Construction Schedule

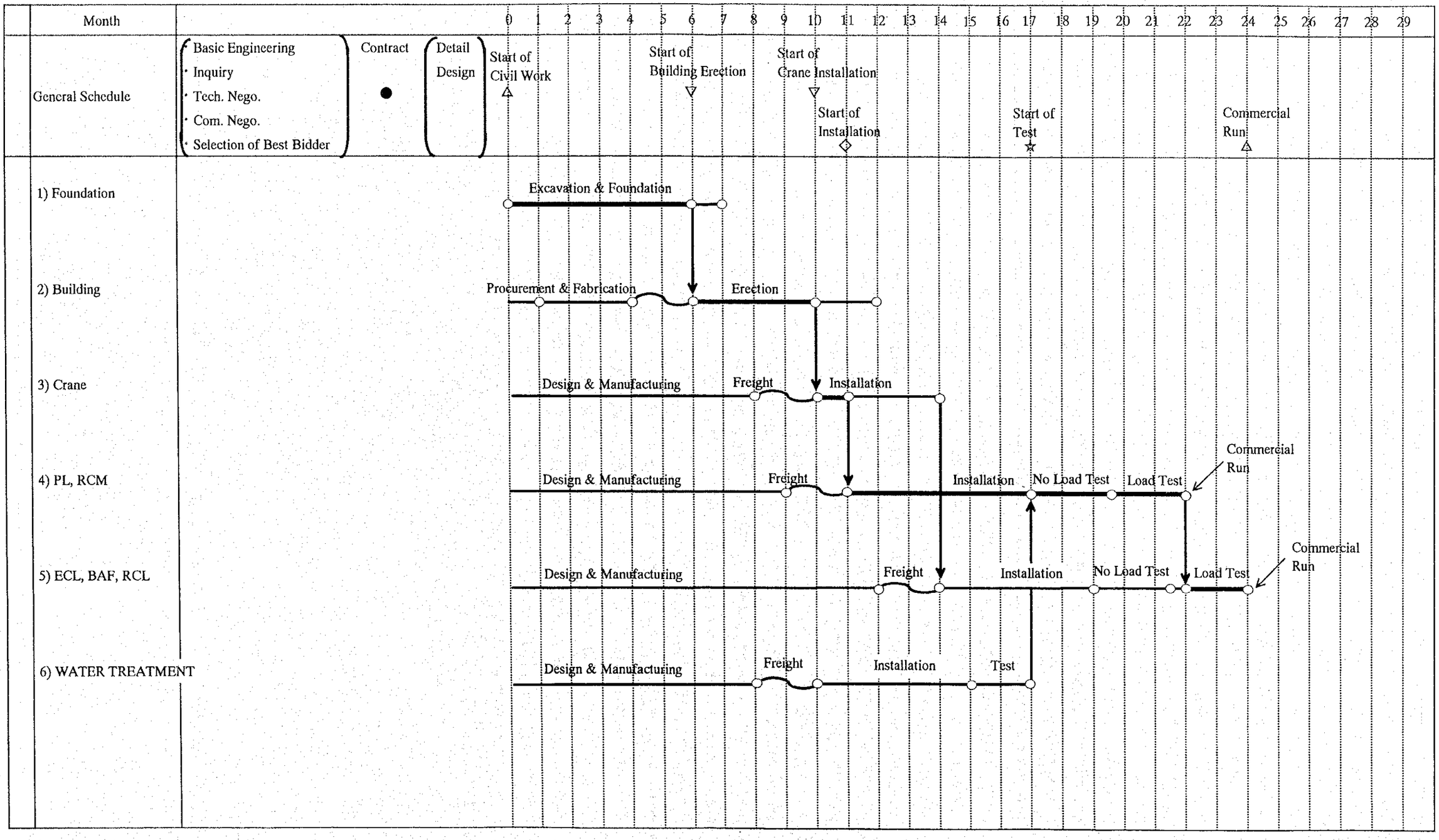


Fig. V - 9 - 1 Construction Schedule

10. Production Plan after Start-up

The production plan after start-up is made as follows. This plan is based on the recent example of the production increase after the start-up of the cold rolling mill complex with an approximately same production capacity.

1) For the first year after the commencement of commercial production, 60 % of the full capacity, namely 123,000 tons/year is to be realized.
2) For the second year, 90 % of the full capacity, namely 184,000 tons/year is to be realized.
3) For the third year, the full capacity, namely 205,000 tons/year is to be realized.

The production increase after the start-up is very much dependent on the workers as well as the equipment. As the planned cold rolling mill complex is the first mill in Viet Nam, the introduction of relevant technologies to staff and operators is a necessity for the realization of the above-mentioned schedule.

11. Construction Cost

11.1 Preconditions

The following principles are applied to the differentiation between the procurements for construction from overseas and that from domestic.

(1) The equipment is to be procured in principle from overseas with the exception of ;
   1) Steel fabrications such as simple tanks which can be manufactured with ease and decks to be attached to the equipment
   2) Power equipments such as high tension voltage panel which has been produced in Viet Nam.
(2) Construction work to be made by relevant companies in Viet Nam.
(3) Materials for construction work is to be procured from relevant companies in Viet Nam, if possible.

11.2 Standard for Cost Estimation

(1) Timing of cost estimation : July 2000
(2) Currency to be used for import : US dollar
    Currency to be used for domestic procurement : Viet Nam Dong (converted to US dollar)
(3) Exchange rate : 1 US dollar = 14,080 Viet Nam Dong

11.3 Cost for Construction

The required cost for the construction of the new cold rolling mill complex is shown in Table V-11-1. The cost for equipment and for civil and building work is estimated from the specifications and construction work volume studied in this FS with the result of the site surveys and the past similar examples taken into consideration.

The cost for inventory, pre-operational expense, contingency and engineering and technical assistance is estimated from the past similar examples. It should be noted that the cost for engineering and technical assistance varies quite a lot depending on the scope and manners of the contract. Refer to VI.1.3.1 for the estimated cost for the interest during the construction.

Table V-11-1 Cost for Construction

Items	Cost (Mil. US$)	Remarks
(1) Equipment	78.1	
①Production equipment, Ancillaries	57.9	Refer to V.2 for detail of the equipment
②Spare parts, SV	5.2	—
③Transportation, Insurance, Installation Work	15.0	—
(2)Civil and Building	22.2	Refer to V.5 for detail of the work
(3)Inventory	2.8	Initial cost for the procurement of consumable such as rolls
(4)Pre-operational expense	2.9	Cost required before the commercial production such as manning cost and operational expense for test run
(5)Contingency	2.4	—
(6) Engineering, Technical Assistance	5.6	—
(7) Interest during construction	11.8	Interest on the loan during construction
Total	125.8	(96.4 Mil. US$, 414.7 Bil. VND)

The equipment cost is estimated on the basis of international tender. However, there exists a possibility of further reduction in the equipment cost depending on the demand and supply conditions of equipment suppliers.

In addition to the above construction cost the working capital summing up to 2 million USD is to be prepared for the procurement of hot coils and consumable such as lubrications and packing materials and for the manning expense required at the initial stage of commercial operation. If the said working capital of 2 million UDS is prepared by loan, an interest of around 0.2 million USD would be borne.

Chapter VI Feasibility Study for New Cold Rolling Mill

1. Financial Analysis

1.1 Preconditions for Financial Calculation

1.1.1 Production and Sales Plan

Production and sales plan is shown in Table VI-1-1.

TableVI-1-1 Production and Sales Plan

(Unit:1000T)

Carender Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014-23
Project Year	1	2	3	4	5	6	7	8	9	10	11-20
Cold Rolled Coil	13	19	21	21	21	21	21	21	21	21	21
Conventional use	0	0	0	0	0	0	0	0	0	0	0
High class	13	19	21	21	21	21	21	21	21	21	21
GI substrate	110	165	184	184	184	184	184	184	184	184	184
Full Hard	72	108	120	120	120	120	120	120	120	120	120
Annealed	38	58	64	64	64	64	64	64	64	64	64
Total	123	184	205	205	205	205	205	205	205	205	205

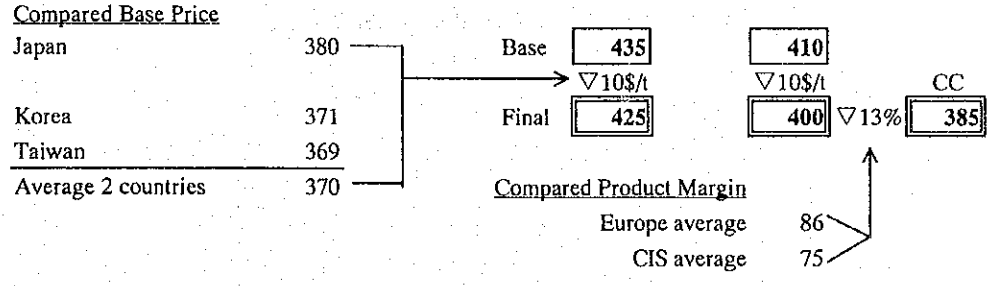
1.1.2 Sales Price of Products

The sales price of each category in Viet Nam is shown in Table VI-1-2.

TableVI-1-2 Sales Price on Each Size per 1ton

(Unit:$/t)

Size Mix	Price (a)	Product Composition(P/C) GH	GS	(b) GIS	(a×b)	P/C (c) CH	(a×c)
0.15mm≦T<0.17mm	470	3%		3%	15		
0.17mm≦T<0.20mm	455	12%		12%	54		
0.20mm≦T<0.30mm	445	32%	1%	33%	148		
0.30mm≦T<0.40mm	430	12%	13%	24%	104	4%	15
0.40mm≦T<0.60mm	410	6%	22%	28%	114	96%	395
Base Size(1.0mm)	380						
		65%	35%	100%	435	100%	410



1.1.3 Cost of Sales

(1) Material cost

The purchase price of hot coils is shown in Table VI-1-3.

TableVI-1-3 Material Price

(Unit:$/t)

Size Mix	Price (a)	P/C (b)	P/C (a×b)
1.2mm	303	0%	0
1.6mm	288	13%	38
1.8mm	288	34%	98
2.0mm	283	51%	143
3.2mm	282	2%	5
Base Size(5.0mm)	280		
		100%	285
		Base	285
			+5$/t
		Final	290

(2) Labor cost

The labor cost for each qualification is shown in TableVI-1-4.

TableVI-1-4 Labor Cost

	Labor Unit Cost (Unit:$/Year/Man)			Labor Total	Labor Cost
	Salaly or Wage	Welfare	(a)	(b)	(a×b)
General Manager	5,800	967	6,767	2	13,533
Manager	4,200	700	4,900	20	98,000
Engineer	3,300	550	3,850	8	30,800
Foreman	2,400	400	2,800	16	44,800
Skilled Worker	1,800	300	2,100	279	585,900
Unskilled Worker	1,200	200	1,400	75	105,000
Total				400	878,033

(3) Maintenance cost is estimated to be 0.75% of the total equipment cost .

(4) Land lease cost is 252,491US$ / year.

1.1.4 Timing and Amount of Total Demand of Funds

Timing and the amount of the total demand of funds are shown in TableVI-1-5.

TableVI-1-5 Timing of Fund Raising

(Unit:mil$)

	Total	2001	2002	2003	2004
Civil & Building	22.2	0.0	22.2	0.0	0.0
Equipments	78.1	6.4	39.6	27.8	4.3
Others	15.7	1.9	0.3	9.2	4.3
Interest	12.0	0.3	2.8	9.0	0.0
Total	128.0	8.6	64.8	45.9	8.6
		6.7%	50.6%	35.9%	6.8%

1.2 Results of Financial Analysis

1.2.1 Precondition of Financial Analysis

Based on each precondition, four cases (Base case and Alternatives 1,2 and 3) are studied for the purpose of financial analysis. These four cases are shown in Table VI-1-6.

TableVI-1-6 Preconditions for Financial Analysis

	Product Mix	Equity	Loan Capital					
			Loan Condition					Source of Fund Rasing
				Amount (mil.US$)	Rate	Loan period: Grace	Loan period: Repayment periods	Type of Repayment
〔 BASIC CONDITION 〕								
Base Case	Case1	None	L-T Loan	128.0	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	305.0	10.20%	-	1 year	Single	Refinance annually
Alternative1	Case1-1	None	L-T Loan	129.8	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	558.9	10.20%	-	1 year	Single	Refinance annually
Alternative2	Case1	None	L-T Loan	66.4	10.20%	3 years	10 years	Annuity	Equipment cost loaned in Buyer's Credit
				64.9	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	401.3	10.20%	-	1 year	Single	Refinance annually
Alternative2A	Case1	None	L-T Loan	47.4	10.45%	3 years	10 years	Equal inst.	Equipment cost loaned in Buyer's Credit
				86.9	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	485.2	10.20%	-	1 year	Single	Refinance annually
Alternative3	Case1	10million$	L-T Loan	116.3	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	127.3	10.20%	-	1 year	Single	Refinance annually
〔 OTHER CONDITION for IMPROVEMENT〕								
Alternative 3A	Case1	10million$	L-T Loan	116.3	7.50%	3 years	9 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	0.5	10.20%	-	1 year	Single	Refinance annually
Alternative 3B	Case1	30million$	L-T Loan	93.8	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
			S-T Loan	-	10.20%	-	1 year	Single	Refinance annually
Alternative 3C	Case1	10million$	L-T Loan	103.0	7.50%	3 years	7 years	Annuity	Total capital cost loaned in domestic funds
(10% cut of total investment cost)			S-T Loan	8.8	10.20%	-	1 year	Single	Refinance annually

1.2.2 Result of Calculation for Profit and Loss

The result of calculation of profit and loss for each case is shown in Table VI-1-7.

TableVI-1-7 Results of Profit & Loss Calculation

	Profit & Loss	
	Making profit firstly	Clearing camulative deficit
Base Case	6th project year	12th project year
Alternative 1	7th project year	15th project year
Alternative 2	6th project year	14th project year
Alternative 3	6th project year	11th project year

1.2.3 Financial Internal Rate of Return (FIRR) and Sensitivity Analysis

The result of financial internal rate of return is shown in Table VI-1-8, and the result of sensitivity analysis by changing the significant factors for the feasibility in Table VI-1-9.

TableVI-1-8 Results of Calculation of IRR

	IRR		Demand for funds in operation
	Before tax	After tax	
Base Case	10.78%	10.32%	Neccesary for refinacing short term loan annually from 1st project year to 12th project year
Alternative 1	9.42%	9.05%	Neccesary for refinacing short term loan annually from 1st project year to 15th project year
Alternative 2	10.46%	10.01%	Neccesary for refinacing short term loan annually from 1st project year to 14th project year
Alternative 3	10.95%	10.49%	Neccesary for refinacing short term loan annually from 1st project year to 10th project year

VI-1-9 Sensitivity Analysis

		-10%	-5%	Base Case	5%	10%
Duty	Base Case		7.49%	10.78%	13.69%	
	Alternative 1		5.77%	9.42%	12.59%	
	Alternative 2		7.21%	10.46%	13.34%	
	Alternative 3		7.64%	10.95%	13.88%	
Investment	Base Case	12.31%	11.52%	10.78%	10.10%	9.47%
	Alternative 1	10.88%	10.12%	9.42%	8.77%	8.16%
	Alternative 2	11.97%	11.18%	10.46%	9.78%	9.15%
	Alternative 3	12.49%	11.69%	10.95%	10.26%	9.62%
Sales Price	Base Case	8.77%	9.80%	10.78%	11.72%	12.64%
	Alternative 1	7.33%	8.40%	9.42%	10.40%	11.34%
	Alternative 2	8.47%	9.48%	10.46%	11.39%	12.30%
	Alternative 3	8.93%	9.96%	10.95%	11.90%	12.82%

(1) Feasibility study

1) Cost of capital = 7.5%×(1-0.25)×100% = 5.6%

2) Financial risk = Up-rate 2.5% by increase of interest rate up to 10%

2.5%×(1-0.25)×100% = 1.9%

3) Business risk 3-1) variation of IRR for 20% change of sales price = 0%～4.0%

3-2) variation of IRR for 10% change of total investment cost = 0%～1.5%

The value of the hurdle rate is assumed to be 7.5% to 13.0%, which is obtained by summing up the above 1), 2) and 3).

The values of IRR for all cases exceed the minimum value of 7.5%. On the other hand, the values of IRR for all cases do not exceed the maximum value of 13.0%. As a conclusion, this project can be considered feasible, but with a certain risk becoming unfeasible depending on the variation of conditions such as sales price and total investment cost.

(2) Situation of demand of funds

The situation of short term loan in operation is shown in Table VI-1-10.

Table VI-1-10 Comparison of Short Term Loan of Each Case

(Unit : Million$)

Calendar Year	Total	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019-23
Project Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-20
Base Case	305.0	2.3	5.3	11.1	18.0	25.5	33.9	43.1	51.6	48.8	36.9	22.3	6.2	0.0	0.0	0.0	0.0
Alternative 1	558.9	3.5	8.4	16.3	25.6	35.9	47.2	59.7	71.7	72.5	64.8	54.6	43.3	30.9	18.8	5.6	0.0
Alternative 2	401.3	3.9	5.9	10.7	16.5	22.9	29.9	37.7	46.2	53.9	53.5	50.0	36.7	23.8	9.6	0.0	0.0
Alternative 2A	485.2	8.4	13.6	20.5	28.3	36.4	44.7	53.5	61.0	63.2	57.6	45.7	31.3	17.9	3.2		0.0
Alternative 3	127.3	0.5	1.2	4.3	8.3	12.7	17.5	22.8	28.6	23.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0

It can be said as a conclusive remark of the economic analysis that conditions of fund raising are not satisfactory although there certainly exists the return on investment.

(3) Case study on other conditions

Three more cases which are studied to improve the situation of fund demand and supply are shown in Table VI-1-11. The flow of short term loan is shown in Table VI-1-12

TableVI-1-11 Case Study of Each Additional Case

	IRR		P/L (Project year)		Demand for fund in operation
	Before tax	After tax	Making profit firstly	Clearing cumulative deficit	
Alternative 3A	10.95%	10.38%	6th year	10th year	Equity capital is 10 mil.US$, and loan period is extended up to 12 years Short term loan is necessary in the first project year. After 2nd project year, funds from operation cover the demand for working capital and financial expense. Contents of fund raising Source of fund / Amount / Rate / Condition of loan Equity / 10 Mil.US$ / - / - L-T-loan / 116.3Mil.US$ / 7.50% / Grace 3years / Level payment for 9years S-T-loan / 0.5Mil.US$ / 10.20% / Only first project year
Alternative 3B	11.20%	10.41%	6th year	8th year	The equity capital is 30 mil.US$, and the loan period is for 10 years Short term loan for operation is not required. Contents of fund raising Source of fund / Amount / Rate / Condition of loan Equity / 30Mil.US$ / - / - L-T-loan / 93.8Mil.US$ / 7.50% / Grace 3years / Level payment for 7years S-T-loan / - / - / No loan
Alternative 3C	12.50%	11.74%	6th year	8th year	The loan period is 10 years, the equity capital is 10 mil.US$, and total investment is reduced by 10%. Only a small amount of short term loan for operation is required. Contents of fund raising Source of fund / Amount / Rate / Condition of loan Equity / 10Mil.US$ / - / - L-T-loan / 103Mil.US$ / 7.50% / Grace 3years / Level payment for 7years S-T-loan / 8.8Mil.US$ / 10.20% / 5th-8th project year

Table VI-1-12 Comparison of Short Term Loan for Additional Cases

(Unit : Million$)

Calendar Year	Total	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019-23
Project Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-20
Alternative 3A	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alternative 3B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alternative 3C	8.8	0.0	0.0	0.0	0.0	0.6	1.6	2.7	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

(4) Conclusion

It is necessary for the realization of this project to solve the following issues.

1) To make profits constantly
2) To keep balance of the fund demand and supply

To solve the above issues, "Alternative 3A" is highly recommended, in which the project becomes more feasible and realistic. At this case the fund except the equity capital is raised in domestic totally and the period of the repayment is 12 years. Accordingly, the following conditions are strongly recommended to be satisfied;

1) Increase of equity capital over 10 million $
2) Fund raising in domestic for investment (for example, Development funds) and the extension of the period of repayment from 10 years to 12 years
3) Realization of 5% import duty for cold rolled products

2. Economic analysis

2.1 Economic Internal Rate of Return (EIRR) and Sensitivity Analysis Are Shown in Table VI-2-1.

VI-2-1 Sensitivity Analysis

		-10%	-5%	Base Case	5%	10%
Investment	Base Case	9.36%	8.63%	7.96%	7.33%	6.75%
	Alternative 1	7.55%	6.86%	6.23%	5.64%	5.09%
	Alternative 2	9.04%	8.32%	7.66%	7.04%	6.46%
	Alternative 3	9.52%	8.78%	8.11%	7.48%	6.89%
Sales Price	Base Case	6.01%	7.01%	7.96%	8.86%	9.73%
	Alternative 1	4.17%	5.23%	6.23%	7.18%	8.09%
	Alternative 2	5.74%	6.72%	7.66%	8.55%	9.42%
	Alternative 3	6.16%	7.15%	8.11%	9.02%	9.90%

2.2 Impact of Project

(1) Saving foreign exchange.
This project contributes to save foreign exchange about 170 million US$.
(2) Creation of new employment
(3) Promotion of industrial development
(4) Promotion of regional development

2.3 Conclusion of Economic Analysis

This project has large value of investment even from the viewpoint of national economy.

3. Advice for Method of Fund Raising

3.1 Basic Idea of Selection for Concrete Plan

The method of fund raising is examined with an emphasis on the following three points.

Loan condition	Long terms of repayment and low interest rate
Realization	Realization of speedy fund raising
Vietnamese policy	Joint venture is not considered

3.2 Result of Study on Fund Raising

Result of study on each method of fund raising is shown in Table VI-3-1.

Table VI-3-1 Study for Method of Fund Raising

Method of fund raising	Concrete plan	Result of study	
		Total	Reason for selection
Introduction of foreign capital	Joint venture	×	Not studied according to the policy of Viet Nam
Fullness of domestic capital	VSC and / or other national facilities buy the stock of new mill	◎	Strong source of fund from specific stockholder
	Subsidy from national facilities	×	Unknown about subsidy for steel industry
Loan from international public banking facilities	Loan from World Bank Group, Asian Development Bank(ex. Using ODA)	×	Depends on governmental negotiation
Loan from export finance	Supplier's credit	△	Ambiguous due to the dependence on the negotiation
	Buyer's credit	○	Possible by sovereign guarantee
Loan from domestic banking facilities	Loan from Development funds in Viet Nam	◎	Preferable conditions compared to the fund raising in foreign countries
	Loan from Commercial bank	○	Possibility of Less interest rate, for example 7.5% per year.

3.2.1 Selection of Fund Raising Methods

The following three fund raising methods are considered as the possible ones in this feasibility study.

	Contents of fund raising	Reason for selection
Case1	All funds are raised in Viet Nam	Most profitable of all in the condition of loan and realization.
Case2	Funds for equipment are raised in buyer's credit. The others are raised in Viet Nam.	To study the fund raising from foreign countries.
Case3	10 mil.US$ is invested for equity capital. The remained is raised in Viet Nam.	To avoid the inadequate capital.

3.2.2 Advice for Fund Raising

(1) Investment to new mill by VSC and other governmental facilities

The fragile financial situation which is caused by the extremely large amount of loan is to be improved by equity from VSC and other governmental facilities. More than 10 million US$ as the equity capital for the new cold rolling mill is strongly recommended.

(2) Fund raising by using the governmental financial system and the commercial banking facilities in Viet Nam.

It is important that the government gives the first priority of development funds to this project, and secures the source of development funds considering the large amount of around 130 million US$ required. Furthermore, an extension of the loan period up to 12 years is strongly recommended.

Chapter VII Proposals for Environmental Countermeasures

1. Policy and Regulation with regard to Environmental Protection in Viet Nam

There are laws and standards with regard to the environmental protection and an Environmental Impact Assessment Rule in Viet Nam. Those standards cover almost all situations, but not completely. For example, " Acoustics Noise in Public and Residential Areas Maximum Permitted Noise Level" (TCVN5949-1995) does not include the standards of industrial zones. In those cases Japanese standards are applied in this study according to MOSTE' s instruction.

Although MOSTE has no concrete plan to change the Industrial Emission Standard of waste gas (TCVN5939-1995) in the near future, the total volume regulation is being considered, which may lead to a change of the standards. With regard to the Industrial Waste Water Discharge Standards (TCVN5945-1995), MOSTE has no concrete plan of alteration, but there is a possibility to increase parameters and substances. Those actions will make the environmental standards become complete.

According to the Circular No.490/1998/TT-BKHCNMT, the following documents should be submitted to MOSTE and DOSTE to get an approval of the project.

(A) Stage of Investment License Application
A part or a certain chapter of the Project documents must provide an initial description of the potential environmental impacts.

(B) Stage of design and construction
One of the following documents should be submitted to MOSTE and DOSTE to get an approval.

a) Environment Impact Assessment report (EIA report)
b) Application for registration for securing environmental standards

In case of the new cold rolling mill complex, " Application for registration for securing environmental standards" is required to be submitted to MOSTE and DOSTE.

2. Present Environmental Standards around Sites for New Cold Rolling Mill Complex

With regard to Emission Standards of Waste Gas, "B" standards of the Emission Standards (TCVN5939-1995) are applied to all the three industrial zones. (AMATA, Nhon Trach and Phu My Industrial Zone).

With regard to Waste Water Discharge Standards, AMATA Industrial Zone has its own standards. "B" standards of TCVN5945-1995 are applied to Nhon Trach and "C" standards to Phu My Industrial Zone.

The waste water from AMATA Industrial Zone is discharged to Dong Nai River, the water of which is used as sources of domestic water supply for HCM city. Accordingly, the waste water from AMATA Industrial Zone should comply with "A" standards, which are the most strict in TCVN5945-1995. As AMATA Industrial Zone has the final treatment plant for the waste water, the standards of discharge water from each factory might be eased from "A" standards. However, "A" standards are applied to almost all the items even inside AMATA Industrial Zone.

The waste water from Nhon Trach Industrial Zone is discharged to Dong Tranh River, the water of which is not used as sources of domestic water supply. The industrial zone does not have a final treatment plant for waste water, so that "B" standards in TCVN5945-1995 are to be applied. There exists a plan to construct a final treatment plant for the waste water in the near future, and the standards might be eased after the installation.

The waste water from Phu My Industrial Zone is discharged to Thi Vai River, the water of which is not used as sources of domestic water supply. In addition, Phu My Industrial Zone has a plan to install a final treatment plant for waste water. Accordingly, "C" standards in TCVN5945-1995 are applied.

Phu My Industrial Zone is located about 20 km near to the sea compared to Nhon Trach Industrial Zone. In case the water of Dong Tranh River and Thi Vai River are used as sources of domestic water supply, Phu My Industrial Zone has less possibility to be affected by the tightened standards than Nhon Trach Industrial Zone.

With regard to Noise Standards, in Viet Nam there are no standards for industrial zones at present. According to MOSTE's instruction, Japanese standards for industrial zones are to be used for this FS.

With regard to generated substances, measures in each industrial zone are not so different. However, one point should be noted, Vina Kyoei, which is located in Phu My Industrial Zone, has a plan to install an Electric Arc Furnace (EAF). After the installation of EAF, the scale and sludge from the new cold rolling mill might be recycled as the raw materials for the EAF.

With regard to waste acid, there is a company in HCM city which performs the treatment. However, this company is considered to be inappropriate to treat the waste acid from the new cold rolling mill complex due to its treatment method and treatment capacity. Accordingly, Acid Regeneration Plant, ARP is required to be installed beside the pickling line.

3. Environmental Impact on Phu My Industrial Zone

3.1 Environmental Standards

Ambient air quality described in TCVN5937-1995 should be followed. In addition, permitted concentration of HCl is to be less than 5 PPM according to Japan Industrial Health Academy recommendation. " B" standard of the Surface Water Quality Standards (TCVN5942-1995) has to be applied to Thi Vai River. Noise limit for industrial zones in Japanese Noise Control Law is applied.

3.2 Present Environmental Condition of Phu My Industrial Zone

With regard to the present air quality, the dust (suspended particulate matter), CO and ozone are to be strictly controlled. However, those are the items which are not affected by the construction of new cold rolling mill complex. Accordingly, those items except the dust are not studied in this report but have to be investigated more deeply later.

With regard to the present water quality, the value of the mineral oil and fat is over the standard value. The reason for the over limit has to be investigated immediately and the countermeasure has to be executed.

The value of mercury is not so accurate for evaluation, and it has to be measured more accurately again. The construction of the new cold rolling mill complex will by no means affect the value of mercury, so that the detailed study is not required in this report.

The new cold rolling mill complex is to be designed to match the Industrial Waste Water Discharge Standards of TCVN5945-1995. In addition, Phu My Industrial Zone has a plan to install a final treatment plant for the waste water. Accordingly, the construction of the new cold rolling mill complex will not be the cause of water pollution of Thi Vai River.

With regard to noise level, the maximum noise level is 46 dB(A), which is considered to be a very low level. Accordingly, the noise simulation was made without those results measured.

3.3 Environmental Impact Simulation after the Construction of New Cold Rolling Mill Complex

At Phu My Industrial Zone the waste water from all the factories in the industrial zone is to be treated at the final treatment plant, so that the environmental impact simulation of water was not executed.

According to the result of the air quality simulation, the annual average concentration and the one-hour concentration of NO_2, SO_2 and HCl are less than the standard values. However, those of suspended particulate matter(SPM) exceed the standard values, since the SPM background concentration (0.33 mg/m^3) already exceeds the standard value by itself. The contribution ratio by new cold rolling mill complex, however, is 0.3% for the annual average concentration, and is 3 to 4 % for one-hour concentrations for both the most frequent weather condition and the highest concentration condition, thus it is considered that the impact on the air environment of the surrounding area is limited.

According to the result of noise level simulation, if ARP exhaust gas fan is placed close to the site boundary (Original Layout : Case 1), the maximum noise level is estimated to be 65.1dB(A) on the southern boundary, thus exceeding the regulated value of 65dB(A). On the other hand, if ARP exhaust gas fan is placed away from the site boundary (Case 2), the maximum is estimated to be 64.1dB(A) on the southern boundary, thus falling below the regulated value. Accordingly, Case 2 is recommended.

4. Proposals for Environmental Countermeasures

The new cold rolling mill complex is considered not to affect the surrounding environment much. When the new cold rolling mill complex is constructed, the following points and comments are recommended to be confirmed from an environmental point of view ;

4.1 Air quality

According to the results of the air quality simulation, the annual average concentration and one-hour concentration of NO_2, SO_2 and HCl are less than the standard values. On the other hand, those of the suspended particulate matter exceed the standard values and this is simply because the background concentration already exceeds the standard value by itself (0.33 mg/m^3). The contribution ratio by the new cold rolling mill complex is 0.3% for the annual average concentration, and 3 to 4 % for one-hour concentrations for both the most frequent weather condition and the highest concentration condition. Thus it is considered that the impact on the air environment of the surrounding area is limited. The present condition of the suspended particle matter, namely the excessive amount of the suspended particle matter has to be investigated before the construction of the new cold rolling mill complex.

According to the results of the investigation on air quality in Phu My Industrial Zone, it seems appropriate for CO and ozone to be investigated deeply although the construction of the new cold rolling mill complex by no means affects them.

4.2 Water Quality

Phu My Industrial Zone has a plan to install a final treatment plant for the waste water, and " C" standards of TCVN5945-1995 are applied. Accordingly, the new cold rolling mill complex is to be designed to satisfy " C" standards first. Furthermore, the capacity and specification of the final treatment plant for waste water is to be designed to meet " B" standards of TCVN5945-1995.

According to the results of the water quality of Thi Vai River, it seems appropriate for the mercury and the mineral oil and fat to be investigated deeply although the construction of the new cold rolling mill complex by no means affects them.

4.3 Noise

According to the results of noise simulation, the maximum noise level of the original layout of the new cold rolling mill complex exceeds the limit value. The most strict point is south boundary near the ARP, and the original layout seems to require some alteration. One of the possible countermeasures is to remove the ARP fan as far as possible from the south site boundary.

4.4 Others

When Vina Kyoei, which is located in Phu My Industrial Zone, installs an EAF, the scale and sludge from the new cold rolling mill complex can be recycled as the raw materials for the EAF.

With regard to the waste acid, there is a company in HCM city which performs the treatment. After the necessary investigation, however, it has been found that the company is not appropriate for the treatment of the waste acid from the new cold rolling mill complex due to its treatment method and treatment capacity. Accordingly, the outside company shall not be used and Acid Regeneration Plant, ARP is required to be installed beside the Pickling Line.

Chapter VIII Technical Evaluation of Sites for Construction of New Cold Rolling Mill

1. Summary

BIEN HOA2 was excluded from the candidate sites by the result of VSC' s preliminary site survey. This is because BIEN HOA2 does not have enough land space for the planned new cold rolling mill complex. Accordingly, the survey was executed in three candidate, namely AMATA, NHON TRACH and PHU MY.

(1) Survey schedule
   1) AMATA Industrial Zone : March 8,2000
   2) NHON TRACH Industrial Zone : March 9,2000
   3) PHU MY Industrial Zone : March 10,2000

(2) Survey items
   1) Soil conditions (elevation, boring data)
   2) Infrastructure (electric power supply, water supply, fuel gas, tele-communication, water treatment)
   3) Port (draft, length of berth, loading facilities)
   4) Environmental issues (sewage disposal standards, emission standards, noise level)

(3) Criteria for site selection
   1) Site area : more than10 hr (100,000 m^2)
   2) Water supply : more than 140 m^3/hr
   3) Electric power supply : more than 15 MVA

(4) Evaluation results of construction sites (as shown in Table VIII-1-1)

1) All of three candidate sites have no fatal problems for the planned new cold rolling mill complex because all of them satisfy the above-mentioned criteria and they sufficiently meet the conditions of other evaluation items(soil condition, environmental issues) .

2) Compared to AMATA and NHON TRACH, PHU MY has the following advantages and disadvantage;

[Advantage]
   ① Near the PHU MY port
   ② Lower transportation cost of hot rolled coils
   ③ Suitable for heavy industry
   A large power plant, natural gas station and VINA KYOEI are in operation in PHU MY.
   On the other hand, existing companies in AMATA and NHON TRACH are almost those of light industries.
   ④ High expandability.

[Disadvantage]

① Relatively remote from customers

3) Although PHU MY is located a little far from the customers, the difference is about 30 km and is not a fatal disadvantage compared to AMATA and NHON TRACH. Accordingly, PHU MY is recommended as the best site for the new cold rolling mill complex.

Table VIII-1-1 Results of Site Survey

Item \ Name of site		AMATA	PHU MY	NHON TRACH
1. The proposed criteria				
1.1 Site area		More than 10ha (100,000m²) A	More than 10ha (100,000m²) A	More than 10ha (100,000m²) A
1.2 Water supply volume		More than 140m³/hr A	More than 140m³/hr A	More than 140m³/hr A
1.3 Electricity from outside network		More than 15MVA available A	More than 15MVA available A	More than 15MVA available A
A : Satisfies criteria, B : Uncertain, subject to further information, C : Not satisfies criteria				
2.1 Site condition	2.1.1 Location	Bien Hoa City, Dong Nai province. ·to HO CHI MINH City : 30km ·to PHU MY Port : 40km ·to GO DAU Port : 37km	Phu My new urban area, Ba ria-Vung tau province. ·to HO CHI MINH City : 68km ·to PHU MY Port : 1.5km ·to GO DAU Port : 10km	New Nhon Trach City, Dong Nai province ·to HO CHI MINH City : 60km ·to PHU MY Port : 22km ·to GO DAU Port : 15km
	2.1.2 Elevation	EL=+31m～+47m	EL=+6～+10m	EL=+28m
	2.1.3 Soil condition	This area provides 11 boreholes. Rough description is as follows: ① 1st layer is clayey sand, thickness(T) is 5m, N value is 6～8. ② 2nd layer is sandy clay, T=7m, N=10～20. ③ 3rd layer is sand, T=5m, N=18～19. ④ 4th layer is clay, T=3m, N>50. There is a possibility for spread foundation (without pile), because lower level is good bearing layer.	According to boring data No.111, No.122 which are near the candidate site, rough description is as follows: ① 1st layer is clay, thickness(T) is 2m, N value is 6. ② 2nd layer is clay, T=5m, N=24. ③ 3rd and 4th layer is sandy clay with gravel, T=29 m, N=19～24. There is a possibility for spread foundation (without pile), because lower level is good bearing layer. Neighboring factory Vina-Kyoei has been constructed without pile.	According to boring data of SIKA factory area, at the center of Industrial Zone, rough description is as follows: ① 1st layer is sandy clay, thickness(T) is 3m, N value is 8. ② 2nd layer is clay with gravel, T=7m, N=27～28. ③ 3rd layer is clayey sand, T=3m, N=20. ① 4th layer is clay, T=7m, N=17～18. There is a possibility for spread foundation (without pile), because lower level is good bearing layer.
	2.1.4 Other		Under construction, candidate site at present is a wood land.	Candidate site at present is a wood land.
2.2 Water supply	2.2.1 Actual state	Supply capacity is 2000m³/day obtained from well in the IZ.	Supply capacity is 2,000 m³/day obtained from well, 3km from the IZ.	Supply capacity is 8,000m³/day obtained from well in the IZ.

Item \ Name of site		AMATA	PHU MY	NHON TRACH
	2.2.2 Future plan	More than 3000m³/day of water volume will be supplied from Water department of Dong Nai province with actual capacity of 15000m³/day as water consumption increases in the IZ.	Water supply capacity will be increased to 10,000 m³/day in the first stage and 20,000 m³/day in the second stage in accordance with increase of water consumption in the IZ.	Supply capacity will be increased to 60000m³/day in the development plan
2.3 Electric power supply	2.3.1 Actual state	110kV power is received from Long Binh substation with 2 lines. 1 set of 40MVA transformer and 6.5MW on-site generator (AMATA power) operates to distribute power to the IZ at 22Kv	110kV power is received from Phu My power plant at Phu My 1-A power station with 2 set of 40MVA transformers which operates to distribute power to the IZ at 22kV.	110kV power is received from Phu My power station and Long Binh substation . 1 set of 40MVA and 16MVA transformer operates to distribute power to the IZ at 22kV
		110kV power receiving is required in cold rolling because of large volume of power consumption and big power fluctuation. Power supply capacity at each candidate IZ : - Long Binh SS is 375MVA - Phu My PP is 500MVA		
	2.3.2 Future plan	1 set of the same capacity of transformer will be added. 120MW in total capacity of generators (AMATA power) will be planned.	220kV power will be able to be supplied from Phu My power plant. 1 set of 63MVA transformer will be installed (Phu My 1-B power station) by the year 2005 to distribute 22kV power to the IZ. 20MW generator in 1st stage will be put into operation by 2001 and 80MW in total capacity at final stage will be planned on BOT system in the IZ.	New substation, named Long Thanh substation, with 220kV power receiving from Long Binh substation, and Ham Thuan hydro power and Phu My power plant will be installed in the IZ. 2 sets of 250 MVA transformers in the substation to step down 220kV power to 110kV to interconnect the existing substation are planned.
2.4 Fuel gas	2.4.1 Actual state	LPG and Heavy oil as fuel will be procured by the Project owner.	LPG and Heavy oil as fuel will be procured by other Project owner. As an alternative plan, fuel will be supplied from existing gas station installed in the IZ.	LPG and Heavy oil as fuel will be procured by other Project owner. As an alternative plan, existing gas pipe line installed along national road of route 51, 4km far from the IZ, may supply fuel.
	2.4.2 Future plan	Not received	Not received	Not received
2.5 Tele-communi-cation	Capacity (lines)	1200	Concrete data were not received. But capacity of the existing exchange is expected to have no problem	500
	In current use(lines)	60		200

Item \ Name of site			AMATA	PHU MY	NHON TRACH
2.6 Port			Useful ports are as follows: ① Phu My port (40km) ② Go Dau port (37km) Sai gon port (32km)	Useful ports are as follows: ① Phu My port (1.5km) ② Go Dau port (10km)	Useful ports are as follows: ① Phu My port (22km) ② Go Dau port (15km)
			○Summary of port specification ① Phu My port: <draft> 12～13m; <Max DWT> 60,000t; <length of berth> 300m; <loading facilities> None ② Go Dau port: <draft> 6.5～10.5m; <Max DWT> 12,000t; <length of berth> 120m; <loading facilities> None ③ Sai gon port: <draft> 8.5～13m; <Max DWT> 25,000～35,000t; <length of berth> 132～207m; <loading facilities> 5～100tCr		
2.7 Waste water treatment	2.7.1 Actual state		1,000 m^3/day	-	-
	2.7.2 Near Future plan		4,000 m^3/day	-	4,000 m^3/day (June 2000)
	2.7.3 Future plan		In accordance with demand	18,000 m^3/day (2002)	12,000 m^3/day
2.8 Environ-mental issue	2.8.1 Waste water		① Discharging to the Dong Nai River which is used for sources of domestic water supply for HCM city. ② Discharge standards are almost the same as Vietnam standard "A", the most strict one.	① Discharging to the Dong Tranh River which is <u>not</u> used for sources of domestic water supply. ② Discharge standards 1)Vietnam standard "C" : From CRM to waste water treatment plant in the IZ 2)Vietnam standard "B": To the Dong Tranh River after treatment ③ Discharging point to the Dong Tranh River is more downstream side than Nhon Trach IZ. Namely there is less chance to be used for domestic water.	① Discharging to the Dong Tranh River which is <u>not</u> used for sources of domestic water supply. ② Discharge standards are the same as Vietnam standard "B". ③ Discharging point to the Dong Tranh River is more upstream side than Phu My IZ. Namely there is more chance to be used for domestic water.
	2.8.2 Waste gas		Should follow AMATA emission standards, middle position between "A" and "B".	Might follow Vietnam emission standards "B" for new plants. It needs to be confirmed again.	
	2.8.3 Noise		There is no noise standards for IZs in Vietnam standards. So should follow certain foreign standards for IZs, for example Japanese standards.		
	2.8.4 Landfill disposal area	Actual	Not exist	Not exist	Exist
		Future	Possible	Possible	Possible

Item \ Name of site		AMATA	PHU MY	NHON TRACH
	2.8.5 Incineration plant	Use out-side company		
	2.8.6 Scale, sludge treatment	No plan	There is a plan. Vina-Kyoei has a plan of EAF.	No plan
	2.8.7 Application for the Project	The Project belongs to the category 1 in the Circular No.490/1998/TT-BKHCMT. But the "Environmental Impact Assessment Report" is not required, because those IZ have been approved by MOSTE. Only the "Application for Registration for Securing Environment Standards" is required.		

< Results >

1. There is no significant problem in 3 candidate sites.

However,

2. There are some advantages in Phu My.
   * Near the Phu My port.
   *Lower transportation cost of hot rolled coils.
   * Suitable for heavy industry.
   A large power plant, a natural gas station and Vina Kyoei have been in operation in Phu My.
   On the other hand, existing companies in Amata and Nhon Trach are almost those of light industries.
   *High expandability.

Chapter IX Preliminary Study on Construction of New Hot Rolling Mill

1. Site Selection for Construction of New Hot Rolling Mill

The result of the comparison of sites for the hot rolling plant is shown in Table IX-1-1. Based on the comparison of port facilities, distance to the major customers and availability of utilities, Phu My and the site adjacent to the cold rolling mill complex is recommended for the site of the construction of the new hot rolling mill.

Table IX-1-1 Comparison of Sites for HSM Plant Area

	South (Phu My)	Central	North
Port Facilities	◎ Berth for maximum 60,000 tons vessel	× No large port at the present	△ Berth for only 5,000 to 6,000 tons vessel
Distance to Major Customers	◎	△	×
Utilities	◎	(no information)	(no information)
Total	◎	△	○

◎ : Excellent ○ : Good △ : Satisfactory × : Poor

In addition, when the hot rolling mill is constructed adjacent to the planned cold rolling mill complex, the following advantages are expected ;

1) Sufficient information exchange with the cold rolling mill can be made, and this enables the mill to accelerate the quality improvement.
2) Improvement of technical knowledge and know-how of technical staffs can be made by having technical discussions with the staff of cold rolling mill.
3) Maintenance work both for hot rolling mill and for cold rolling mill can be made by one department, resulting in the reduction of the workers.
4) Inventories such as bearings can be used by both mills.
5) Machines and/or devices for maintenance can be used by both mills.
6) Machines and/or devices for chemical analysis and inspection of products can be used by both mills.

2. Product Mix, Production Capacity and Required Quality

2.1 Product Mix

2.1.1 Product Mix

The kind of products which are expected to be produced in the planned hot rolling mill is shown in Table IX-2-1.

Table IX-2-1 Kind of Products

Kind of Products	Remarks
Hot coil for cold rolling mill	Totally for new cold rolling mill for the present
Hot coil for general use	Low and middle carbon steel, high strength steel (TS= 500 N/mm^3 class), low alloy steel, For pipe and section, general use and so on.
Heavy plate	To be manufactured without coiling For ship building, etc.

2.1.2 Product Size

1) Product Width: The maximum width determined to be five feet ranging from 600 mm to 1,600 mm.
2) Product Thickness: 1.5 mm to 12.7 mm for coils
   maximum 32mm for heavy plate
3) Maximum Coil Weight: 29 tons

2.2 Production Capacity

2.2.1 Production Capacity

The production capacity is shown in Table IX-2-2.

Fig. IX-2-2 Planned Production Capacity

	Annual Production Capacity	Ratio of Heavy Plate	For Cold Rolling Mill
Step 1	800,000-1,000,000 tons/year	10%	217 ,000 tons/year
Step 2	1,200,000-1,500,000 tons/year	10%	500,000 tons/year (after expansion of CRM)

The production capacity based on the slabs consumed is 1,050,000 tons/year and 1,567,000 tons/year for Step 1 and Step 2 respectively by the study of the material flows.

2.2.2 Working Ratio

Working hours and scheduled maintenance time are shown in Table IX-2-3.

Table IX-2-3 Working Hours

Item	Time (hours/year)	Remarks
Calendar hours	8,760	24 hours/day×365 days/year
Scheduled Maintenance 1) Annual Maintenance 2) Periodical Maintenance	552 (240) (312)	1)+2) 24 hours/day×10 days/year 12 hours/time×26 times/year
Hours for Operation	8,208	
Actual Operating Hours	6,977	Availability 85% assumed

2.2.3 Production Efficiency

The required production efficiency which are calculated is shown in Table IX-2-4.

Table IX-2-4 Required Production Efficiency

	Production Quantity (Slab basis)	Required Time (hours)	Efficiency
Step 1	Heavy plate : 111,000 tons/year	1,100	100 ton/hr
	Hot rolled coil : 939,000 tons/year	5,867 (=6,977−1,100)	160 ton/hr
Step 2	Heavy plate : 166,000 tons/year	1,660	100 ton/hr
	Hot rolled coil : 1,401,000 tons year	5,317 (=6,977−1,660)	263 ton/hr

2.3 Required Quality for Hot Rolled Product

In this FS the target figures of quality items for operation in the mills which export the hot rolled products to international markets are shown as an example in Table IX-2-5. These figures are to be used for studying the equipment and functions of the hot rolling mill.

Table IX-2-5 Example of Required Quality of Hot Coil

Item	Operating target level
Thickness Accuracy	Within ±0.03 mm
Width Accuracy	Target width ±5 mm
Temperature Accuracy	Within ±20℃
Crown at 25 mm Position from the Coil Edge	Within ±0.03 mm
Flatness	30 I- unit

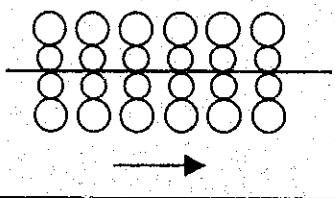
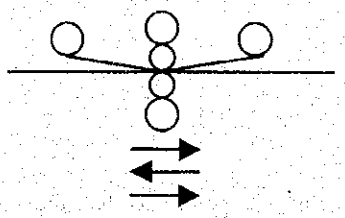
3. Comparison and Technical Evaluation of Hot Rolling Processes and Specifications of Major Equipment

3.1 Comparison and Technical Evaluation of Hot Rolling Processes

3.1.1 Finishing Mill Type

The comparison of finishing mill type is shown in Table IX-3-1. From the viewpoints of production capacity and quality, the conventional type is adopted in this FS.

Table IX-3-1 Comparison of Finishing Mill Type

	Conventional type	Steckel mill type
Schematic image		
Annual production capacity	maximum 3,000,000 to 4,000,000 tons	300,000 to 400,000 tons for one stand 600,000 to 800,000 tons for two stands
Quality Temperature Thickness Surface	 ◎ ◎ ◎	 △ ◎ △
Major Products	Normal steel, special steel	Stainless steel, special steel
Investment cost	Large	Small

◎ : Excellent ○ : Good △ : Poor

3.1.2 Roughing Mill Type

The comparison of three mill types is shown in Table IX-3-2.

The coil box type mill is recommended as this satisfies all the factors such as production capacity, low initial investment cost and stability of operation and quality.

Table IX-3-2 Comparison of Roughing Mill Type

	Semi-continuous Type	Coil Box Mill Type	Three Quarter Mill Type
Annual Production Capacity	800,000 to 3,000,000 tons	800,000 to 3,000,000 tons	3,000,000 to 5,000,000 tons
Rolling at Finishing Mill	Accelerated rolling	Rolling with constant speed	Accelerated rolling
Quality	Possible disturbance due to acceleration	Little disturbance due to no acceleration	Possible disturbance due to acceleration
Line Length	Medium	Short	Long
Initial Investment Cost	(base)	same as semi-continuous	+ 150 - 300 million

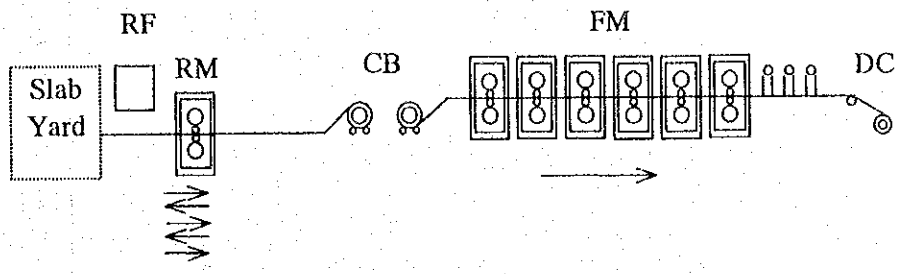


Fig.IX-3-1 Schematic Drawing of Roughing Mill

3.1.3 Process for Heavy Plate Production

The type which the plate is discharged from delivery side of down coiler is recommended from the viewpoint of quality and productivity.

3.2 Specifications of Main Equipment

3.2.1 Configuration of Hot Rolling Mill

The configuration of the hot rolling mill is shown in Table IX-3-3.

Table IX-3-3 Configuration of Hot Rolling Mill

	Step 1	Step 2
Slab Yard	Area for slab stock of 30day operation	Area for slab stock of 30 day operation
Reheating Furnace	1	2
Roughing Mill	1 stand	1 stand
Coil Box	1	1
Finishing Mill	6 stands	6 stands
Down Coiler	1	1
Roll Shop	2 roll grinders	3 roll grinders

3.2.2 Configuration of Hot Finishing Facilities

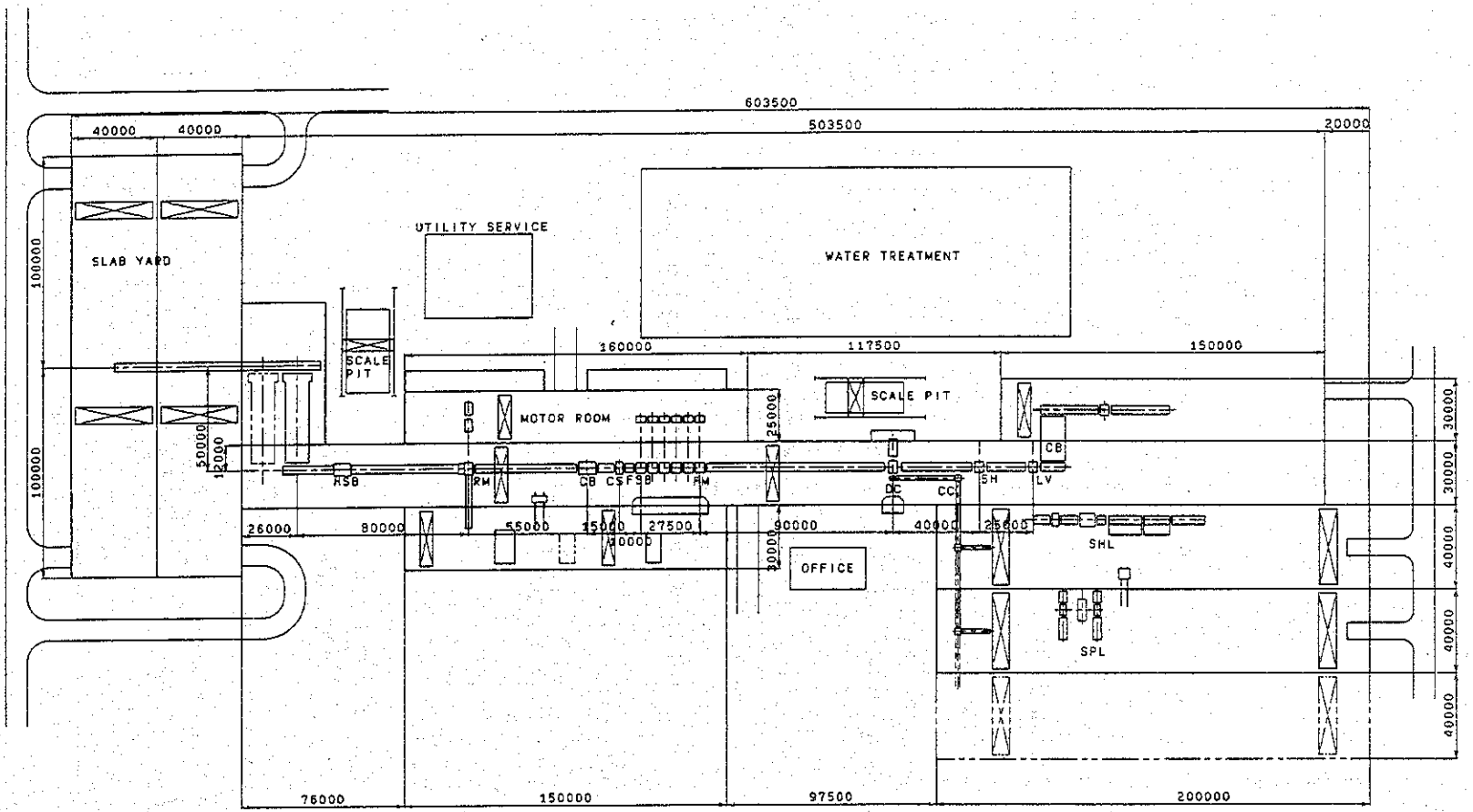
The configuration of the hot finishing facilities is shown in Table IX-3-4.

Table IX-3-4 Configuration of Hot Finishing Facilities

	Quantity	Capacity	Thickness Range
Hot Skinpass Line	1	700,000 tons/y	1.5 - 6 mm
Hot Shear Line	1	300,000 tons/y	1.5 - 13 mm
Heavy plate line	1	150,000 tons/y	9 - 32 mm

4. Layout

The layout of hot rolling mill plant is shown in Fig. IX-4-1.



CLIENT	New Hot Strip Mill
TITLE	General layout

図 IX-4-1 Layout of Hot Rolling Mill Plant

5. Construction Schedule and Construction Cost

5.1 Construction Schedule

The rough construction period is planned to be 29 months that covers the period from the commencement of civil work to the start-up of the hot rolling mill.

5.2 Construction Cost

The rough estimation of construction cost of the hot rolling mill complex is shown in Table IX-5-1. The following preconditions are used for this estimation ;

1) The equipment is to be purchased and imported in principle from overseas. Some equipment is to be manufactured in Viet Nam depending on the availability.
2) Civil work, erection and installation are to be done by the contractors in Viet Nam. However, some portion of construction materials is to be imported.

Table IV-5-1 Rough Estimation of Construction Cost

Item	Cost (mil. US$)	Remarks
(1)Equipment	230	including installation and SV
(2)Civil and building	40	
(3)Inventory	9	
(4)Pre-operational expense	8	
(4)Contingency	10	
(5)Engineering and technical assistance	9	
Total	306	

Note : Interest during construction is excluded

Note : Cost for Step 2 is excluded