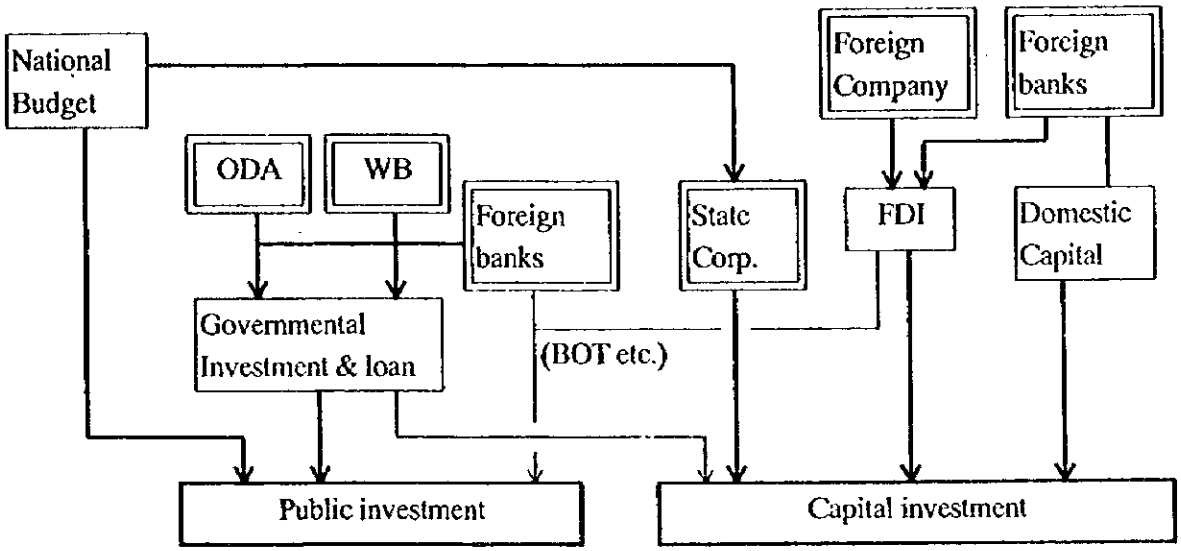


Figure 4-1 Flow of investment and loan in Viet Nam

1.1 Public investment

Public investment is usually made from the following:

- National budget
- Governmental investment and loan supported by ODA funds, WB loan, etc. sometimes with cofinancing from foreign banks
- FDI and foreign banks in case of BOT etc.

1.2 Capital investment

Capital investment is usually made by the following:

- Investment by state owned enterprises
- FDI
- Domestic capital
- Governmental investment and loan

2. Potential financing sources in general

The following are the potential financing sources for projects in general.

2.1 Supplier's credit (Figure 4-2)

In supplier's credit (S/C) a Japanese exporter accepts the deferred payment by an importer in a developing country, and at the same time receives a loan equal to the cost of the exported goods from the financial institution in charge (Export-Import Bank of Japan, city bank or others). A Letter of Guarantee (L/G) by the foreign government concerned or leading bank is required for the acceptance of supplier's credit. Export license and export insurance are then provided by the Japanese government (MITI). The amount of finance by S/C is as follows:

Export amount eligible for S/C - Down payment (over 15%) - Amount equivalent to profit (Min. 10%)

2.2 Buyer's credit (Figure 4-3)

In buyer's credit (B/C), financial institutions (Export-Import Bank of Japan, city bank or others) agree to the loan directly with importer(s) of a developing country to make possible the payment for imported goods. L/G by the foreign government concerned or the Central Bank is required for the acceptance of B/C. An export license is then provided by MITI. Buyer's credit insurance is necessary for a loan given by city banks etc. (not EX-IM Bank). The amount of finance by B/C is as follows:

Export amount eligible for B/C - Down payment

2.3 Project finance (Figure 4-4)

The term "project finance" is used to refer to a wide range of financing structures which have, however, one feature in common: the financing is not primarily dependent on the credit support of the sponsors or the value of the physical assets involved. In a project financing, it generally includes:

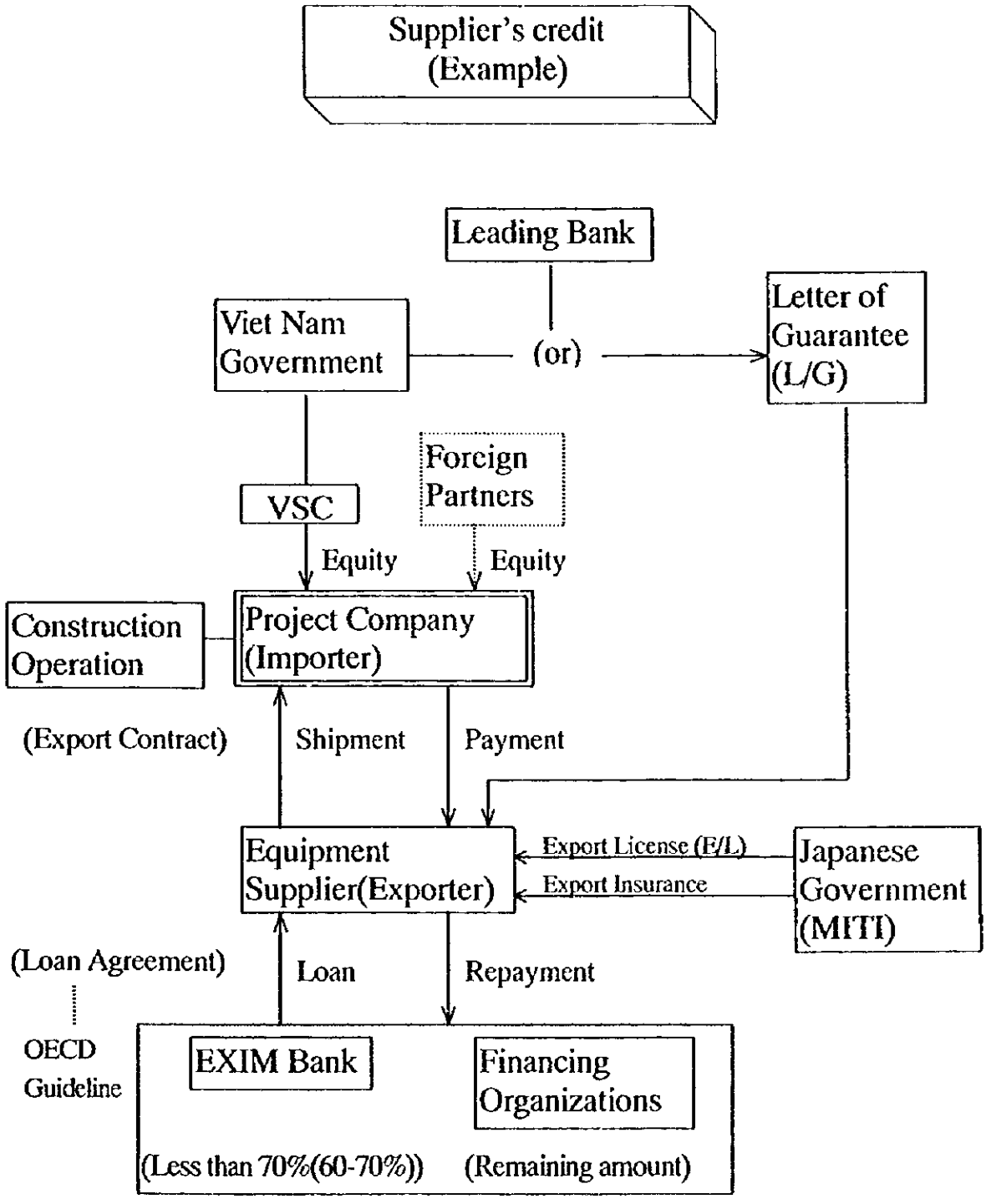


Figure 4-2 Supplier's credit

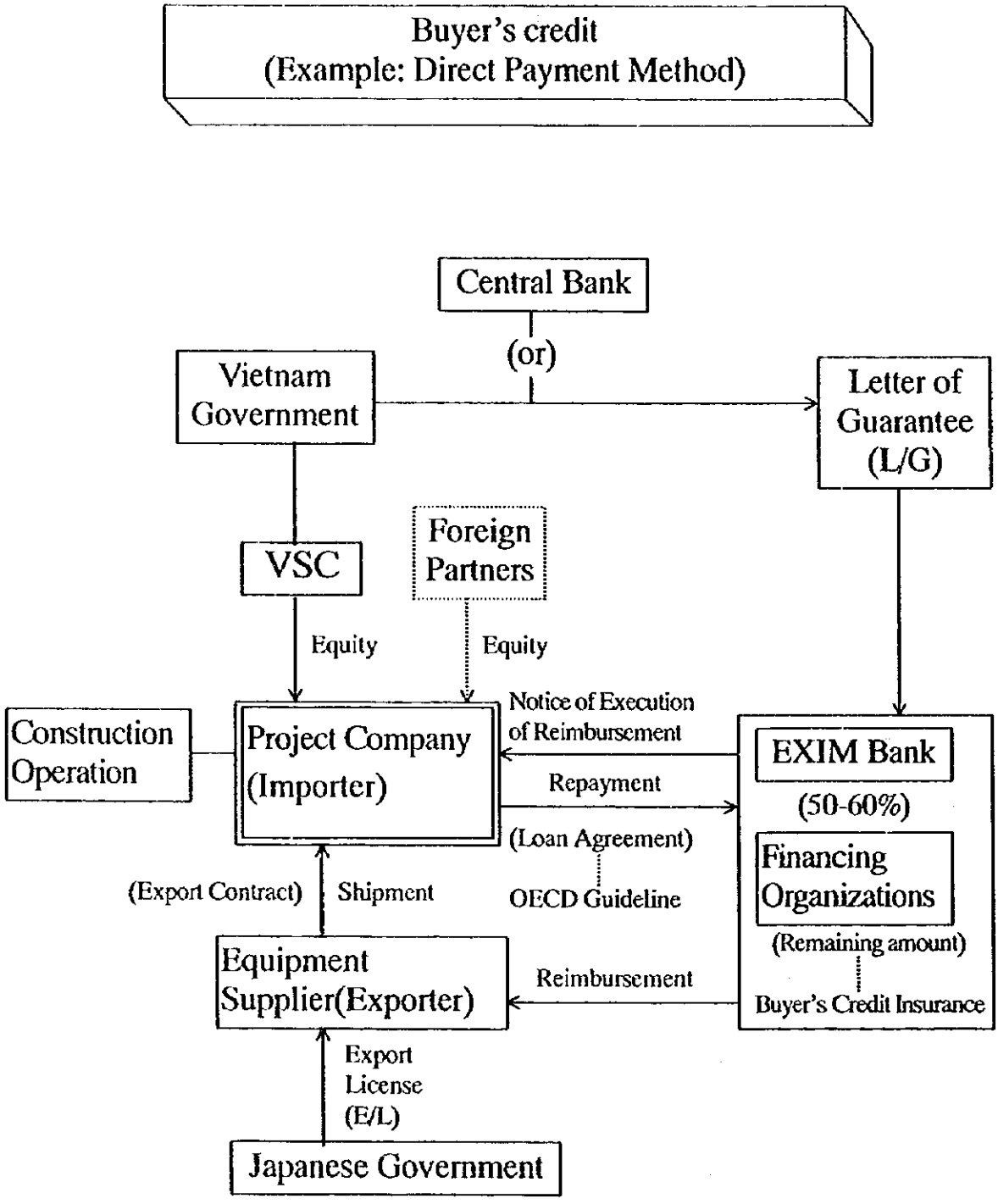
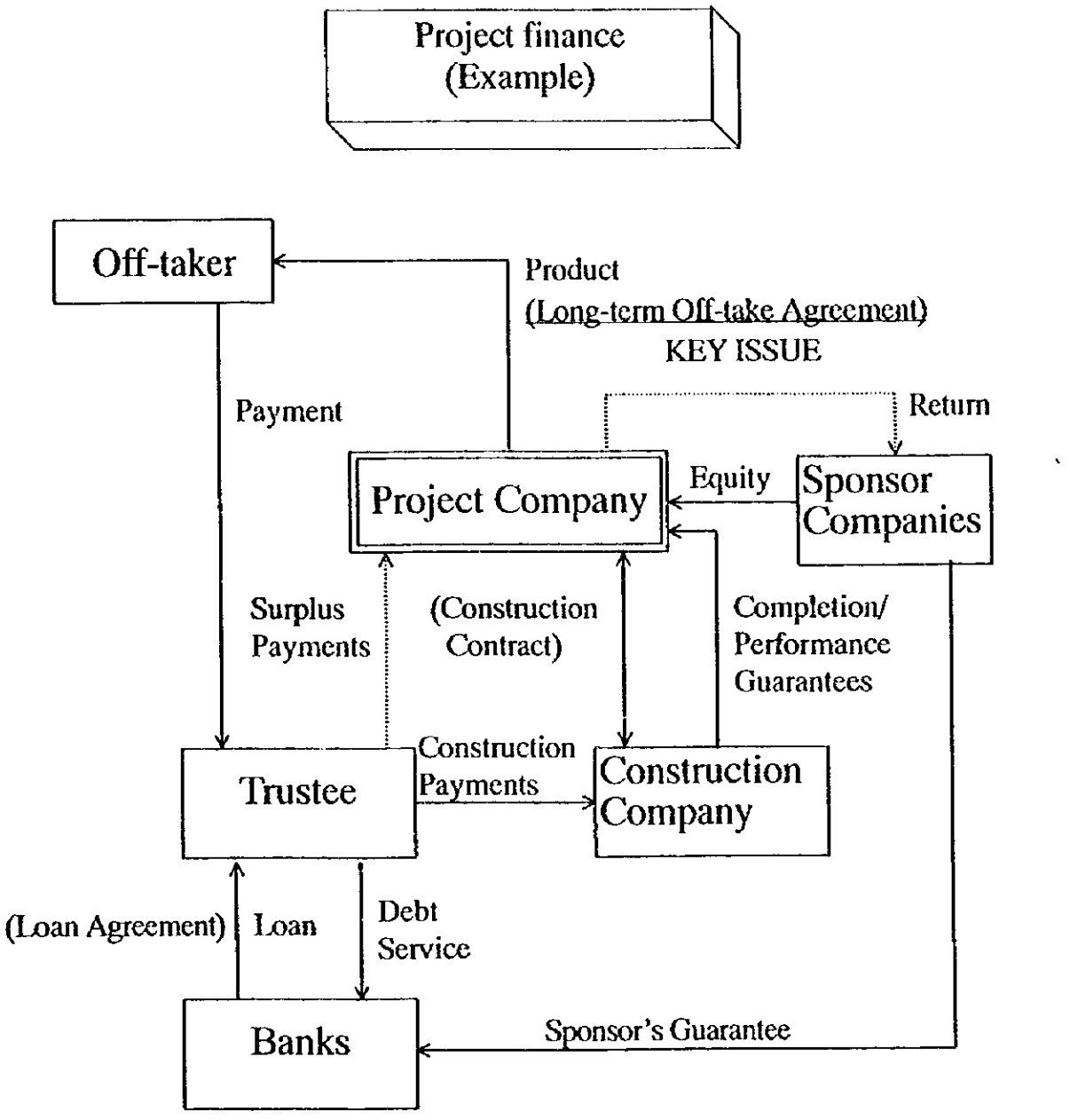


Figure 4-3 Buyer's credit



Feature of project finance

Reliance on project assets and cash flows of the project without full recourse to the sponsors

Figure 4-4 Project finance

- some element of reliance on project assets and cash flows without full recourse to the sponsors or, in some cases, to the borrower;
- a specialist for technical and economic evaluations of the project, the project sponsors' or operators' business and thorough on-going monitoring by the lender;
- complex loan and security documentation, quite probably involving innovative structures; and
- higher margins and fees to reflect the lender's exposure to the project (often political risk).

As a result, those who are interested in the project will concern themselves closely with the feasibility of the project and its sensitivity to the impact of potentially adverse factors.

A successful structure will entail a satisfactory and economic allocation of project risk among the various interested parties. In addition to the project sponsors and the senior lenders, risk might be accepted to a greater or lesser extent by suppliers of raw materials or equipment, contractors, operators, product purchasers or end users, insurers and government agencies (including export credit agencies). The extent to which any party will be willing to accept project risk depends on the anticipated return it will receive.

In the case of banks, it is certainly true that they will rarely enter into a project financing without some form of commitment (e.g. product off-take agreement) on the part of the project sponsors.

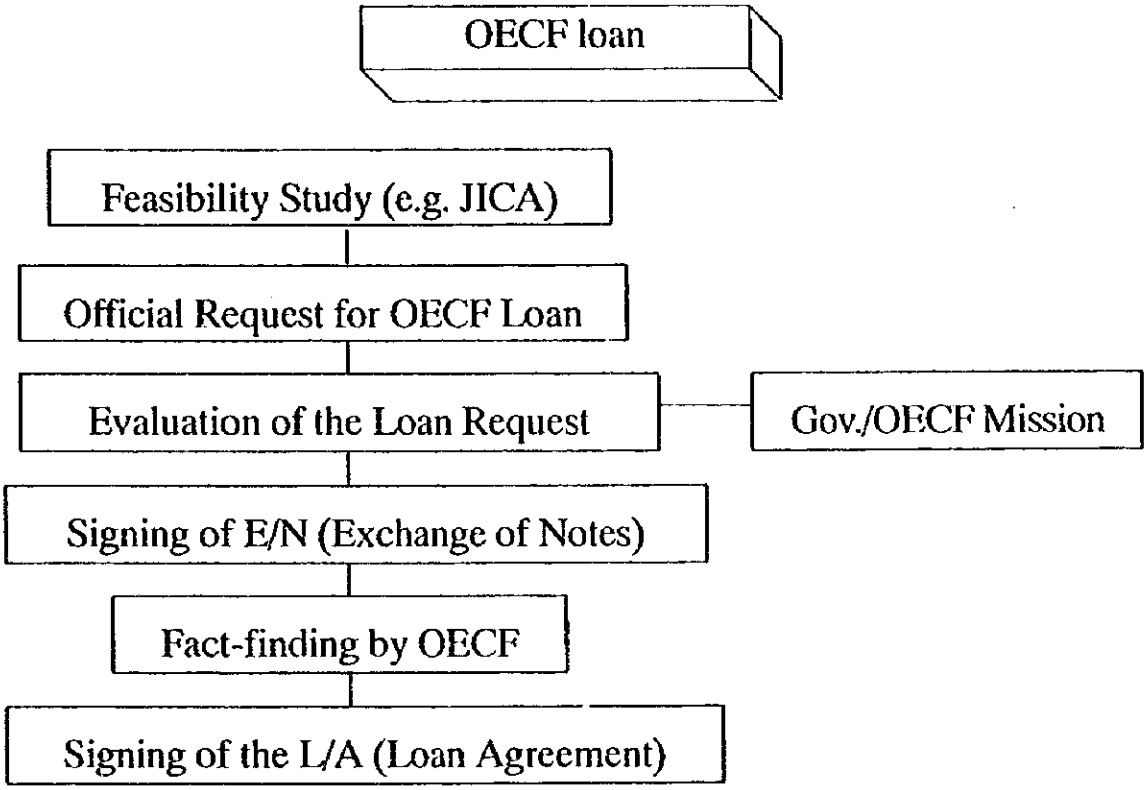
2.4 OECF (Overseas Economic Cooperation Fund) Loan (Figure 4-5)

The Japanese government provides loan assistance (long-term, low-interest loans), usually called "yen loan", to developing countries.

2.4.1 Official request for loan assistance

Requests for loan assistance from developing countries are generally made through diplomatic channels by means of a written document (e.g., verbal note).

In the case where Japan participates in co-financing with international financial institutions such as the World Bank and the Asian Development Bank, loan requests come not only from developing countries but also from these institutions.



Loan conditions for Viet Nam

- Interest rate: 2.3% p.a.
- Period: 30 years including 10-year grace period
- Scope: foreign portion + some local portion

Co-financing with International Financing Institutions
(e.g. World Bank)

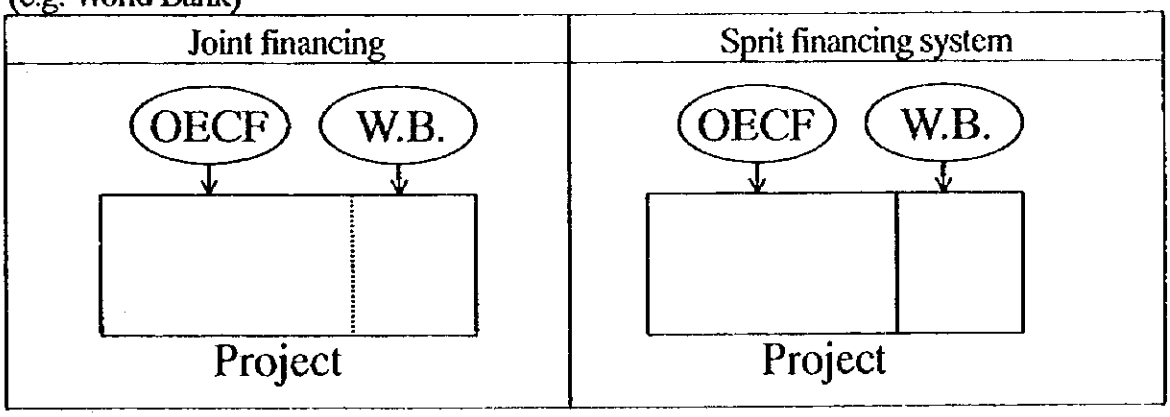


Figure 4-5 OECF Loan

2.4.2 Evaluation of the loan request

After receiving the yen loan request, the Ministry of Foreign Affairs collects all the necessary data and information to enable a full understanding of the contents of the request.

In the case of a project loan, for example, Japan gives loan assistance to a project that would contribute to economic development and improvement of the living standard of the people of the recipient country. Accordingly, it is necessary to check through some points prior to the approval of the loan. In other words, the following facts should be sufficiently confirmed beforehand:

- Order of priority and degree of importance of projects in question within the overall economic development plan of the recipient country
- Degree of contribution of the loan extended by Japan to the project implementation itself and to the improvement of relations with Japan
- Feasibility of the project
- Degree of maturity of the project

The study on technical, economic and financial feasibility normally has to be presented to Japan (e.g. by JICA F/S). When a project loan request is made to Japan, the presentation of such a report is required. The contents of the report are then examined and analyzed, and the feasibility of the project has to be confirmed by the Japanese Government.

However, if the presented data and information are not sufficient to confirm feasibility of the project, a survey team may be sent to the recipient country, as a part of the technical cooperation extended by JICA.

Normally, when a project is proved feasible as a result of the survey mentioned above, the Ministry of Foreign Affairs makes the initial decision on such important items as the type of the loan, the amount, the interest rate, the repayment period, etc.

The decisions adopted by the Ministry of Foreign Affairs is made by consultation with the four ministries concerned, namely the Ministry of Foreign Affairs, the Ministry of Finance, the Ministry of International Trade and Industry, and the Economic Planning Agency. The conclusion agreed upon by these four ministries becomes the policy of the Government of Japan.

When the government policy is thus decided upon, the Ministry of Foreign Affairs informs it to the government of the recipient country.

2.4.3 Signature of the Exchange of Notes

After reaching an agreement on E/N between the Japanese Government and the government of the recipient country, E/N is to be signed by the two governments. The direct involvement of the government itself comes to an end, and the loan project is now in the hands of the executing agency: OECF.

The Overseas Economic Cooperation Fund (OECF) is handling, as an executing agency, project implementation including the disbursement of the yen loan extended and repayment of it.

2.5 World Bank Loan (Figure 4-6)

The World Bank Group consists of the following.

2.5.1 The International Bank for Reconstruction and Development (IBRD)

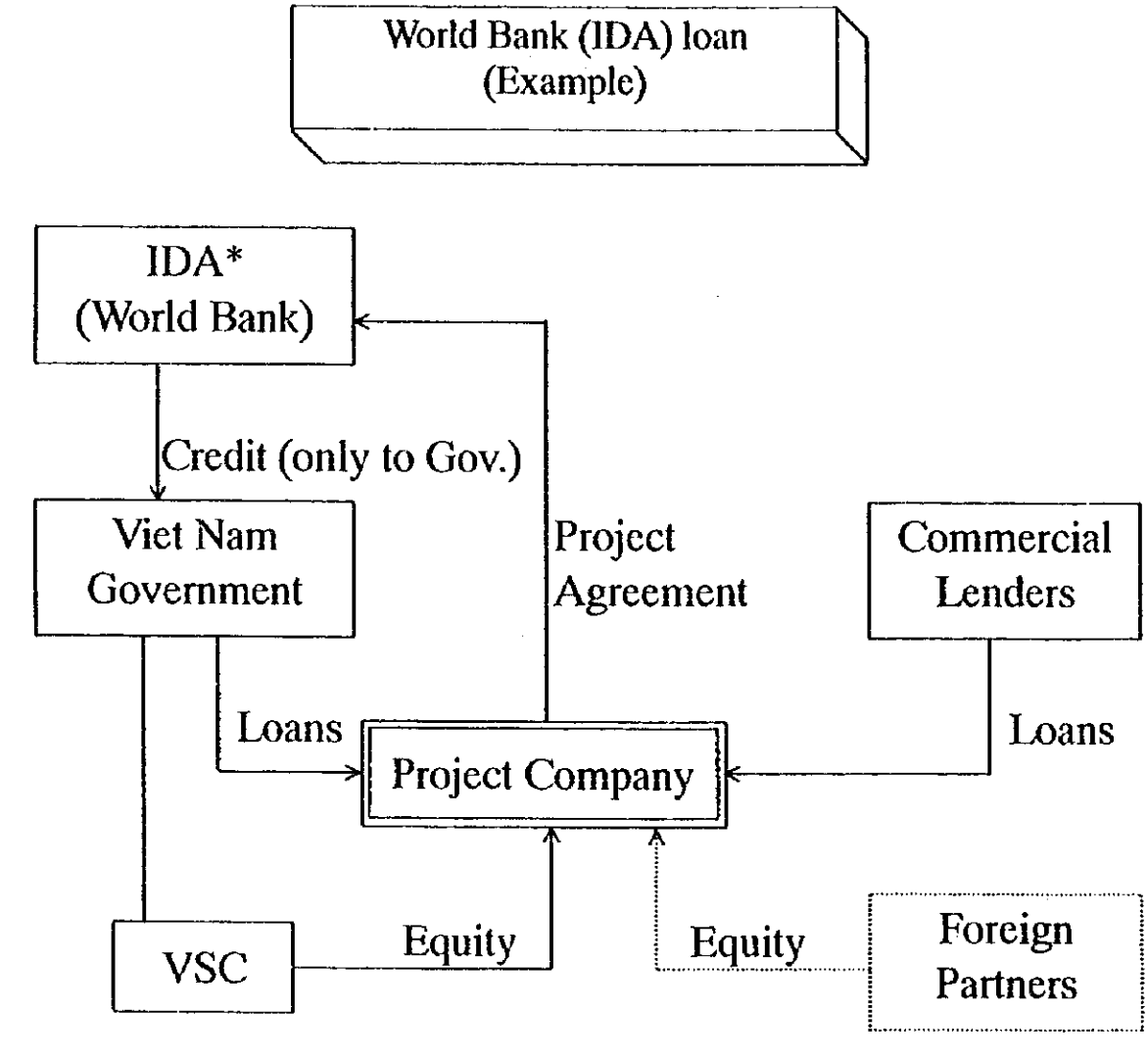
The IBRD is the single largest provider of development loans to middle-income developing member countries and a major catalyst of similar financing from other sources. Its operations are financed primarily through borrowings in international capital markets, and its lending is backed by government guarantees.

2.5.2 The International Development Association (IDA)

IDA provides financing on highly advantageous terms for the world's poorest countries (GDP per capita: less than US$ 765 (1995)). It relies mostly on contributions from its wealthier member countries to fund its loans. The most favorable financing source from the World Bank Group in Viet Nam seems to be IDA credits. IDA credits are made only to governments. They have to be repaid over a period of thirty-five to forty years. They carry no interest, but there is an annual service charge of 0.5 percent on the disbursed amount of each credit. When the IDA credits can not finance the total loan amount, cofinancing by other financing sources could be arranged.

2.5.3 The International Finance Cooperation (IFC)

IFC is the largest source of financing for private sector projects in developing countries. It invests in commercial enterprises by means of loan and equity financing in collaboration with other investors. Unlike the IBRD and IDA, IFC does not receive government guarantees of repayment.



*: International Development Association

(Note) Credit conditions of IDA (to countries with GDP per capita less than US$765 (1995))
Repayment: 35 - 40 years
Interest: none
Service charge: 0.5% p.a. of residual principal

Figure 4-6 World Bank Loan

2.5.4 The Multilateral Investment Guarantee Agency (MIGA)

MIGA encourages the flow of foreign direct investments to developing countries by providing private investors with guarantees against political risk. It also offers investment marketing services and advice to developing countries on how to better attract foreign investment.

3. Case study

Figure 4-7 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.

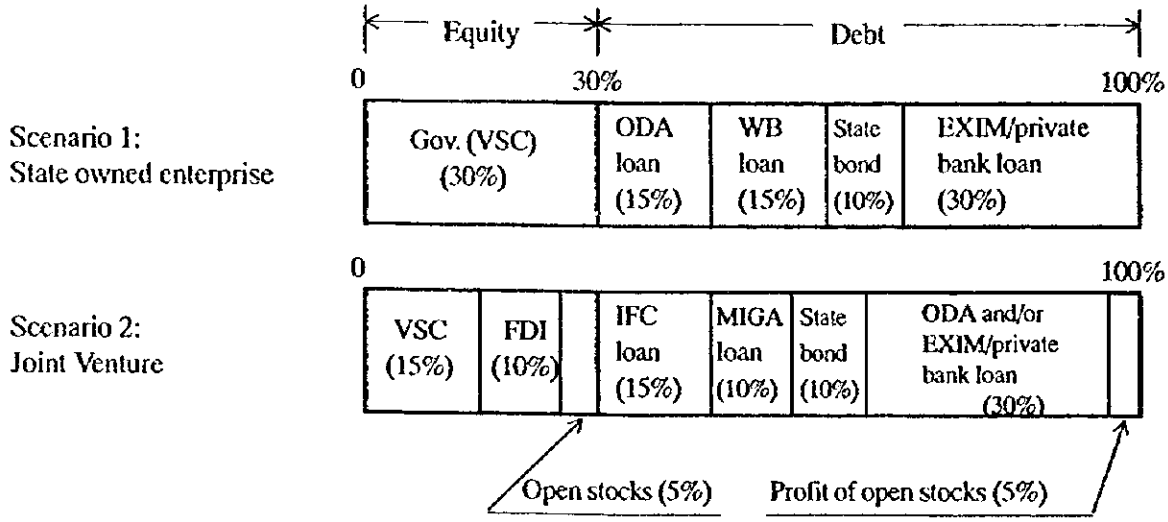


Figure 4-7 Scenarios for financing of an integrated steel plant project

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

Contents

Page

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

Contents

Page

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

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Page

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

Contents

Page

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

Contents

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.

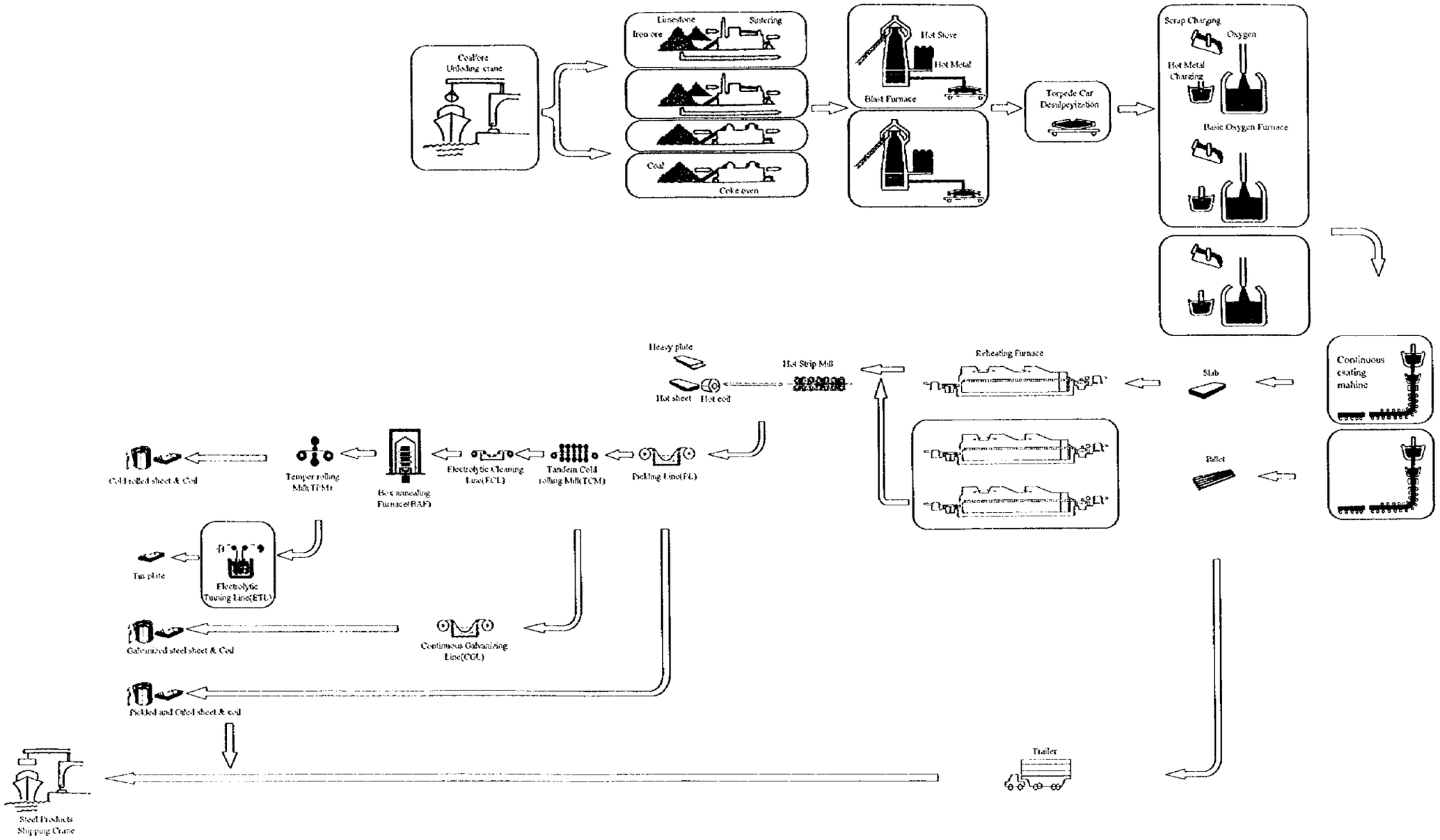

Figure 3-1 Flow of production process

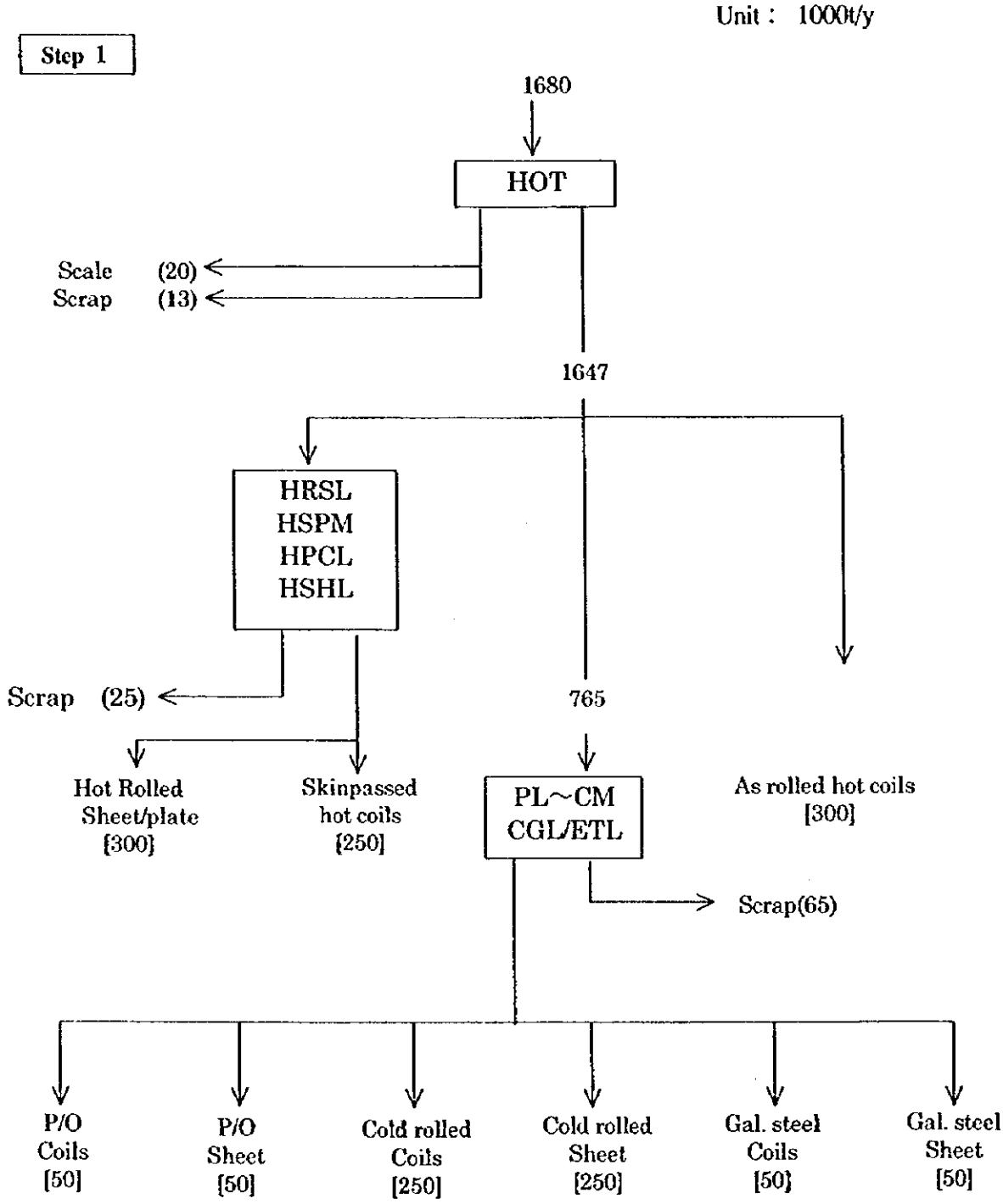

Figure 3-2 Material flow and material balance

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JICA/Nippon Steel	Chapter	Part	Section	Page
Date: Feb 17, 1998 Rev.:	IV	2	3	3

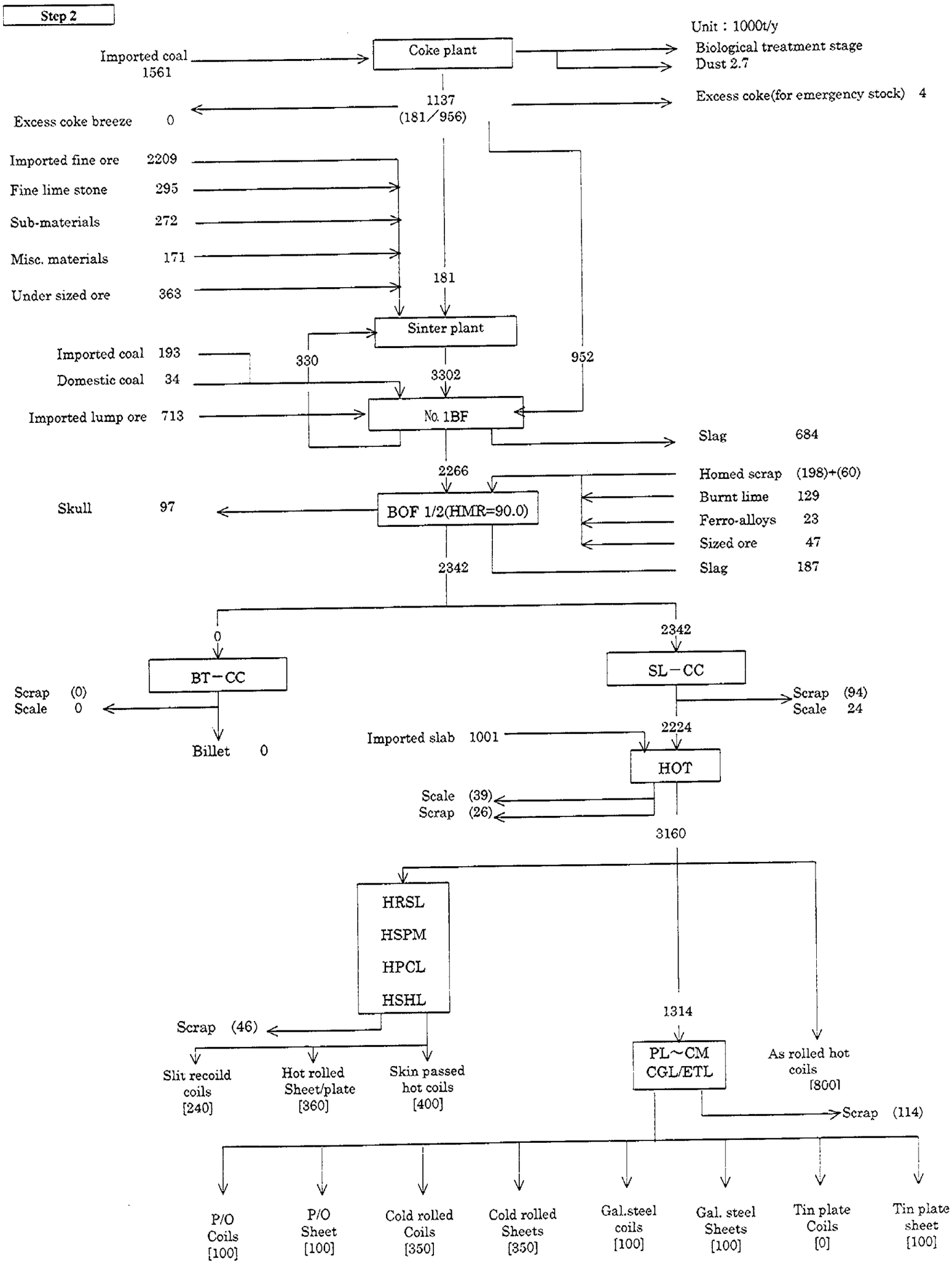

Figure 3-3 Material flow and material balance

Step 3

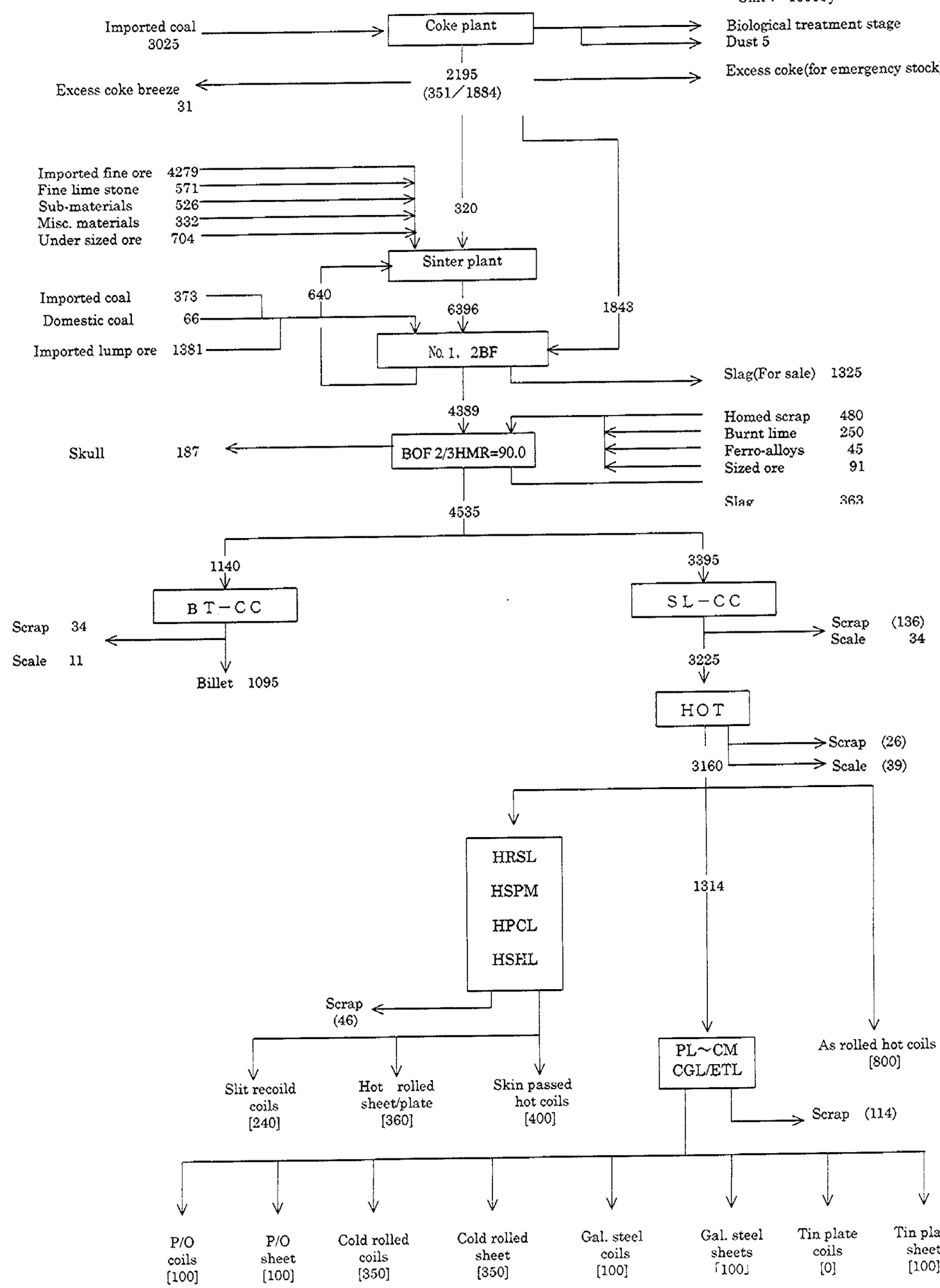

Figure 3-4 Material flow and material balance

Section 4 Outline of the Production Facilities

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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 : $6.5m^h x 0.45m^w x 15.56m^l x 120$ 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

Contents

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.

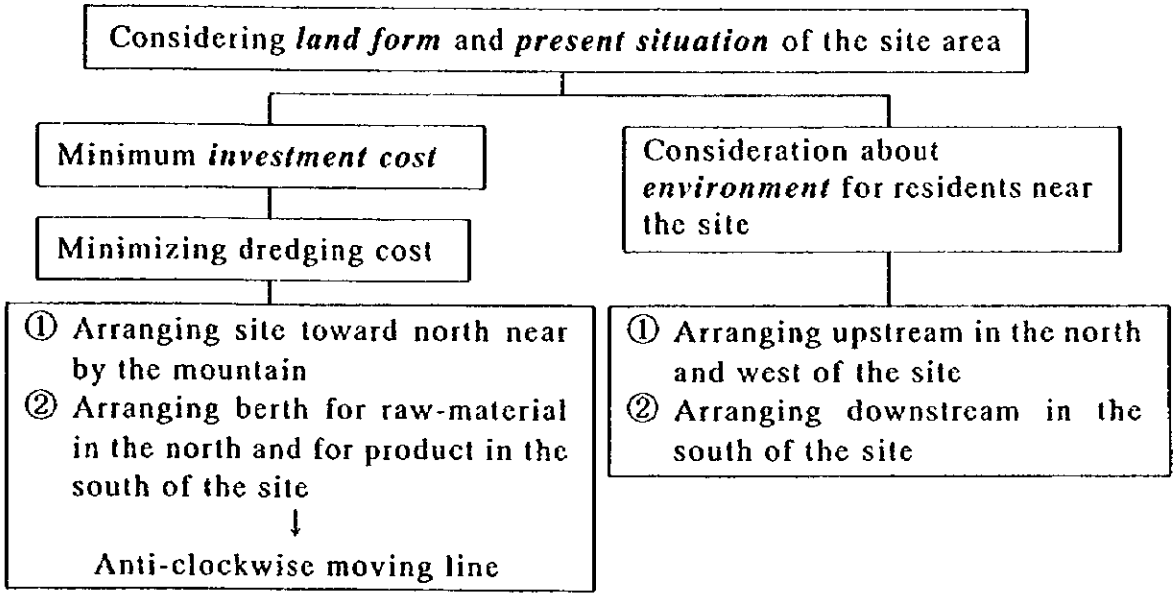
Section 6 Concept of General Layout for Mui Ron Site

Contents

Page

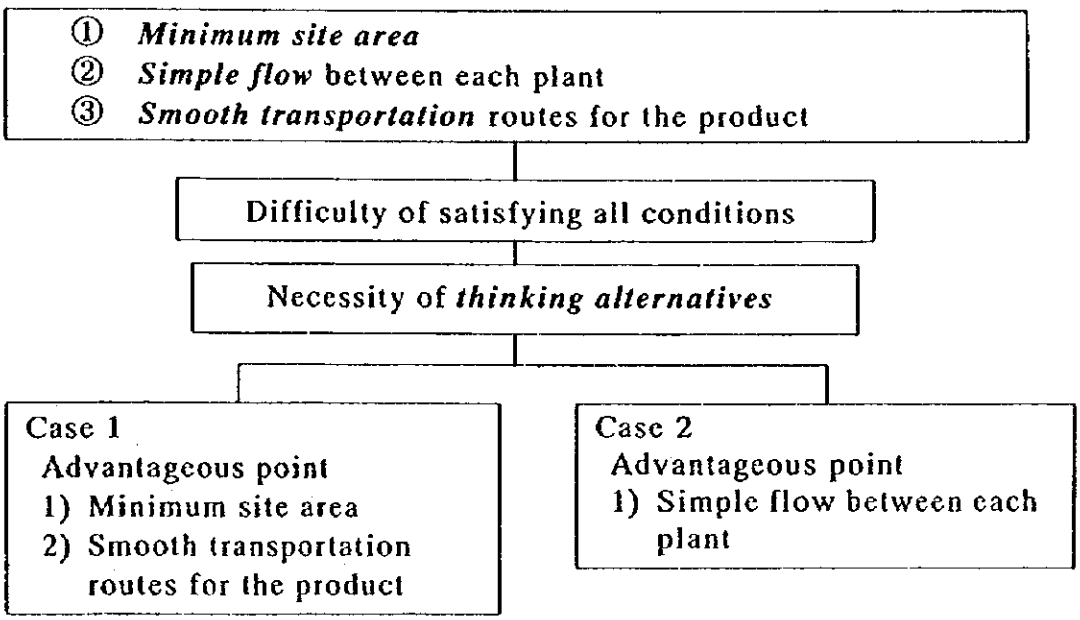
1. Site location and zoning of site

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:



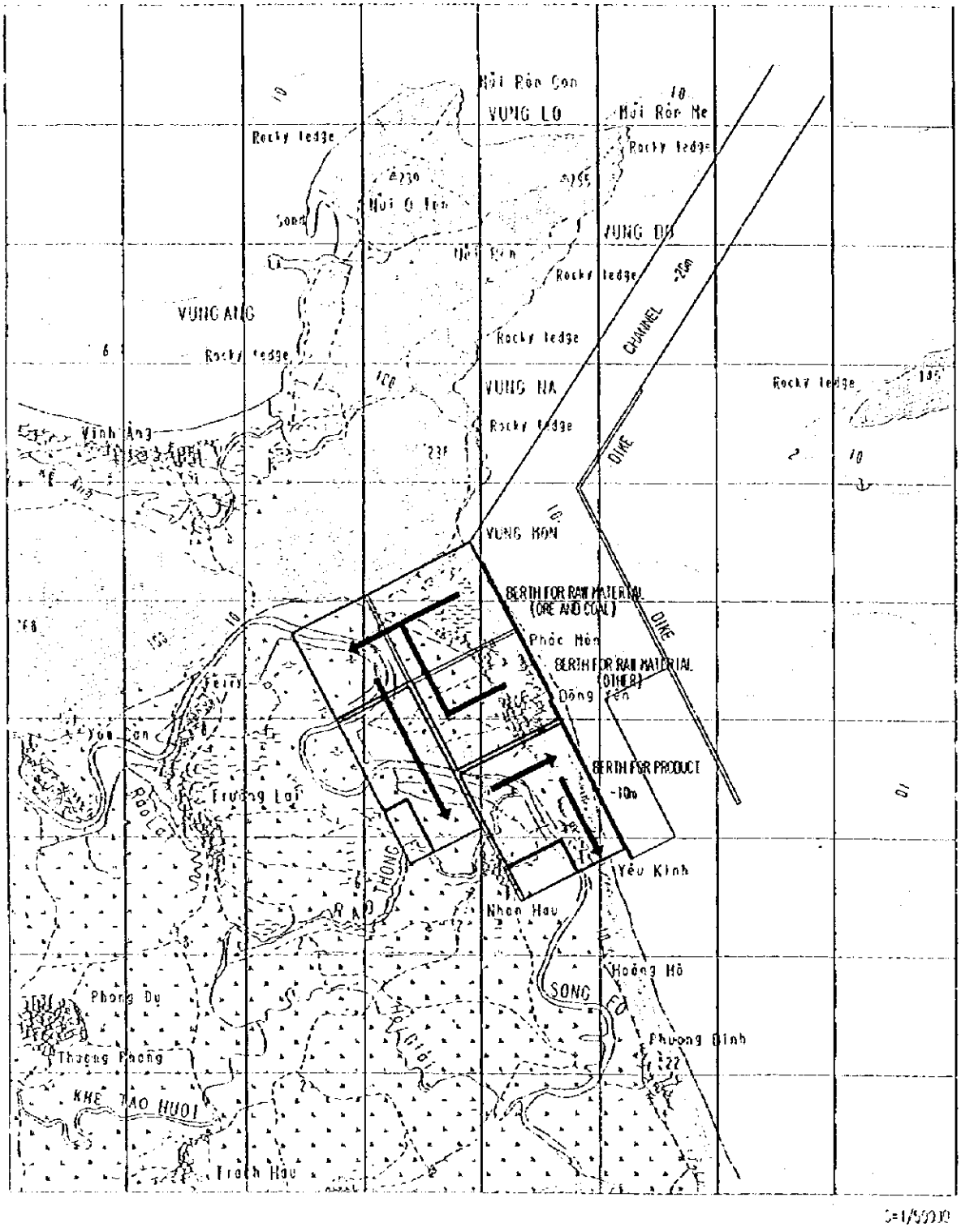


Figure 6-1 Case1-1 of general layout

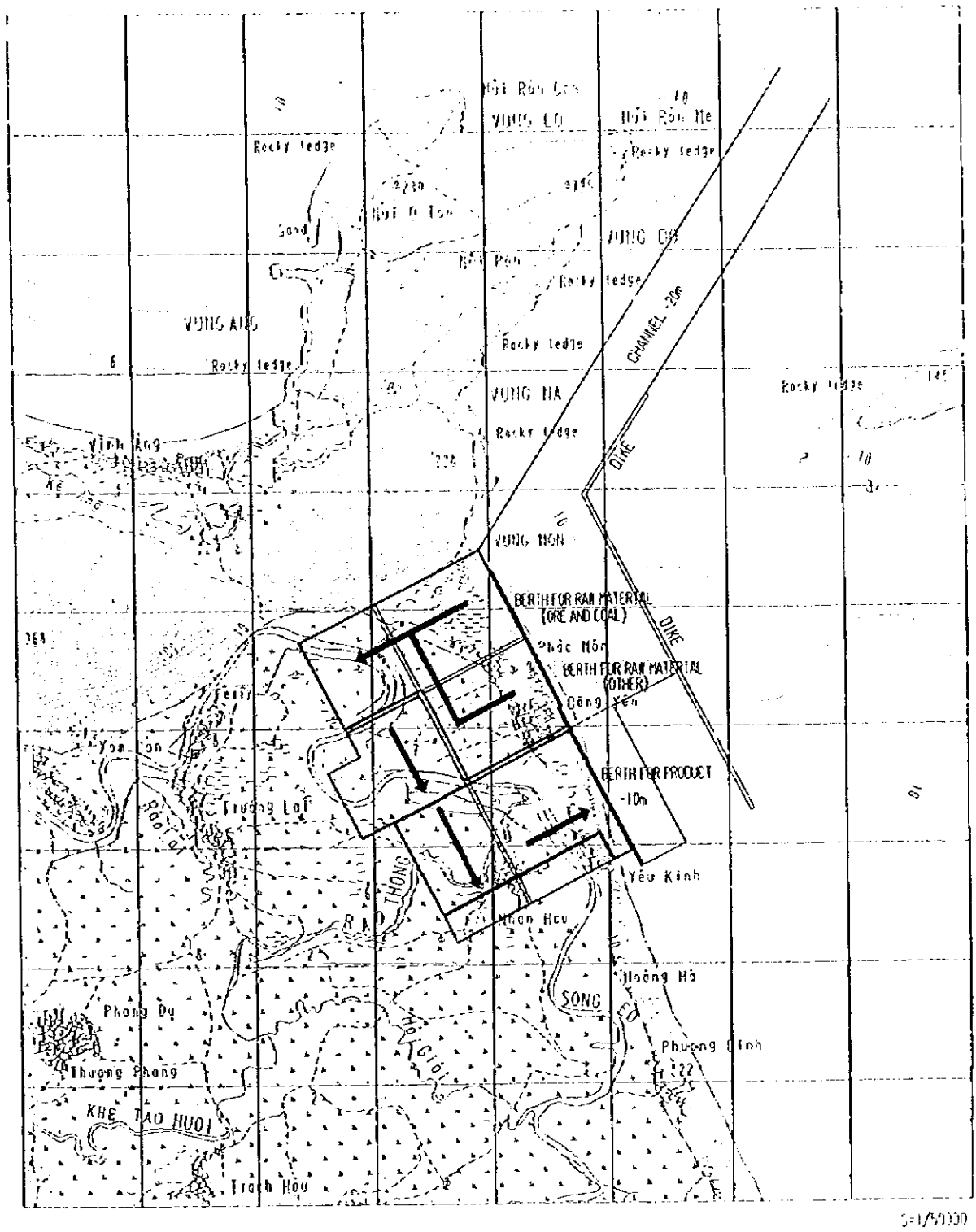


Figure 6-2 Case2-1 of general layout

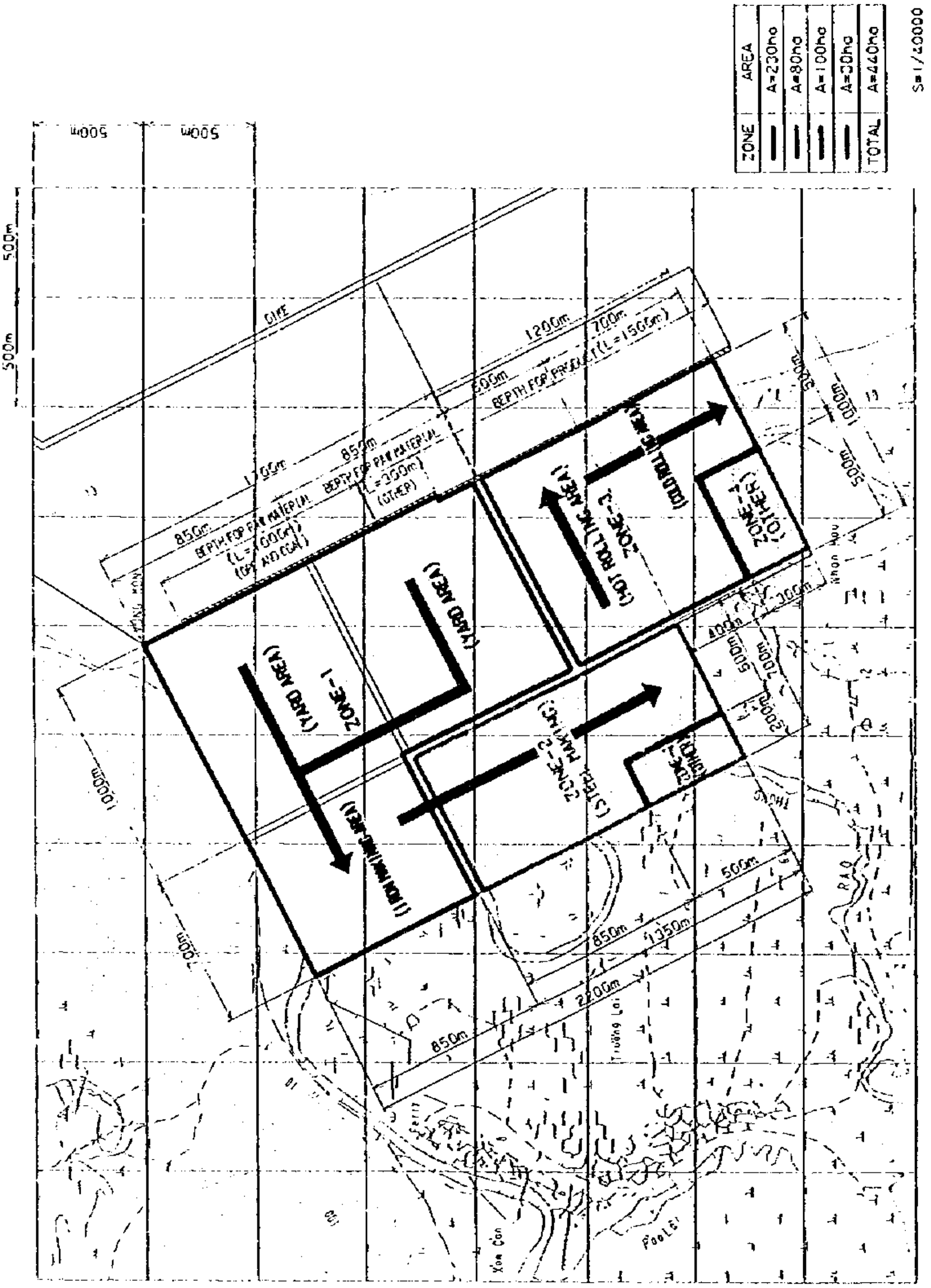


Figure 6-3 Case1-2 of general layout

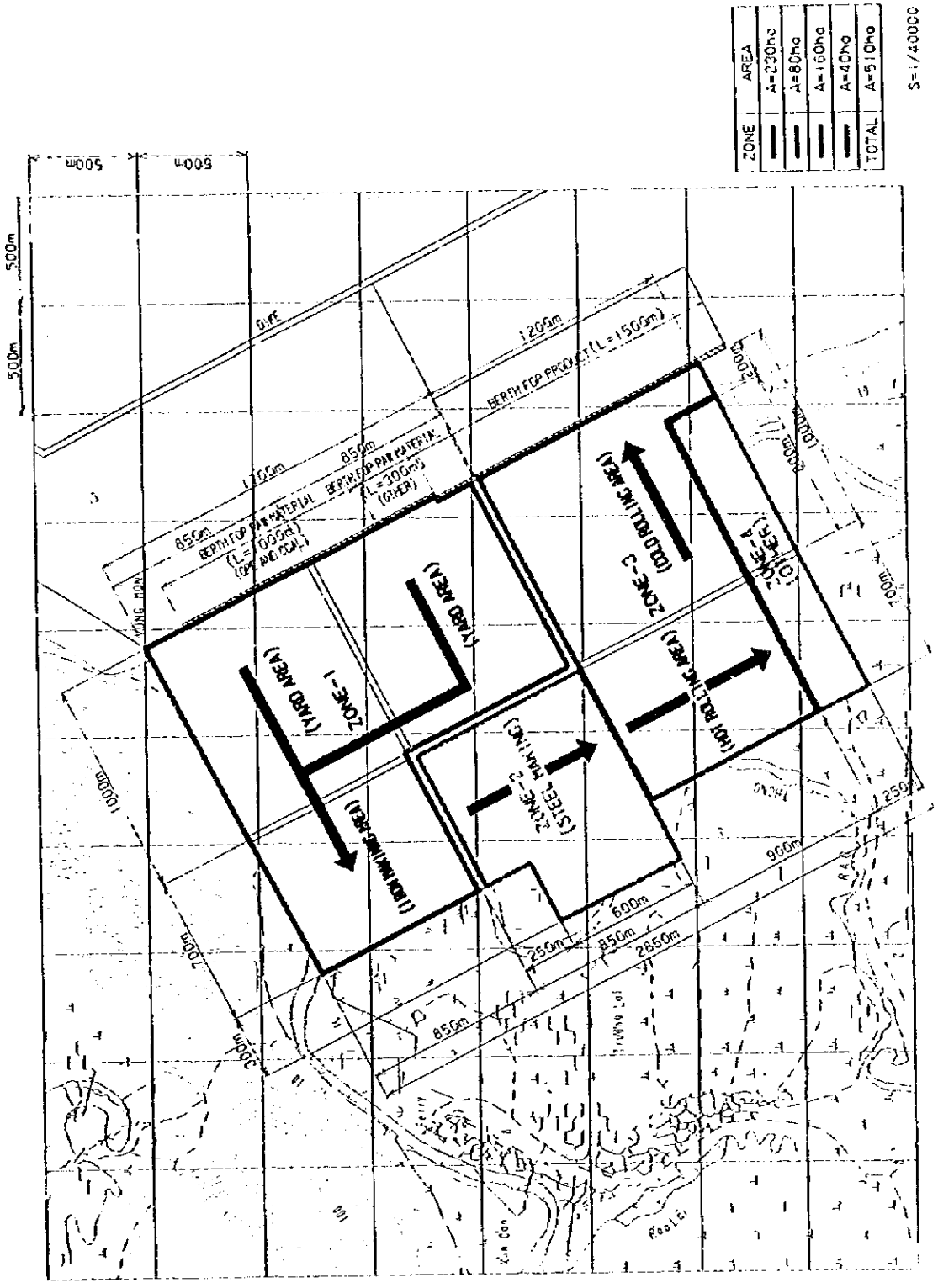


Figure 6-4 Case2-2 of general layout

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.

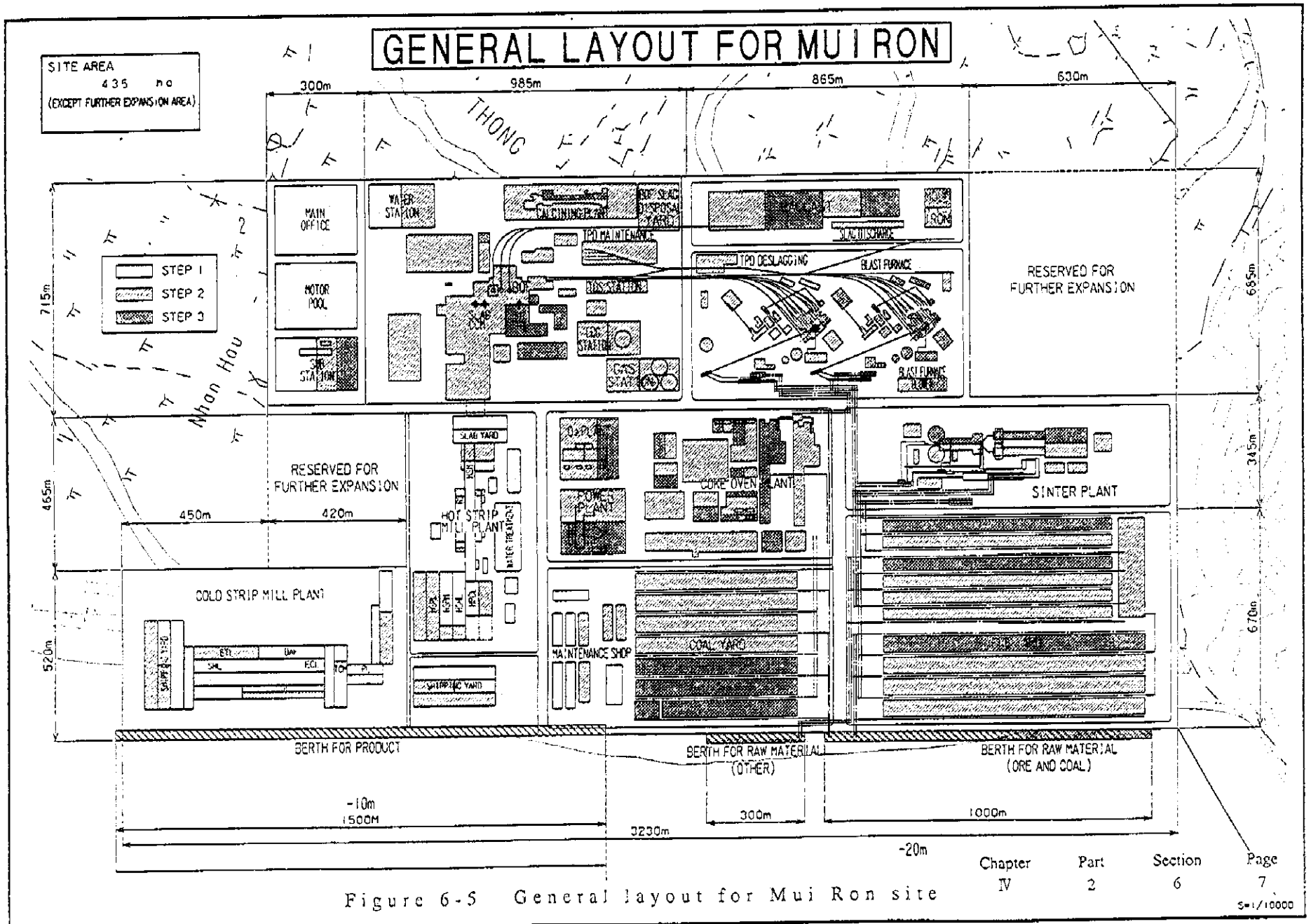


Figure 6-5 General layout for Mui Ron site

Section 7 Construction Schedule

Contents

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

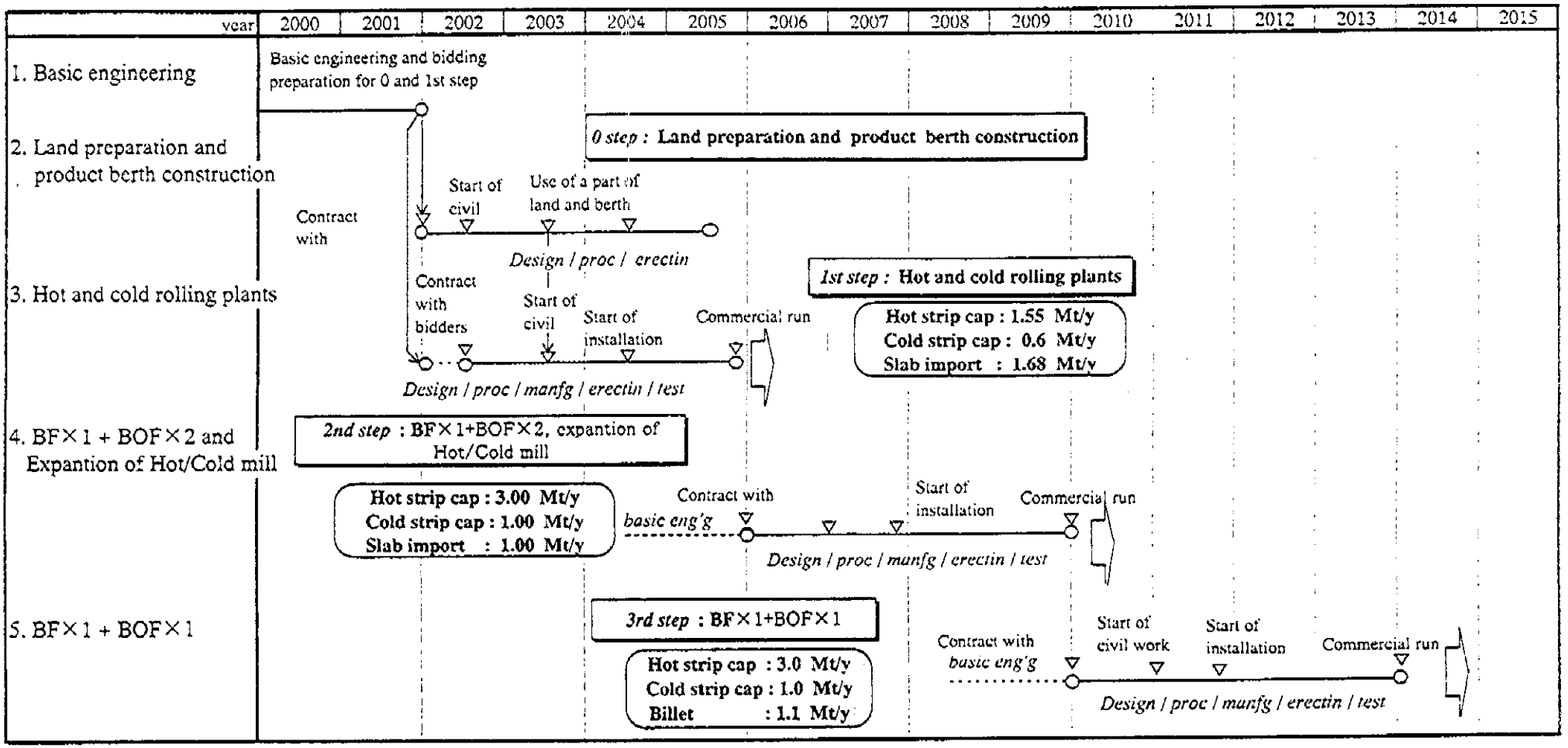
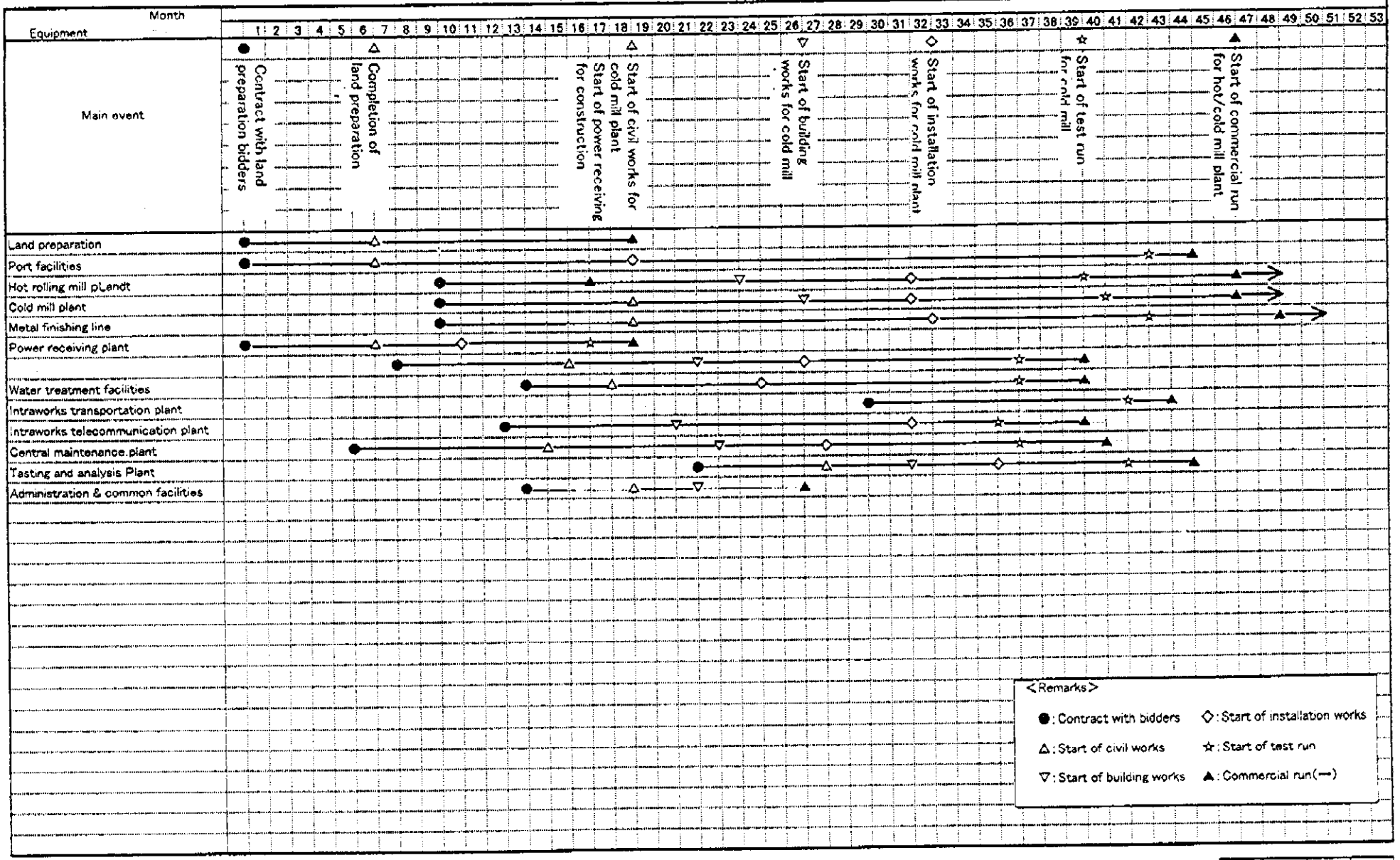
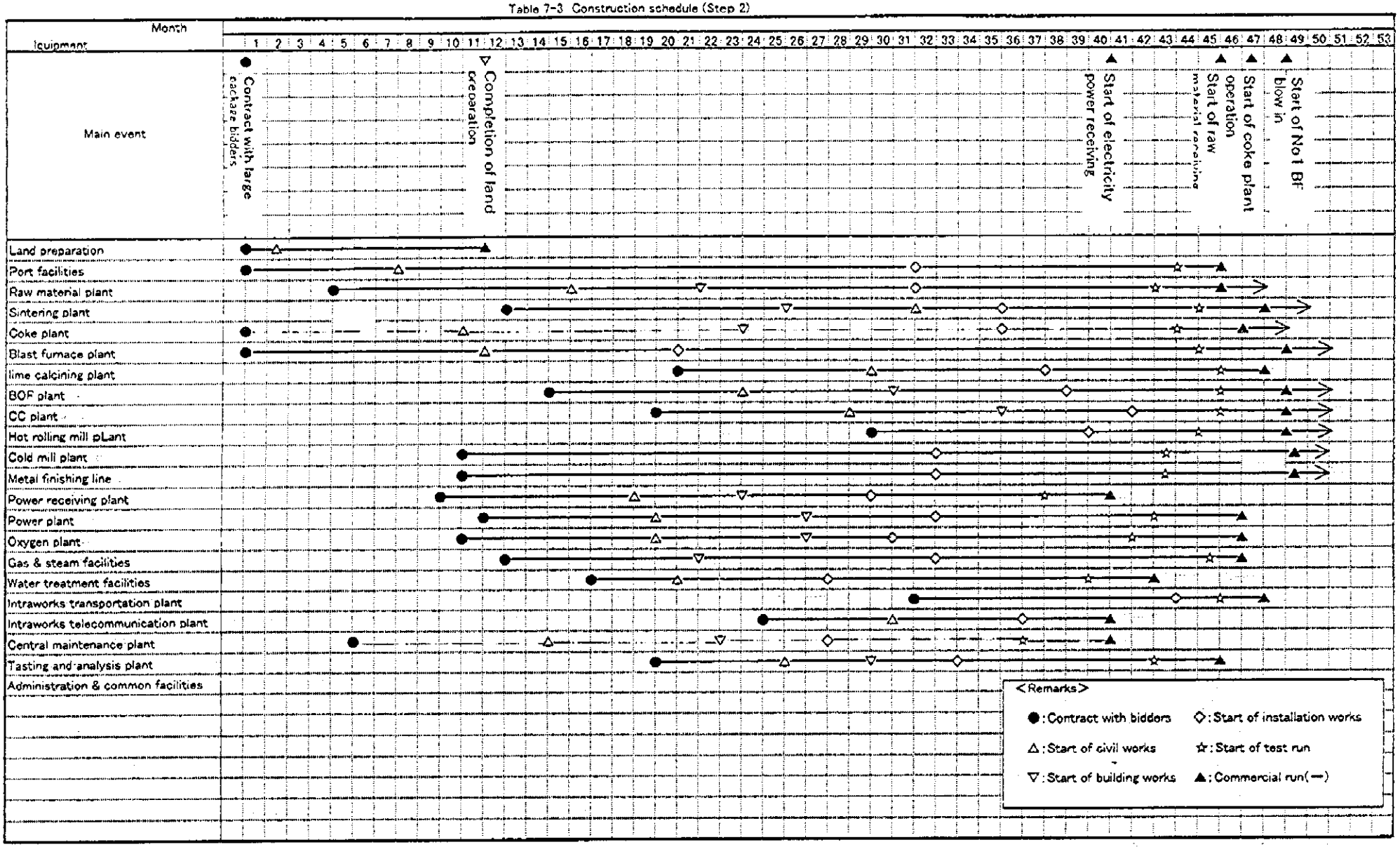


Table 7-2 Construction schedule (Step 0 & 1)



Chapter	Part	Section	Page
IV	2	7	3

Table 7-3 Construction schedule (Step 2)



Chapter	Part	Section	Page
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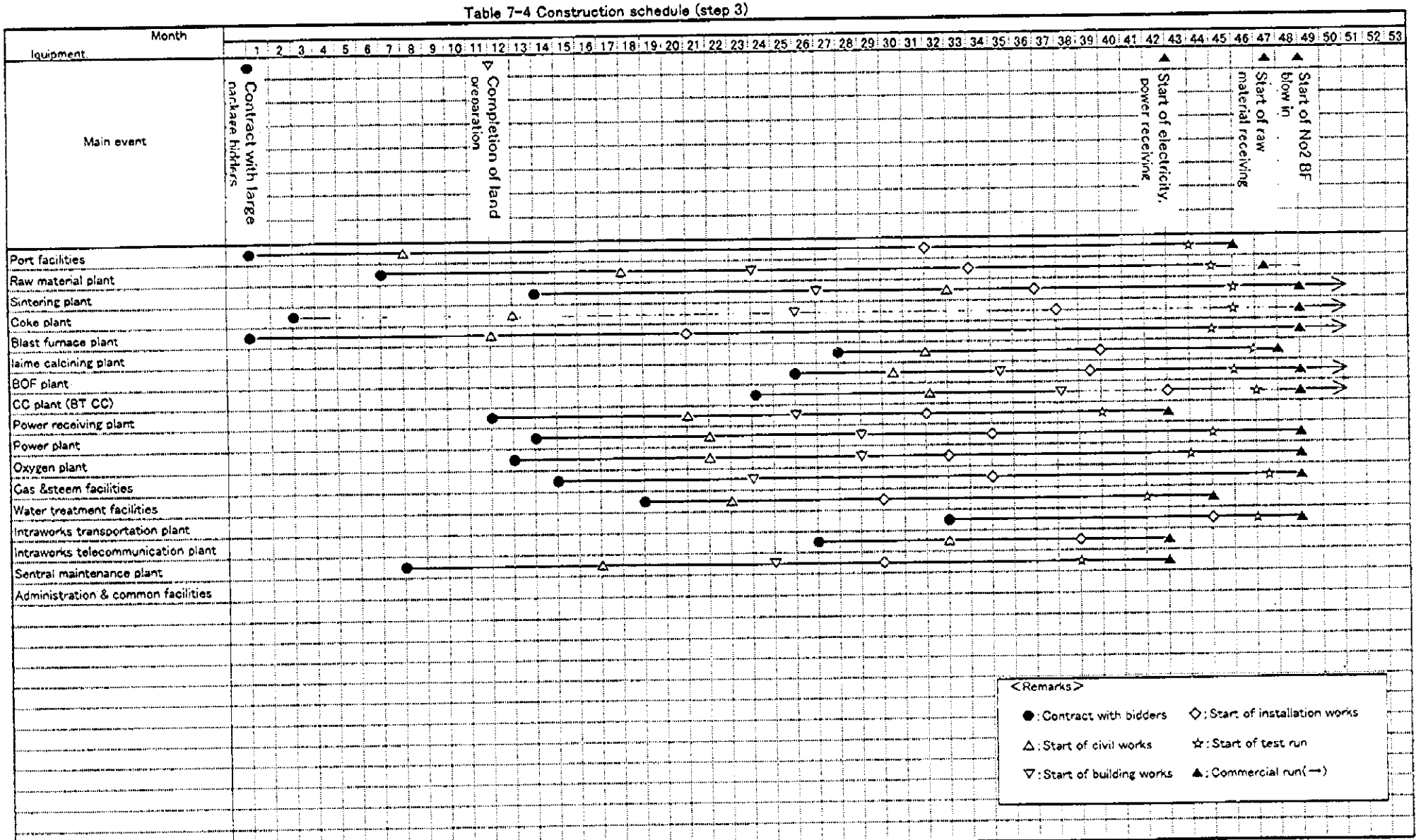
Table 7-4 Construction schedule (step 3)



Chapter	Part	Section	Page
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Section 8 Financial Analysis

Contents

Page

1. Summary of capital cost expenditure

(1) Total investment (Total of Steps 1, 2 and 3)

Categories	Amount US$ million	Cost per ton US$/t-steel	Make up percentage %
Direct construction cost	5,231	1,211	91.3%
Engineering fee	157	36	2.7%
Initial	78	18	1.4%
Interest during		0	0.0%
Contingency	157	36	2.7%
Construction cost total	5,623	1,302	98.2%
Operation spare parts	105	24	1.8%
Total required capital	5,728	1,326	100.0%

Alternative 1 (Hot strip mill, cold strip mill and CGL)

Categories	Amount US$ million	Cost per ton US$/t-steel	Make up percentage %
Direct construction cost	1,245	288	91.3%
Engineering fee	37	9	2.7%
Initial organization	19	4	1.4%
Interest during construction		0	0.0%
Contingency	37	9	2.7%
Construction cost total	1,338	310	98.2%
Operation spare parts	25	6	1.8%
Total required capital investmen	1,363	316	100.0%

(2) Bases of estimation

(a) Time of estimation

- Import : October 1997 -International market price
- Domestic Procurement : August 1997 -Vietnamese domestic market price

(b) Currency and Exchange Rate

- Currency Import : US$
  Domestic Procurement : VND (exchange to US$)
- Exchange Rate 1US$ = 11,700VND (August 1997)

(c) Division between import and domestic procurement

Equipment to be purchased : Import
Civil works , erection & installment : Domestic

(d) Price fluctuation : Not considered

2. Summary of estimate of product cost

(1) Production cost

Profit-loss by product type (ordinary year)

(Unit: 1,000t, US$/t)

	Shipment	Total cost				Total cost	Selling price	Profit		
		Product cost	Transportation	General administrative expenses	Interest			US$/t		Amount (US$ mil.)
Billet	1,095.0	233.4	28.5	0.1		255.4	267.5	12.1	(4.5%)	13.2
As Rolled HC	802.9	283.5	28.5	0.1		305.4	369.2	63.7	(17.3%)	51.2
Skin passed HC	400.0	295.9	28.5	0.1		317.9	384.2	66.2	(17.2%)	26.5
Slit recoild HC	240.0	303.5	28.5	0.1		325.5	409.2	83.7	(20.5%)	20.1
Plate	120.0	307.7	28.5	0.1		329.7	429.2	99.5	(23.2%)	11.9
HR sheet	240.0	307.3	28.5	0.1		329.3	429.2	99.9	(23.3%)	24.0
P/O coil	203.1	306.3	28.5	0.1		328.3	389.2	60.9	(15.6%)	12.4
CR coil	350.0	405.4	28.5	0.1		427.4	509.3	82.0	(16.1%)	28.7
CR sheet	350.0	417.4	28.5	0.1		439.4	539.3	99.9	(18.5%)	35.0
CG coil	100.1	532.3	28.5	0.1		554.2	686.9	132.7	(19.3%)	13.3
CG sheet	100.0	548.3	28.5	0.1		570.3	716.9	146.6	(20.5%)	14.7
Tin sheet	100.0	667.8	28.5	0.1		689.8	909.5	219.7	(24.2%)	22.0
Total	4,101.1									272.8

(2) Construction of production cost

Table 1-6 Cost Structure

		Slab		Billet		Hot Rolling Coil		Cold Rolling Coil	
		US$/t	%	US$/t	%	US$/t	%	US$/t	%
Total Cost		247.9	100.0%	239.8	100.0%	286.5	100.0%	340.2	100.0%
Material total		145.7	58.8%	144.4	60.2%	148.7	51.9%	155.6	45.7%
	Ore	100.0	40.3%	98.9	41.3%	102.0	35.6%	106.8	31.4%
	Coal	8.3	3.4%	8.2	3.4%	8.5	3.0%	8.9	2.6%
	Other mate	37.4	15.1%	37.3	15.6%	38.1	13.3%	39.9	11.7%
Variable total		19.9	8.0%	20.0	8.3%	36.3	12.7%	54.5	16.0%
	By-product	-53.0	-21.4%	-51.6	-21.5%	-55.3	-19.3%	-63.3	-18.6%
	Refractry	14.4	5.8%	14.1	5.9%	14.7	5.1%	17.2	5.1%
	Energy	9.5	3.8%	8.6	3.6%	15.0	5.2%	27.1	8.0%
	Other	49.0	19.8%	48.9	20.4%	61.9	21.6%	73.4	21.6%
Fixed cost		82.3	33.2%	75.4	31.4%	101.6	35.5%	130.1	38.2%
	Dep.	35.2	14.2%	32.3	13.5%	43.0	15.0%	54.2	15.9%
	BF relining	5.1	2.1%	5.0	2.1%	5.2	1.8%	5.4	1.6%
	Maintenan	15.2	6.1%	13.3	5.6%	20.2	7.0%	27.2	8.0%
	Interest	24.8	10.0%	22.6	9.4%	30.9	10.8%	39.6	11.7%
	Labor	1.3	0.5%	1.4	0.6%	1.6	0.5%	2.4	0.7%
	Welfare	0.7	0.3%	0.7	0.3%	0.8	0.3%	1.2	0.4%

(3) Sensitivity analysis

Sensitivity analysis (Effect to operating cost)

(Unit: US$/t)

	Condition		Effects			
	Items	Variation	Slab	Billet	Hot rolling coil	Cold rolling coil
Base case	Operation cost		247.9	239.8	286.5	340.2
Sensitivity	Capital expenditure cost	±10%	±3.5	±3.2	±4.3	±5.4
	Iron ore price	±10%	±10.0	±9.9	±10.2	±10.7
	Coal price	±10%	±0.8	±0.8	±0.8	±0.9
	Variable	±10%	±7.3	±7.2	±9.2	±11.8
	Fixed	±10%	±8.2	±7.5	±10.2	±13.0
	Operation rate	-10%	+9.1	+8.4	+11.3	+14.5

3. Summary of financial analysis

(1) Premises for financial analysis

(a) Forecast period : 2001-2029

(b) Source of fund from capital : 30% of total investment

(c) Borrowing condition of loans

Long-term loans : 5.3%

Short-term loans : 15.0%

(d) Taxes

Income tax : 25%

Sales tax : 2%

(2) Investment efficiency and sensitivity analysis

Investment effect analysis and sensitivity analysis

	Base Case	Alternative1
IRROI (After tax)	**6.67%**	**9.34%**
IRROI (Before tax)	**7.57%**	**11.18%**
IRROE	**12.00%**	**17.98%**
<Sensitivity analysis of IRROI (Before tax)>		
Selling price		
10%up	10.63%	17.48%
10%down	4.04%	0.67%
Variable cost		
10%up	5.85%	3.78%
10%down	9.22%	16.30%
Operating Fixed cost		
10%up	7.30%	11.00%
10%down	7.83%	11.37%
Total investment		
10%up	6.51%	10.13%
10%down	8.77%	12.40%
Slab import price		
10%up	7.27%	8.08%
10%down	7.88%	13.98%

Base case: Total of Steps 1, 2 and 3

Alternative 1: Construction of hot strip mill and cold strip mill including CGL

Section 9 Economic Analysis

Contents

1. General

Financial analysis is concerned with whether the project will be able to secure the funds it will need and be able to repay these and whether the project will be able to yield reasonable profits. Economic analysis is directed toward determining whether the project is likely to contribute significantly to the development of the economy as a whole and if the contribution of the project is likely to be great enough to justify the use of the scarce resources (including foreign exchange) which will be needed. The former evaluates the financial viability of the project based on the market prices, while the latter evaluates the economic viability of the project based on the economic values (shadow priced values) from a viewpoint of the national economy.

2. Procedure for economic analysis

Firstly, the financial analysis is reviewed from the viewpoint of economic analysis.

Secondly, shadow pricing of the financial costs and benefits is carried out by the following procedures:

1) Classification of shadow pricing
2) Calculation of standard conversion factor (SCF)
3) Calculation of shadow exchange rate (SER)
4) Calculation of shadow prices of traded and nontraded goods
5) Calculation of shadow price of land
6) Calculation of shadow wage rate of unskilled labor
7) Identification of taxes applied to the project (transfer item)

Thirdly, economic cash flow analysis is undertaken to compute the economic internal rate of return (EIRR) by a DCF method. Sensitivity analysis is also made in this phase.

Finally, the impact of the project is assessed on: (i) foreign exchange, (ii) employment, (iii) industrial development, and (iv) regional development.

3. Shadow pricing of financial cost and benefit

The shadow pricing of financial cost and benefit is summarized for the economic analysis in the following table.

	Before 2005	After 2006
Standard conversion factor (SCF)	0.940	0.980
Shadow exchange rate (SER)	VND 12,447/US$	VND 11,939/US$
Traded and nontraded goods in VND	Adjustment by SER	Adjustment by SER
Shadow price of land	US$ 47,722/y	US$ 49,753/y
Shadow wage rate of unskilled labor	US$ 133/y	US$ 139/y

4. Economic cash flow analysis

4.1 Economic internal rate of return (EIRR)

EIRR = 5.66 %

4.2 Sensitivity analysis

	-10%	Base case	+10%
Construction cost	7.20 %	5.66 %	4.03 %
Selling price	5.99 %	5.66 %	5.33 %
Operation cost	6.79 %	5.66 %	4.68 %

5. Impact of the project

5.1 Savings of foreign exchange

The foreign exchange savings will be aggregated at US$14.4 billion for the whole project period.

5.2 Improvement of unemployment situation

The following employment will be made annually by the project.

	New employment
During construction (max.)	10,000
During operation (employee)	6,500

5.3 Promotion of industrial development

It is necessary for establishment of the steel industry to develop the supporting industry. It involves industrial sectors of machine manufacturing, machining, refractory manufacturing, etc. Contractors and subcontractors for undertaking plant maintenance and expansion works are also considered to be grouped in the supporting industry. Without such a supporting industry, smooth operation of integrated steelworks seems difficult.

Most of the supporting industry will become more capable through the introduction of foreign technologies and/or training by foreign companies and are located around the integrated steelworks.

On the other hand, a transportation industry will be developed for conveying a big volume of raw materials and final products of the integrated steelworks and a shipbuilding industry will take place along with its development. It is also expected that heavy industries as well as a metal manufacturing industry will mature by using quality steel products from the integrated steelworks.

5.4 Promotion of regional development

A lot of people will work in the integrated steelworks. A new community will be necessary for not only the workers but also their families. Services for drinking water supply and sewage treatment will be well established and available for the community, where such facilities as schools, hospitals, parks and a public hall will be also constructed.

In addition, wide roads and networks for electricity supply and communication will be well constructed in connection with the project, which will benefit the community as well.

The construction of the integrated steelworks will, therefore, greatly contribute to the promotion of regional development.

Section 10 Environment Protection

Contents

1. Concept of environmental control measures

1) The meteorological conditions at the planned construction site of the new steel plant were investigated in order to determine which environmental control measures should be taken. Furthermore, water quality was investigated and noise measurements carried out as part of the environmental survey of the site.
2) Environmental control measures that meet Viet Nam's regulatory standards are first taken. However, when Japan's regulatory standards are more rigorous than those of Viet Nam, measures that meet the former are taken. The technologies for environmental control measures are based on the measures presently taken by the Japanese steel industry.
3) For the environmental control measures and energy-saving measures considered necessary in the future, a layout that enables these measures to be established as a future concept is planned.

2. Energy-saving measures

1) O_2 control of combustion exhaust gas necessary for ordinary combustion control, waste heat recovery of hot stoves equipped with standard facilities, installation of recuperators in reheating furnaces, etc., are conducted as general energy-saving measures. Furthermore, the control of OG necessary for operation, hot charge to the reheating furnaces of hot strip mill, etc., are also conducted.
2) For the environmental control measures and energy-saving measures considered necessary in the future, a layout that enables these measures to be established as a future concept is considered. Large-size energy-saving facilities, such as those for enabling sensible heat recovery from sinter main exhaust gas and CDQ of coke ovens, are not installed at the initial stage of the new steel plant from the standpoint of equipment cost reduction.
3) These large-size energy-saving facilities are to be installed after their economic efficiency is evaluated in terms of energy-saving cost and equipment investment after the start of the operation of the steel plant. However, equipment layouts which enable these large-size energy-saving facilities to be installed in the future are planned. It is desirable from an environmental view, however, to carry out the measures related to large-size energy-saving facilities soon after the start of operation.

3. Air

1) For air pollution control, SOx control measures are taken by installing desulfurizing equipment in the sinter main exhaust gas system, substantially reducing the amount of SOx emissions by COG desulfurization, use of low-sulfur fuels, etc. For NOx also, the amount of emissions is reduced by the adoption of low-NOx burners, etc. Furthermore, combustion exhaust gas is diffused into the air from high stacks.
2) The ground concentrations of SOx and NOx near the steel plant when these above measures are taken were simulated. As a result, it was found that the obtained values were far lower than those of Japan's environmental quality standards and there is no special environmental problem.

4. Water quality

1) Regulatory standards for water quality are met by removing suspended solids by thickeners, the coagulation and sedimentation process, etc., removing oil by pressure floatation, etc., removing COD in ammonia liquor and harmful substances by activated sludge treatment, etc.
2) The greater part of the fresh water used in each process at the steel plant is circulated and reused (circulation ratio = 94%), thereby reducing the industrial water volume and the amount of effluents.

5. Noise

1) General noise control measures are taken against principal sources of noise, namely, blast-furnace septum valves, main blowers of sintering machines, large-size dust-collection blowers, fans, etc.
2) However, the sound level is highest in that part of the site boundary that is nearest to the blast furnaces and thus the target sound level is achieved by enhancing noise control measures in the septum valves of blast furnaces, large-size dust collection blowers, etc.

6. Generated substances

1) Substances generated at the steel plant are recycled when they can be used. The amount of generated substances that is discharged from the steel plant is thus minimized. Landfill areas are secured within the steel plant and generated substances that cannot be recycled or sold outside are dumped and used for landfilling.
2) However, generated substances that cannot be dumped or can be incinerated are incinerated. For this purpose, an incineration plant is installed within the steel plant. Blast-furnace slag and converter slag, of which the largest amounts are generated, can be used as raw material for cement and a road base material. However, because their applications and demand are unclear, both kinds of slag are dumped near the steel plant and used for landfilling in the initial stage.

7. Investment for environmental preservation

1) The total investment for environmental preservation equipment is about 8 % (US$ 400 million) of the total capital expenditures.
2) The investment cost for environmental preservation equipment is incorporated in the estimate of each plant equipment.

Part 3 Steel Demand Projection and Projection Plan

Section 1 Steel Demand

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1. Methodology of market study

This market study was carried out by analyzing data and information collected through an interview survey in Viet Nam. The organization list for the interview survey is summarized in the Appendix in this chapter. In the course of analysis in Viet Nam, many discussions were made between VSC people in charge and the JICA study team. In addition, various papers and documents were examined to know the past/present market situation as well as to make a future projection of supply and demand of steel. It should be noted that the published data sometimes seems inaccurate and some important statistical information is not available, causing some inconsistency in the estimation. The study team tried its best to avoid such inconsistency.

1.1 Steel supply analysis

Figure 1-1 illustrates a steel supply projection flow chart. Steel supply consists of domestic production and import from foreign suppliers. The forecast of domestic production is based not only on the present construction plans but also on investigation of possibilities of their realization through discussions with VSC people etc. Import of steel estimates were based on detailed trade statistics which are not published in Viet Nam.

The following data and information were used for the analysis:

- The existing steel mill's information
- Development of steel industry
- Trade statistics

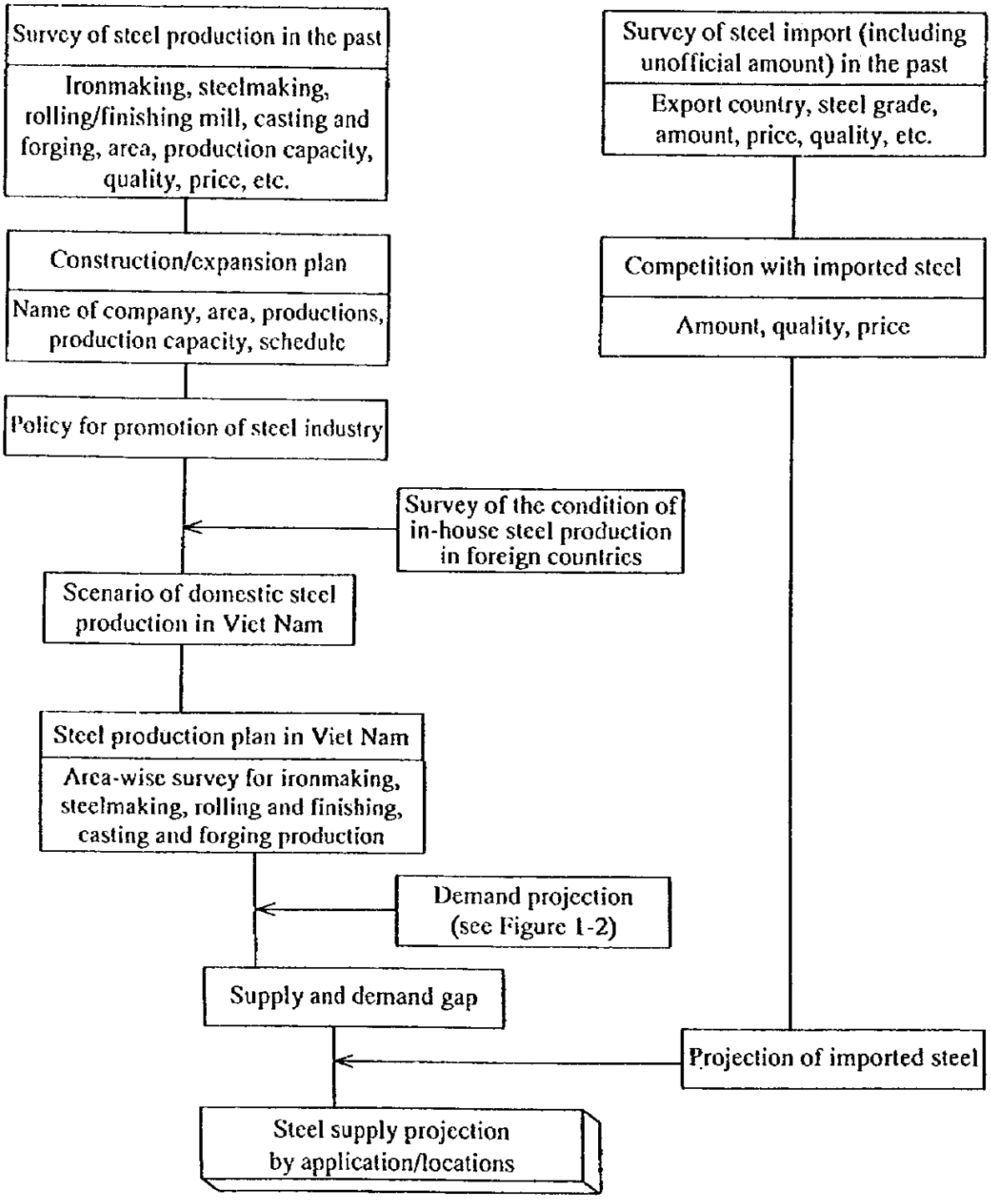


Figure 1-1 Steel supply projection flow chart

1.2 Steel demand analysis

Figure 1-2 illustrates the steel demand projection flow chart. Two kinds of analysis were undertaken: 1) macroscopic analysis and 2) microscopic analysis. Some adjustments were made between the two analyses to get the final market mix which was transferred to the technical study group. Since the export of steel is very small, it is not incorporated into the demand projection.

The data and information which were mainly used for the study are summarized below.

1) Macroscopic analysis
   a) GDP growth rate
   b) Steel intensity (SI) curve
   c) Apparent steel consumption (ASC) and ASC per capita
   d) Flat and non-flat products ratio

2) Microscopic analysis
   a) Industrial development plan by industrial sub-sector
   b) Growth rates by industrial sub-sector
   c) Competitiveness of steel products (price, quality, technology level, etc.)
   d) Unit consumption of steel

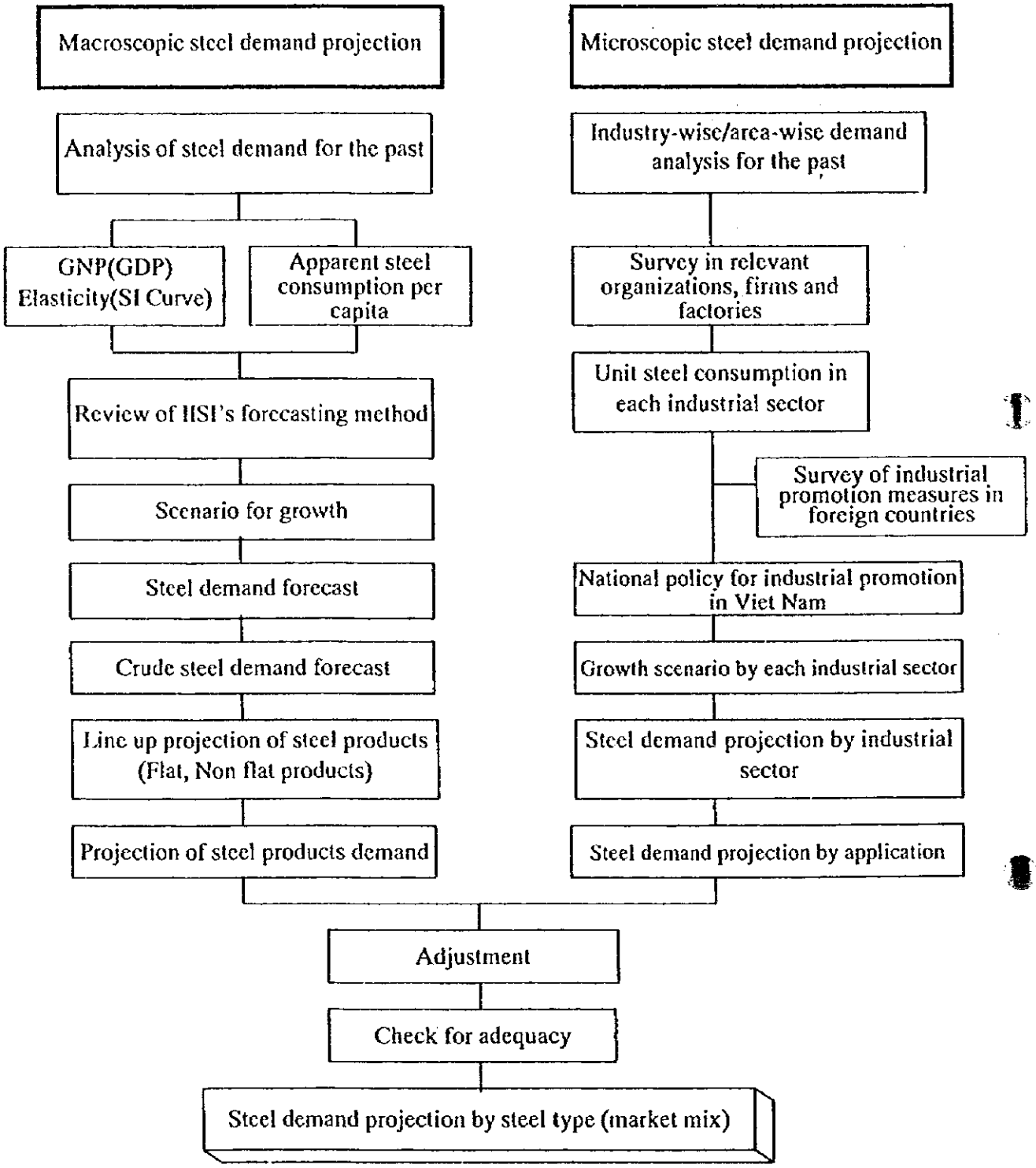


Figure 1-2 Steel demand projection flow chart

2. Present situation of supply and demand of steel products

2.1 Domestic steel production

Domestic steel production in Viet Nam has been increasing recently, and it reached 1 million ton/y in 1996.

2.1.1 Domestic steel production by company

Such a rapid production increase in 1996 was due to the starting-up of several joint venture companies which produced some 400,000 ton of bar and wire rod for construction application. Table 1-1 shows the domestic steel production by company for the last 5 years.

Table 1-1 Domestic steel production by company

(Unit: final products base 1,000t)

	1992	1993	1994	1995	1996
1) VSC					
TISCO	103	109	113	148	180
Hai Phong/Da Nang	2	4	12	12	12
SSC	85	117	144	208	260
Total	190	230	269	368	452
2) JVs	0	0	0	0	400
3) 4 mini mills *	10	10	30	30	30
4) Reroll companies	10	10	20	20	20
5) Galvanizing (POSVINA)	9	22	28	41	50
(Others)	5	8	10	20	30
6) Pipe manufacturers	0	0	4	12	21
Total demestic production (round number)	220	280	360	490	1,000

* : Song Cong, Cam Pha, Ninh Binh, Duyen Hai

Source : VSC

JV companies

2.1.2 Domestic steel production in 1996 by steel type

As is shown in Table 1-2, about 90% of domestically produced steel was non-flat products (or long products) and 10% was flat products. Non-flat products mainly consist of bar for reinforcement and wire rod for construction. Some quantity of rolled light section is also produced domestically.

As for flat products, hot-dipped galvanized steel and welded pipe are produced using imported cold-rolled sheet and hot-rolled sheet, respectively.

Table 1-2 Domestic steel production by steel type in 1996

(Unit : 1,000t)

Steel type	Production
1) Bar	572
2) Wire rod	250
3) Rolled heavy section	0
4) Rolled light section	80
Total non-flat products	902
1) Plate	0
2) Hot rolled coil/sheet	0
3) Cold sheet	0
4) Welded section	0
5) H-D galv.	80
6) EG galv.	0
7) Tin plate	0
8) Welded pipe	21
Total flat products	101
Grand total (round number)	1,000

Source: VSC

2.2 Supply and stock

As mentioned in 2.1.1, due to a rapid increase of domestic steel production, the total steel supply to market including imported steel exceeded the steel demand of Viet Nam in 1996. Table 1-3 shows the total steel supply to market which focuses on an aspect of steel supply and stock for the last 5 years. As seen in this table, the actual total supply to market (domestic production quantity + imported quantity) is 1,300,000 ton.

Table 1-3 Total steel supply to market

(Unit: 1,000t)

Subject		1992	1993	1994	1995	1996
	(A) Domestic production	220	280	360	490	1,000
	(B) Imported steel products	343	686	600	866	920
	(C) Raw material for domestic steel products *	20	40	50	80	110
Stock	(D) Carried over from the preceeding year	0	3	106	0	176
	(E) Stock raised in corresponding year	3	103	-106	176	334
	(F) Total stock (F)=(D)+(E)	3	106	0	176	510
	(G) Total supply to market (G)=(A)+(B)−(C)−(F)	540	820	990	1,100	1,300

*: Raw material for the production of H-D galv and pipe

Source: Ministry of Trade
VSC

2.3 Total steel demand summary for 1992-1996

(Unit: 1,000t)

Year	1992	1993	1994	1995	1996
Steel demand	540	820	990	1,100	1,300

2.4 Steel demand in 1996 by steel type

By analysing the statistical documents of steel import, total steel demand in 1996 by steel type is projected and summarized in Table 1-4.

Table 1-4 Steel demand in 1996 by steel type

(Unit: 1,000t)

	Domestic products	Quantity of imports, and domestic stock	Total
1) Bar	572	-102	470
2) Wire rod	250	50	300
3) Rolled heavy section	0	0	0
4) Rolled light section	80	60	140
Total non-flat products	902	8	910(70%)
1) Plate	0	58	58
2) Hot rolled coil/sheet	0	48	48
3) Cold sheet	0	65	65
4) Welded section	0	0	0
5) H-D galv.	80	48	128
6) EG galv.	0	11	11
7) Tin plate	0	40	40
8) Welded pipe	21	19	40
Total flat products	101	289	390 (30%)
Grand total(round number)	1,000	300	1,300 (100%)

Source: Ministry of Trade, VSC

2.5 Steel quality by demand

As for the non-flat steel products, domestic products or low grade imported steel from such countries as Russia and former low grade block countries are accepted by the construction industries. Most JV companies with Japan and western countries procure quality steel from VINAKYOEI or from foreign countries. As for the flat products, the customers use the high grade imported steel.

3. Projection of future steel demand in Viet Nam (Macroscopic projection)

3.1 General aspect

The relation between the nation's steel demand and economic expansion is explained by the Steel Intensity curve (SI curve). The SI curve shows the correlation between Apparent Steel Consumption (ASC) per GNP and increase of GNP per capita. Figure 1-3 shows the typical SI curve. This SI curve is considered to be the figure that illustrates the elastic nature of apparent steel consumption.

The SI curve explains the following aspect: in general when GNP level goes over about US$ 1,000/capita as of the 1985 price level, the steel demand becomes higher than the GNP growth rate due to the nationwide industrialization movement and investment. At around US$ 5,000/capita of GNP, the steel demand reaches to a stable level, where the steel demand growth rate is almost the same as the GNP growth rate. When GNP rises over US$ 8,500/capita level, the steel demand growth rate becomes lower than the GNP growth rate. This is because of the growth of such industries as tertiary industries and information/communication industries which do not require big amount of steel products, as well as the increase in steel export.

This SI curve is based on IISI data from the past, and they do not indicate the actual economic and industrial situation at present completely, but the general trend as a whole can be seen through this figure.

Further, IISI summarized the model in Figure 1-4 by analyzing the relation between the economic development process and apparent steel consumption (ASC) in each country. This model shows that when ASC goes over 100kg/capita the steel demand increases rapidly and this tendency continues until ASC reaches 600kg/capita level. After that, steel demand remains unchanged in the matured period, and after that it starts to decrease, coming down to the stable period.

Economic and steel demand situation of Viet Nam in 1996 was :

GDP/capita	- US$ 269
ASC/capita	- 17kg
ASC/GDP	- 0.06kg/US$

At present, Viet Nam's situation is not developed enough to apply the above tendency, so the steel demand is projected taking into account estimated GDP growth rates.

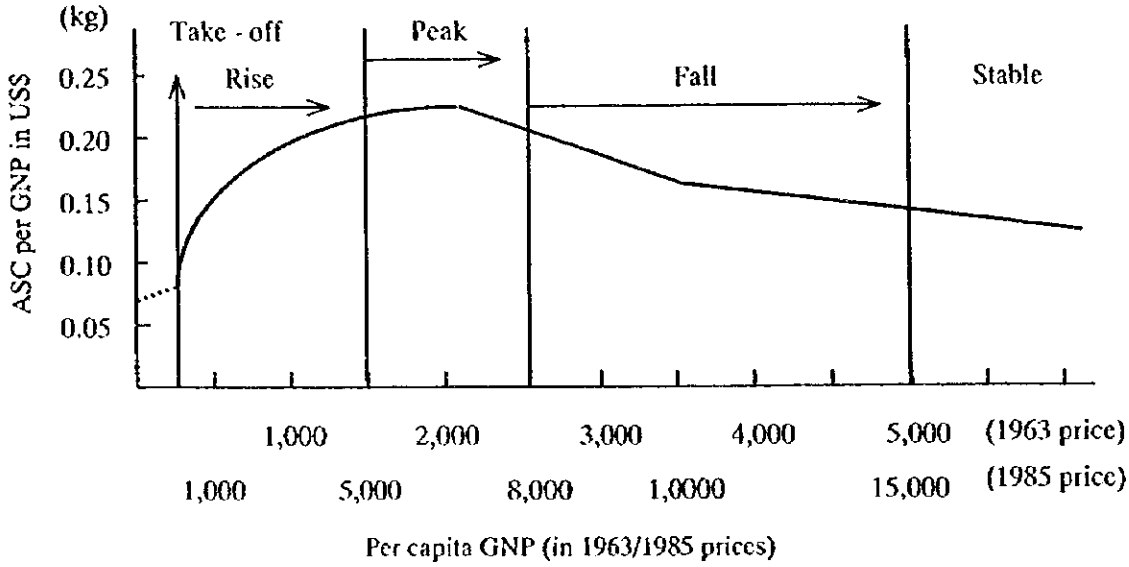
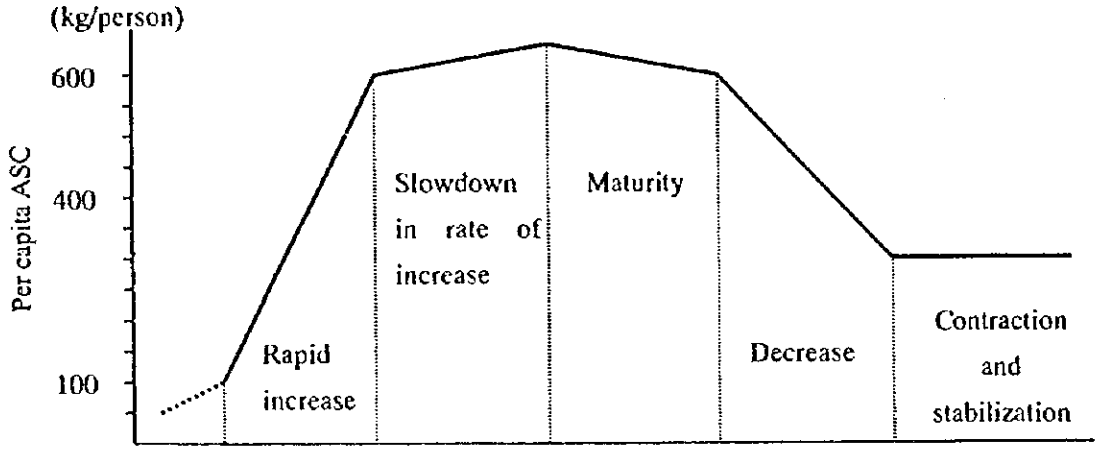


Figure 1-3 Steel Intensity (SI) curve



	Take off		Peak		
U.K.	1890	1960	1964	1973	1985
U.S.A.	1900	1964	1973	1982	1990
Japan	1955	1970	1973	1986	1995
Taiwan	1970	90/95	95/2000	2005	2015
Korea	1976	1995	2000	2010	2020
China	1995				

Source: IISI

Figure 1-4 Per capita ASC and steel industry development stages

3.2 GDP growth rate

Table 1-5 summarizes the GDP growth rate. GDP gowth rates during the 1996-2000 Five-year Plan period are estimated at 9-10%/year for the whole industry and 14-15%/year for the manufacturing industry. Long-term estimation of GDP growth rate (after the year 2000) is not available. It depends on the nation's policy for development of science, technology, human resources, and the acceleration of industrialization. The expansion of foreign investment as well as the JV company are also important factors. The international surrounding situation also affects GDP value. Through discussion with the governmental agencies and VSC, the GDP growth rate after 2000 is considered to be 8-9% p.a. during 2001-2005 and 7-8% p.a. during 2006-2010.

Table 1-5 GDP growth rate

(Unit: %/y)

Five-year Plan	Planned GDP growth rate		Actual GDP growth rate	
	Total GDP	Manufacturing Industry	Total GDP	Manufacturing Industry
1991-1995 Five-year Plan	5.5 - 6.5	7.5 - 8.5	8.2	13.3
1996-2000 Five-year Plan	9 - 10	14 – 15	-	-

Source: General statistical office

3.3 Steel demand growth rate

Average steel demand growth rate from 1993 to 1996 was about 16%/year as shown in Table 1-6.

Table 1-6 Steel demand growth rate

Year	Steel demand (1,000t)	Growth rate (%/y)
1993	820	-
1994	990	20
1995	1,100	11
1996	1,300	18
1993-1996 (av.)	-	about 16

3.4 Projection of steel demand

For projection of steel demand, two cases are taken:

1) Base case (most probable case)
Growth rate of steel consumption for 1996-2000 is assumed to be 16%/y on average, which is a little higher than the planned GDP growth rate for the manufacturing industry for the corresponding years (14%/y). This rate is same as the average steel demand growth rate for 1993-1996. After the year 2000, it is projected to be lower than those of the preceeding years and is assumed to be 12%/y on average from 2001 through 2005. When annual production quantity comes to a certain level, growth rate usually declines, and is assumed to be 9%/y on average in 2006-2010.

2) Optimistic case (maximum case)
In this case, average growth rates are set to be 10-25% higher than those of the Base case.

In Table 1-7 and Figure 1-5, the projection of steel demand up to 2010 for both cases are shown.

Table 1-7 Projection of steel demand up to 2010

Case	Average growth rate (%/y)			Steel demand (1,000t)			
	1996-2000	2001-2005	2006-2010	1996	2000	2005	2010
1) Base case	16	12	9	1,300	2,350	4,150	6,380
2) Optimistic case	20	15	10	1,300	2,700	5,200	8,340

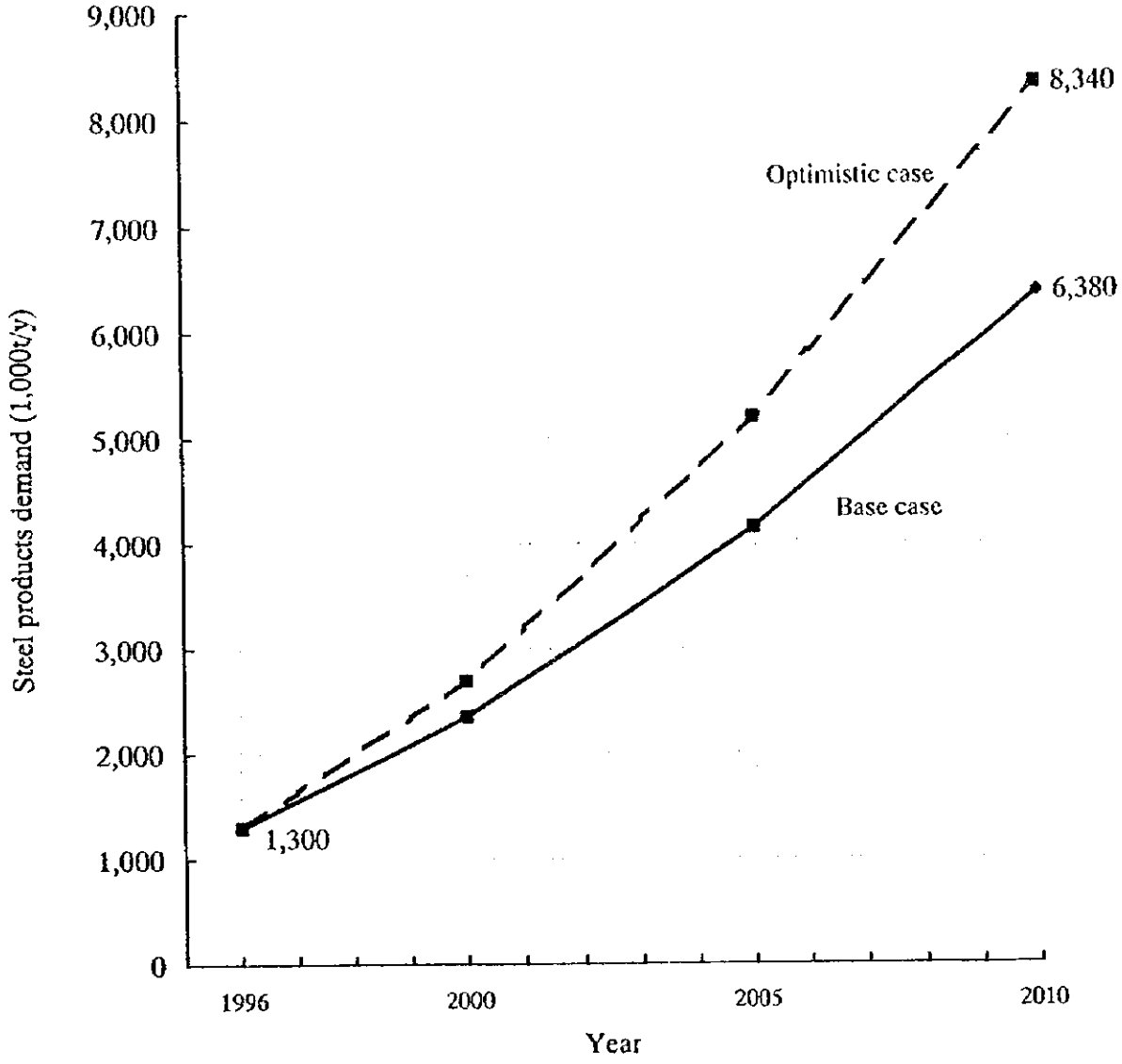


Figure 1-5 Projection of steel products demand

3.5 Projection of flat products quantity

With the modernization and industrialization of a country, the ratio of flat products demand to total steel demand of the country rises. In most industrialized countries including Thailand these ratios are ranging around 50 to 60%, and in Viet Nam it is assumed it will go up to 55% in 2010. In Table 1-8, the projection of flat products ratio and its quantity are summarized.

Table 1-8 Projection of flat products ratio and its quantity

Subject	1996	2000	2005	2010
Flat products ratio (%)	30	37	46	55
(1) Base case (1,000t)	390	870	1,910	3,510
(2) Optimistic case (1,000t)	390	1,000	2,390	4,590

3.6 Projection of ASC

Based on the above projection of steel demand, ASC/capita is estimated and summarized in Table 1-9.

Table 1-9 Projection of ASC/capita

Subject	1996	2000	2005	2010
Population (million) *	75.6	81.2	87.5	92.2
(1) Base case (kg/capita)	17	29	47	69
(2) Optimistic case (kg/capita)	17	33	59	90

* : Average population growth rate (Unit: %/y)
1996-2000 : 1.8
2001-2008 : from 1.7 to 1.0
2009-2010 : 1.0
Source: MPI