Chapter 6. FACILITY PLAN

This chapter describes the facilities, which are required for the start-up of the flat product plant in 2005 (1st stage) and of which annual production capacity is one million tons as shown in section 5-1.

6-1 Direct Reduction Plant

(1) Outline

The direct reduction plant (DRP) for the flat product plant is to adopt the MIDREX Megamod® of gas based direct reduction plant. Production capacity of the DRP is 1,000,000 ton of direct reduced iron per year and expected total Fe content of the product is 90-94 wt %.

(2) Basic design

The design base of the raw materials for DRP is 1.5 tons of iron ores feed mixture of lump ore and oxide pellet for 1 ton of production. Typical standard mixing ratio of lump ore and oxide pellet is 20-30 wt % and 80-70 wt %, respectively.
Expected utility consumption (per ton of product) based on the MIDREX Megamod® plant is as follows:

1) Natural gas:	2.5 Gcal(LHV)
2) Electricity:	125 kWh
3) Water:	1.5 m^3

(3) Production plan

Standard annual operation hours of the MIDREX DRP is 7,500 - 8,000 hours. Rated production capacity is 1,000,000 tons of direct reduced iron based on 7,500 hours operation per year. However, estimated production capacity of the 1st and the 2nd year from the initial start-up will be 70 % and 90 % of the rated capacity, respectively.

(4) Plant description

The DRP comprises of the process systems such as reduction system, reforming system, process gas system, heat recovery system and seal gas and purge gas system, and utility systems.
General layout of the DRP is given in Figure 6-1-1 attached hereinafter.

(5) General layout

Refer to Figure 6-1-1.

6-2 Steelmaking Plant

The steelmaking plant (SMP) consists of one 160 t electric arc furnace, one 160 t ladle furnace, one strand continuous casting machine and auxiliary facilities to produce slab for flat products.

1) Production:
   Molten steel : 1,026,000 t/y = 160 t/heat x 310 d/y x 20.7 heat/d
   Slab : 1,000,000 t/y = 1,026,000 t/y x 97.5 %
2) Products: Slab of 210 mm thickness x 800 - 1,600 mm width x 5,000 - 10,900 mm length x 28.0 t weight
3) Facilities:
   Electric arc furnace (EAF)
   Type and numbers : DC (Direct Current) type x 1
   Capacity : 160 t with 20 t of hot heel
   Transformer : 133 MVA
   Raw materials : DRI/scrap ratio = 86.3/13.7
   Tap-to-tap time : 70 min.
   Ladle furnace (LF)
   Type and numbers : AC (Alternating Current) type x 1
   Ladle capacity : 160 t
   Operation time : 20 - 40 min.
   Slab continuous casting machine (SL-CCM)
   Type and numbers: Vertical progressive bending type of one strand with multi-point unbending x 1
   Casting speed : Max. 2.0 m/min., average 1.4 m/min.
   Casting time : 57 min.
   Other
   Handling facilities
   Fume extraction facilities
   Cranes
   Electrical equipment, computer system and instruments
4) Operating shift: Three shifts operation by four crews
5) Personnel : 233

6) General layout : Figure 6-2-1

6-3 Hot Strip Mill Plant

The Hot Strip Mill Plant (HSMP) shall consist of slab reheating furnace, roughing mill, finishing mill, down coiler, skinpass line (SKL) and plate finishing line (PFL), and produce hot rolled coil and plate. It is assumed that hot rolled coils is processed into sheet and slitted coil at the service centers located near customers. Production capacity shall be set at approximately one million tons per year.

1) Slab size

Thickness	: 210 mm (Nominal)
Width	: 650-1,600 mm
Length	: 5,000 - 10,900 mm

2) Hot rolled product size

- Hot rolled coil

Thickness	: 1.60 - 13.0 mm
Width	: 610-1,600 mm
Coil weight	: 28 ton max.

- Hot rolled plate

Thickness	: 13.0 - 24.0 mm
Width	: 1,300 - 1,600 mm
Length	: 5,000 - 15,000 mm
Plate weight	: 4.5 ton max.

3) Hot strip mill capacity

The rolling rate of the hot strip mill is decided by reheating furnace capacity when the rolling rate is low. In this flat product plant, reheating furnace capacity is 150 t/hr to satisfy the planned requirements for one million tons per year of products. Production capacity of the hot strip mill is calculated as follows ;

6,839 (hr/y) x 150 (t/hr) = 1,026,000 t/y

4) Personnel : Total personnel in the HSMP is 258.

5) General Layout : Refer to Figure 6-3-1

6-4 Cold Strip Mill

(1) Outline

Cold strip mill plant (CSMP) shall consist of pickling line, cold rolling mill, batch annealing furnaces, temper mill, continuous dip galvanizing line and recoiling line, and produce cold rolled coils and galvanizing coils. Capacity will be set at approximately 295,000 tons of products per year.

(2) Production and products

Cold rolled coil :224,000 ton/year (Approx. 76 %)
Galvanized coil :71,000 ton/year (Approx. 24 %)

(3) Material

Material to be handled in CSMP are summarized in Table 6-4-1.

(4) Operation shift and production capacity

Operation shift and estimated production capacity of each equipment are summarized in Table 6-4-2.

Table 6-4-1 Materials to Be Handled in Cold Strip Mill Plant

Items	PPL	CRM	BA	TM	CGL
Entry strip	Hot rolled coil	Pickled coil	Cold rolled coil	Cold rolled coil	Cold rolled Coil
- Thickness	2.0-5.0 mm	2.0-5.0 mm	0.5-2.5 mm	0.5-2.5 mm	0.4-1.6 mm
- Width	610-1,250 mm	610-1,250 mm	610-1,250 mm	610-1,250 mm	610-1,250 mm
- I. Diameter	762 mm	762 mm	610 mm	610 mm	610 mm
- O. Diameter	1,900 mm max.	1,900 mm	1,900 mm max.	1,900 mm max.	1,900 mm max.
- Weight	22 ton max.	22 ton max.	22 ton max.	22 ton max.	22 ton max.
Exit strip	Pickled coil	Cold rolled coil	Cold rolled coil	Cold rolled coil	Cold rolled coil
- Thickness	2.0-5.0 mm	0.4-2.5 mm	0.5-2.5 mm	0.5-2.5 mm	0.4-1.6 mm
- Width	610-1,250 mm	610-1,250 mm	610-1,250 mm	610-1,250 mm	610-1,250 mm
- I. Diameter	762 mm	610 mm	610 mm	610 mm	610 mm
- O. Diameter	1,900 mm	1,900 mm	1,900 mm max.	1,900 mm max.	1,900 mm max.
- Weight	22 ton max.	22 ton max.	22 ton max.	22 ton max.	22 ton max.

Table 6-4-2 Estimated Production Capacity of Cold Strip Mill Plant

Items	PPL	CRM	BA	TM	CGL
Production	340,000 t/y	323,000 t/y	246,000 t/y	246,000 t/y	74,000 t/y
Average strip size	3.0 x 1,000 mm	Entry 3.0 x 1,000 mm Exit 1.0 x 1,000 mm	1.0 x 1,000 mm	1.0 x 1,000 mm	0.9 x 1,000 mm
Line speed	Max. 90 mpm	Max. 1,200 mpm	(21 bases)	Max. 1,000 mpm	Max. 90 mpm
Estimated average ton/h	55 ton/hour	55 ton/hour	1.8 ton/hour per one base	100 ton/hour	15 ton/hour
Estimated capacity	55 x 6,839 =376,000 t/y	55 x 6,839 =376,000 t/y	1.8 x 21 x 7,207 =272,000 t/y	100 x 6,839 =684,000 t/y	15 x 6,839 =103,000 t/y
Operating shifts/crews	3 shifts/4 crews	3 shifts/4 crews	3 shifts/4 crews	2 shifts/2 crews	3 shifts/3 crews

Note: Temper mill has much surplus capacity and so it will be designed as combination mill in preparation for future shortage of cold rolling capacity.

(5) General layout

Refer to Figure 6-4-1.

6-5 Lime Calcining Plant

(1) Outline

A lime calcining plant will be constructed to deliver burnt lime to the steelmaking plant. The burnt lime is a very active material and it hydrates easily to calcium hydroxide when exposed to moisture. The calcium hydroxide creates a problem in not making a suitable slag in the electric arc furnace. The lime calcining plant will, therefore, be located nearby the steelmaking plant to supply the required amount of burnt lime.

The requirement of the steelmaking plant for burnt lime will be 24,000 t/y in 2005 and 40,000 t/y after that. However, burnt lime will be produced at the nominal capacity of 52,800 t/y from 2006 and the surplus burnt lime will be sold in the domestic market.

Limestone abundantly produced in the country will be used as the raw material in the plant. Consumption of raw material will be 2.0 tons per ton of burnt lime. Fines of limestone are expected to be about 10%.

Lime kiln consists of two towers, which are used for calcining and regenerating, alternately. The kiln can be divided to preheating zone, calcining zone and cooling zone from the top. Limestone changes to burnt lime as it descends in the kiln.

(2) General Layout

Refer to Figure 6-5-1.

6-6 Power and Distribution Facilities

(1) Outline

1) Substation in the plant shall mean the station receiving two incoming 220 kV power which is supplied by Egyptian Electrical Authority (EEA) through under ground cables from substation at El Dekhiela and stepping it down to 33 kV. Electrical equipment of the plant will take power at 33 kV or 6.6 kV from substation.
2) The flat product plant is composed of DRP, Slab CCM, HSMP and CSMP (flicker free load) and EAF and LF (flicker generating load). 220/33 kV transformer will be installed separately on flicker free load and flicker generating load.

3) Diesel generators will be installed at D/G yard in the substation for emergency power supply. Emergency power supply voltage will be 6.6 kV and 0.4/0.23 kV, and will be supplied to each plant whenever necessary.

(2) Attachment

The following table and figure for power receiving and distribution facilities are attached.

1) Table 6-6-1 Estimated Power Demand for the Flat Product Plant
2) Figure 6-6-1 Single Line Diagram 220kV and 33kV System

Table 6-6-1 Estimated Power Demand for Flat Product Plant

Department	Production 1,000t/year	Operation hour/year	Power consumption kWh/t	Power consumption GWh/year	Average Load MW	Load Factor	Maximum demand MW
DR Plant	1,000	7,500	130.0	130	17.3	0.9	19.3
LCP	40	7,500	50.0	2	0.27	0.9	0.3
EAF & LF and other	1,000	7,440	607.0	607.0	81.6	0.58	140.7
CCM	1,000	7,440	10.0	10	1.3	0.7	1.9
HSM	985	8,000	101.5	100.0	12.5	0.6	20.8
Skinpass mill	178	2,000	1.5	0.3	0.13	0.7	0.2
Plate	97	2,000	2	0.2	0.10	0.7	0.14
Pickling line	323	8,000	8.42	2.7	0.34	0.8	0.42
Cold rolling mill	320	8,000	75.8	24.3	3.0	0.7	4.3
CGL	71	8,000	45	3.2	0.40	0.8	0.50
Batch annealing	246	8,000	20	4.9	0.62	0.8	0.77
Temper mill	241	5,300	20.4	4.9	0.93	0.8	1.2
Recoiling line	224	5,300	5.4	1.2	0.23	0.8	0.3
Utilities & Services		8,000		73	20	0.9	22.2
Total				963.7	138.8		213.0

Note : The number for each power consumption shows only the consumption by each department.

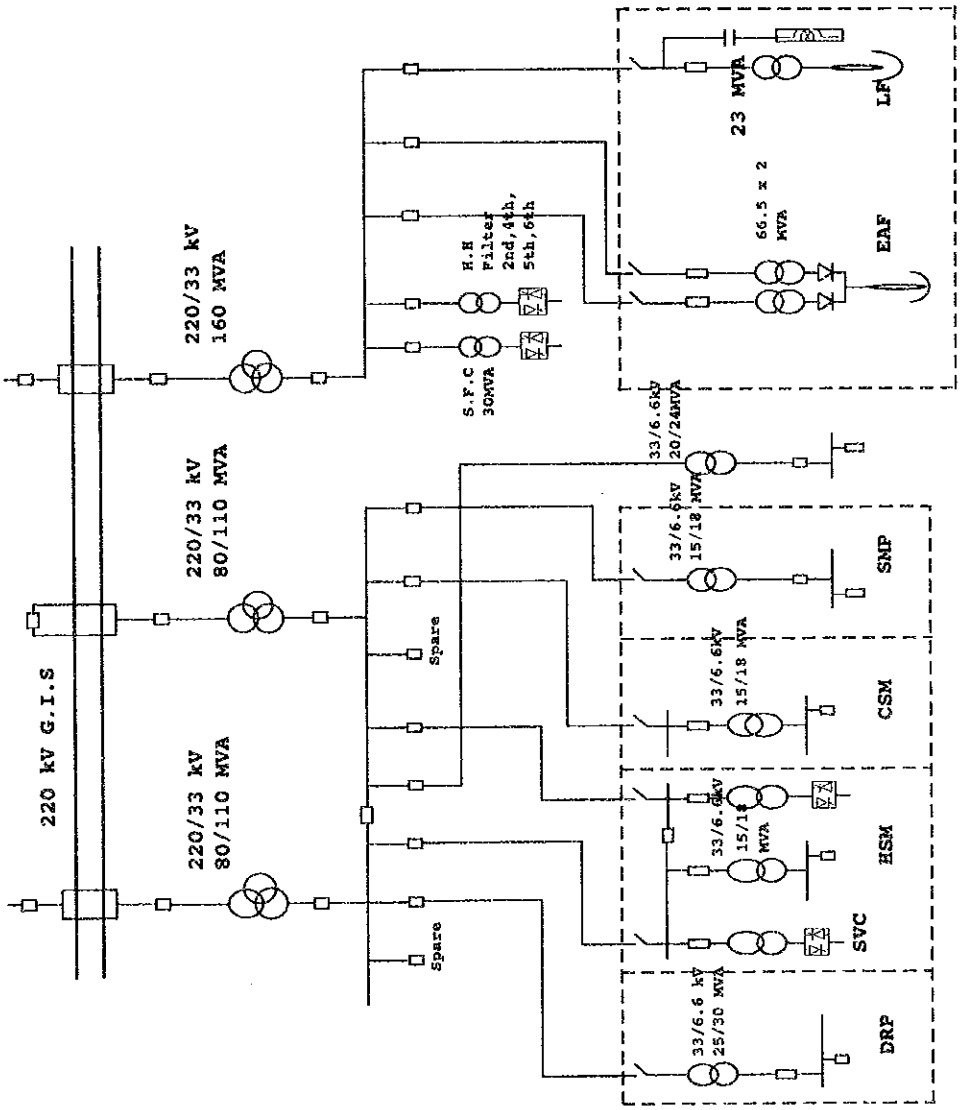


Figure 6-6-1 Single Line Diagram 220kV and 33kV System

6-7 Utilities

(1) Outline

The plant utilities are as follows;

Natural gas, oxygen gas, nitrogen gas, argon gas, plant air, hydrogen gas, steam, raw water, potable water, circulation water, waste water, sewerage water, and fire hydrant

1) Natural gas

Natural gas will be received at the battery point and will be supplied to each plant after metering the flow quantity by turbine meter.

2) Oxygen gas, nitrogen gas and argon gas

Oxygen gas, nitrogen gas and argon gas will be received from the gas supply company through a pipe line and the generation facilities will be completed by the end of 1998.

3) Plant air, hydrogen gas and steam

Plant air is generated by plant air compressors.

Hydrogen gas is produced by means of natural gas reforming and supplied to the plants.

Steam is generated from plant boiler equipment.

4) Raw water

Raw water will be received from municipal potable water system through a pipe line.

Raw water is treated (filtration and softening) and then supplied to each plant as make up water.

Alternatively raw water is filtered and chlorinated and supplied as potable water.

The fire hydrant supply system located in the raw water treatment station supplies water to the outdoor fire hydrant system all the time.

5) Water treatment

In order to reduce raw water consumption, re-circulation and cascade use systems are employed.

As the result, an index to show the advanced situation for utilization of water, a water recovery ratio has been employed.

Water recovery ratio(WRR)

= {(recycled quantity - make up water quantity) /(recycled quantity)} x 100

Water recovery ratio (WRR) in this conceptual plan is calculated and result is as follows;
WRR = (22,807-907)/22,807 = 96.0 %

Some steelworks in Japan have maintained a WRR = 95 - 96 %.
In the case of ANSDK, WRR = 95.5 %

The conceptual plan will be reached to an advanced level.

6) Waste water

Acid, alkali, chromate and oil waste water are discharged from CSMP respectively.
These shall be treated within target values as per latest proven technology in the world , the impurity values will be lesser than discharge limit in accordance with Law No.4/1994. Then after treated water will be discharged to sea.

7) Yard piping system

Yard piping system is required to connect between supply systems, plants, re-circulation system and discharge systems.
The pipe line will generally be installed on the pipe rack for easy maintenance.
Fire water main is laid under ground as per NFPA.

(2) Production plan (Annual supply plan)

Production plan (Annual supply plan) of utilities at the 1st stage is indicated in Table 6-7-1.

Table 6-7-1 Production Plan of Utilities

(Annual supply plan at 1st stage)

Cost center		Natural gas	Steam	Plant air	Oxygen gas	Nitrogen gas	Argon gas	Hydrogen gas	ICW	DCW	Others	Make up water	Potable water
		1,000 Nm^3	ton	1,000 Nm^3	1,000 Nm^3	1,000 Nm^3	1,000 Nm^3	1,000 Nm^3	1,000 m^3	1,000 m^3	1,000 m^3	1,000 m^3	1,000 m^3
Production section	DRP	285,000		17,250		6,075			3,750	18,750		1,500	
	EAF	800		13,000	30,000	4,000	200		19,344			800	
	LF								2,976				
	SMP Others								17,484				
	CC	3,200		29,000	2,000		500		11,755	8,332		1,000	
	HSM	27,777		38,021		0			7,486	63,040		2,069	
	LCP	4,000		2,200								1	
	Skinpass mill			18					18				
	Plate			10					10				
	As roll			0									
	PPL	678	5,782	2,390		32			355		162	162	
	CRM		3,232	16,160					960		64	64	
	CGL	1,420	2,130	1,420		1,420		142	1,420		71	71	
	BAF	4,674		0		3,690		369	2,214				
	TM			6,146					121				
	RCL			493					45				
	CRC												
	Total	327,549	11,144	126,107	32,000	15,217	700	511	67,937	90,122	297	5,666	0

Cost center		Natural gas	Steam	Plant air	Oxygen gas	Nitrogen gas	Argon gas	Hydrogen gas	ICW	DCW	Others	Make up water	Potable water
		1,000 Nm^3	ton	1,000 Nm^3	1,000 Nm^3	1,000 Nm^3	1,000 Nm^3	1,000 Nm^3	1,000 m^3	1,000 m^3	1,000 m^3	1,000 m^3	1,000 m^3
Support section	Raw material handling												
	Industrial water												
	Plant air								1,752				
	Natural gas												
	Hydrogen generator	280	700						76			2	
	Electric power												
	Steam boiler	1,052										15	
	Analyzing												
	Maintenance shop												
	Product handling												
	Stock house												
	Head office												192
	Total	1,332	700	0	0	0	0	0	1,828	0	0	17	192
Grand total		328,881	11,844	126,107	32,000	15,217	700	511	69,765	90,122	297	5,683	192
To be purchased		328,881			32,000	15,217	700					5,683	192

6-8 In-works Transportation Facilities

The in-works transportation facilities include transporting and storing of scrap, limestone, additives, refractories, electrode, mill scale, slag, waste materials and others required for keeping production of 1st stage operation.

The facilities of in-works transportation cover the following:

1) Movable equipment such as crawler crane, crawler shovel, wheel shovel, forklift, etc. for unloading and loading.
2) Transportation equipment such as dump truck, flat deck truck, slag pot carrier, etc. for transportation.
3) Warehouse for brick, electrode, additives, and spare parts.
4) Open scrap yard for storage of scrap.
5) Limestone storage yard
6) Slag yard
7) Truck weighing equipment

6-9 Analysis and Inspection Facilities

Analysis and inspection facilities will be installed for the flat product plant and be used for carrying out quality control work including routine analysis of DRI, molten steel, cast slabs, and finished products.

The analysis and inspection facilities will consist of two groups of equipment: one for analysis needed for steelmaking process and raw materials and the other for physical and metallurgical inspection of semi-finished and finished products. The first group of equipment will be installed in a building (called the analysis center) to be constructed beside the steelmaking plant. The other group of equipment will be installed in a building (called the material testing center) to be constructed beside the CRM building.

The system and equipment will be installed to eliminate individual difference among operators and also to avoid complicated manual measuring as much as possible so that stable results of analysis and inspection will be obtained.

6-10 Maintenance shop

Maintenance shop consists of machine shop, overhaul and assembly shop, fabrication shop,

electric repair shop and car repair shop.

The facilities in the maintenance shop is designed to handle only for emergency repair. Ordinary repair will be entrusted to outside companies.

6-11 Administrative Facilities

The following administrative facilities shall be considered.
The design and system of each facility shall be made in accordance with the "Egyptian codes of practice" or equivalent international codes and standards.

1) Main office
2) Canteen
3) Clinic
4) Guard office
5) Fire fighting station
6) Site offices for each facility
7) Parking lot and other

6-12 Civil and Building Work

The civil and building work will cover all foundations and building items required for the construction and installation of the flat product plant facilities listed below, and the design basis shall be that established in accordance with the "Egyptian codes of practice for design and executing Reinforced Concrete Structures" and/or equivalent international codes and standards.

1) Land preparation including gates and perimeter fencing
2) Direct reduction plant facility
3) Lime calcining plant facility
4) Steel making plant facility
5) Hot strip mill plant facility
6) Cold strip mill plant facility
7) Power and distribution facility
8) Utilities
    a) Water treatment facility for SMP, HSMP
    b) Waste water and water treatment facility for CSMP
    c) Steam boiler and hydrogen generator unit
    d) Natural gas receiving station

c) Raw water receiving and treatment station

f) Sewage treatment station

g) Drainage pumping station

9) In-works transportation facility

10) Analysis and inspection facility

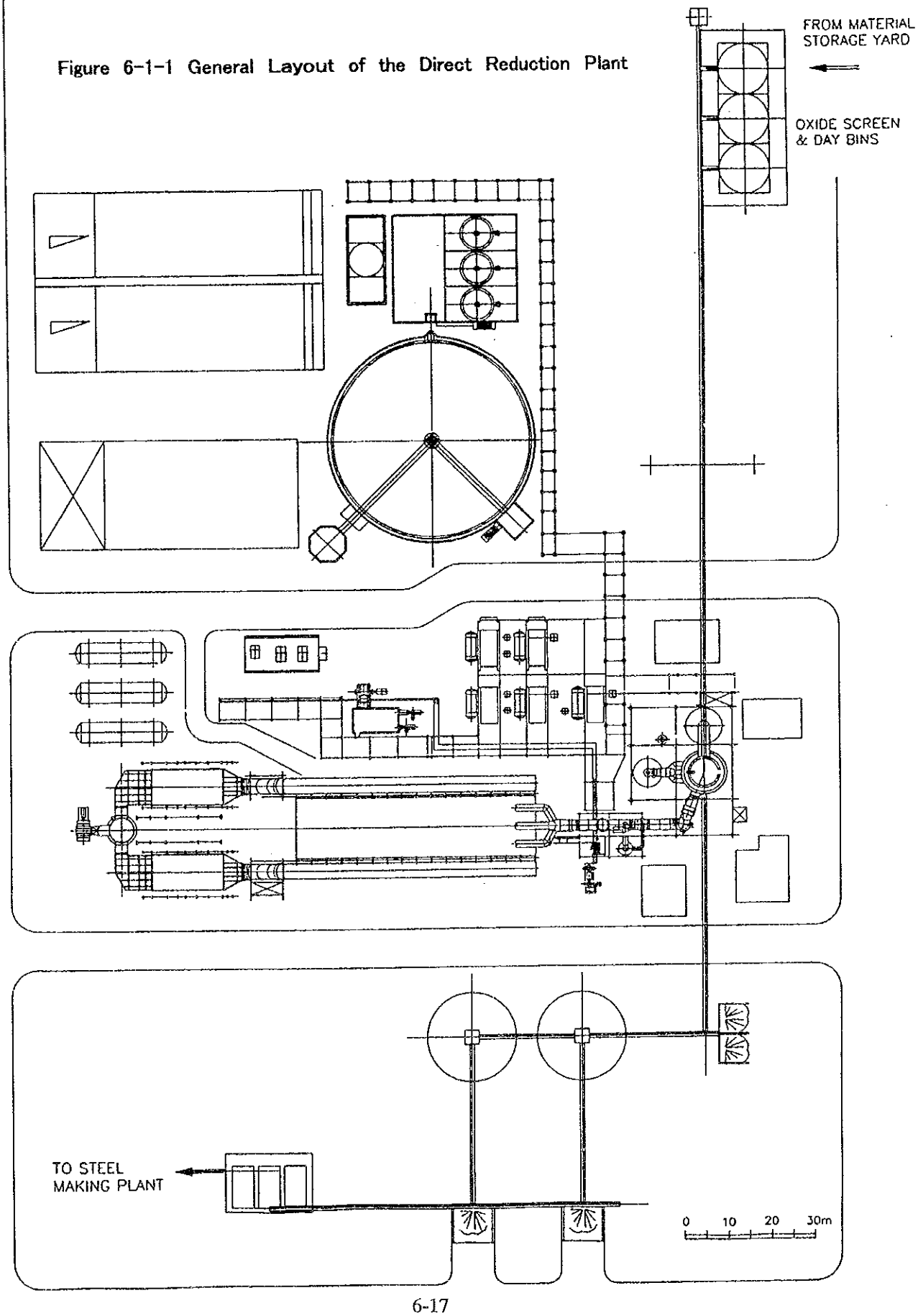
11) Maintenance shop facility

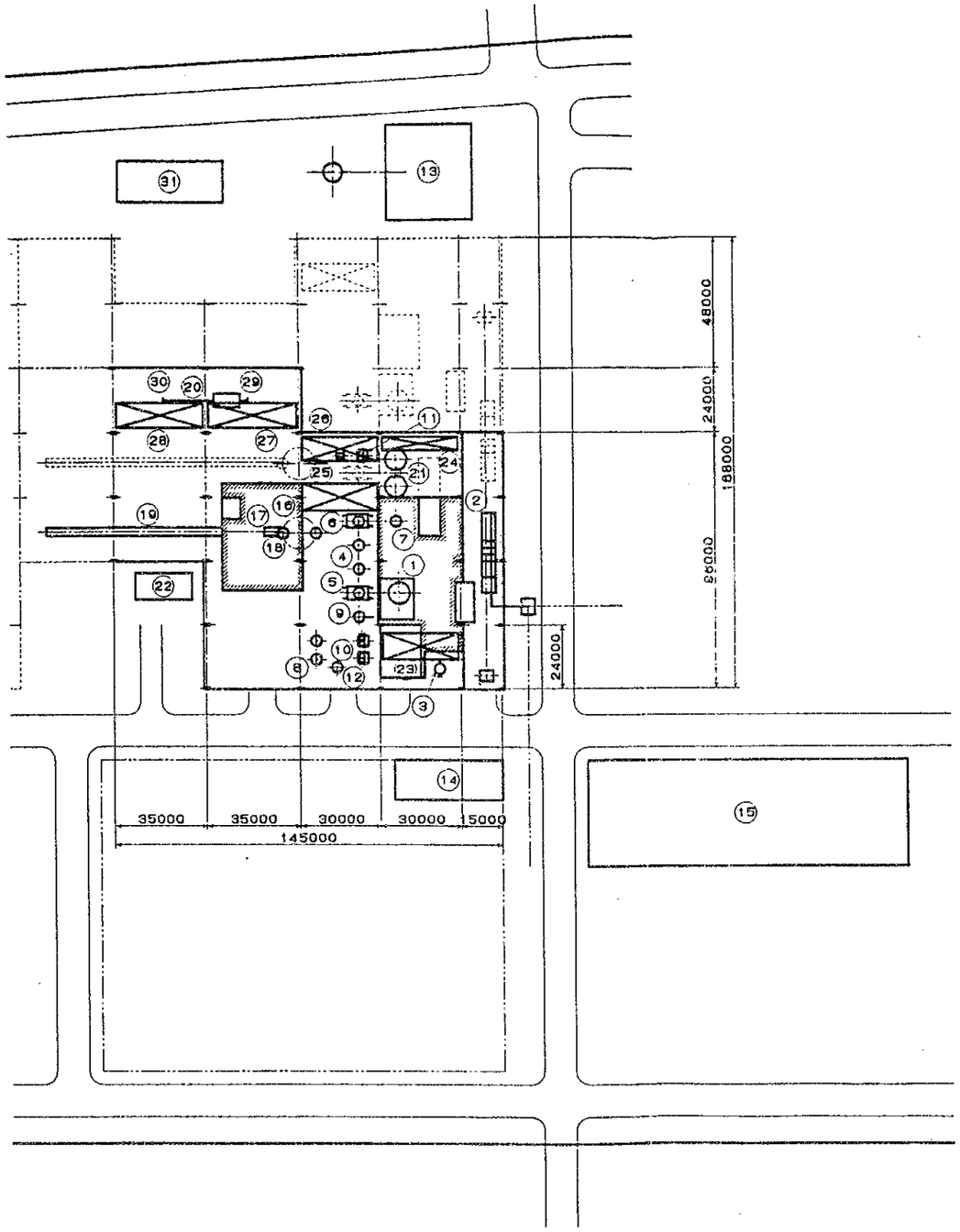
12) Administrative facility

13) Roads and paving

14) Drainage systems for rain water, waste water and sanitary sewage

Figure 6-1-1 General Layout of the Direct Reduction Plant

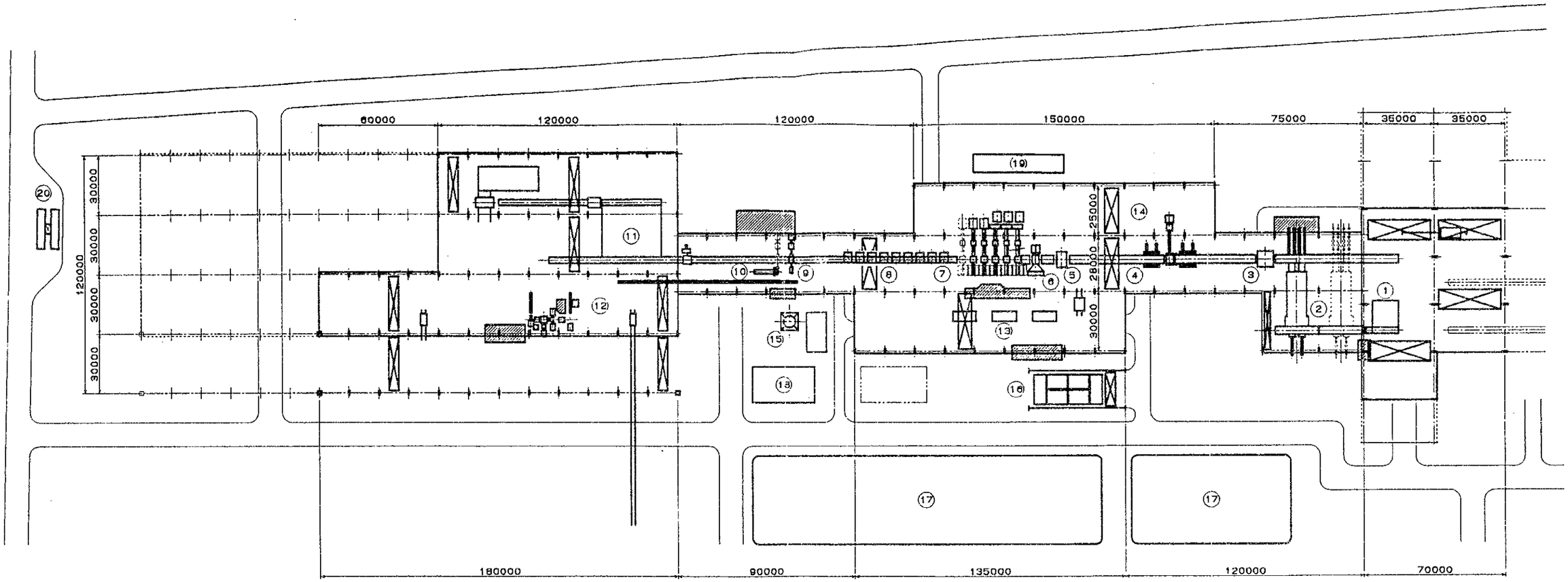




NO	EQUIPMENT
1	ELECTRIC ARC FURNACE
2	MATERIAL HANDLING SYSTEM
3	SCRAP BUCKET
4	LADLE
5	LADLE TRANSFER CAR FOR EAF
6	LADLE TRANSFER CAR FOR LF
7	LADLE FURNACE
8	LADLE RELINING STATION
9	LADLE DRYER
10	PREPARATION STATION
11	LADLE DIGOUT STATION
12	SLAG POT
13	DUST COLLECTOR
14	SMP SUBSTATION
15	WATER TREATMENT FOR SMP
16	LADLE TURRET
17	TUNDISH
18	SLAB CASTER
19	RUNOUT TABLE
20	SEGMENT TRANSFER CAR
21	EAF ROOF STAND
22	SCALE PIT
23	SCRAP CHARGING CRANE
24	SERVICE CRANE
25	LADLE CRANE
26	LADLE SERVICE CRANE
27	TUNDISH HANDLING CRANE
28	SEGMENT HANDLING CRANE
29	TUNDISH YARD
30	MOULD/SEGMENT YARD
31	SMP OFFICE

Figure 6-2-2 General Layout of the Steelmaking Plant

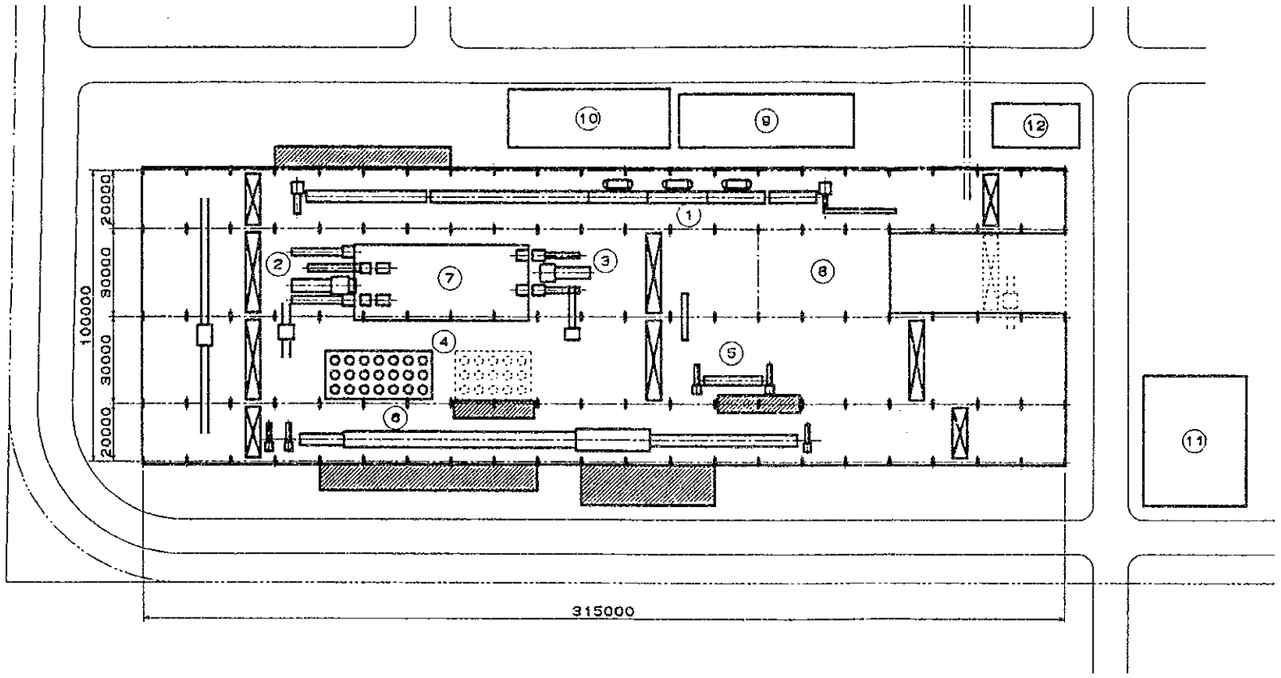
FLAT PRODUCT PROJECT OF EGYPT			
TITLE	SMP GENERAL LAYOUT		
DWG NO. EFP-SMP-001			
DATE	JUL.31.1997	SCALE	1/1000



①	SLAB CONVEYOR	⑧	CROP SHEAR	⑪	PLATE LINE	⑭	SCALE PIT
②	REHEATING FURNACE	⑦	FINISHING MILL	⑫	SKINPASS MILL	⑰	WATER TREATMENT
③	HYDRAULIC SCALE BREAKER	⑧	RUNOUT COOLING	⑬	ROLL SHOP	⑱	HSM OFFICE
④	ROUGHING MILL	⑨	DOWN COILER	⑭	MOTOR ROOM	⑲	HSM SUBSTATION
⑤	COIL BOX	⑩	COIL INSPECTION	⑮	RUN OUT WATER PIT	⑳	TRUCK SCALE

Figure 6-3-1 General Layout of the Hot Strip Mill Plant

FLAT PRODUCT PROJECT OF EGYPT			
TITLE	HSM GENERAL LAYOUT		
DWG NO. EFP-HSM-001			
DATE	JUL.31.1997	SCALE	1/1000



NO	EQUIPMENT
①	PICKLING LINE
②	REVERSING MILL
③	TEMPER MILL
④	BATCH ANNEALING FURNACE
⑤	RECOILING LINE
⑥	HOT DIP GALVANIZING LINE
⑦	MOTOR ROOM
⑧	ROLL SHOP
⑨	ACID REGENERATION PLANT
⑩	UTILITY PLANT
⑪	WATER TREATMENT
⑫	CRM OFFICE

Figure 6-4-1 General Layout of the Cold Strip Mill Plant

FLAT PRODUCT PROJECT OF EGYPT			
TITLE	CRM GENERAL LAYOUT		
DWG NO. EFP-CRM-001			
DATE	JUL.31.1997	SCALE	1/1000

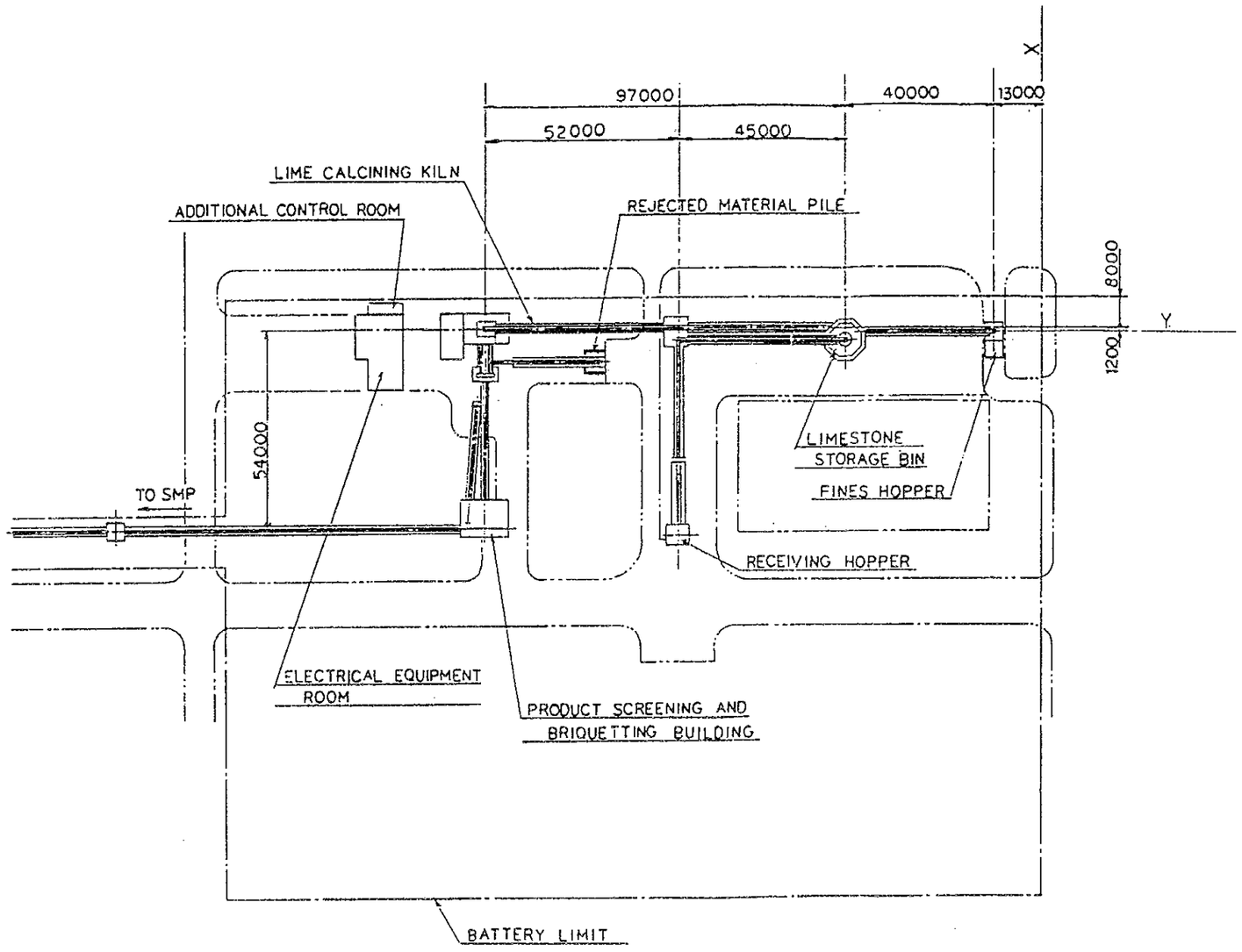


Figure 6-5-1 General Layout of Lime Calcining Plant

REV. NO.	REVISION NOTE		DESIGNED	CHECKED	APPROVED	REVIEWED
D		19				
C		19				
B		19				
A		19				
0		1 July 1997 H.M.				

ENGINEERING DEPARTMENT

SCALE 1/1000

ISSUED BY

O. NO.

T. NO. 2 --

KOBELCO | KOBE STEEL, LTD.
ENGINEERING & MACHINERY DIVISION

TITLE

LIME CALCINING PLANT GENERAL LAYOUT (PLAN)

JOB NO.	AREA	DRAWING NO.	REV.
		D 6-21	◇

Chapter 7 . IMPLEMENTATION PLAN

7-1 General

Steel plant complex projects normally require a variety of technological methods, engineering skills and innovations. A huge amount of material and tremendous consumption of required resources, time ,money, manpower and talent is also required.

For instance, the construction period for this flat product plant is estimated at 35 months from the placement of supply contracts for equipment to start-up of the plants, and the total amount of investment will reach US$ 1,100 million. In spite of great and continuous efforts by the persons concerned, many issues such as cost overruns, schedule delays, failures in the performance guarantee tests, etc., will occur during the construction administration stage.

Rather than focusing on post-failure analysis, the project owner is required to concentrate on ways to control performance of the project before failures take place.

The process of project implementation consists of three separate steps. These steps are closely related to each other. The first step is to conduct a basic engineering study. This study include development and refining of the scale of the project and design and definition of the conditions. Cost estimation and financial planning for the project are also implemented during this first step.

The second step is preparing the specifications and floating bids for the project and to award contracts to the successful bidders.

The final step is construction itself.

Before the project can be executed, legal approval should be obtained. It can be said for all projects in the world that the efficient and smooth execution of the project depends on timely obtaining of governmental, regional and/or other authorities' approval. In addition, these authorities' scope of work and time schedule shall be clearly defined.

As far as these steps are properly and fairly applied to actual practices, the project will be successful and the interests of the investors can be preserved.

7-2 Infrastructure

(1) Natural gas supply

Required quantity of natural gas will be 50,000 Nm3/h and GASCO will supply facilities and the required quantity of natural gas at the battery limit of flat product plant.
It was confirmed that quality of natural gas meets requirement of DRP.

(2) Raw water

The existing water supply pipe lines are of 700 mm and 1,000 mm diameter used for potable water and raw water.
Pipe line has a enough capacity for 1,000 m3/h raw water.
Raw water will be received at the battery point through the municipal pipe line and will be supplied to the plants after treatment at the raw water treatment station.

(3) Electric power supply

The electric power will be supplied by EEA through two 220 kV undercables from El Dekhiela substation.

(4) Port and road

1) Port facilities

As the main raw material for the flat product plant, iron ore is imported with 100,000-150,000 DWT vessels. Therefor, port facilities for these vessels, unloading, transporting and storage facilities for raw materials are necessitated.

The Mineral jetty at El Dikheila port has a 600m length and 14 m - 20 m depth at which 150,000 DWT vessels can be accommodated. As for unloading and transporting facilities, two 1,000 t/hr unloading gantry cranes and two 2,000 t/hr belt conveyor lines are equipped.
The area of storage yard for iron ore and coal located at the south of the Mineral jetty is 50,000 m^2.
The handling capacity of the mineral jetty is about 5,500,000 - 6,000,000 t/year. At present, about 1,250,000 t/year of iron ore for ANSDK, which will be increased to 2,500,000 t/year, in 1998 and 1,250,000 t/year of coal for EISCO are handled at the

Mineral jetty.

As described above, the existing Mineral jetty at El Dekhiela, still has enough capacity for the flat product plant of which raw materials to be unloaded at this port will be about 1,500,000 t/year. The Mineral jetty, therefor could be utilized without any modification or additional equipment .

The port is now under the control and administration of the Alexandria Port Authority, and above facilities' operation and maintenance are conducted by ANSDK.
Under such circumstances, detailed utilization and maintenance plan of the mineral jetty should be made in consultation with the Alexandria Port Authority and ANSDK.

2) Road

The existing roads which are able to be connected to the new flat product plant site are the Dessert road and the Alexandria Matrouh road.
Both roads are well arranged and maintained to transport materials and products to and from the plant.

New road construction work will not be required for the new flat product plant.

(5) Raw material yard

Storage capacity and storage area of iron ores required for the flat product plant are estimated about 250,000 tons and 4.5 hectares, respectively. In the area of El Dikheila, the existing steel works has been operating by making use of the port facilities and the storage facilities installed by IMC and administrated by the Alexandria Port Authority. In order to make synergy effect on the facilities of this region, it has been planned in this study that necessary facilities of the raw material yard for the flat product plant would be placed in the authority's charge as same manner as the existing works' case.

7-3 Consultant Engineering

This flat product plant will be the first integrated project covering DR/EAF to flat products rolling in Egypt. It is recommended that the project should retain an experienced foreign consultant. The consultant shall perform a basic engineering, procurement services and supervisory services for the smooth execution of the flat product project. Based on proprietary knowledge and experiences, the consultant shall participate in predetermination of the budget and schedule and closely coordinate with the parties concerned such as the owner of the project, authorities, equipment suppliers and construction contractors, etc.

7-4 Procurement Method

(1) General

Procurement policy and methods have significant effects on the overall budget, on the construction schedule and on the technical aspects of the project. Before proceeding to procurement practices, the following policies and decisions shall be considered and established .

1) Pricing Policy:

- Fixed prices or firm prices with escalation closes for Supply of equipment.
- In the case of the civil and steel structural contract, fixed or firm rates against measured work.
- Advantages for use of local manufactures and contractors

2) Package classification

The policy and method of procurement depends on the source of founding, scope and magnitude of the work and construction period, etc. A sample matrix of a contract package is shown as follows.

(a) Design, manufacturing and supply of equipment with supervision of installation:

- Direct reduction plant
- Steel making plant (EAF & SCC)
- Hot strip mill plant
- Cold strip mill plant
- Power and distribution facilities
- Utilities
- Auxiliary facilities

(b) Installation of equipment and machinery:

- The installation of equipment and machinery executed under supervision of equipment supplier

(c) Civil and building work:

- Land preparation, fence and gate
- Foundations and buildings for the plants
- Ancillary buildings, drainage and road construction and other civil works

(2) Procurement localization

In order to minimize the burden of the need for foreign currency, and to encourage and develop local industries, localization of procurement shall be considered and utilized as much as possible.

Construction material for civil and building work, steel structures, etc. can be procured from the local market. Delivery time and quality shall be assured and secured before entering into contracts.

Preference of local manufactures and contractors shall be defined in the bid documents.

7-5 Project Schedule

The overall implementation schedule for the flat product project is shown in Figure 7-5-1.

Based on the marketing study of flat products, the start-up date of the hot strip mill and cold strip mill is scheduled to be January 1, 2005. The total construction period from basic engineering to start-up of the project is estimated at 55 months and the period of construction for major plants from CIF contract to start-up is set at 35 months. Other ancillary facilities shall be implemented with proper timing for start-up of the steel plant.

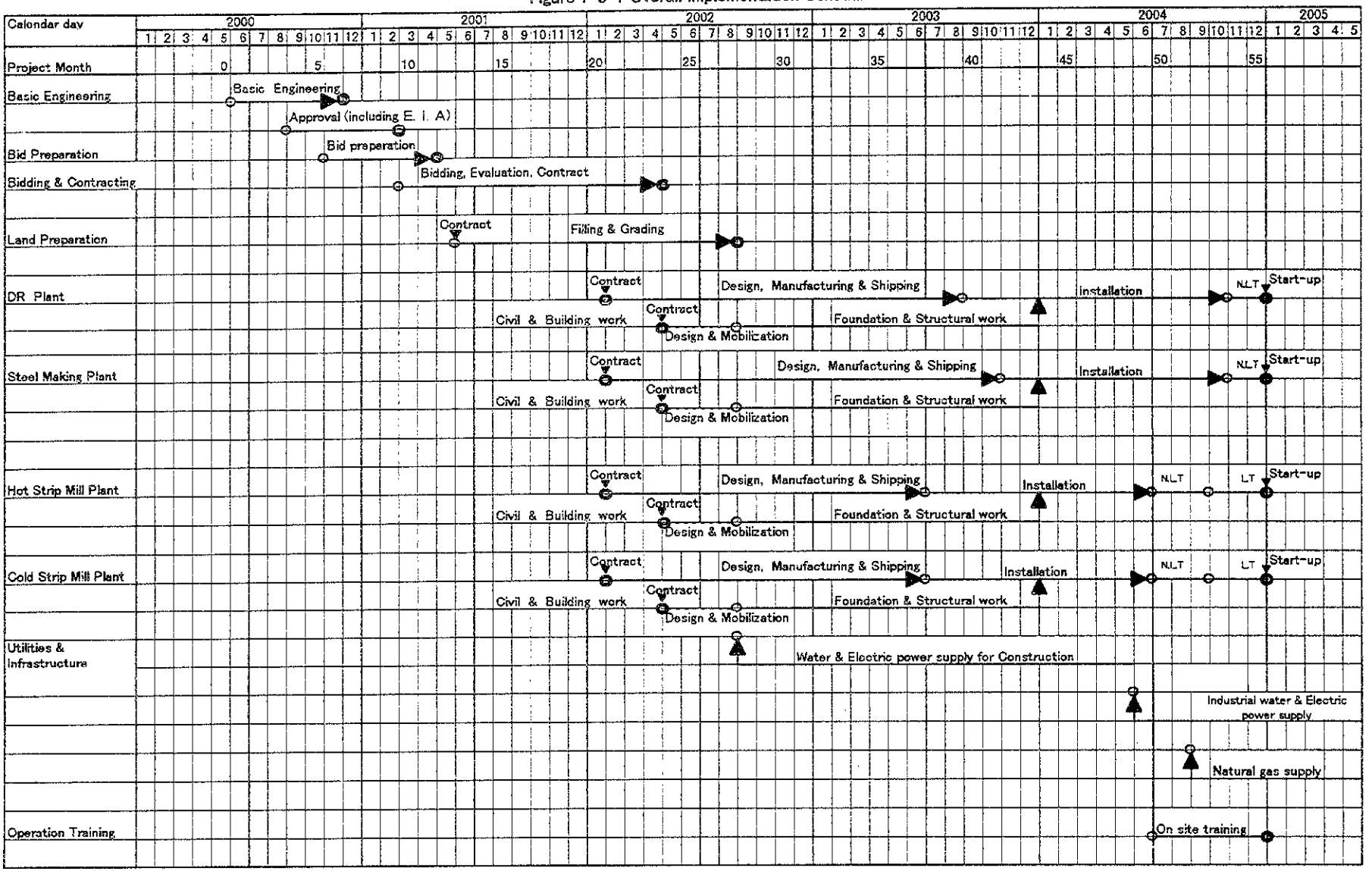
At the preparation stage, the basic engineering, which includes such work as review of the feasibility study, environmental impact assessment(E.I.A), overall implementation schedule, organization of management and the operating plan are conducted.

When construction of the new flat product plant has been decided and approved by the owner and relevant authorities, project organization shall be established and contractual strategies shall be made.

The contracts for the project will be made through international competitive bidding process for the supply of equipment, installation of equipment, and foundation and buildings work.

Inadequate content of the bidding and contract documents, inadequate bidder qualification or bid management will cause serious damage to the following contract performance and administration.

Figure 7-5-1 Overall Implementation Schedule



7-6 Construction and Transportation

The construction and transportation work shall be planned and implemented in consideration of the scale of, overall work volume for, manpower requirements at the peak of, area requirements of temporary work during, and effective transportation procedures in compliance with the project master schedule.

Chapter 8. ENVIRONMENTAL ASSESSMENT

Pollutant emissions from this planned process which will be adopted by the flat product plant of this Study are less than the traditional integrated steel plant which consists of blast furnace, basic oxygen furnace, sintering plant, and coke oven.
Furthermore, by adopting advanced environmental control systems, the effects to the environment will be improved, therefore the conditions currently observed around existing steel plants in Egypt will not occur.

However, to judge the environmental conditions after the installation of the flat products plant, as the environmental assessment, the Study Team surveyed the present environmental situation at the proposed site, and then calculated the distribution of pollutants using a simulation based on surveyed data and predicted pollutant volume emitted from the new flat product plant.

8-1 Present Environmental Situation

(1) Environmental Laws

The basis of environmental protection is Law No.4 of 1994 and the Decree No.338 of 1995. This law covers air pollution, water pollution, waste material treatment and environmental assessment.

According to the executive regulations on the environment from Law No.4 of 1994, industrial establishments are required to comply with the EIA (Environmental Impact Assessment) procedure.
Before beginning a project, an EIA screening form should be submitted to, and approval obtained from the Egyptian Environmental Affairs Agency.

(2) Environmental conditions at Alexandria

Recent measured data of principal pollutants is shown in Table 8-1-1 for air quality and Table 8-1-2 for sea water quality.

Table 8-1-1 Air Quality Data

	Data	Measurement point	Measurement period
NOx *1	39.0 $\mu g/m^3$	N.A.	1992
SOx *2	10.4 $\mu g/m^3$	Wadi El Kamer	Jan.- Sep. /1995
T.S.P. *2	30.2 $\mu g/m^3$		
Falling Dust *2	135 ton/mile^2/month		

Source: *1 Assessment of industrial hazardous wastes in Alexandria

*2 Directorate for Health Affairs in Alexandria/Central Laboratory

Table 8-1-2 Water Pollution Data

Parameter	Analysis method	Value (mg/l)	Source
COD(Cr)	dichrome method	300	Alexandria Governorate
COD(Mn)	permanganate method	4.3	by estimation

Source: Alexandria Governorate

The present value of air quality in Alexandria is within Egyptian law and superior to that of Kawasaki City, except falling dust value is higher due to the occurrence of dust and sand-rising in Egypt.

There are no laws or regulations concerned with water quality in the sea, therefore, the COD parameter, a typical figure for water quality, is higher than the bottom standard of Japanese law.

8-2 New Flat Product Project Environmental Control

Tables 8-2-1 shows the estimated emission of air pollutants which will be generated from the planned plant, Table 8-2-2 shows the estimated noise level, and Table 8-2-3 shows the estimated discharge water COD.

Table 8-2-1 Air Emission Data

Element	NOx	SOx	Dust	
Plant	DRP			SMP
Facility	Reformer			EAF
Emission value (mg/m^3)	69.0	2.4	2.1	0.5

Table 8-2-2 Estimated Noise Level

Plant	Generating facility	Noise level (dB)
DRP	Reformer	95 - 105
SMP	EAF	105
HSM	Entire mill	105
Utility	Air compressor	95

Table 8-2-3 Estimated Discharge Water COD

Parameter	Value
COD	1.4 mg/l
Water quantity	150 Nm^3/hr

Concerning pollutant emissions from the new flat product plant equipment, not only the parameters mentioned above but also other parameters both based on original design are within the limits of the emissions standards.

8-3 Assessment

For the environmental assessment of this flat product plant, the Study Team estimated the effects to the surrounding area by simulation of typical parameters.

Considering the characteristics of the flat product plant, the items to be simulated are as follow;

- Air pollution : NOx, SOx, Dust, Noise
- Water pollution (sea discharge) : COD

The results mentioned above are summarized in Table 8-3-1.

Table 8-3-1 Evaluation

Parameter		Contribution*	Background	Total	Limit
Air quality ($\mu g/m^3$)	NOx	A.m. 99.5	-	-	-
		D.m. 110.1	39.0	149.1	150
	SOx	6.1	10.4	16.5	60
	T.S.P.	13.0	30.2	43.2	90
Noise (dB)		43/59	64.8	-	D 60/70 N 50/60
Sea water (mg/l)	COD	0.001	4.3	4.3	-

Note: * Maximum value (in the case of air quality, at ground level)

A.m.: Annual mean, D.m.: Daily mean D: Day time N: Night time

An environmental impact assessment was conducted on the principle pollutants NOx, SOx and dust as well as noise and effluent COD which are supposed to be emitted from the flat product plant with reference to the following standards.

- Emissions limit

  Comparison of the predicted emissions with Egyptian standards

- Environmental standards

  Comparison of the pollution levels, calculated by simulation using data from the site and the predicted emissions levels from the flat product plant, with Egyptian standards

As a result of the assessment, the emissions value from the plant and environmental pollution near the site will be within the limits of Egyptian environmental standards.

Therefore, it can be said that pollution will be kept within the limits of Egyptian standards provided the flat product plant is constructed equipped with the environmental control systems described in this report.

Chapter 9. CORPORATIVE IMPLEMENTATION PLAN

9-1 General

In recent years in Egypt, the government has been strongly promoting the privatization of industry. Under the privatization policy, this flat product project will be carried out as an enterprise in the private sector.

The project cost is assumed to be US$1,108 million. 30 % of the total investment is privately financed by equity, and 70 % of that is by debt.

This flat product plant shall produce yearly one million tons with manpower of 1,550. Most of the flat products shall be delivered to domestic consumers and they will not be basically exported.

9-2 Organization and Personnel Plan

(1) Organization plan

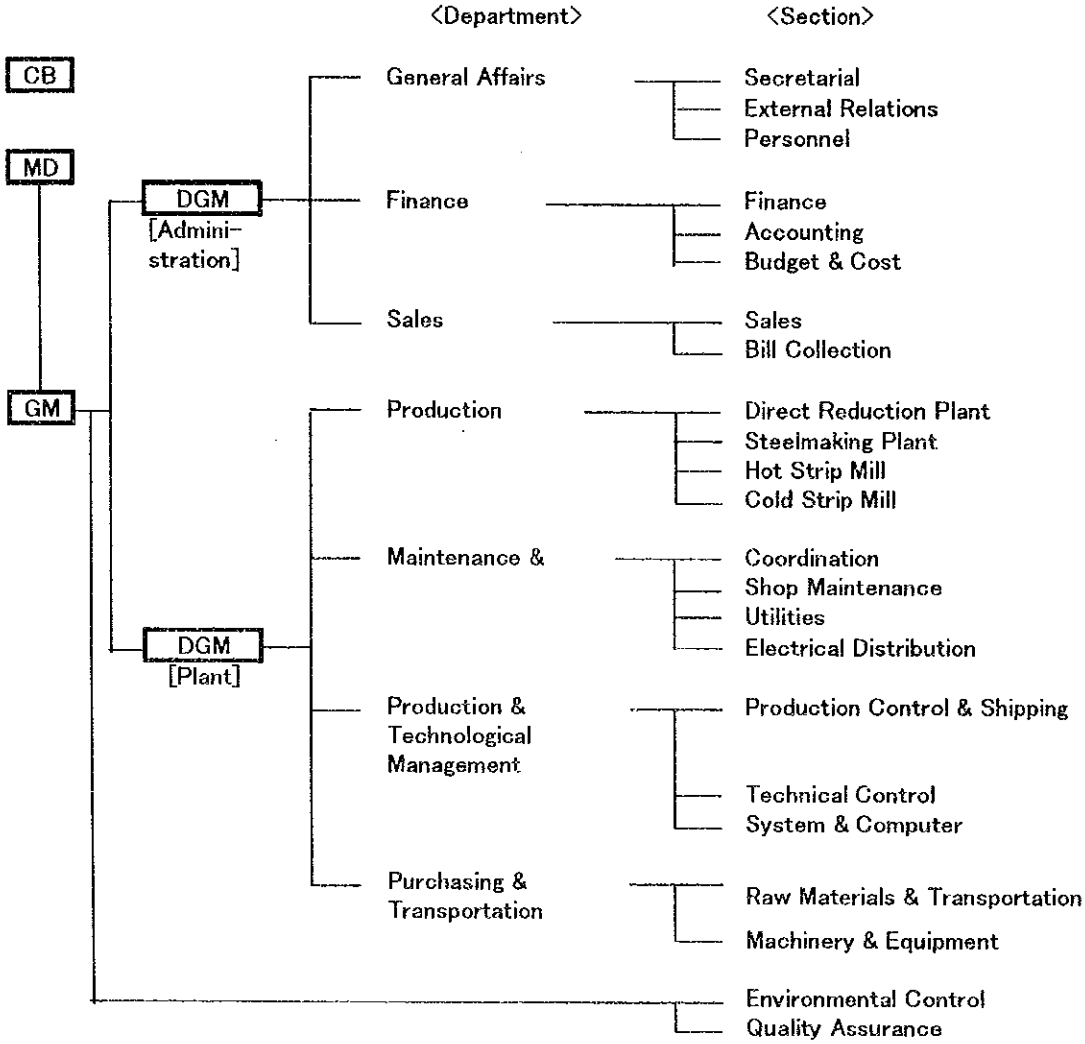
The organization of this project is charted in Figure 9-2-1.

This organization is made under the following consideration :

- The administration division is kept small in order to reduce administrative expenses and maintain international competitiveness.
- The four departments in the plant division are independent so that the responsibility of each is clearly defined.
- The technical control section in the production & technological management department is established in order to satisfy the high quality requirements for flat steel products

This project is organized by two divisions, seven departments and twenty-three sections.

Figure 9-2-1 Organization Chart



Note: CB/ Chairman of Board, MD/ Managing Director
GM/ General Manager, DGM/ Deputy General Manager

(2) Personnel plan

Required manpower is shown in Table 9-2-1. The administration division has 152 persons including one general manager, one deputy general manager and three department managers. The plant division has 1,398 persons including one deputy general manager and four department managers. The required manpower is 1,550 persons in total.

In order to keep international competitiveness, this number of required manpower shall be minimized. Especially the administration division shall be kept as small as possible.

(3) Recruitment and training plan

1) Recruitment

In Egypt labor market will be in oversupply for these ten years. Thus, it will be easy to employ skilled workers and potential university graduates, due to serious restructuring of companies in the public sector and restrained recruitment of the authorities concerned.

The recruitment of key personnel for plant operation such as managers, engineers and foremen, shall be started at least two to three years prior to the start-up of production, and that of ordinary personnel in principle shall be started at least six to twelve months prior to the start-up of production.

As for the stage of plant construction, managers and engineers concerned shall be employed at least five years before the scheduled date of start-up of operation along with Figure 7-5-1.

Table 9-2-1 Manpower Requirement

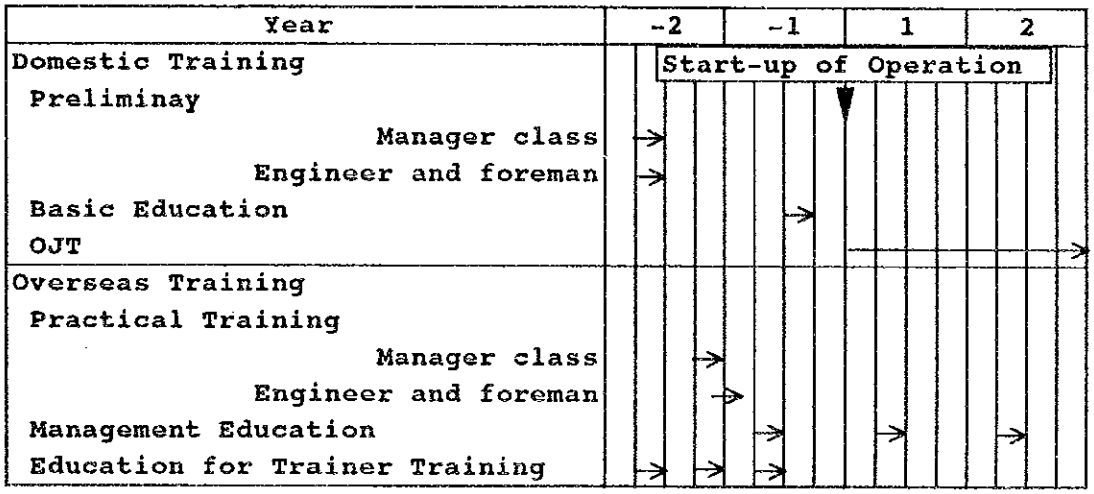
	Department	Section	Section Manager	Assistant Section Manager	Engineer or Clerk	Worker	Sub-total
Administration	General Affairs	Secretarial	1	1	1	0	3
		External Relations	1	1	1	2	5
		Personnel	5	8	26	23	62
	Finance	Finance	1	1	5	0	7
		Accounting	1	2	12	0	15
		Budget and Cost	1	2	9	0	12
	Sales	Sales	1	4	24	0	29
		Bill Collection	1	1	4	0	6
Plant	Production	Direct Reduction Plant	1	1	8	64	74
		Steelmaking Plant	1	3	4	252	260
		Hot Strip Mill.	1	2	2	153	158
		Cold Strip Mill	1	2	4	193	200
	Maintenance and utilities	Coordination	1	3	15	0	19
		Shop Maintenance	1	6	22	202	231
		Utilities	1	3	4	112	120
		Electrical Distribution	1	1	3	12	17
	Production & Technological Management	Production Control & Shipping	1	4	8	78	91
		Technical Control System & Computer	2	3	9	96	110
			1	2	12	0	15
	Purchasing & Transportation	Raw Materials & Transportation	1	2	10	60	73
		Machinery & Equipment	1	3	17	4	25
		Environmental Control	1	1	2	0	4
		Quality Assurance	1	1	2	0	4
		Total	28	57	204	1,251	1,540

Note : GM(General Manager) = 1 DGM(Deputy General Manager) = 2
DM(Department Manager) = 7 Gross Total = 1,550

2) Training plan

The purpose of training is that new employees can acquire enough ability to execute administration and operation in the works as soon as possible. The training plan is shown in Figure 9-2-2.

Figure 9-2-2 Training plan



In Egypt, domestic preliminary training, basic education at site, and OJT (On-the-Job Training) are carried out. Practical training, management education and education for trainer training are carried out as overseas training.

The selected personnel in domestic preliminary training is given overseas training. OJT for operators is conducted by the consultant at first. Then training transfers from consultant to original in-company trainer.

3) Support of foreign consultant

Support of the foreign experienced consultant is indispensable for the establishments of plant management and techniques by Egyptian in the early stage. The term of the consultant is for five years, that is, two years for preparation before the start-up of operation and three years for plant operation after the start-up of operation. The personnel requirement for foreign technical assistance is shown in Table 9-2-2.

Table 9-2-2 Personnel Requirement for Foreign Technical Assistance

Year	-2	-1	1	2	3
Head Office	4	4	4	4	4
Works					
Production and technological control	1	1	1	1	1
Production DR plant	1	5	8	5	5
Steel making plant	1	8	14	8	8
Hot strip mill plant	1	11	20	11	11
Cold strip mill plant	1	11	20	11	11
Utilities	1	10	17	10	10
Maintenance	1	7	12	7	7
Total	11	57	96	57	57

9-3 Operation Management Plan

(1) Production control plan

The production control shall be carried out by taking characteristics of flat products into consideration.

1) Raw material control plan

Most of the main raw materials are imported to produce flat products in Egypt. If imported materials are not supplied on schedule, production will stop. Therefore, management should concentrate on controlling vessel assignment and purchasing of materials by means of long-term contract in close cooperation with the purchasing & transportation department.

2) Whole production plan

According to sales plan, production plans are made up in such four terms as one year, six months, quarterly and monthly. Production plan, that contains operation of main equipment, flows of raw material, semi-products and finished products, is made up efficiently by balancing each of the processes.

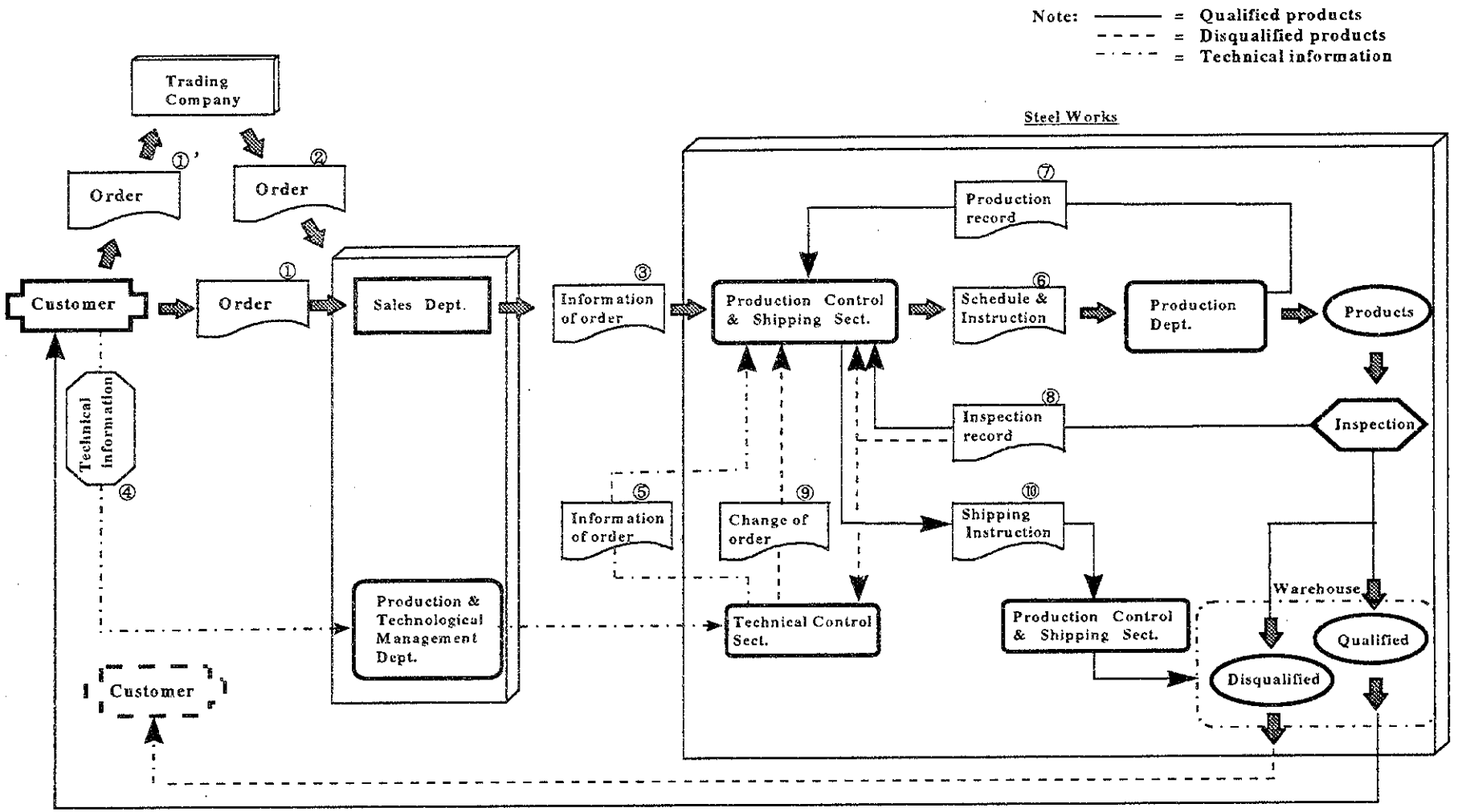
3) Rolling plan

In order to meet the contract delivery time for consumers, a rolling plan and delivery plan shall be made.

(2) Quality control plan

Quality control is to understand precisely consumers' requirements, and to make concrete quality standard or quality specifications. And then, it is to make products most economically , and to keep the delivery time as required. It is quality control that a series of these tasks are efficiently carried out. A quality control plan should be, therefore, established as illustrated in the Figure 9-3-1.

Figure 9-3-1 Example of Quality control System



9-4 Sales Plan

As opposed to bar products, of which consumers are mainly construction companies on project basis, the consumers of flat products are mainly manufacturers. This shows that flat product plant can expect stable demand for flat products with ease, because the demand is the accumulation of periodic and stable demand from manufacturers as far as they operate constantly.

Sales activities should be strongly executed by targeting the areas of big demand such as welded pipes, construction and automobiles for hot-rolled products, and home appliance, metal furniture and automobiles for cold-rolled products, and construction and home appliances for galvanized products.

The Sales plan is shown in Table 9-4-1.

To acquire fixed customer, especially in 2005 and 2006 at the stage of production start, every effort for sales should be concentrated on penetration into the domestic market by winning market share against imports through the following measures :

- Customer-oriented technical services
- Quality of products
- Delivery time
- Pricing Policy
- Quality assurance

Table 9-4-1 Sales Plan

(Unit: 1,000 t/y)

Year	HRC	Plate	CRC	GI	Total
2005	312	56	128	40	536
2006	532	95	220	70	917
2010	541	97	224	71	933
2015	541	97	224	71	933
2020	541	97	224	71	933

In Egypt the consumption of flat products will increase under the development of the market economy and privatization in the next ten years, and the number of coil service centers will also be increased.

The sales base shall be established in Cairo, where is easily accessible to market information,

because many headquarters of consumers are located, separated from the flat product plant in Alexandria.

9-5 Research and Development Plan

Judging from the Egyptian flat product market, a large demand for high grade products can not be expected. Most of the product will be of commercial grade. Therefore, it is recommended to introduce operating technology from an outside steel company as occasion demands without organizing a large scale research and development center.

This may be organized when requirements for high grade products increase due to changes in the market in future.

9-6 Future Expansion Plan

(1) Flat product market growth

As described in Section 5-1, demand for flat products in Egypt is not supposed to grow enough to support production of two million tons per year by the flat product plant before 2015. Execution of the expansion plan shall be suspended till market size justifies the expansion of production capacity to two million tons per year. If the growth of demand continues following the medium growth rate shown in the Phase-1 report, there will be the possibility to expand production capacity by 2018.

(2) Basic plan for the future expansion

Although this feasibility study does not cover dates beyond 2015, the basic plan for the expansion of the plant is shown as followings.

1) Material flow

Production capacity for the 2nd stage shall be two million tons per year. The kinds of products will be increased and steel grade is assumed to be higher than that of the 1st stage. The material flow of the 2nd stage is shown in Figure 9-6-1.

2) Facility plan

In addition to the facilities of the 1st stage, the facilities shown in Table 9-6-1 shall be installed for the expansion of production capacity of flat products from one million to two million tons

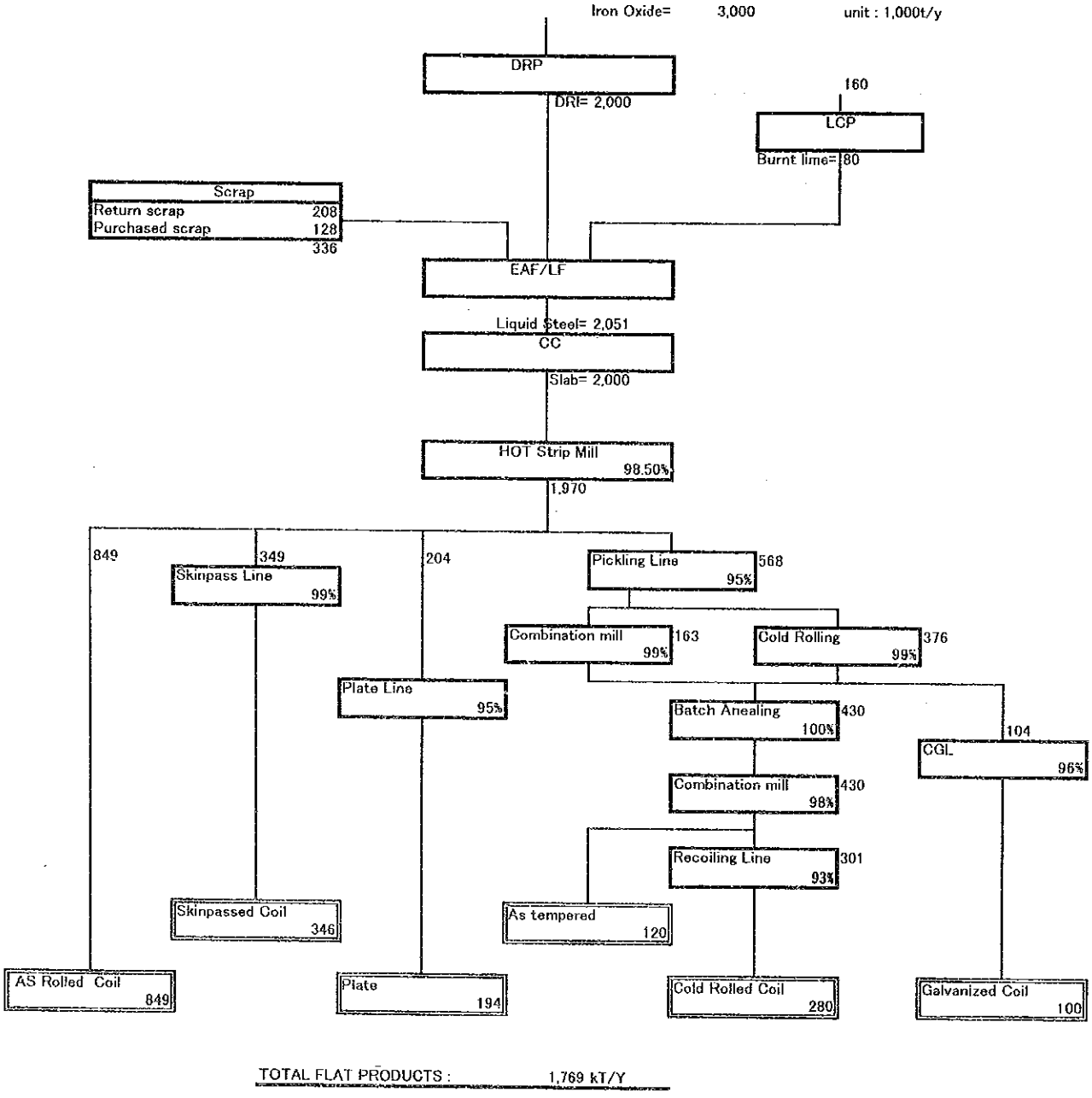
per year.

3) Construction cost

Although the production capacity will be double that of the 1st stage, the 2nd expansion will not require so large amount of construction cost as the 1st stage. It will not be necessary to pay for land acquisition, land preparation, construction of the hot rolling mill and administrative facilities. Consequently, if high market demand is expected, a rather high return of investment can be expected from the 2nd expansion compared to the 1st stage.

Figure 9-6-1 2nd Stage Material Flow

(Production capacity : two million tons per year)



TOTAL FLAT PRODUCTS : 1,769 kT/Y

Table 9-6-1 Facilities for 2nd Stage Construction

Plant	1st stage (Initial stage)	2nd stage (Additional equipment)		Remarks
	Main facilities	Main facilities	Ancillary equipment	
DR plant				
[Capacity]	[1 million ton/y]	[1 million ton/y]		
- DR plant	- Megamod x1 plant	- Megamod x 1 plant		
Steelmaking plant				
[Capacity]	[1 million ton/y]	[1 million ton/y]	- Crane & lifting equipment	Expansion of
- FAF	- 160 t/heat x1	- 160 t/heat x1	- Water treatment system	Buildings
- LF	- 160 t/heat x1	- 160 t/heat x1		
- Slab caster	- 1 machine/1 strand	- 1 strand/1 strand		
Hot strip mill				
	[1 million ton/y]	[1 million ton/y]		
- Slab reheating furnace	- 250 t/h x1	- 250 t/h x1	- Roll grinders	Expansion of
- Rolling mill			- Crane & lifting equipment	Buildings
Rougher	- 1 stand	-	- Water treatment system	
Coil box	- 1 machine	-		
Finisher	- 5 stands	-		
Coiler	- 1 machine	- 1 machine		
- Skinpass mill	- 1 mill	-		
- Plate line	- 1 line	-	- Crane & lifting equipment	

Plant	1st stage (Initial stage)	2nd stage (After expansion)		Remarks
	Main facilities	Main facilities	Ancillary equipment	
Cold strip mill				
[Capacity]	[0.35 million ton/y]	[0.20 million ton/y]	- Roll grinders	Expansion of
- Pickling line	- 1 line (with 3 tanks)	- (Additional 3 tanks)	- Crane & lifting equipment	buildings
- Reversing mill	- 1 mill	-	- Water treatment system	
- Combination mill	- 1 mill	-		
- Annealing furnace	- 21 bases/ 10 furnaces	- 13 bases/6 furnaces		
- Recoiling line	- 1 mill	-		
- Galvanizing line	- 1 line	-		
Auxiliary facilities				
- Lime calcining plant	- 1 plant	- 1 plant		
- Sub-station	- 1 set	- 1 set		
- Maintenance shop	- 1 shop	-		

Chapter 10. ESTIMATION OF CAPITAL INVESTMENT COST

This chapter estimates the direct capital investment cost and the accompanying indirect cost required for construction of the flat product plant.

The direct capital investment cost includes the following costs expressed in foreign currencies for imports at CIF prices and in local currency for domestic procurements and inland transportation.

- Equipment to be purchased: Import
- Site work: Domestic, including land and reclamation
- Construction material: Import, except for ballast, sand, and red bricks, which can be procured domestically

The indirect cost includes engineering fees and contingency costs.

Other initial investment cost includes preproduction costs, interest to be paid during construction period, and working capital before start-up of production, all covered in Chapter 12.

The capital investment cost is estimated based on international price levels as of June 1997 and the following data and information.

- Information/data collected during the site survey for field work and local supply
- Estimation by NKK and Kobe Steel for foreign supply
- Information/data quoted for field work
- Information/data collected at the international bidding at the similar project for foreign supply
- Information/data collected at the engineering work of similar project for supply and field work

The capital investment cost estimated on the above preconditions is shown in Table 10-3-1.

Table 10-3-1 Summary of Estimated Capital Investment Cost

Unit: 1,000 US$

	Equipment			Installation			Civil & Building			Total		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
Direct Reduction Plant	164,992	2,999	167,991	0	16,740	16,740	0	15,873	15,873	164,992	35,612	200,604
Lime Calcining Plant	8,025	1,633	9,658	0	1,786	1,786	0	2,024	2,024	8,025	5,442	13,467
Steelmaking Plant	108,100	8,900	117,000	0	11,800	11,800	8,900	28,622	37,522	117,000	49,322	166,322
Hot Strip Mill Plant	123,570	22,410	145,980	0	17,100	17,100	5,550	51,182	56,732	129,120	90,692	219,812
Cold Strip Mill Plant	63,252	12,915	76,167	0	9,360	9,360	920	21,621	22,541	64,172	43,896	108,068
Hot-dip galvanizing Line	20,538	4,302	24,840	0	4,995	4,995	80	6,466	6,546	20,618	15,763	36,381
Electric Power	26,711	189	26,900	0	6,030	6,030	0	5,080	5,080	26,711	11,299	38,010
Utilities	27,457	5,947	33,404	0	5,044	5,044	0	10,794	10,794	27,457	21,784	49,242
In-works Transportation	4,230	4,950	9,180	0	90	90	0	6,023	6,023	4,230	11,063	15,293
Analysis & Inspection	5,001	68	5,069	0	464	464	0	145	145	5,001	677	5,678
Maintenance Shop	558	189	747	100	18	118	0	3,752	3,752	658	3,959	4,617
Administration Office	0	0	0	0	0	0	0	4,194	4,194	0	4,194	4,194
Sub-total	552,435	64,501	616,936	100	73,427	73,527	15,450	155,776	171,226	567,985	293,704	861,689
Land & Reclamation										0	39,822	39,822
Engineering Fee										27,045	0	27,045
Contingency										28,399	16,676	45,076
Total										623,430	350,202	973,632
Customs Duty										0	28,394	28,394
Sales Tax										0	59,628	59,628
Grand Total										623,430	438,224	1,061,654

Note: 1) Customs duty of 5 % for all imports.

2) Sales tax of 10 % for the value of all procurements.

Chapter 11. ESTIMATION OF PRODUCTION COST

Absorption (full) costing is used for cost accounting. Absorption costing includes all manufacturing costs (variable and fixed costs) to reflect all the costs incurred for production.

The continuous process cost method is used to calculate production cost. The process cost method is applicable to the mass production of similar products through a continuous production process.

Cost centers are decided in consideration of such things as classification of facility control, organization and staff control, and production control. They are established as shown in Figure 11-1-2.

The proposed price levels are based on the prevailing market prices as of June 1997, when the site survey was conducted.

Production cost, including variable costs and fixed costs, is estimated at normal operation condition (slab production: one million ton/year).

- Variable costs include the following:
  raw materials, utilities, and manufacturing supplies

- Fixed costs include the following:
  labor, maintenance, and plant and equipment depreciation costs incurred in the manufacturing sectors

The estimation of production cost is shown in Table 11-3-1.
The production cost by product is shown in Table 11-3-2.

Figure 11-1-2 Establishment of Cost Center

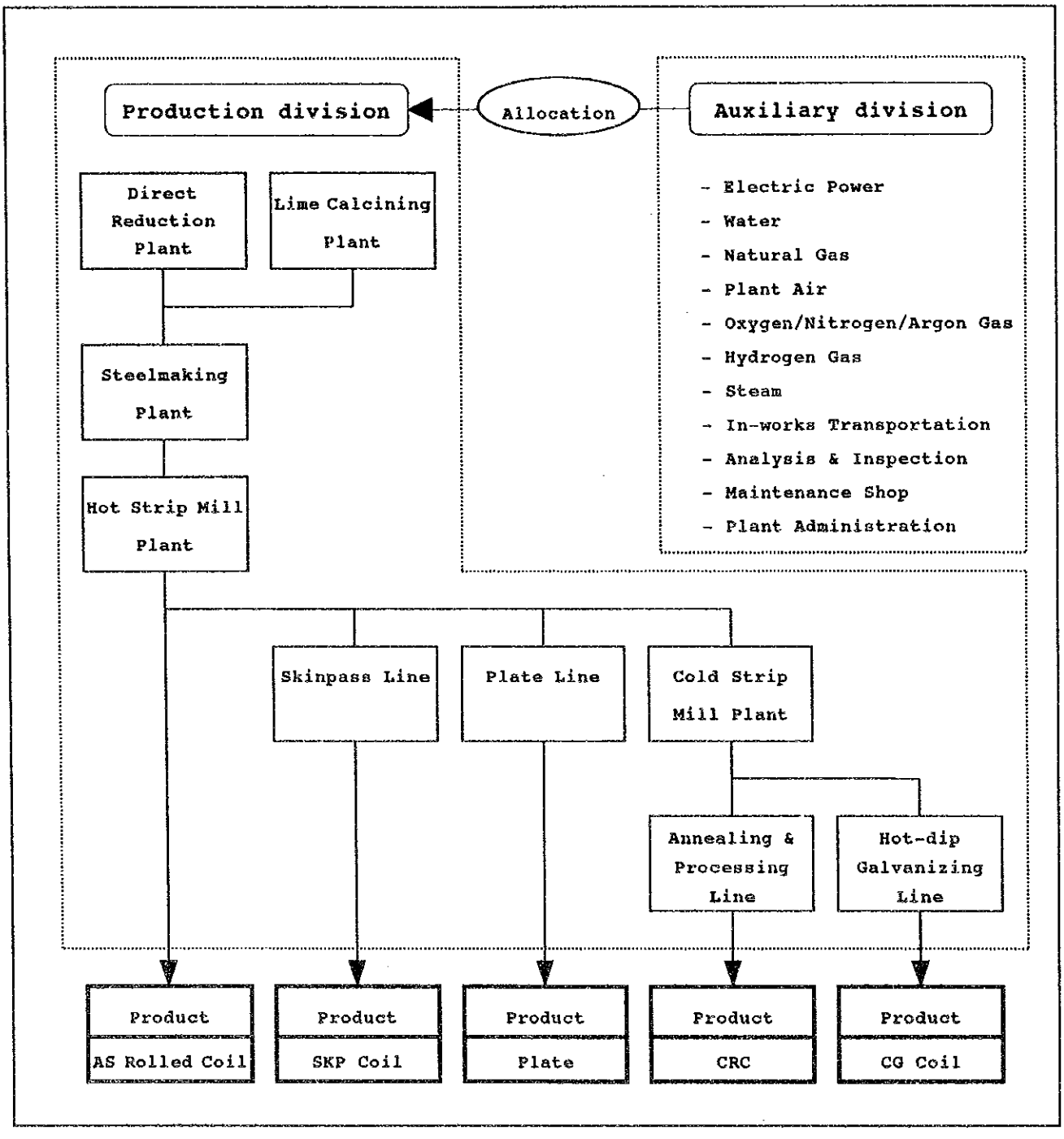


Table 11-3-1 Estimation of Production Cost

	Unit Cost		Requirement		Amount (1,000 US$)	Costs per ton (US$/ton)
Variable Costs					171,811	184.15
Material Costs					132,532	142.05
Lump ore	50.97	US$/ton	300,000	ton	15,291	16.39
Oxide pellet	54.54	US$/ton	1,200,000	ton	65,448	70.15
Scrap	165.00	US$/ton	167,700	ton	27,671	29.66
Limestone	6.50	US$/ton	80,000	ton	520	0.56
Graphite electrode, Fe-Mn, Fe-Si, Refractory, etc.	316.40	US$/ton	53,100	ton	16,801	18.01
Hydrochloric acid	3.00	US$/ton	20,000	ton	60	0.06
Coil packing for APL & CGL	1.50	US$/ton	295,000	ton	443	0.47
Coil packing for HSMP	0.10	US$/ton	368,000	ton	37	0.04
Coil packing for SKL	0.20	US$/ton	173,000	ton	35	0.04
Zinc ingot	2,000.00	US$/ton	2,982	ton	5,964	6.39
Chromate liquid	3,000.00	US$/ton	21	ton	64	0.07
Roll	5,000.00	US$/ton	40	ton	200	0.21
(-) By-products (Scrap)	165.00	US$/ton	-81,000	ton	-13,365	-14.32
Other Variable Operating Costs					52,644	56.42
Electricity	0.020	US$/kWh	953	GWh	19,054	20.42
Water	0.300	US$/$m^3$	5,684,000	m^3	1,705	1.83
Natural Gas	0.084	US$/$Nm^3$	328,881,000	Nm^3	27,626	29.61
Oxygen Gas	0.088	US$/$Nm^3$	32,000,000	Nm^3	2,816	3.02
Nitrogen Gas	0.044	US$/$Nm^3$	28,022,000	Nm^3	1,233	1.32
Argon Gas	0.300	US$/$Nm^3$	700,000	Nm^3	210	0.23
Fixed Costs					83,364	89.35
Labor Costs			1,398	person	4,165	4.46
General Manager	31,500	US$/person	0	person	0	0.00
Deputy General Manager	26,600	US$/person	1	person	27	0.03
Department Manager	21,600	US$/person	4	person	86	0.09
Section Manager	9,900	US$/person	14	person	139	0.15
Assistant Section Manager	8,400	US$/person	35	person	294	0.32
Engineer & Specialist	4,700	US$/person	118	person	555	0.59
Worker	2,500	US$/person	1,226	person	3,065	3.29
Repair Costs					21,855	23.42
Depreciation					57,343	61.46
Total Production Costs					255,175	273.50

Note 1) Customs duty of 5 % for all imported equipment and machinery is included.

2) Prevailing customs duties in Egypt for imported raw materials is included.

3) Sales tax of 10 % for all procurements is included.

Table 11-3-2 Estimation of Production Cost by Product

Unit: US$/ton

	Total	AS Rolled Coil	Skinpassed Coil	Plate	Cold Rolled Coil	Galvanized Coil
Variable Costs	184	174	174	175	184	268
Materials Costs	142	128	130	134	151	228
(-) By-products	-14	-5	-7	-14	-33	-23
Other Variable Operating Costs	54	50	50	52	64	61
Costs from Auxiliary Department	1	1	1	1	2	2
Fixed Costs	89	67	75	86	122	141
Labor Costs	2	1	2	2	3	3
Repair Costs	21	16	18	20	28	32
Depreciation	53	38	43	51	73	88
Costs from Auxiliary Department	14	11	12	13	18	18
Total Costs	273	241	249	261	306	410

Chapter 12. FINANCIAL ANALYSIS

12-1 Basic Policy for Financial Analysis

Financial analysis is used to evaluate the profitability, efficiency, solvency, and overall feasibility of the flat product plant project.

Financial analysis examines the Project in terms of sales, production, operation, investment, and financing, and provides information for necessary improvements and criteria for decision making in the Project.

12-2 Development of Financial Statements

(1) Assumptions for financial statements

The financial projection period is 20 years, from 2000 to 2019. This period is established as being equal to 5-year construction period plus 15-year economic life of major plant equipment and machinery.

Investment Law No. 8 of 1997 is applied to the Project.

Other assumptions are shown in the following tables.

Table 12-2-1 Production Plan by Product

Unit: 1,000 ton

Products	1	2	3-19
	2005	2006	2007-2019
Slab	600	1,000	1,000
AS Rolled Coil	221	368	368
Skinpassed Coil	104	173	173
Plate	58	97	97
Cold Rolled Coil	134	224	224
Galvanized Coil	42	71	71
Total of flat products	560	933	933

Table 12-2-2 Sales Plan by Product

Unit: 1,000 ton

Products	1	2	3-19
	2005	2006	2007-2019
AS Rolled Coil	212	362	368
Skinpassed Coil	100	170	173
Plate	56	95	97
Cold Rolled Coil	128	220	224
Galvanized Coil	40	70	71
Total	536	917	933

Table 12-2-3 Sales Price by Product

Unit: US$/ton

Products	Sales Price
AS Rolled Coil	410
Skinpassed Coil	430
Plate	500
Cold Rolled Coil	530
Galvanized Coil	680

Table 12-2-4 Changes in Net Working Capital

Unit: 1,000 US$

	1	2	3	4	5
	2005	2006	2007	2008	2009
Current Assets	33,005	39,093	39,328	39,328	39,328
Accounts Receivable	0	0	0	0	0
Inventories	33,005	39,093	39,328	39,328	39,328
Raw Materials	19,529	19,861	19,861	19,861	19,861
Semifinished	5,906	8,742	8,857	8,857	8,857
Finished	7,569	10,490	10,609	10,609	10,609
Current Liabilities	0	0	0	0	0
Accounts Payable	0	0	0	0	0
Net Working Capital	33,005	39,093	39,328	39,328	39,328
Changes in Net Working Capital	21,605	6,088	235	0	0

Table 12-2-5 Investment Plan

Unit: 1,000 US$

	Total	-5	-4	-3	-2	-1
		2000	2001	2002	2003	2004
Construction cost*	1,002,026	2,832	20,927	306,614	525,178	146,475
Preproduction cost	31,207	325	675	1,397	6,554	22,256
Interest during construction	64,118	0	110	870	15,768	47,369
Initial working capital	20,588	0	0	0	0	20,588
Raw Materials	11,400	0	0	0	0	11,400
Cash-in-hand	9,188	0	0	0	0	9,188
Total Investment	1,117,939	3,157	21,712	308,882	547,500	236,687

* Includes engineering fees and contingencies

Table 12-2-6 Annual Construction Cost

Unit: 1,000 US$

	Total	-5	-4	-3	-2	-1
		2000	2001	2002	2003	2004
Equipment & Machinery	644,558	0	0	193,367	386,735	64,456
Installation	73,527	0	0	0	22,058	51,469
Civil & Building	171,999	0	0	68,799	85,999	17,200
Land & Reclamation	39,822	0	15,929	23,893	0	0
Engineering Fee	27,045	2,705	4,057	6,761	6,761	6,761
Contingency	45,076	127	941	13,793	23,625	6,589
Total Construction Cost	1,002,026	2,832	20,927	306,614	525,178	146,475

Table 12-2-7 Annual Preproduction Cost

Unit: 1,000 US$

	Total	-5	-4	-3	-2	-1
		2000	2001	2002	2003	2004
Salaries & Wages	5,403	162	338	699	1,627	2,578
Consultant Fee	20,400	0	0	0	3,300	17,100
Others	5,403	162	338	699	1,627	2,578
Total Preproduction Cost	31,207	325	675	1,397	6,554	22,256

Table 12-2-8 Financing Plan

Unit: 1,000 US$

	Total	-5	-4	-3	-2	-1
		2000	2001	2002	2003	2004
Total Investment	1,117,939	3,157	21,712	308,882	547,500	236,687
Total Finance	1,117,939	3,157	21,712	308,882	547,500	236,687
Equity	300,608	1,578	10,856	96,058	96,058	96,058
Long-term Loans	817,331	1,578	10,856	212,824	451,442	140,630

(2) Financial statements

Financial statements are developed for Profit and Loss, Balance Sheet, and Cash Flow, with the assumptions. Summary of Profit and Loss Statement is shown in Table 12-2-9.

Table 12-2-9 Summary of Profit and Loss Statement

	1		2		3		4		5		10		15	
	2005		2006		2007		2008		2009		2014		2019	
Sales Volume	535,708	(ton)	917,417	(ton)	933,000	(ton)	933,000	(ton)	933,000	(ton)	933,000	(ton)	933,000	(ton)
(Unit)	(1,000 US$)	(US$/ton)	(1,000 US$)	(US$/ton)	(1,000 US$)	(US$/ton)	(1,000 US$)	(US$/ton)	(1,000 US$)	(US$/ton)	(1,000 US$)	(US$/ton)	(1,000 US$)	(US$/ton)
Sales	252,914	472	433,401	472	440,770	472	440,770	472	440,770	472	440,770	472	440,770	472
Cost of Sales	181,979	340	252,305	275	255,175	273	255,175	273	255,175	273	255,175	273	255,175	273
Variable Costs	98,615	184	168,942	184	171,811	184	171,811	184	171,811	184	171,811	184	171,811	184
Fixed Costs	83,364	156	83,364	91	83,364	89	83,364	89	83,364	89	83,364	89	83,364	89
Gross Profit	70,935	132	181,096	197	185,595	199	185,595	199	185,595	199	185,595	199	185,595	199
General & Administrative Expenses	49,726	93	38,026	41	38,026	41	20,926	22	20,926	22	1,861	2	1,861	2
Operating Income	21,210	40	143,070	156	147,570	158	164,670	176	164,670	176	183,735	197	183,735	197
Non-operating Expenses	57,213	107	57,213	62	51,492	55	45,771	49	40,049	43	11,443	12	0	0
Net Income before Taxes	-36,004	-67	85,857	94	96,078	103	118,899	127	124,620	134	172,292	185	183,735	197
Net Income after Taxes	-41,966	-78	85,857	94	96,078	103	111,233	119	116,954	125	111,323	119	124,939	134
Net Profit Margin	-16.6	(%)	19.8	(%)	21.8	(%)	25.2	(%)	26.5	(%)	25.3	(%)	28.3	(%)

(3) Analysis of financial statements

In the start-up year of operation, 2005, although the Project incurs loss from the low production volume, 60 % of ordinary operation level, cash inflow sufficiently covers the loss and short-term finance is unnecessary.

In the second year of operation, 2006, production volume increases substantially to ordinary operation level and enjoys a net profit margin of 19.8 %. Starting from the third year, 2007, production volume stabilizes and constant growth of profit continues because of a continuous decrease of interest payment of long term loans until 2015. After the redemption of long term loans, in 2016 and thereafter, the net profit margin stabilizes at 28.3 %.

Financial statements show that the Project generates enough excess cash inflow to operate as a going concern.

12-3 Evaluation of the Flat Product Plant Project

(1) Evaluation of plant operation

Table 12-3-1 Financial Ratios

	1	2	3	5	10	15
	2005	2006	2007	2009	2014	2019
(1) Profitability						
Gross Profit Margin (%)	28.05	41.78	42.11	42.11	42.11	42.11
Operating Profit Margin (%)	8.39	33.01	33.48	37.36	41.68	41.68
Net Profit Margin (%)	-16.59	19.81	21.80	26.53	25.26	28.35
Return on Assets (%)	-3.89	7.95	8.78	10.09	10.78	9.89
(2) Efficiency						
Asset Turnover (%)	23.51	40.13	40.27	38.02	42.70	34.90
(3) Solvency						
Debt-to-Equity (times)	3.16	2.14	1.48	0.73	0.09	nm
Debt Service Coverage Ratio (times)	1.22	1.54	1.68	1.92	1.93	nm

Profitability of the Project is quite high and gross profit margin stabilizes in the third year at 42.1 % as the production level remain at the ordinary level. In the sixth year and thereafter,

operating profit margin is expected to record excellent performance since no more consultant fees and amortization costs are incurred. Although net profit margin is minus figure in the first year, it turns around to 19.8 % in the second year and continues to grow and keeps remain at the level of more than 25 %.

(2) Project feasibility

The discounted cash flow method (DCF) is applied to the financial analysis.

The internal rate of return (IRR) is the discount rate that equates the present value of cash flows to the present value of total investment, that is, the discount rate by which the net present value of future cash flows is equal to zero.

IRR on total investment (ROI) and IRR on equity (ROE) are calculated and shown in Table 12-3-2.

Table 12-3-2 Calculation of IRR

	IRR (%)
ROI before tax	14.4
ROI after tax	12.6
ROE	21.8

ROI before tax is substantially greater than the weighted average cost of loans of 7 % in the Study, and even greater than the general financing cost of 11 % to 13 % in financial markets.

ROE greater than 20 % is attractive enough for investors.

From the points described above, an analysis of IRR safely concludes that the Project is feasible.

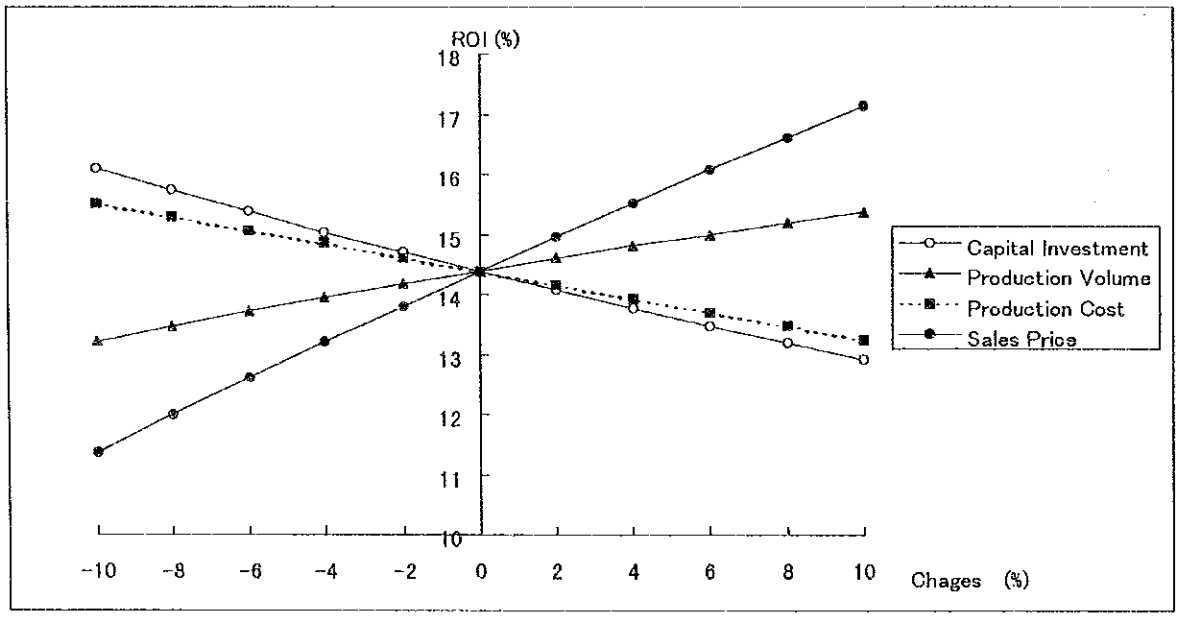
ROI after tax , however, is 12.6 %, which is almost equal to the general financing cost. ROE is 14.3 % with interest on long-term loans of 13 %. These results cast a delicate question on the feasibility of the plant as a private investment project without additional tax exemptions or governmental support.

(3) Sensitivity analysis

Sensitivity analysis examines the effects on ROI before tax by changes in the range of -10 % to +10 % in the factors of capital investment cost, Production cost, sales price and production volume

The elasticity of ROI is greatest with respect to sales price, followed, in order, by capital investment, production cost and production volume, as shown in Figure 12-3-1.

Figure 12-3-1 Effects on ROI by Changes in Respective Factors



(4) Economic analysis

This section examines the benefit of the flat product plant to the whole economy.

The objectives of the Fourth Economic Development Plan are promotion of privatization, establishment of economic plan, and creation of employment. Taking over the Third Economic Development Plan, improvement of foreign currency balance and industrial development continue to be focused on in the Fourth Plan. The flat product plant meets these objectives and is expected to bring about the following direct and indirect benefits.

1) Creation of employment

The flat product plant will create 1,550 jobs at the ordinary operation stage, and more than 6,000 jobs at the peak of construction. In Egypt, the surplus employees at the state owned enterprises, and the high unemployment rate in the younger generation are national problems. The flat product plant will contribute to job opportunities for these people. For indirect benefits, the number of employees could be several times that if the effects on related industries are considered, as explained in Item 3), and this will generate economic benefits for the people of Egypt.

2) Improvement of foreign currency balance

The flat product plant sells its products in the domestic market and doesn't earn foreign currencies directly. But the flat product plant, whose products are import substitutes, does conserve the outflow of foreign currencies from Egypt. If a decrease in imports is equal to the sales of the flat product plant, 200 million to 300 million U.S. dollars is saved annually after taking account of the increase in raw materials and equipment to be imported, as shown in Table 12-3-3, which in 15 years amounts to 3.5 billion U.S. dollars.

Table 12-3-3 Improvement of Foreign Currency Balance

Unit: 1,000 US$

	Total	-5	-4	-3	-2	-1	1	2	3	4	5
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Substitution of Imported Steel Products	6,416,325	0	0	0	0	0	252,914	433,401	440,770	440,770	440,770
Imported Materials, Spare Parts and Supplies	-1,960,798	0	0	0	0	-11,400	-104,580	-135,678	-131,689	-131,454	-131,454
Capital Investment Costs in Foreign Currencies	-725,301	-2,828	-4,341	-196,049	-392,930	-120,439	0	0	0	0	0
Issuances of Common Stock in Foreign Currencies	167,033	1,414	2,170	54,483	54,483	54,483	0	0	0	0	0
Proceeds from Long-term Debt in Foreign Currencies	560,953	1,414	2,170	141,566	338,447	77,355	0	0	0	0	0
Repayment of Long-term Debt in Foreign Currencies	-560,953	0	0	0	0	0	0	-56,095	-56,095	-56,095	-56,095
Interest Payment of Long-term Debt in Foreign Currencies	-255,234	0	0	0	0	0	-39,267	-39,267	-35,340	-31,413	-27,487
Net Foreign Currency Savings	3,642,025	0	0	0	0	0	109,067	202,361	217,646	221,807	225,734

(continued)

	6	7	8	9	10	11	12	13	14	15
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Substitution of Imported Steel Products	440,770	440,770	440,770	440,770	440,770	440,770	440,770	440,770	440,770	440,770
Imported Materials, Spare Parts and Supplies	-131,454	-131,454	-131,454	-131,454	-131,454	-131,454	-131,454	-131,454	-131,454	-131,454
Capital Investment Costs in Foreign Currencies	-4,358	0	0	0	0	-4,358	0	0	0	0
Issuances of Common Stock in Foreign Currencies	0	0	0	0	0	0	0	0	0	0
Proceeds from Long-term Debt in Foreign Currencies	0	0	0	0	0	0	0	0	0	0
Repayment of Long-term Debt in Foreign Currencies	-56,095	-56,095	-56,095	-56,095	-56,095	-56,095	0	0	0	0
Interest Payment of Long-term Debt in Foreign Currencies	-23,560	-19,633	-15,707	-11,780	-7,853	-3,927	-0	-0	-0	-0
Net Foreign Currency Savings	225,303	233,587	237,514	241,440	245,367	244,936	309,316	309,316	309,316	309,316

3) Industry related benefits

Because of the size of steel plants, in general, and the nature of the steel industry, the flat product plant will have a great influence on other industries. Also the promotion of the steel industry leads to a development of its customer industries (forward linking effect) and to its supplier industries of materials and services (backward linking effect).

In the process of establishment of the flat product plant, and after the plant operation, a huge volume of construction materials, raw materials, utilities, spare parts, and equipment maintenance will be required. Naturally, these activities will generate the backward linking effect on industries such as construction, power and energy, raw material suppliers, respective parts-manufacturers, transporting, and distributing.

High quality flat product and its timely delivery to the Egyptian domestic companies in the industries such as consumer electronics, autos, can manufacturing, construction enable the companies to reduce sales price and shorten delivery-time of their products. This forward linking effect will enhance the competitiveness of these domestic industries. While price-competitiveness is essential for basic products such as bar steel, quality and service determine competitiveness for flat products. In this way, the Project's forward linking effect described above is expected to be substantial.

In the future, the flat product plant is expected to promote high value-added industries, such as electronics and automotive, and also lead to an incentive for foreign companies to directly invest in Egypt.

From the points described above, the flat product plant is considered to contribute to the further development of high technology industries in Egypt and benefit the Egyptian economy as a whole.

Chapter 13. CONCLUSION AND RECOMMENDATION

The Study Team states the conclusion and recommendation of the feasibility study as follows.

Total investment cost will reach US$ 1.1 billion including construction cost, preproduction cost, initial working cost and interest during construction.
The ROI calculation shows that the figure of 14.4 % is greater than the 7 % of weighted average cost of capital and 21.8 % of ROE is big enough to induce investment. As a result, it can be said that the projected flat product plant is feasible and effective in terms of capital investment.

However, financial conditions for such a small steel plant are easily influenced by its surroundings such as change of interest and foreign currency exchange rate, especially in a case where the plant is constructed in a developing country. Therefore, in spite of the feasible result of the financial analyses, in order to ensure the establishment of stable management and to promote further investor's interest in a steel company, it is recommended that the government protect the new flat product company by exempting import duties and sales tax on the plant equipment for the project.

On the other hand, construction and operation of a flat product plant requires great amounts of construction material, raw material, utilities, spare parts, and maintenance of the equipment although the capacity itself is rather small than conventional steel plant in the world. It also generates employment opportunities among not only the company itself, but also subsidiary companies and supporting industries.

Furthermore, domestic industries will be encouraged to improve their productivity (cost and delivery) by the supply of high quality flat products with reasonable delivery times. In consequence, their international competitiveness will be strengthened in both domestic and overseas markets.

The flat product plant is not planned to export products. However, the plant, whose products are import substitutes, does conserve the outflow of foreign currencies from Egypt. Provided that the amount of import substitution is equal to the sales of the plant, US$ 200 to 300 million is saved annually which amounts to US$ 3.5 billion during fifteen years.

Therefore, materialization of the flat product plant will have quite beneficial effects of promoting expanded employment opportunities and development of surrounding industries in Egypt as well as improvement of international balance of foreign currency.

Consequently, it can be concluded that construction of a flat product plant in Egypt is recommended, and

it will contribute to the development of the Egyptian economy as a whole.