JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

GENERAL ORGANIZATION FOR INDUSTRIALIZATION
THE ARAB REPUBLIC OF EGYPT

FINAL REPORT
FOR
THE FEASIBILITY STUDY
ON
INSTALLATION OF STEEL FLAT PRODUCTS COMPLEX
IN
THE ARAB REPUBLIC OF EGYPT
(PHASE-2)

- SUMMARY -

DECEMBER,1997

NKK CORPORATION
IN ASSOCIATION WITH
KOBE STEEL,LTD.

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PREFACE

In response to a request from the Govemment of the Arab Republic of Egypt, the government of Japan decided to conduct a development study on Feasibility Study on Installation of Steel Flat Products Complex (Phase2), and entrusted the study to the Japan International Cooperation Agency (JICA).

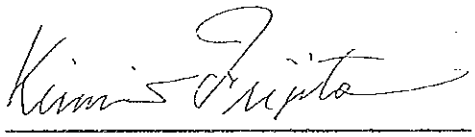
JICA sent to Egypt a study team headed by Mr. Nobuhisa Otani, NKK Coporation, three times between March 1997 and September 1997.

The team held discussions with the officials concerned of the Government of Egypt and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Egypt in order to descuss a draft report and the present report was perpared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Egypt for their close cooperation extended to the team.

December 1997



Kimio Fujita
President
Japan International Cooperation Agency

December, 1997

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmission

Dear Mr. K. Fujita:

We are pleased to submit to you the final report for the feasibility study on Installation of Steel Flat Products Complex in the Arab Republic of Egypt (Phase-2)

The purpose of the study is to select the most appropriate plant site among the candidates Egyptian counterpart proposed and to establish facility and operation plan, and to verify the construction of steel flat products complex In Egypt through environmental assesment and financial analysis based on the forcast of the flat product market in Egypt assuming that the plant will be put into operation in 2005.

The report consists of the following thirteen chapters.

As the result of the feasibility study, it is concluded that, although the total amount of investment will reach US$ 1.1 billion, the materlalization of a steel flat products complex in Egypt will be quite beneficial and feasible in terms of capital investment.

Constrution and operation of a flat product plant will require great amount of construciton materials, raw materials, utilities, spare parts, and maintenance of the equipment. It will generate 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 by the supply of high quality flat products with reasonable delivery time. In consequence, their international competitiveness will be strengthened in both domestic and overseas market.

The production of flat products will conserve the out flow of foreign currency from Egypt. If a decrease in import is equal to the sales amount of the plant, US$ 200 to 300 million will be saved annually.

Therefore materialization of the project 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, the Study Team concluded that construction of steel flat products complex in Egypt is feasible and it will contribute to the development of the Egyptian economy as a whole.

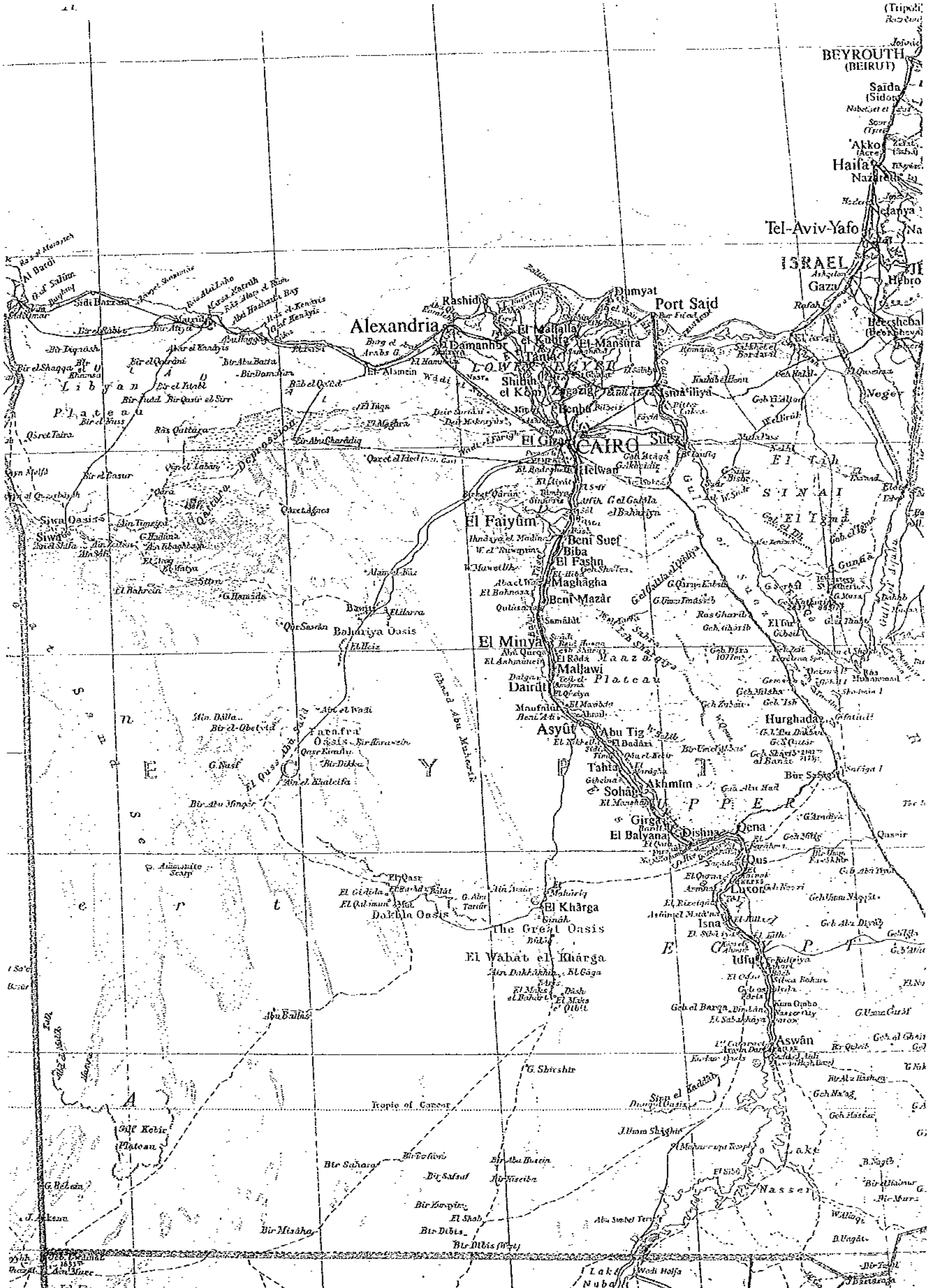
We wish to take this opportunity to express our sincere gratitude to the Ministry of Foreign Affairs, the Ministry of International Trade and Industry of Japan, and your Agency in the Arab Republic of Egypt, for valuable advice and support extended to the study. We also wish to express our deep appreciation to GOFI and relevant authorities in the Arab Republic of Egypt for close cooperation and assistance extended to the study.

Sincerely yours,

Nobuhisa Otani
Team Leader
The Feasibility Study on Installation of Steel Flat Products Complex in the Arab Republic of Egypt

Photographs of the Site

Map of Egypt


BEYROUTH
(BEIRUT)
Saïda
(Sidon)
Haifa
Tel-Aviv-Yafo
ISRAEL
Gaza
Alexandria
Rashid
Dumyat
Port Said
Damanhur
El Mansura
Zagazig
Isma'iliya
Suez
CAIRO
Helwan
El Faiyum
Beni Suef
Biba
El Fashn
Maghagha
Beni Mazar
El Minya
Mallawi
Dairut
Asyut
Abu Tig
Tahta
Sohag
Akhmim
Girga
El Balyana
Dishna
Qena
Qus
Luxor
Isna
Idfu
Aswan
Hurghada
Siwa Oasis
Bahariya Oasis
Farafra Oasis
Dakhla Oasis
El Kharga
The Great Oasis
El Wahat el Kharga
Tropic of Cancer
Libyan Plateau
Qattara Depression
SINAI
Lake Nasser
Lake Nuba
Wadi Halfa
Selima Oasis
Batn el Hajar

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Chapter 1. GENERAL

1-1 Background and Purpose of the Study

The third five-year economic development plan of Egypt ended at the end of June, 1997, and the subsequent fourth five-year plan has just started. These development plans have been carried out principally with the aims of promoting privatization, orientation to build the market economy and expanding employment opportunities. It is expected that with the progress of economic growth in Egypt, demand for quantity and high quality flat products will expand.

In this connection, in January 1995, the Egyptian Government requested the Government of Japan to implement a feasibility study on construction of a steel flat products complex (hereinafter referred to as flat product plant) in Egypt. In reply to that request, JICA dispatched a study team to Egypt in December 1995 and exchanged a scope of work (S/W) agreement between GOFI, in which the process and scope of the study was defined.

The result of Phase-1, which was conducted in 1996, shows that there will be enough demand for flat products to make the construction of the flat products complex feasible by the year of 2005. Consequently, JICA decided to conduct the Phase-2 study starting from February, 1997.

1-2 Study Team Member and Schedule

The Study Team was organized by NKK Corporation in association with Kobe Steel, Ltd. consisting of 12 members. The feasibility study was conducted from February to November, 1997, including four times of site surveys and one additional survey in Egypt with cooperation and assistance of GOFI. Draft final report was prepared and submitted to GOFI in October for review and comment. The final report was submitted to GOFI in December 1997 after revision of the draft final report taking account of the requirements and comments from GOFI.

1-3 Principal Subject

The study have been principally carried out on the following subjects.

- Present situation of the Egyptian steel industries
- Production and demand for flat products in Egypt
- Plant site selection
- Formulation of concept of the flat product plant
- Environmental assessment
- Operation plan for the flat product plant
- Financial and economic analyses

1-4 Consideration on Construction of Flat Product Plant

During the feasibility study on construction of flat product plant, the Study Team conducted the study by taking account of the following local conditions.

1) Market and project size
   - To minimize the project size and construction budget of the plant:
     Great flat product market can not be expected in Egypt and the plant size shall be of an appropriate size.
2) Process selection
   - To select the most appropriate process taking into account of domestic natural resources such as natural gas, electric power and water supply:
     Abundant natural gas and electricity shall be utilized. But water is scarce, and high quality iron ore is not available. Scrap generation is limited.
3) Operation cost
   - To minimize operation cost with the latest technology and small size of organization for management and operation:
     The plant shall be internationally competitive against imported products.
4) Plant site selection
   - To make due consideration on location of present and future major market in Egypt:
     Transportation cost of products will affect seriously on the operation cost and price.
   - To study on availability of port facilities for unloading imported iron ores:
     If new exclusive port for the plant is constructed, it will affect seriously on the feasibility of the project.

- To study carefully on the existing and future construction plan of infrastructure:

  Utilization of existing infrastructure is indispensable for making investment cost lower.

- To pay attention on the environment of resort area:

  Most area of the sea shore, especially on the Red Sea, are designated as resort area for tourism and plant constructions are not allowed.

The study results are outlined below.

Chapter 2. STEEL PRODUCTION IN EGYPT

2-1 Outline of the Egyptian Steel Industry

(1) Existing plants

There are fifteen steel companies in Egypt, six of which have steelmaking shops and produce crude steel. Crude steel production in Egypt was three million tons in 1994. However, more than 80 % of crude steel was produced by the two major companies EISCO (Egyptian Iron and Steel Co.) and ANSDK (Alexandria National Iron and Steel Co.). EISCO is the only company which produces flat products in Egypt. Production of flat products is almost 0.5 million tons per year and the remaining products are mostly bars and rods for construction.

(2) Future expansion and construction

In addition to the existing steel companies, recently, there are plans for expansion of existing plants and construction of new ones. In 2000, when these projects are completed, production capacity of crude steel is expected to reach five million tons per year. Future provisions for crude steel production are shown in Table 2-1-1.

(3) Locations

Most of these steel works are located near Cairo including Kalioubia. Some companies are constructing new steel works in the new industrial zone of Sadat City and 10th of Ramadan City. Locations of these steel works are shown in Figure 2-1-1.

2-2 Flat Products Production and Demand

The supply of and demand for flat steel products are shown in Table 2-2-1. Apparent average consumption was 0.77 million tons during six years from 1990 to 1995. Flat steel products of approximately 0.56 million tons per year are produced only in EISCO. Accordingly, imports of flat products are approximately 0.21 million tons per year. Exports of flat steel products are negligible excepting welded pipes.

Table 2-1-1 Crude Steel Production in Egypt

Unit: 1,000 ton

Company	Process	Location	1995	2000	Products
Existing plant					
ANSDK	DR/EAF	Alexandria	1,306	1,789	Bar & rod
EISCO	BF/BOF	Cairo	1,151	1,270	Flat, Section
NMI	OHF,EA	Kalioubia	192	260	Bar
DSC	F	Kalioubia	144	160	Bar
ECW	EAF	Alexandria	151	160	Bar
El Termish	EHF	Kalioubia	37	37	
	EAF				
Under construction or planned					
ARCO Steel					
El EZZ Steel	EAF	Sadat City	-	165	Special steel
Abu Zaabal	EAF	Sadat City	-	316	Bar
Suez Steel		Kaioubia	-	42	
Al Atiuo Co.	EAF	Suez	-	632	Billet
Boshay			-	85	Bar
Kouta		Sadat City	-		Bar
		10th of Ramadan	-		
Total			2,981	4,916	

Source : JICA Phase-1 report

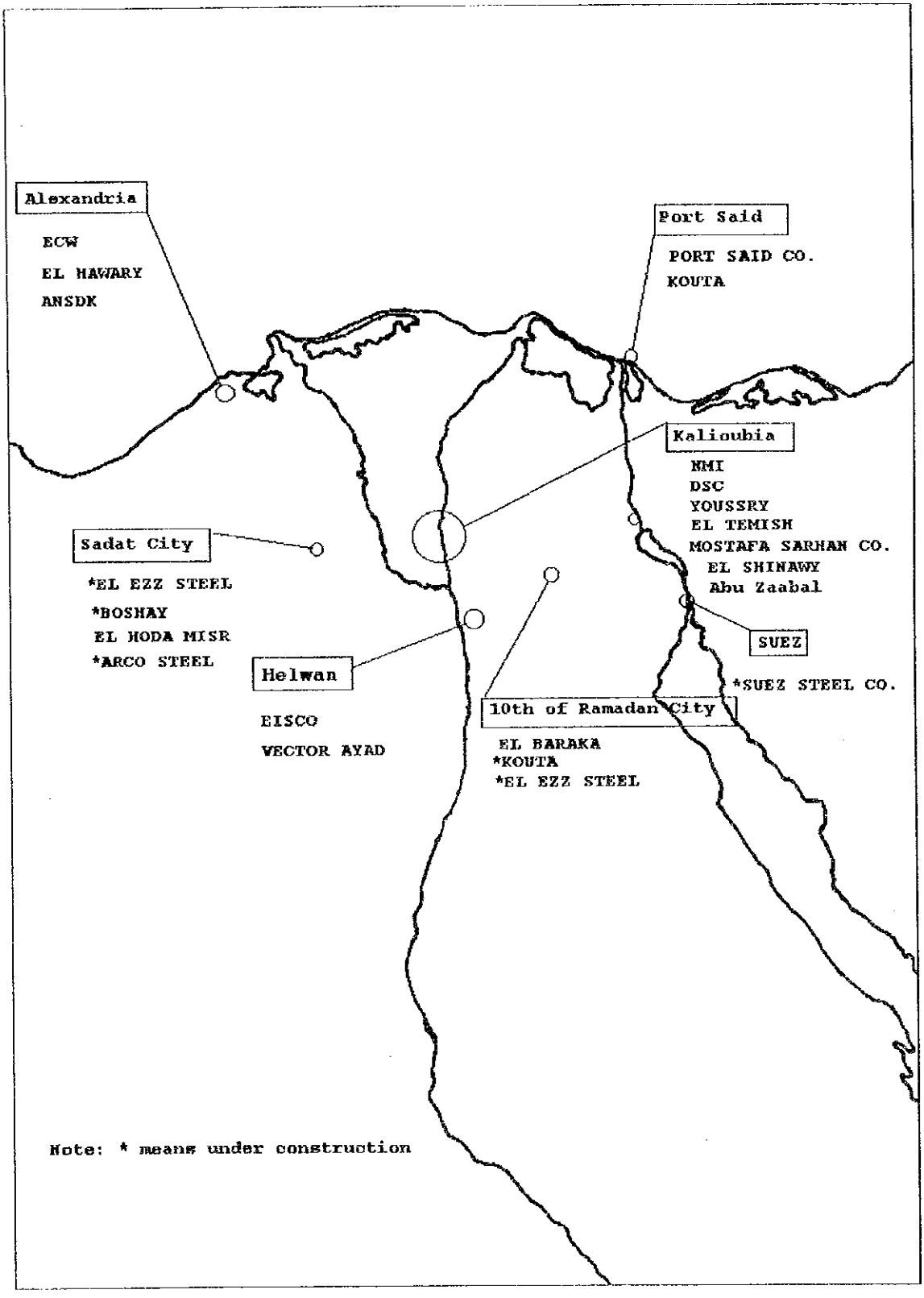
Table 2-2-1 Apparent Consumption Trend of Flat Products

Unit: 1,000 ton

	1990	1991	1992	1993	1994	1995	Ave.
Production	514	609	422	516	583	729	562
Import	201	192	182	209	171	295	208
Export	-	-	-	-	-	-	-
Apparent Consumption	715	801	604	725	754	1,024	770

Source : IISI 1996 report

Figure 2-1-1 Steel Works Locations



Chapter 3. FLAT PRODUCT MARKET IN EGYPT

3-1 Consumption of Flat Products

Trends of production and import of flat products for the last six years are shown in Tables 3-1-1 and 3-1-2 respectively. Export of flat steel products is negligible.

The apparent flat product consumption (production + import - export) in Egypt is indicated in Table 3-1-3. The total consumption was 600,000 - 800,000 tons per year.

Table 3-1-1 Production Trend of Flat Products

Unit: 1,000 ton

Product	1990	1991	1992	1993	1994	1995	Ave.
Hot rolled coil & plate	387	409	281	380	412	522	399
Cold rolled coil & sheet	123	195	137	133	169	205	160
Galvanized coil & sheet	4	5	4	3	2	2	3
Total	514	609	422	516	583	729	562

Source: JICA Phase-1 report (revised by IISI 1996 report)

Table 3-1-2 Import Trend of Flat Products

Unit: 1,000 ton

Products	1990	1991	1992	1993	1994	1995	Ave.
Hot rolled coil & plate	54	57	52	77	105	124	78
Cold rolled coil & sheet	42	34	25	27	27	71	38
Galvanized coil & sheet	34	1	35	31	28	37	28
TIN & TFS sheet	56	62	58	55	-	47	46
Electrical sheet	5	2	3	3	4	2	3
Other coated coil & sheet	9	36	10	15	7	13	15
Total	200	192	183	208	171	294	208

Source: JICA Phase-1 report (revised by IISI 1996 report)

Table 3-1-3 Apparent Flat Product Consumption

Unit: 1,000 ton

Product	1990	1991	1992	1993	1994	1995	Ave.
Hot rolled coil & plate	441	466	333	457	517	646	477
Cold rolled coil & sheet	165	229	162	160	196	276	198
Galvanized coil & sheet	38	6	39	34	30	39	31
TIN & TFS sheet	56	62	58	55	-	47	46
Electrical sheet	5	2	3	3	4	2	3
Other coated coil & sheet	9	36	10	15	7	13	15
Total	714	801	605	724	754	1023	770

Source: JICA Phase-1 report (revised by IISI 1996 report)

3-2 Current Steel Consumption by Consumers and End Users

(1) Outline of surveyed consumers

The Study Team selected some representative companies from each product category and visited their factories in order to define flat product specifications.

Quality and size requirements by these consumers are summarized in Table 3-2-1.

Table 3-2-1 Quality and Dimension Request to Flat Products

Flat Products	End use & Consumers		Delivery	Quality and Dimension Request	Necessary Dimensions	
	End use	Company			Thickness	Width
Plate & Hot rolled products	Construction (Steel Structure)	Ferrometalco	Sheet	* Plates wider than 1,500mm from the local market * Improvement shape for thicker plates (>8mm) * Good quality of thicker material (>20mm) * Uniform thickness * Grade ST37, ST52	3-60mm	1,000-2,500mm
		the Arab Contractors	Sheet			
	Shipyard	Suez Shipyard	Sheet	* No special requirements	8-30mm	
	Steel pipe	EL-NASR Steel Pipes & Fittings	Coil	* No special requirements * Coils wider than 1,000mm from the local market	2.5-12.7mm	Max.1,500mm
	Automobiles	NASCO	Sheet	* Grade ST37, ST44, ST52 * Sheets wider than 1,000mm from the local market		Max.1,500mm
Cold rolled products	Home appliances	IDEAL	Sheet	* No special requirements	0.5-1.5mm	Max.1,000mm
	Metal furniture	MOHM	Sheet	* Normal carbon steel from the local market * Products of good surface steepness * Good surface finished products * Uniform bending formability * Deep drawing quality	0.5-2.0mm	720-1,250mm
		Mobica	Sheet			

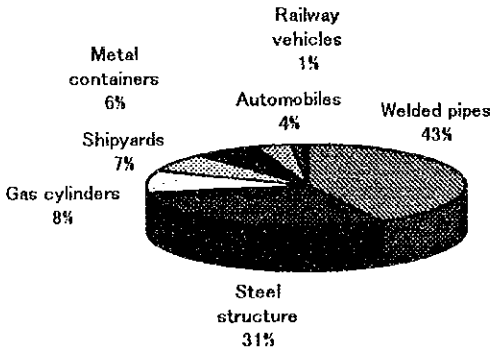
Flat Products	End use & Consumers		Delivery	Quality and Dimension Request	Necessary Dimensions	
	End use	Company			Thickness	Width
				* Grade SPCC, SPCD, SPCE * Sheets wider than 1,000mm from the local market		
	Automobiles	Suzuki Egypt	Sheet	* Good quality for automobiles * Deep drawing quality		
		NASCO	Sheet	* Grade ST14, ST12		Max.1,000mm
		Engineering Co. for Exhaust Systems	Sheet	* No special requirements	1.0–3.0mm	Max.1,250mm
Galvanized products	Construction (Corrugated sheets)	Egyptian Italian Co.	Sheet & Coil	* No special requirements	0.5–1.25mm	Max.1,250mm
		ALPHAMETAL	Sheet & Coil	* No special requirements	0.3–1.1mm	Max.1,300mm
	Home Appliances	IDEAL	Sheet	* No special requirements	1.25–1.5mm	Max.1,000mm
	Metal Furniture	MOHM	Sheet	* No special requirements (for construction use)	0.3–0.8mm	Max.1,250mm
	Automobiles	Suzuki Egypt	Sheet	* No special requirements (for exhaust pipe)		
		Engineering Co. for Exhaust Systems	Sheet	* Aluminized products & Zn–Ni coated Sheets (Consumption of galvanized is very small.)	0.6–1.5mm	Max.1,250mm
TIN & TFS products	Canned Food	EL–NASR Canned Food	Sheet	* Hardness control * Uniform thin oil film	0.18–0.28mm	515–720mm
		The Edfina Co. for Preserved Foods	Sheet		0.18–0.20mm	730–760mm

(2) Consumption of flat products by end use category

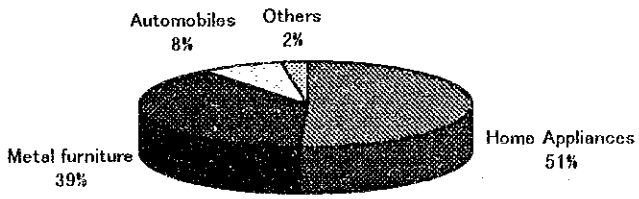
Table 3-2-2 shows flat product consumption by product category in 1995 and also shows the flat product required.

From Table 3-2-2 the following can be drawn.

1) Consumers of hot rolled products including plate are manufacturers of;



2) Consumers of cold rolled products are manufacturers of;



3) Consumers of galvanized products are constructors, home appliances and automobiles.

4) Consumers of TIN & TFS are manufacturers of food cans.

Table 3-2-2 Consumption by Product Category

Use of Flat Product	Consumption t/y in 1995	Rate (%)	Products				
			Plate	Hot rolled	Cold rolled	Galva-nized	Tin
Steel structure	176,350	21.1	x	x			
Corrugated sheet	13,500					x	
Ship yards	41,700	5.0	x	x			
Welded pipe	246,889	29.6		x			
Home appliances	72,249	8.7			x (91 %)	x (9 %)	
Automobiles	31,787	3.8		x (67.5 %)	x (32.5 %)		
Food cans (Note)	17,279	2.1					x
Metal furniture	50,000	6.0			x		
Pressure vessels	1,350	0.2	x	x			
Railway vehicles	6,338	0.8	x	x			
Gas cylinders	48,960	5.9		x			
Metal containers	10,000	1.2		x			
Other government	26,200	3.1		x	x		
Other	91,313	10.9		x	x	x	
Total	833,915	100.0					

Source: JICA Phase-1 report

Note: As for the flat products consumed for food cans, galvanized products are listed in the Phase-1 report, but as a result of visiting food can companies it turned out that they were not consuming galvanized products. Therefore the Study Team excluded it and regarded all consumption to be TIN & TFS.

(3) Consumption of flat products by location

In order to investigate consumption in each area, the Study Team analyzed data from the JICA Phase-1 report. Figure 3-2-1 shows total flat product consumption in 1995 in major industrial zones.

As shown in Figure 3-2-1, currently nearly 80 % of flat products are consumed in the Cairo area (including 10th of Ramadan City and 6th October City). 99 % is consumed within 250 km of

Cairo.

Consequently, the location of the steel plant, whether it is chosen to be the Suez I.F.Z. or El Dekhiela in Alexandria, does not have any major impact on operating costs from the view point of transportation costs.

(4) Consumers quality requirement for flat products

During the first and second field survey, the Study Team visited fifteen major flat product consumers.
The following are typical requirements from these customers.

1) Plate and hot rolled products ;
   - supply of wider plates and coils from local supplier (The width available in the local market is less than 1,000mm)
   - improved quality of shape, surface flatness, surface texture and component homogeneity of plate thicker than 8 mm
   - supply of special steel such as ST52 from local supplier

2) Cold rolled products ;
   - supply of good quality products from local supplier (surface finish, steel components, etc.)
   - supply of deep drawing quality products from local supplier

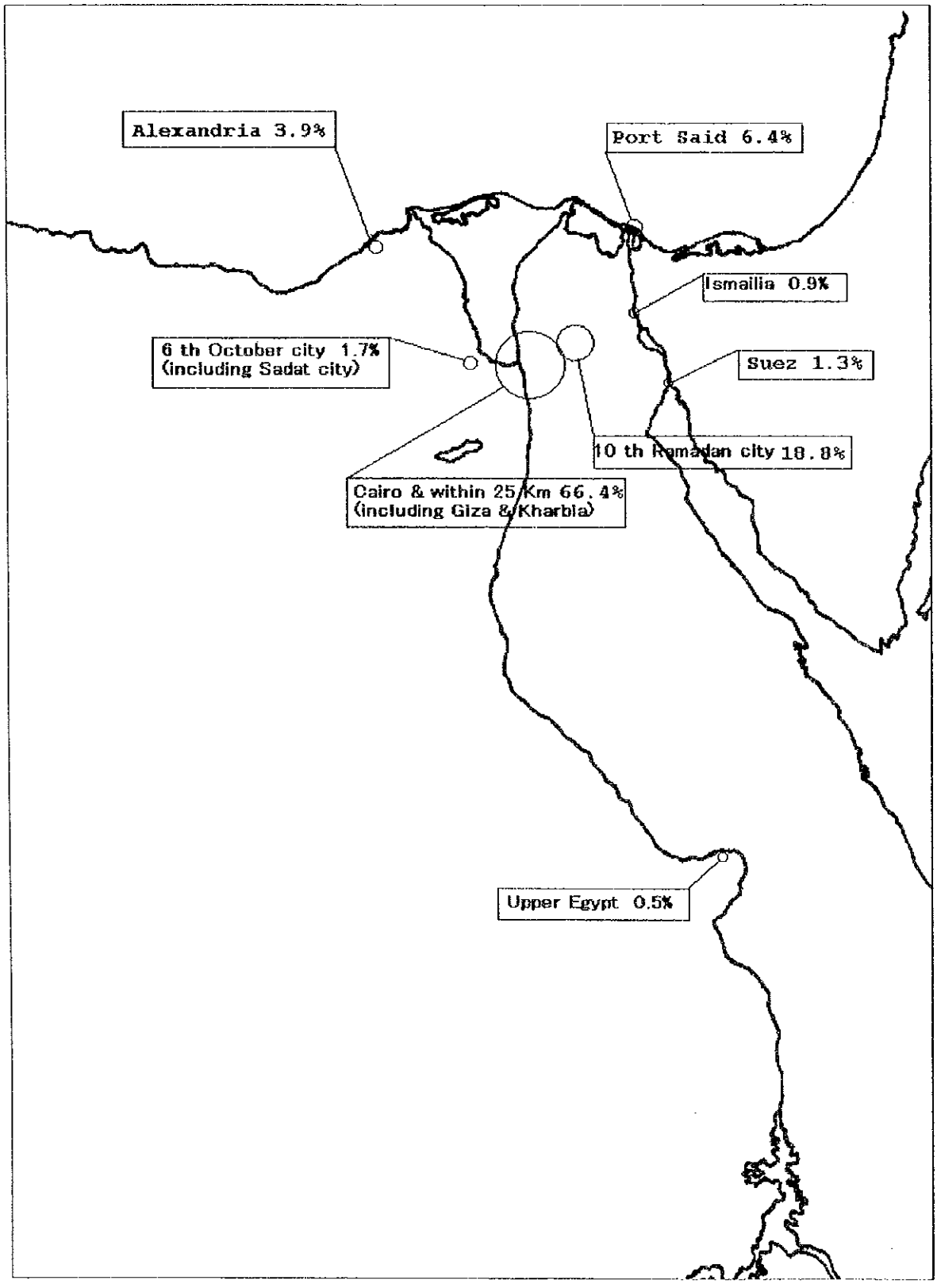
3) Galvanized Products

   In the first and second field surveys, it turned out that more than 30,000 ton/year of galvanized products were consumed for construction. Galvanized sheets are roll-formed into corrugated sheets and shipped to construction sites or end users. In the case of corrugated sheet it will require only commercial quality with 200-300 g/m^2(both sides) of coating weight.

4) Tinplates

   At present no tinplate is produced in Egypt and all of it imported. With regard to imported tinplate they have some small quality problems excepting products imported from Japan. In Egypt usage of glass and plastic bottles is increasing rapidly. Can use will not increase in future.

Figure 3-2-1 Consumption of Flat Products by Location (in 1995)



Chapter 4. PLANT SITE SELECTION

At the initial stage of site selection in March 1997, GOFI proposed eight areas, three areas in Safaga, three areas in Suez and two areas in Alexandria. However, these areas are not appropriate for construction of the flat steel plant.
After the stage-1 of the second field survey, conducted by GOFI with assistance of the Study Team, GOFI proposed three sites of Suez (Adabiya Free Zone and Bir Odeib) and Alexandria (El Dekhiela) taking into due consideration the requirement and specification of the plant site.

Based on the proposal, the Study Team visited following authorities of Cairo, Suez and Alexandria, together with the personnel in charge of GOFI, to investigate the possibility of the construction of the flat steel plant at each proposed site.

Suez	:	Suez Governorate
		Red Sea Port Authority
Alexandria	:	Alexandria Governorate
		Alexandria Port Authority
		ANSDK
Other authorities	:	GAFI, GASCO, NOPWASD, etc.

4-1 Importance of plant location

In constructing a steel plant with production capacity of one million ton of flat steel products a year, a huge amount of investment will be required. Furthermore, if infrastructure necessary for a steel plant such as port facilities, road, electric power, natural gas and industrial water supply, sewage, housing, etc. are constructed simultaneously, the investment for these facilities will reach twice as much capital as construction of a steel plant.

Every aspect of the plant operation activities is greatly influenced by the regional area and geographical location of the plant.

The plant site requires vast land with solid soil.

Port facilities for unloading raw materials and steel scrap, and the same for shipping products and road network are dominant conditions of the site.

Energy supply and utilities such as electric power, natural gas, industrial water and waste water sewer are also indispensable for operation of the plant.

Furthermore great impact with respect to employment and relevant city facilities can be given to the surrounding area by construction and operation of a steel plant. Operation of the plant requires expertise of management, technologies and a large number of skilled labors.

Construction of a steel plant will facilitate new relevant industry to grow. It is necessary to assure that no deterioration of environment nor bad influence to the ecosystem are generated by construction and operation of a new steel plant.

It is obvious that if all amount of investment for infrastructure are imposed on or borne by the steel plant, the project of the steel plant shall no longer be feasible. Dominant conditions to be investigated in selecting the most appropriate site include regional development plan and implementation schedule of infrastructure.

4-2 Specification and Requirement of the Plant Site

(1) Land

The ideal plant site area necessary for construction of the plant is,

1st stage : 0.8 - 1.0 million m^2

2nd stage : 1.2 - 1.5 million m^2

The plant site area could be reduced to a certain extent according to the conditions of the specific site.

(2) Port facility

Raw material berth

- Iron ore and pellet : 20 m depth, 320 m length
  for 120,000 DWT vessel
- Scrap : 11 m depth, 200 m length

Products shipping berth

- Products : 7.5 m depth, 130 m length

(3) Energy, natural resources and utilities

- Electric power : 200 MW
- Natural gas : 55,000 Nm^3/hr
- Industrial water : 36,000 m^3/day (Make up water)
- Waste water sewer: 24,000 m^3/day

4-3 Proposed Site Information and Data

(1) Site condition (Location and area)

Location and features of the proposed sites are summarized as follows (Refer to Figures 4-3-1 and 2):

1) Suez

Suez is located to the east of the Nile Delta and to the north west of the Suez Gulf about 140 km east of Cairo.

The proposed site for the steel plant site in Suez is situated in the Adabiya Industrial Free Zone which lies on the western coast of the Suez Gulf. It is about 12 km from the center of Suez City.

The Adabiya Industrial Free Zone was planned as one of the zones of the Suez Bay Coastal Area Development. The area of the proposed site is about 662,000 m^2 (excluding about 180,000 m^2 of the business center zone and surrounding public road area) and located 4-5 km from Adabiya port. The shape of the area is rectangular about 800 m wide and 1,000 m length. Since the industrial zone lies at the foot of the Ataqa mountains, topography of the area is very steep for the site of a steel plant. The difference in elevation between the lowest and the highest point is about 30 m.

The proposed site is allocated as industrial free zone for small and medium scale enterprises, and the area is divided into eight blocks and already graded. The each block is surrounded by paved road where drainage pipe, electric power and telephone cables have been already installed.

According to the Red Sea Port Authority, the port facilities for steel plant use are planned for construction in Adabiya port. Details of the facilities, and the issues how to construct and implement the project, etc., are under consideration.

Land acquisition cost in the Suez area will be LE 30/m^2.

In addition to the Addabiya Industrial Free Zone, GOFI proposed to study on Bir Odeib area located at 60 km south of Suez City.
However, the Study Team disregarded to study on the site. Because, the development plan of Bir Odeib has just started and any concrete plan for infrastructure and utilities has not been decided.

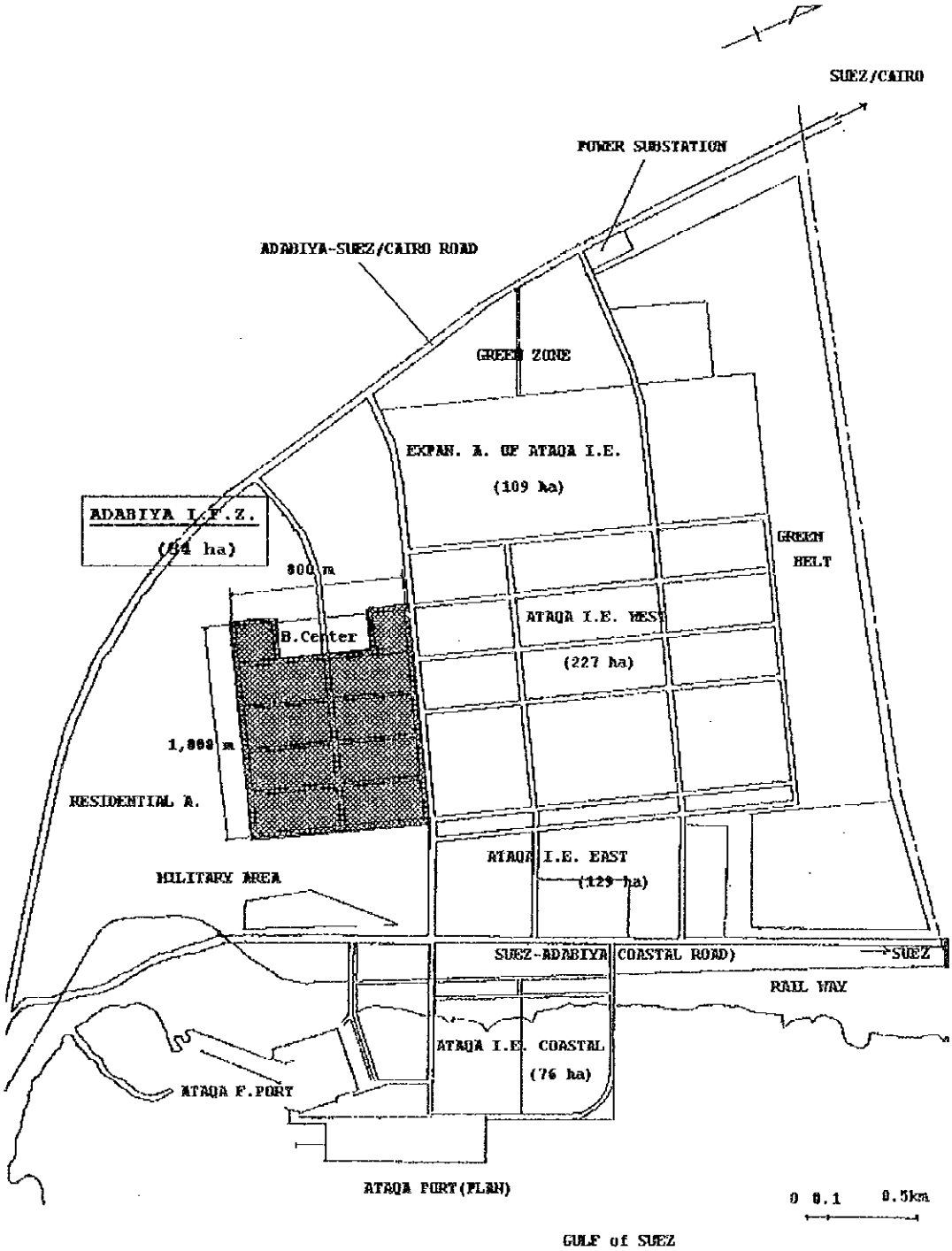
2) Alexandria

Alexandria, which has a population of three million, and is the center of industrialization in Egypt, is located at the coast of the Mediterranean Sea.
Agriculture, chemical, steel and tourist industries are under development in this district, thus the area offers exceedingly easy access to public facilities and infrastructure such as roads, railways, port, natural gas, industrial water and electric power supply, etc. Alexandria National Iron and Steel Company (ANSDK), which is one of the biggest and most modern integrated steel plant in the Middle East, is located some 15 km west of the city of Alexandria.

The proposed site for the steel plant is located at the north west part of lake Maryut and beside the ANSDK steel plant.
The proposed site, with an area of about 600,000 m^2, is faced to the El Dekhiela port and shape of the land is rectangular .
The ground level at the site is very low and seems to be reclaimed land on lake Malyut. Since the upper layer of subsoil is silty clay of which bearing capacity is very limited, piled foundation for heavy machine and building shall be applied.

The land acquisition cost in Alexandria area will be LE 150/m^2.

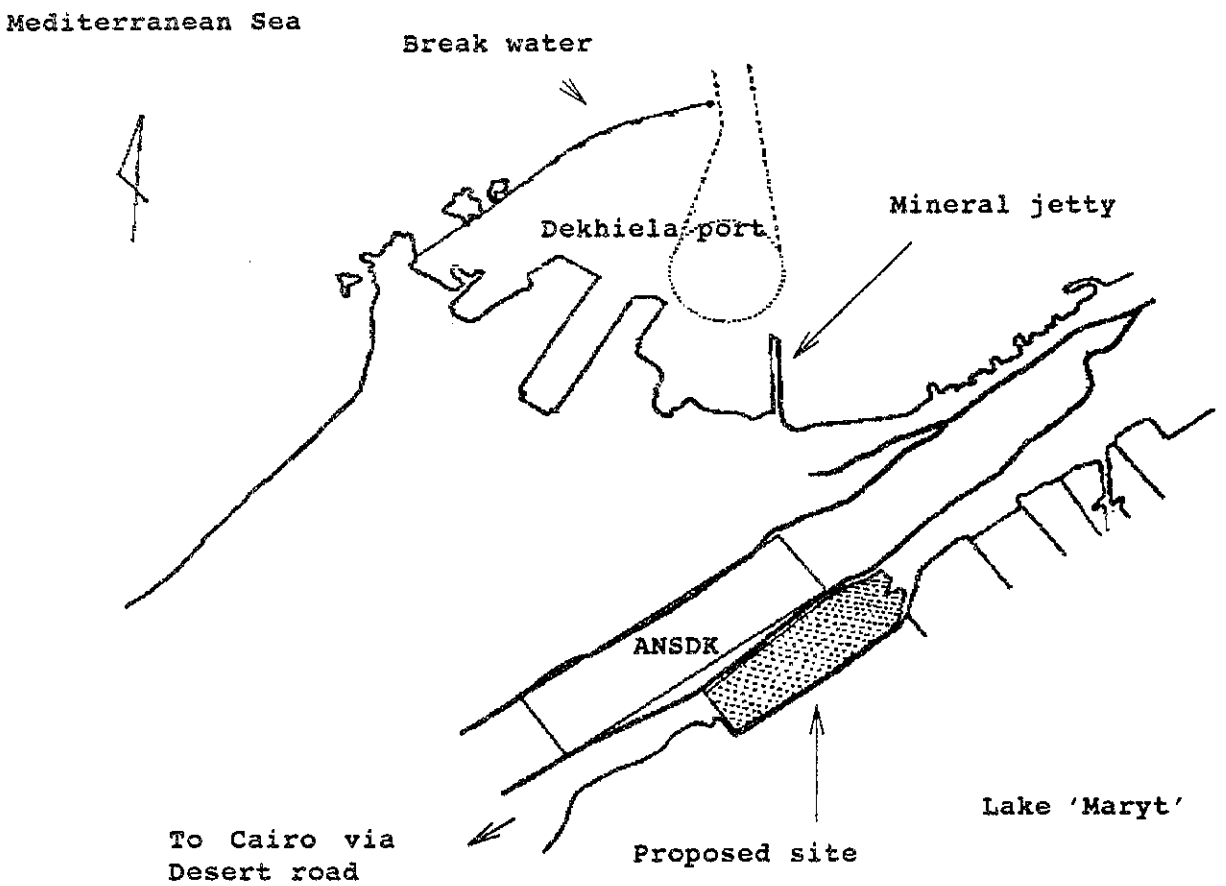
Figure 4-3-1 Location of the Proposed Site at Adabiya Industrial Free Zone



Source: JICA Report of the Suez bay coastal area development '93

Figure 4-3-2 Location Plan (El Dekhiela)

(Non-scale)



(2) Social conditions

As for the development plan, the government has executed the first to third Five Year Plan (from fiscal 1982 to 1997).
According to the regional development plan, the government has not been presented the development plan for Cairo and Alexandria up to this time. It seems that the government is anxious about overpopulation and increase of mass industries in these two areas. On the contrary, the government has enlisted infrastructure plan for the development of industries in Suez since 2nd Five Year Plan (from 1988 to 1992 fiscal year) so that Suez may have one million population in 2000. Suez has been gradually experiencing fulfillment of infrastructures under such development plan as the Development Plan of Suez Bay Coastal Area.

As for labor force, social service sectors and the agriculture sector have many surplus employees in Egypt. Generally speaking, manufacturing sector has the capability of absorbing new job opportunities. However, in Egypt, the scale of manufacturing is very small. Labor market is thought to be in oversupply for these years. In both cities, a new steel company, which can pay higher wages, will be able to employ with ease less than 2,000 employees necessary for flat product plant. Because of the population scale, it will be easier for the steel company to be located in Alexandria to employ workers than in Suez.

As for future housing conditions in Suez and Alexandria, Suez may have some advantages than Alexandria due to social policy such as the Development Plan of the Suez Bay Coastal Area.

As for incentives, etc., the government has been constructing new towns as "New Communities," in the area away from the major center of Cairo and Alexandria. It is said that extremely generous incentives are available to attract investment into these new towns. Suez is not included in New Communities. The government established "Free Zones" in 1974 to promote manufacturing. This investment system is not so attractive as " New Communities " in terms of incentives. One of the proposed sites for flat steel product plant is in the public free zone of Suez. But this project intends to sell flat steel products mainly in the domestic market, so a site in the free zone is not necessarily advantageous.

As for supporting industries, the steel works generally needs a lot of commodities, which range from office supplies, construction materials, production supplies to machinery. Special and large-scale machinery or plant will be supplied
from abroad. In the construction stage, domestic companies will be employed as building and civil engineering contractors. In Egypt major domestic supporting companies are located at Cairo, partially at Alexandria, and scarce at Suez. These conditions will be going on for next

ten to fifteen years.

(3) Transportation and port facilities

1) Port facility

(a) Adabiya port in Suez

The port is situated on the coast of the head of Suez Gulf and about 5 km south of the proposed site of steel plant. The capacity of the port is outlined as follows:

- Total number of quays: 10 quays
- Total length of quays: 2,140 m:
- Quay depth: up to 13 m
- Port total productive area: 6.3 million ton/year
- Total storage capacity cereals store: 15,000 m^2

In addition, there is a plan of new container quay construction of 1,000 m length and 14.5 m depth in view. Adjacent to this new container quay, a planning for the construction of mineral jetty for the steel plant shall be developed.

(b) El Dekhiela port

The port is situated on the coast of Mediterranean Sea and 15 km west of Alexandria port and has a function of unloading general cargo, iron ores for ANSDK and coal for EISCO. The capacity of the port is outlined as follows:

(Overall)

- Total number of quays : 13 quays
- Total length of quays : 3,510 m
- Quay depth : up to 20 m
- Port total productive area : 8.4 million ton/year
- Total storage capacity areas : 869,000 m^2

(Mineral jetty)

- Berth : 300 m long and 14 m deep
  300 m long and 20 m deep
- Unloader : 1,000 t/hr x 2
- Stacker : 1,000 t/hr x 2
- Reclaimer : 800 t/hr x2

2) Road and railway

(a) Road transport

Egypt has 45,000 km of roads, of which 17,000 km are inter-city roads in relatively fair and good condition. Cairo is connected by roads with several cities such as Alexandria, Suez, Ismailia, Port Said and other delta towns, and Aswan as far as the High Dam. The private sector plays a major role in land transport.

(b) Railway transport

Egypt has 5,300 km of railways which are connected to main cities. Railways transport is mainly used for passengers. Egyptian National Railways (ENR), a public sector company, monopolizes railway transport. ENR has more than 70,000 employees, and is chronically embarrassed by deficit. ENR is studying its privatization and its restructuring. EISCO uses the railway to transport material and steel products. Most other steel mills except EISCO do not use the railway to transport materials and steel products. They do not have directly connected railway lines within their works as EISCO has.

(c) Domestic transportation for flat steel works

As it is difficult that ENR under restrictions will invest new lines for private steel companies, only transport by road, that is by truck, has been studied for domestic transport for flat product plant. Domestic transport for flat product plant is mainly divided into that of domestic materials and that of flat steel products. The Study Team learned the freight charges of main road transport from a representative private agency. These are shown as follows:

- Suez - Cairo	: 16 - 18 L.E./ton (134 km)
- Alexandria - Cairo	: 16 - 18 L.E./ton (221 km)
- Suez - 10th Ramadan	: 18 - 20 L.E./ton (170 km)
- Alexandria - 10th Ramadan	: 18 - 20 L.E./ton (284 km)
- Alexandria - Suez	: 20 - 21 L.E./ton (355 km)

These do not necessarily show freight charges in proportion to distance. Availability of return cargo has a big impact on freight.

(4) Water supply, sewage and waste water treatment

1) Water supply

The flat product plant at the 1st stage will require a large volume of fresh water as follows;

36,000 m^3/d (1,500 m^3/hr) for raw water

1,000 m^3/d for drinking water

(a) Water resource

Information on water resources from Ministry of Irrigation and Water Resources is as follows;

Water intake: from canal

Case-A: - Water brought from canal to the flat product plant directly.
- Responsibility belongs to Ministry of Irrigation and Water Resources.
- Cost of construction of water intake facilities shall be borne by the steel plant.

Case-B: - Water brought from canal via a water clarification system to the steel plant.
- Responsibility belongs to water authorities.
- The pipe line from water clarification system to the steel plant shall be borne by water authorities.

(For example, this was the case for ANSDK.)

(b) Supply facilities of potable and raw water

a) Potable water

Potable water is available in both the sites.

b) Raw water

Supply facilities for two proposed sites are briefly summarized as follows:

Table 4-3-1 Raw Water Supply Facilities for Two Proposed Sites

	Requirement for flat steel plant	Suez	Alexandria
Pipe line for raw Water		Not available (Future plan exists)	Available
Construction of pipe Line		Case-B	Case-B
Water quality			
- pH		8.27	7.6-8.6
- Turbidity (NTU)		18	-
- Total hardness as $CaCO_3$ (mg/l)	<90	224	150 - 220
- Chloride ion (mg/l)	<70	500(117)	38 - 67
- TDS (mg/l)	<300	733	245 - 344
- Alkalinity (mg/l)		174	160
Unit price of raw Water (LE/m^3)		Not yet set up	1.02

Source : NOPWASD, Suez Governorate and ANSDK

-Suez

As for raw water quality from Suez sweet water canal, chloride ion is much higher than the required value.

Desalination plant shall be required so that raw water quality will meet with requirements of flat product plant.

-Alexandria

As for raw water quality which is available in Alexandria,

chloride ion is almost same as the required value.

Desalination plant is not required and only water softener is required for reducing total hardness.

2) Sewage and industrial waste water

Disposal quantity of sewage and industrial waste water from the flat product plant under study is estimated as follows:

Sewage : 1,000 m^3/d

Industrial waste water : 24,000 m^3/d (1,000 m^3/hr)

(a) Law and regulation for sewage and waste water

Egyptian Environmental Law No.4 for 1994 was received from GOFI. According to the above law, standard and specification of some elements in disposal water are specified, and the following laws stipulate where the disposal water should be discharged respectively.

Egyptian Law No.4 for 1994	: To the sea
Egyptian Law No.48 for 1984	: To the Nile
Egyptian Law 93 for 1962	: To the sewage

(b) Facilities of sewage and waste water

The facilities of sewage and waste water in two candidate sites were investigated, and facilities in each site are summarized as follows:

a) Suez

The sewage treatment station of the capacity of 55,800 m^3/d is located beside the proposed area.

Industrial waste water will be treated here also.

The standard value of elements of waste water shall be in accordance with Egyptian Law 93 for '62.

b) Alexandria

Industrial waste water and sewage system are available now and waste and sewage can be discharged to the sea after being treated in the fpat product plant.

The capacity of discharge system to the sea in ANSDK is 1,860 m^3/h and currently 170 m^3/h is used, so it has enough capacity.

The discharge quality of waste water, circulation water which after being treated by water treatment station is much better than those of standard value in accordance with Law No.4 for 1994.

(5) Natural resources and energy

1) Electric power

(a) The power supply grid

The power supply grid supplying power to the whole country is interconnected at 500 kV, 220 kV and 132 kV.

(b) The annual report of electric statistics of Egypt

Egyptian Electric Authority (EEA) has been publishing the annual report of electric statistics of Egypt for promotion of electrical energy and its growth since last year.

Important data extracted from EEA annual report are shown in Tables 4-3-2 and 4-3-3.

(c) Power supply to the proposed site

Power supply for both sites, Alexandria and Suez, can be sufficient.

For the further detailed data, refer to Table 4-3-4.

Table 4-3-2 Expected Projects within Two Years-
Networks (Sub-Station)

Name of Project	kV	Capacity (MVA)
500 kV Substation		
- New Suez	500/220/11	1 x 500
220 kV Substation		
- Loxur Shark	220/66/20	2 x 75
- Zaafrana	220/22	2 x 75
- Maghagha	220/66/33/11	2 x 75
- Taba	500/400/22	1 x 75
	500/220/22	1 x 500
- Safaga	220/66/22	2 x 75
- Marsa Matrouh	220/66/11	2 x 75
- Nowebaa	220/66/22	2 x 75
- Sharm El Shiekh	220/66/22	2 x 75

(Source: EEA)

Table 4-3-3 EEA Medium Term Plan for Capacity Addition of Generation Plants from 1994/1995 to 2005/2006

Plant	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06
Talkha Ext.	210											
Assult	2x300	300										
Cairo West								2x325				
Mahmodia C.C.		100										
Damanhour Ext.											325	
Damanhour C.C.		50										
Cairo South C.C.	165											
Kurimat			650	650								
Sidi Krir					325	325						
Ayon Mousa							325	325				
Attaka(Pumps St.)									325	325		
Cairo North G.T.												
Delta North G.T.												
Nobaria C.C.											2x300	300
Suez Gulf									325	325		325
El Tebien G.T.										2x100		
Total	975	450	650	650	325	325	325	975	650	850	925	625

Source: GOFI (JICA phase-1 report)

Table 4-3-4 Evaluation of Power Supply for Proposed Sites

No.	Description	Site	
		Alexandria	Suez
		El Dekhiela	Ataqa
1	Requirement of Power		
	a) Average maximum demand (MW)	200	200
	b) Power supply capacity (Back power) (MVA)	1000	1000
2	Existing Major Power Stations Capacity		
2.1	Alexandria site		
	a) Damanhoor Power Station		
	* Installed capacity (MW)	300	
	* Load factor (%)	60	
	* Excess capacity (MW)	120	
	b) Kafr El Dawar Power Station		
	* Installed capacity (MW)	270	
	* Load factor (%)	30	
	* Excess capacity (MW)	189	
	c) Abo Qir Power Station		
	* Installed capacity (MW)	871	
	* Load factor (%)	56	
	* Excess capacity (MW)	382	
2.2	Suez site		
	a) Ataqa Power Station		
	* Installed capacity (MW)		850
	* Load factor (%)		57
	* Excess capacity (MW)		365
	b) Suez Power Station		
	* Installed capacity (MW)		106
	* Load factor (%)		64
	* Excess capacity (MW)		38
	c) Abu Soltan Power Station		
	* Installed capacity (MW)		575
	* Load factor (%)		50
	* Excess capacity (MW)		287
3	Total Excess capacity (MW)	691	690
4	Distance from Substation to site (m)	Approx. 200-300	1000
5	Supply voltage level (kV)	220	220
6	Line configuration	Double line	Double line
7	Power supply condition in terms of reliability such as ;		
	-Volatge	205-220 kV	205-220 kV
	-Frequency	49.9-50.2 Hz	49.9-50.2 Hz
	-Power failure (Instantaneous)	0.1-0.5 sec.	0.1-0.5 sec.
	-Power failure (Frequency stoppage)	5-15 min/2-3year	5-15 min/2-3year
8	Result of evaluation	ufficient	Sufficient

2) Natural gas

The flat product plant under study will require about 55,000 Nm^3/hr of natural gas.

(a) Back ground

During the survey, information on " An overview of Egypt's Oil and Gas Sectors " issued by American Chamber of Commerce in Egypt was received as back ground data and information. It is briefly summarized as follows:

a) Reserves

In 1990, Egypt had known gas reserves of 12 trillion cf., including 8.5 trillion cf. of non-associated gas reserves. Current reserves of natural gas amount is estimated at 21.4 trillion cf. due to a sharp increase over 1992.

The government's objective is to discover new reserves, averaging 1.35 trillion cf. annually over the next twenty years. This will eventually maintain reserves at the current level while meeting domestic demand, which is forecast at 27 trillion cf., over the period.

b) Production

Until 1992, natural gas production has been averaged 1.1 billion cf./d.

EGPC (Egyptian General Petroleum Corporation) has forecast that production will reach at 1.6 billion cf./d in 1996/97 at the end of the current Five Year Plan.

Natural gas production in 1994 is indicated in Table 4-3-5.

Table 4-3-5 Natural Gas Production in Egypt(In 1994)

Unit : 1,000 ton

Natural Gas	Quantity
Abu Madi	2,632
Abu Qir/Naf	1,199
Abu Al-Gharadiq	547
Badreddin 1	129
Shukeir (Suez Gulf)	1,254
Badreddin 2,3	2,408
Sinai	103
Khalda	24
Abu Sinai	186
Across Gulf	246
El-Qaraa	786
TOTAL	9,514

Source: American Chamber of Commerce in Egypt

(b) Natural gas supply

The following data is received from GASCO (Egyptian Natural Gas Company):

a) Capacity of the existing supply sources

Required quantity for the flat product plant is 55,000 Nm^3/hr and GASCO has enough supply sources.

b) The existing supply pipe lines

Net work of supply line exists respectively in Alexandria and Suez.

Supply pipe line up to factory boundary shall be installed by Egyptian Natural Gas Company (GASCO).

c) The required quality of natural gas for flat product plant project

The required quality of natural gas for flat product plant is indicated in Table 4-3-6.

Table 4-3-6 Required Quality of Natural Gas for Flat Product Plant

Item	Requirement
Supply capacity	55,000 Nm^3/hr
Service	Feed to DRP (Direct Reduction Plant) Fuel gas
Composition	C_5+ (Heavy hydro carbon) < 0.5 (mol. %) Sulfur (as H_2S) = 5 - 10 ppm

Sales gas analysis from GASCO was received and is indicated in Table 4-3-7.
Analysis value will meet with the requirements for flat product plant project.
As for H_2S content, natural gas which is under production in Alexandria is less content and is preferable for DR plant.

Table 4-3-7 Sales Gas Analysis

Composition	Mol %
N_2	0.65 - 1.06
CO_2	1.87 - 0.45
C_1	77.51 - 92.00
C_2	13.37 - 3.69
C_3	6.02 - 1.65
IC_4	0.27 - 0.39
NC_4	0.26 - 0.39
IC_5	0.03 - 0.15
NC_5	0.03 - 0.15
C_6+	0.01 - 0.1
G.C.V(BTU/FT)	1183 - 1077

Source : GASCO

d) Unit price of natural gas

Unit price of Natural gas is linked with international price and is the same for both proposed sites.
The unit price which will be used for feasibility study calculation of the flat product plant, which will start in 2005, is indicated in Table 4-3-8.

Table 4-3-8 Unit Price of Natural Gas

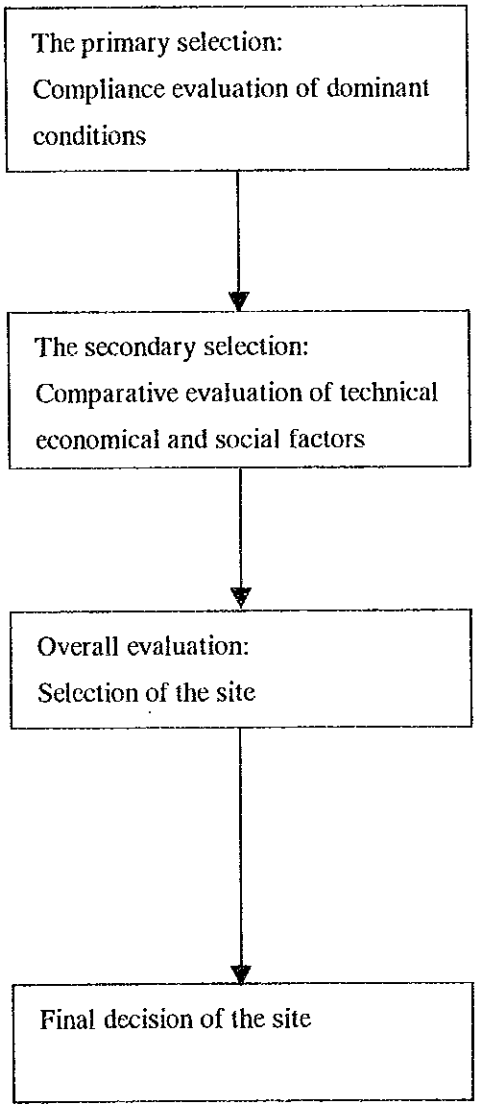
(Unit: 0.01 US$/Nm^3)

Proposed site	Unit price
Suez, Alexandria	8.4

Source : GASCO

4-4 Evaluation Criteria

(1) Flow of site selection



(2) Primary selection

To evaluate compliance of proposed sites with essential conditions for the flat product plant construction, compliance evaluation of dominant conditions shall be made. The compliance evaluation criteria was prepared based on the following concept.

Energies, utilities and relevant infrastructures shall meet requirements of the steel plant quantitatively and qualitatively.

The plant is assumed to start its operation in 2005. Development of energies, utilities and infrastructures shall also meet the implementation schedule.

(3) Secondary selection

1) Technical evaluation

All possible proposed sites, which successfully passed through primary selection shall be evaluated with Check List for Site Selection - Technical evaluation for Secondary Selection.

2) Economical comparison

In the field survey including observation of the actual site, it is helpful for site selection study to collect data on energy costs, utility charges and land purchase prices. Based on these data, calculation shall be made site by site to figure out influence of the initial investment amount, and long term operation costs generated from regional differences. Then, economical comparison among candidate sites shall be carried out.

3) Social factor evaluation

Social factor shall be evaluated in accordance with Check List for Site Selection, Social factors evaluation for Secondary Selection .

(4) Overall evaluation

After the secondary selection of technical, economical and social factor evaluation, the overall evaluation shall be made.

4-5 Results and Recommendation

The results and recommendation of the Study Team can be summarized as follow;

(1) Primary and secondary evaluation

Both proposed sites of Suez and Alexandria(El Dekhiela) are passed primary and secondary evaluation.

(2) Conclusion of the Site selection

After due consideration of the features and results of the technical and economical evaluation on both sites of Suez and Alexandria, it is concluded that El-Dekhiela area of Alexandria site is more appropriate for conducting feasibility study.

Following are the briefing of the conclusion.

1) Technical evaluation

Both sites of Suez (Adabiya F.Z.) and Alexandria (El Dekhiela) are technically acceptable as the flat product plant site.

2) Economical evaluation

- Investment of the Suez site is higher by around LE 270,000,000 (US$ 80,000,000) than Alexandria site.
- Operation cost of Suez is higher by around LE 30,000,000 (US$ 9,300,000) per year than Alexandria.

3) Site condition

(a) Suez

There are some unpredictable factors surrounding Suez site such as;

- Future port availability
- Land acquisition issue under the regulation of Free Zone
- Industrial water supply and its price

(b) Alexandria

Proposed area are owned by Military of Ddefense, Alexandria governorate and ANSDK.

All of these parties concerned have to agree to sell the land to the project.

4) Recommendation

Alexandria site (El Dekhiela) is more appropriate for conducting further feasibility study.

Chapter 5. BASIC FLAT PRODUCT PLANT CONCEPT

5-1 Production and Products

The production plan of the new flat product plant is prepared based on the future consumption of flat products in Egypt predicted in the JICA Phase-1 report with some modifications incorporated from the results of the Phase-2 field survey described in Chapter 3.

(1) Production estimate

1) Estimation from the JICA Phase-1 Study

Consumption of flat products in Egypt was investigated through the Phase-1 JICA Feasibility Study and shown in the JICA Phase-1 report submitted in 1996. According to the report, for the case of medium growth rate, consumption of flat products in Egypt will be 1,734,000 tons per year in 2005 and reach 2,528,000 tons per year in 2015 as shown in Table 5-1-1 and Figure 5-1-1. Estimated breakdown of each product at 2005 is shown in Table 5-1-2.

Although consumption for high and low growth rates were also shown in the report, the following study will be conducted based on the estimated consumption for the medium growth rate.

2) Salable flat steel product estimate

Salable products from the new flat product plant in 2005 are estimated by rearranging the data of the Phase-1 report and by subtracting the following product items (f) and (g) from the total estimated consumption shown in Table 5-1-3.

(a) Hot and cold rolled products (thickness < 3.0mm)

Products of thickness less than 3 mm in the category, "hot & cold," were already divided into two categories by the Phase-1 report, about 50 percent for hot rolled products and 50 percent for cold rolled products.

Table 5-1-1 Forecast of Flat Products Consumption in Egypt

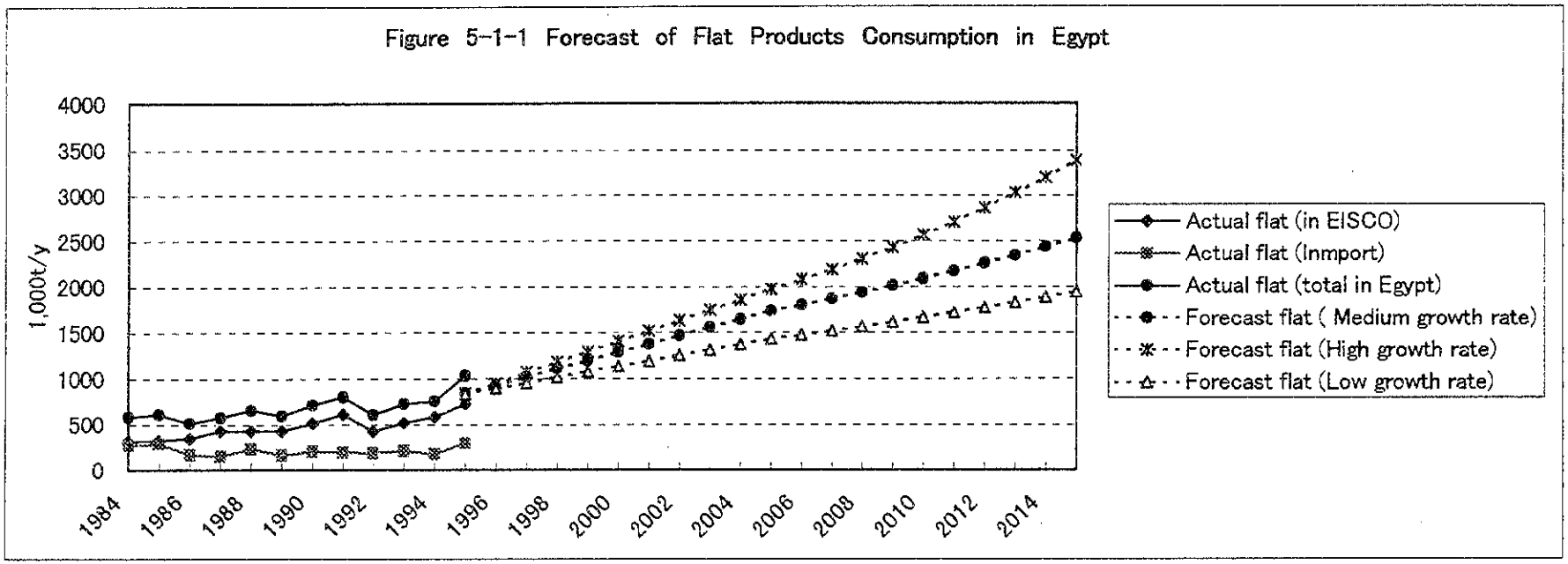
Unit : 1,000 t/y

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Actual flat (in EISCO)	311	322	346	427	428	429	514	609	422	516	583	729																				
Actual flat (Inmport)	271	290	167	150	229	163	201	192	182	209	171	295																				
Actual flat (total in Egyp	582	612	513	577	657	592	715	801	604	725	754	1024																				
Forecast flat (Medium growth rate)												834	924	1014	1104	1194	1284	1374	1464	1554	1644	1734	1798	1865	1936	2009	2086	2167	2251	2339	2431	2528
Forecast flat (High growth rate)												834	948	1061	1175	1288	1402	1516	1629	1743	1856	1970	2073	2184	2302	2428	2562	2706	2860	3024	3199	3386
Forecast flat (Low growth rate)												834	893	953	1012	1071	1131	1190	1249	1308	1368	1427	1471	1517	1564	1612	1663	1715	1769	1825	1882	1942

Source: Actual Flat Consumption based on IISI 1997

Forecast Flat Demand based on JICA Phase-1 Report 1996

Figure 5-1-1 Forecast of Flat Products Consumption in Egypt



(b) Hot rolled products (thickness = 3.0-24 mm)

Hot rolled products of thicknesses "between 3.0 and 24 mm" shall be divided into two categories, hot rolled products with thicknesses from 3.0 to 13mm and plate with thicknesses from 13 to 24 mm.

(c) TIN and TFS

Products in the category "coated" are composed of galvanized products, tinplate (including TFS), color coated products and a small amount of other products.

Demand for tinplate, which is categorized as "Cans", is estimated to be 36,281 tons per year. However, judging from the results of the Phase-2 field survey , the sum of average consumption of tinplate between 1990 and 1995 was about 45,000 tons per year. Moreover, this number seems to be unchanging until 2020 due to the increase of consumption of substitute materials.

(d) Demand for metal containers

The results of the Phase-2 field survey showed that the consumption of 28,346 tons per year of "metal containers" was actually used for corrugated sheet. Therefore, this amount shall be transferred to the category, "Construction".

(e) Coated products

Coated products excluding "Cans" are regarded as galvanized products, color coated products and a small amount of other products. Judging from the ordinary coated product market, it is assumed that 85 % of the coated product would be galvanized products and remaining 15 % would be color coated products and others.

(f) Production at EISCO

It is assumed that production of flat products by EISCO will be kept at the same level as the average production during the year of 1990 to 1995.

Actual production will be as follows;

Hot rolled products

- Production : 400,000 tons/year including;
  - Hot rolled coil = 320,000 tons/year
  - Plate = 80,000 tons/year
- Nominal capacity : 600,000 tons/year

Cold rolled products

- Production : 160,000 tons/year
- Nominal capacity : 250,000 tons/year

(g) Exclusions

The following products shall be excluded from the products of the new flat product plant because of the small size of the market or decreased demand.

- Hot rolled products of widths over 1,500 mm
- Hot rolled products of thickness over 24 mm
- Tinplate and TFS products
- Other coated sheets

(h) Skinpassed coil

Fifty percent of hot rolled coil under 3 mm shall be processed by a skinpass line to correct flatness.

As a result of the adjustments described above, the demand forecast and estimated salable products were calculated and shown in Tables 5-1-3, 5-1-4 and Figure 5-1-2.

Table 5-1-2 Demand Forecast for Flat Products in 2005 (Medium growth case)

	Thickness	Width <1500mm												W>1500mm	Total
		Construc	Ship yards	W.Pipe	Gas cyl.	Metal Cont.	Railway	Auto	Home	Can	Furniture	Gov.	Other		
Hot & Cold	t<3	6,215	12,598	317,447			1,050	24,825	136,669		104,985	8,399	99,395		711,583
Hot	t=3-24	278,695	19,737	211,633	102,801	20,997	11,179	41,918	1,380			45,983	18,574	106,684	859,581
Hot	t>24	20,144					1,079					630		24,234	46,087
Non Coated		305,054	32,335	529,080	102,801	20,997	13,308	66,743	138,049		104,985	55,012	117,969		1,486,333
Coated						28,346			13,652	36,281			38,006		116,285
Total		305,054	32,335	529,080	102,801	49,343	13,308	66,743	151,701	36,281	104,985	55,012	155,975	130,918	1,733,536

t<3mm : Hot 342,549, Cold : 369,034

Source : JICA Phase-1 Report 1996

Table 5-1-3 Demand Forecast for Flat Products in 2005 Revised by the Study Team

Unit : t/y

	Thickness	Width <1500mm												W>1500mm	Total
		Construc	Ship yards	W.Pipe	Gas cyl.	Metal Cont.	Railway	Auto	Home	Can	Furniture	Gov.	Other		
Cold	t<3							21,686	136,669		104,985	6,299	99,395		369,034
Hot	t<3	6,215	12,598	308,728			1,050	3,138	0		0	2,100	0		333,829
Hot	t=3-13	139,348	9,869	211,633	102,801	20,997	11,179	41,918	1,380			45,983	18,574	53,342	657,023
Plate	t=13-24	139,348	9,869											53,342	202,558
Plate	t>24	20,144					1,079					630		24,234	46,087
TIN & TFS										45,000					45,000
Galvanized		24,094							11,604				32,305		68,003
Color coated		4,252							2,048				5,701		12,001
Total		333,400	32,335	520,361	102,801	20,997	13,308	66,742	151,701	45,000	104,985	55,012	155,975	130,918	1,733,535

(a) Hot Rolled Products of 3.0-24.0mm thickness are divided into 3.0-13.0mm and 13.0-24.0mm segments, over 13.0mm will be considered plate

(b) 50% of Hot Rolled Products under 3.0mm will be skinpassed coil

(c) Coated products for cans are TIN & TFS products. Consumption will be 45,000 t/y (the same average consumption as 1990-1995) see Table 3-1-2 Chapter 3.

(d) Coated products except tin consist of 85% galvanized and 15% color coated products

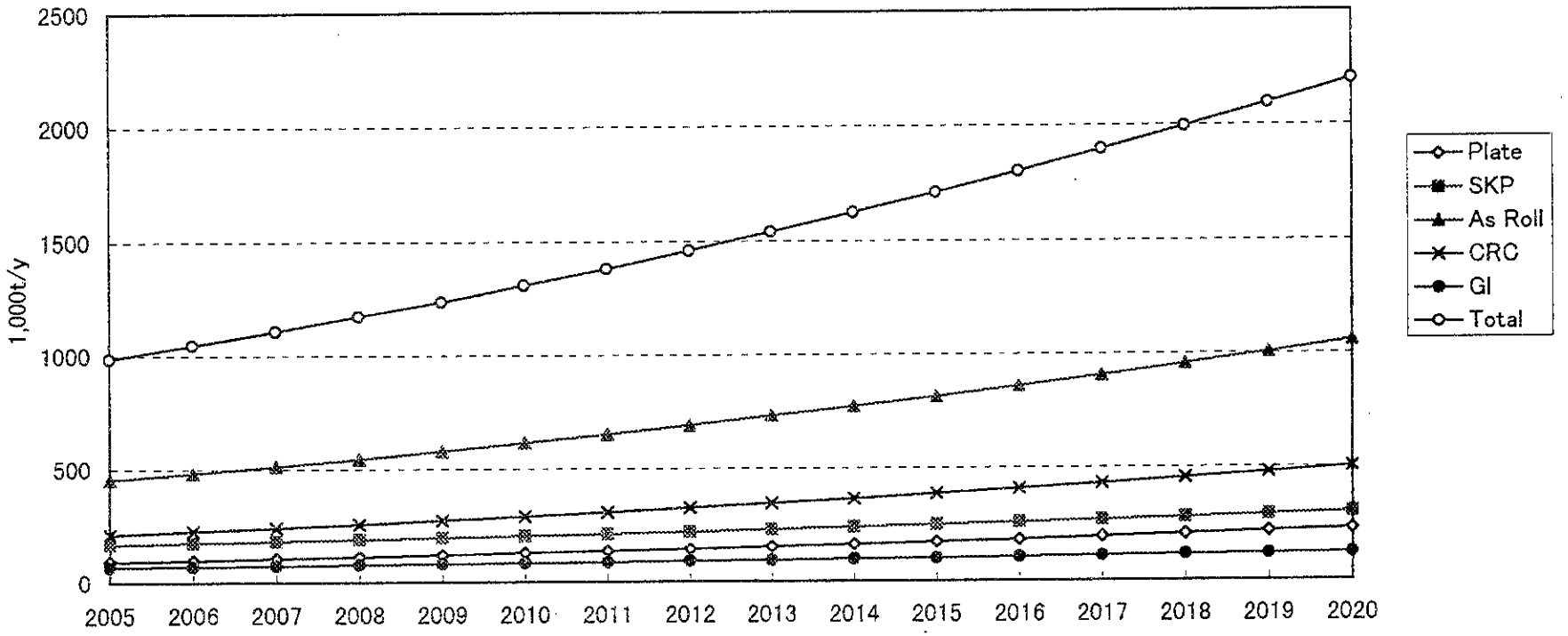
(e) Coated products for metal containers mean galvanized sheet for walls and roofing of buildings and should be categorized as "construction"

Table 5-1-4 Forecast of Salable Domestic Flat Products in the Flat Product Plant

Unit : 1,000 t/y

Demand Forecast of Flat products in Egypt										EISCO's Production			Salable Domestic Flat Products in New Flat Project						
year	Cold	t<3	t=3-13	Plate	TIN	GI	Color	W> 1500	Total	Cold	Hot	Plate	year	Plate	SKP	As Roll	CRC	GI	Total
2005	369	334	604	171	45	68	12	131	1734	160	320	80	2005	91	167	451	209	68	986
2006	384	347	627	177	45	71	12	136	1798	160	320	80	2006	97	173	480	224	71	1046
2007	398	360	651	184	45	73	13	141	1865	160	320	80	2007	104	180	511	238	73	1106
2008	413	374	676	191	45	76	13	147	1936	160	320	80	2008	111	187	543	253	76	1171
2009	429	388	702	199	45	79	14	152	2009	160	320	80	2009	119	194	577	269	79	1238
2010	446	404	730	207	45	82	15	158	2086	160	320	80	2010	127	202	612	286	82	1308
2011	464	420	759	215	45	85	15	165	2167	160	320	80	2011	135	210	649	304	85	1382
2012	482	436	789	223	45	89	16	171	2251	160	320	80	2012	143	218	687	322	89	1459
2013	501	454	820	232	45	92	16	178	2339	160	320	80	2013	152	227	727	341	92	1540
2014	521	472	853	242	45	96	17	185	2431	160	320	80	2014	162	236	769	361	96	1624
2015	542	491	888	251	45	100	18	193	2528	160	320	80	2015	171	246	813	382	100	1713
2016	564	511	923	261	45	104	18	200	2627	160	320	80	2016	181	255	858	404	104	1803
2017	586	531	960	272	45	108	19	208	2729	160	320	80	2017	192	265	905	426	108	1897
2018	610	552	998	283	45	112	20	216	2835	160	320	80	2018	203	276	954	450	112	1994
2019	634	574	1037	294	45	117	21	225	2946	160	320	80	2019	214	287	1004	474	117	2095
2020	659	596	1079	305	45	121	21	234	3061	160	320	80	2020	225	298	1057	499	121	2201

Figure 5-1-2 Forecast of Salable Domestic Flat Produc
from Flat Product Plant



(2) Product mix and production plan

1) Product mix

As shown in Section 5-1, the products to be produced by the flat product plant shall be hot rolled coil, plate, cold rolled coil and galvanized coil. Annual production of the products to be produced is shown in Figure 5-1-3.

2) Sizes and specifications of products

The present size mix of flat products was investigated and reported by the JICA in Phase-1. For the time being, the average width of flat products in Egypt is rather narrow compared to the international market due to the fact that most flat products are supplied by EISCO and maximum width of the hot and cold rolled products is limited to 1,000 mm . However, it is supposed that this will be changed to wider products to improve operating efficiency and yield in the near future when the new flat product plant starts production.

Therefore, it will be more appropriate to estimate the future size mix based on the international market.

Size mix and specifications of products are estimated and shown in Tables 5-1-5, 6, 7, 8 and 9.

Table 5-1-5 Slab Size Mix

Width (mm)	Mix (%)	Remarks
650-800	(5.0)	Slitted slab
850-1,100	33.0	
1,150-1,300	36.0	
1,350-1,600	31.0	
Total	100.0	

Note 1. Average slab width = 1,195 mm

2. Slab 800 mm and under in width shall be produced from double width slab by gas cutting
3. 5 % of slabs are assumed to be surface conditioned
4. Hot charge rolling ratio is assumed to be 60 %

Table 5-1-6 Hot Strip Mill Size Mix

(Unit: %)

Thickness (mm)	Width (mm)				Total
	610-799	800-1,099	1,100-1,299	1,300-1,600	
1.6- 2.9	4.0	14.0	15.0	4.0	37.0
3.0-12.9	1.0	19.0	21.0	12.0	53.0
13.0-24.0	0	0	0	10.0	10.0
Total	5.0	33.0	36.0	26.0	100.0

Note : Average = 7.0 x 1,158 mm

Table 5-1-7 Cold Strip Mill Size Mix

(Unit: %)

Thickness (mm)	Width (mm)		Total
	610-1,099	1,100-1,250	
0.4-1.0	27.5	27.5	55.0
1.0-1.6	11.0	19.0	30.0
1.6-2.5	7.5	7.5	15.0
Total	44.0	54.0	100.0

Note : Average = 1.08 x 1,028 mm

Table 5-1-8 Galvanizing Line Size Mix

(Unit: %)

Thickness (mm)	Width (mm)		Total
	610-999	1,000-1,250	
0.4-1.0	35.0	35.0	55.0
1.0-1.6	15.0	15.0	30.0
Total	50.0	50.0	15.0

Average = 0.88 x1,015 mm

Table 5-1-9 Hot Rolled Coil Specifications

(Unit: %)

Specification	Final products	
St-12,13,14	36.0	Cold rolled or Galvanized products
St-33	4.0	Hot rolled coil or plate
St-37	54.0	
St-44,50,52	6.0	
Total	100.0	

3) Production plan and start-up production program

The production plan was decided and is shown in Table 5-1-10. Production of the flat product plant is defined by the production of slab which will be one million tons per year from the second year after start-up of the plant. However, it will be 60 % of full capacity, i.e. 600,000 tons of slab per year in the first year, 2005.

(3) Material flow

The flow for full operation in 2007 is shown in Figures 5-1-3.

Table 5-1-10 Production Plan and Start-up Program

Product	2005	2006	2007
DRI	700,000	900,000	1,000,000
Burnt lime	24,000	40,000	40,000
Slab	600,000	1,000,000	1,000,000
Hot rolled coil (As rolled)	221,000	368,000	368,000
(Skinpassed)	104,000	173,000	173,000
Plate	58,000	97,000	97,000
Cold rolled coil	134,000	224,000	224,000
Galvanized coil	42,600	71,000	71,000
Total of flat products	560,000	933,000	933,000

(4) Coil service center

The market for flat products is much more varied compared to that for re-bar. Therefore, for the convenience of the consumers the coils are normally delivered from steel plants to the

service center where the coils are stocked and delivered to consumers by slitting in width or cutting in length just after receipt of an order from the end user.
It is assumed for this study, that service centers will be constructed outside the flat product plant and adjacent to the major market at a distance from the flat product plant.

Reasons why the coil center are expected to be constructed outside the flat pruduct plant are as follows;

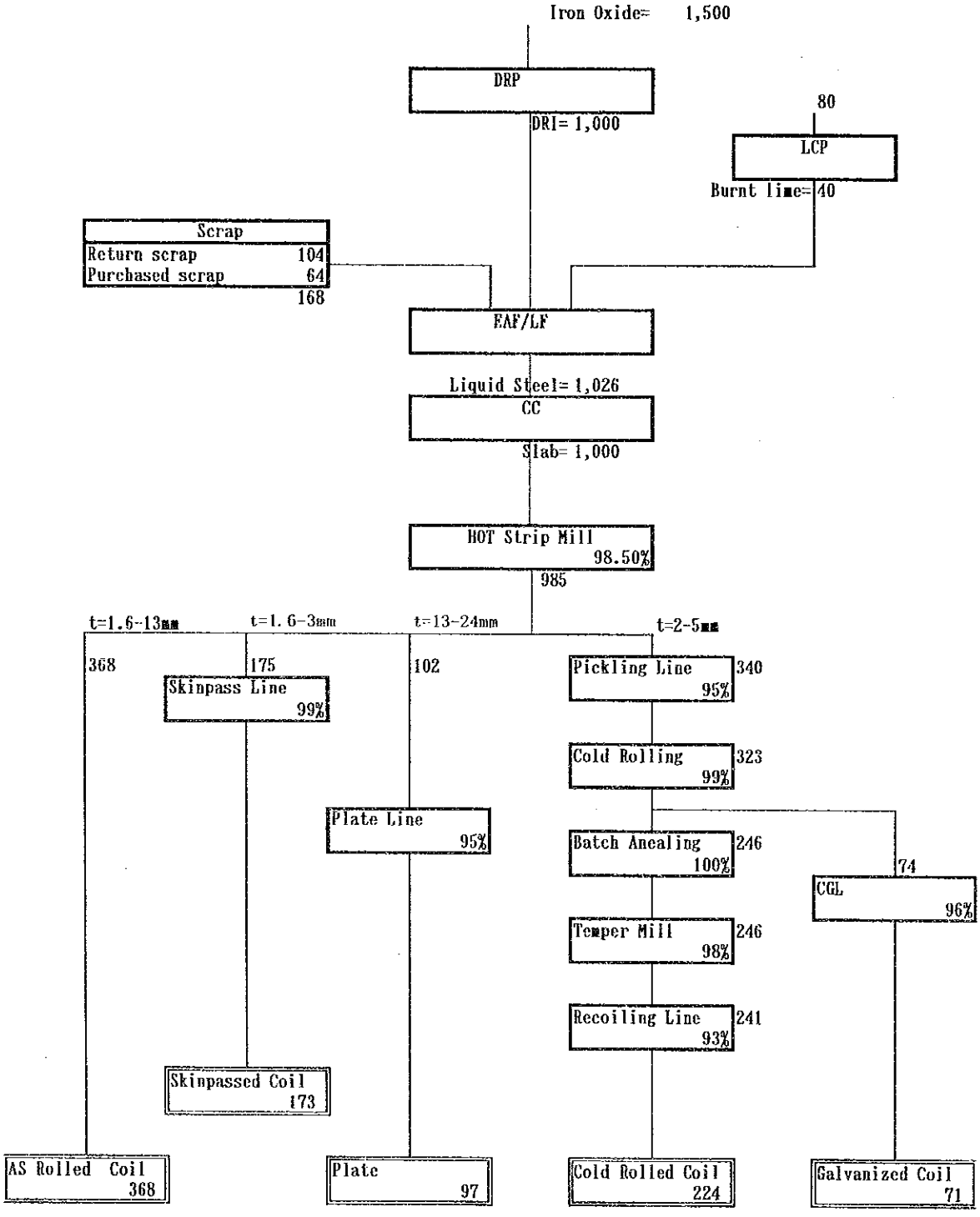
a) A short delivery time can be expected for orders of great size and grade variety

b) Some service centers are already operating adjacent to the major market and future expansion can be expected

c) The scale of the storage yard and facilities is rather small and can be updated step by step in accordance with market demand

Figure 5-1-3 Material Flow Sheet in 2007 (Full Operation)

unit : 1,000t/y



TOTAL FLAT PRODUCTS : 933 kT/Y

5-2 Outline of Principal Project Facilities

The flat product plant will consist of the main production plants shown in Table 5-2-1 along with the auxiliary facilities such as the lime calcining plant, power and distribution facilities, utilities, in-works transportation facilities, analysis and inspection facilities, maintenance shop and administrative facilities.

Table 5-2-1 Outline of Principal Plant

Plant	Description
1. Direct reduction plant (DRP)	- Type: Midrex process, MEGAMOD® - Number of units: One set
2. Steelmaking plant (SMP)	
2.1 Electric arc furnace (EAF)	- Type: DC (direct current) arc furnace with EBT (eccentric bottom tapping system) - Number of units: One set
2.2 Ladle furnace (LF)	- Type: AC (alternating current) of three phase type - Number of units: One set
2.3 Slab continuous casting machine (SL-CCM)	- Type: Vertical progressive bending type with multi-point unbending - Number of units: One set
3. Hot strip mill plant (HSMP)	- Type: Semi-continuous type - Number of units: One line
4. Cold strip mill plant (CSMP)	- Type: Four Hi single stand reversing mill - Number of units: One line

5-3 Selection of Process

(1) Direct reduction process

1) Representative processes

The steel making processes by the direct reduction - EAF route presently occupy the second largest share in operation throughout the world. Among direct reduction processes, the following are the representative processes industrially proven or commercially available.

Natural gas based process:

- MIDREX Process
- HYL-III Process
- FINMET (former FIOR) Process
- IRON CARBIDE Process

Coal based process

- SL/RN Process

2) Selection of the direct reduction process

Comparison of main features of the representative processes is given in Table 5-3-1. In this study, the MIDREX process was selected because of the following reasons:

(a) MIDREX process has the largest number of commercial plants installed all over the world.
(b) MIDREX process has the largest accounts for the total capacity of production of direct reduced iron all over the world.
(c) MIDREX process is only one direct reduction process which was commercially installed in Egypt and has been operating about ten years in stable.

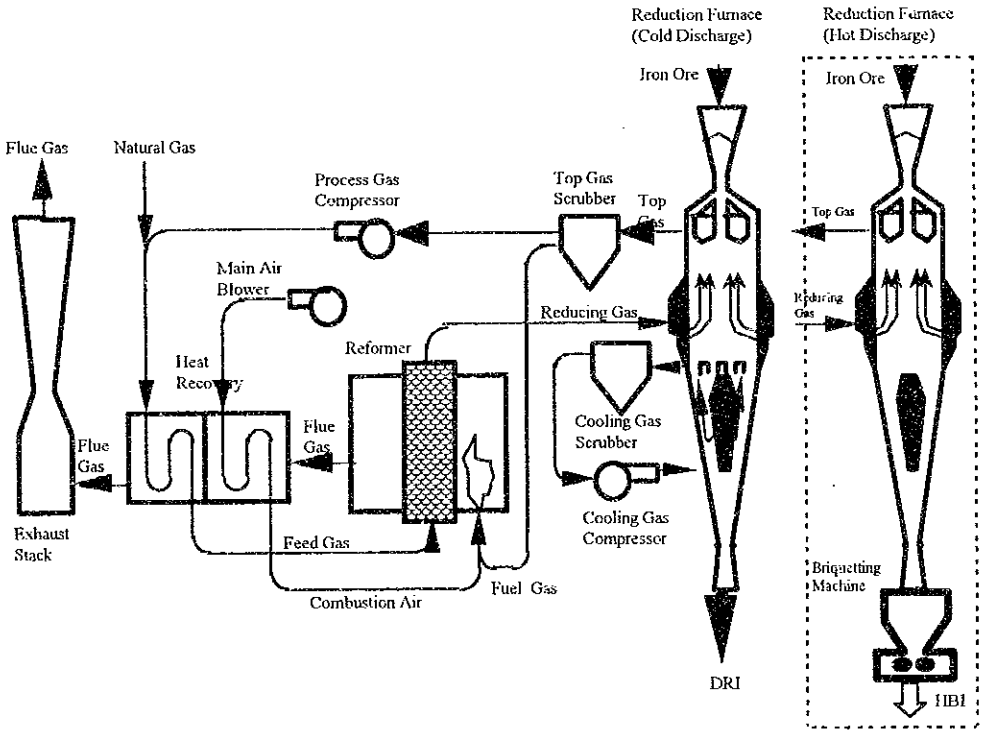
Figure 5-3-1 shows schematic process flow diagram of the MIDREX process.

Table 5-3-1 Comparison of the Representative Processes

	Gas based				Coal based
	MIDREX	HYL-III	FINMET [forme / FIOR]	IRON CARBIDE	SL/RN
Status	Industrial	Industrial	Industrial	Industrial	Industrial
Iron source	Pellets Lump	Pellets Lump	Fines Size:sinter feed	Fines Size: 0.1-1mm	Pellets Lump
Fuel source	Natural gas	Natural gas	Natural gas	Natural gas	Coal
Pressure (kg/cm^2)	Atomospheric	5	11 - 12	0.8	Atomospheric
Typical plant capacity ($x10^3$ tons/y)	1,000	1,000	FINMET: 1,000 FIOR: 400	320	150 - 250
Plant installed (modules)	39	13	1	1	8**
Total capacity installed ($x\ 10^3$ tons/y)	20,010	6,370	400	300	1,320**
Selective evaluation*	I The most spread process	I Less plants than MIDREX	II Few industrial plants	II Few industrial plants	II Small scale plants
Commercial operation in Egypt	Yes	No	No	No	No
Result of selection	Representative process				

*I: Representative process **: SL/RN plants of production over 150,000 tons/y
II: Next representative process
III: Not mature

Figure 5-3-1 MIDREX Process Flow



(2) Electric arc furnace

1) Differences of two types

There are two types of electric arc furnace for steelmaking, the AC (alternating current) arc furnace and the DC (direct current) arc furnace.

The major difference between AC and DC arc furnaces is the use of alternating or direct current for generation of the arc.
In the arc furnace, scrap is melted by the arc. The arc is generated by an alternating current going to and from three graphite electrodes, through the scrap or molten steel, in the AC arc furnace. In the DC arc furnace, a direct current goes from an anode electrode installed in the bottom of the furnace to a single graphite cathode electrode through the scrap or molten steel.

Accordingly, equipment configuration is different. Figure 5-3-2 shows the equipment configuration of a DC arc furnace.

Major equipment differences of the DC arc furnace from the AC arc furnace are;

- addition of the thyristor rectifier and bottom electrode, both of which are not required in the AC arc furnace, and
- a single graphite electrode and corresponding electrode lifting device, both of which require three sets for the AC arc furnace.

2) DC arc furnace needs

Historically the AC arc furnace began with "UHP (Ultra High Power) operation" and development continued to scale-up furnace size and utilize oxygen gas. Furthermore, new technologies; EBT (eccentric bottom tapping), SPH (scrap pre-heating) and operation in combination with a LF (ladle furnace) were introduced, along with improved operational techniques such as long arc and foamy slag operations.

Now traditional AC arc furnaces seem to have reached the final development stage. It is difficult to make further improvements and the flicker problem, which prevents scaling-up input power can not be escaped.

The DC arc furnace has been studied and developed in Europe. In 1985, MAN-GHH constructed the first commercial DC arc furnace in the world at Nucor Steel, USA and NKK constructed the largest (130 t) DC arc furnace at that time in the world at Tokyo Steel in 1989, the success of which established the DC arc furnace's reputation. After that,

promoting construction of DC arc furnace began in the world.

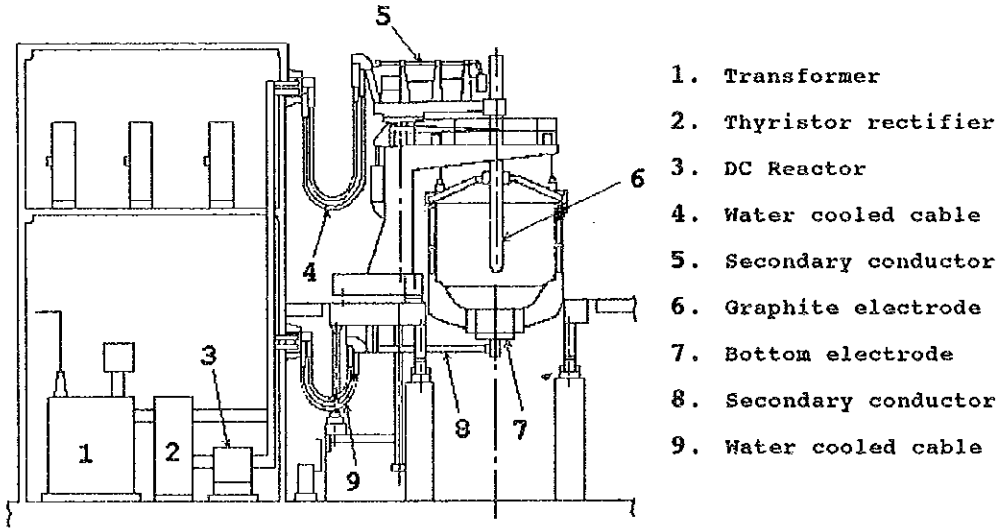
3) Advantages of the DC arc furnace

Due to the nature of the direct current use, the DC arc furnace has advantages, compared with the AC arc furnace, such as achievements of uniform melting and strong bath stirring, easy long arc and foamy slag operation, superior heating efficiency, half level of flicker occurrence.

4) Conclusion

Due to the above mentioned considerations, the DC arc furnace is more appropriate for the flat product plant.

Figure 5-3-2 DC Arc Furnace Equipment Configuration



(3) Continuous casting machine (CCM) and hot strip mill (HSM)

There are many CCM - HSM processes in the world. In order to select most appropriate process the following combination process are studied.

- The Thin Slab CCM & HSM process (TSP)
- The Medium Slab CCM & HSM process (MSP)
- The Conventional Slab CCM & HSM process (CVP)

Schematic drawings of TSP, MSP and CVP are shown in Figure 5-3-3. It Is assumed that DRI and high quality scrap will be provided as raw material in this project. The technical features of the three processes are compared taking into consideration the actual conditions in Egypt as shown in Table 5-3-2 and 5-3-3.

Conclusion : The Conventional CCM process is recommended.

The reasons are as follows :

- TSP can not produce plate of 13 - 24 mm in thickness.
- MSP technology is still under development at present.
- TSP and MSP are not suitable for producing narrow strip (610 - 800 mm in width) due to low productivity.
- Both TSP and MSP are not suitable for production of high grade steel such as DDQ (Deep Drawing Quality), EDDQ (Extra Deep Drawing Quality), automobile body parts, etc.

The outline of the CCM & HSM are shown as follows :

- Slab thickness : 210 mm
- Slab conditioning : applicable
- Max. hot rolled product width : 1,600mm *1
- Max. hot rolled product weight : 28 ton max. *2

*1 Width of Hot rolled products

Considering market demand in Egypt, 93 % of flat products are of width under 1,500 mm. The reason for the 1,500 mm borderline is the existing plant restriction (Maximum plate width from EISCO is 1,500mm). Generally "five feet" implies 1,524 mm in the international steel business and

approximately 30 - 50 mm will be added at the hot rolling mill. Consequently the maximum width at hot rolling shall be 1,600 mm considering five feet of hot rolled products.

*2 Coil weight

Generally 1,000 PIW (pound per inch width) is the standard of modern hot strip mills (= 17.8 kg/mm). In the case of 1,600 mm maximum width, weight of the hot rolled coil is 28 tons.

Figure 5-3-3 Schematic Drawing of TSP, MSP and CVP

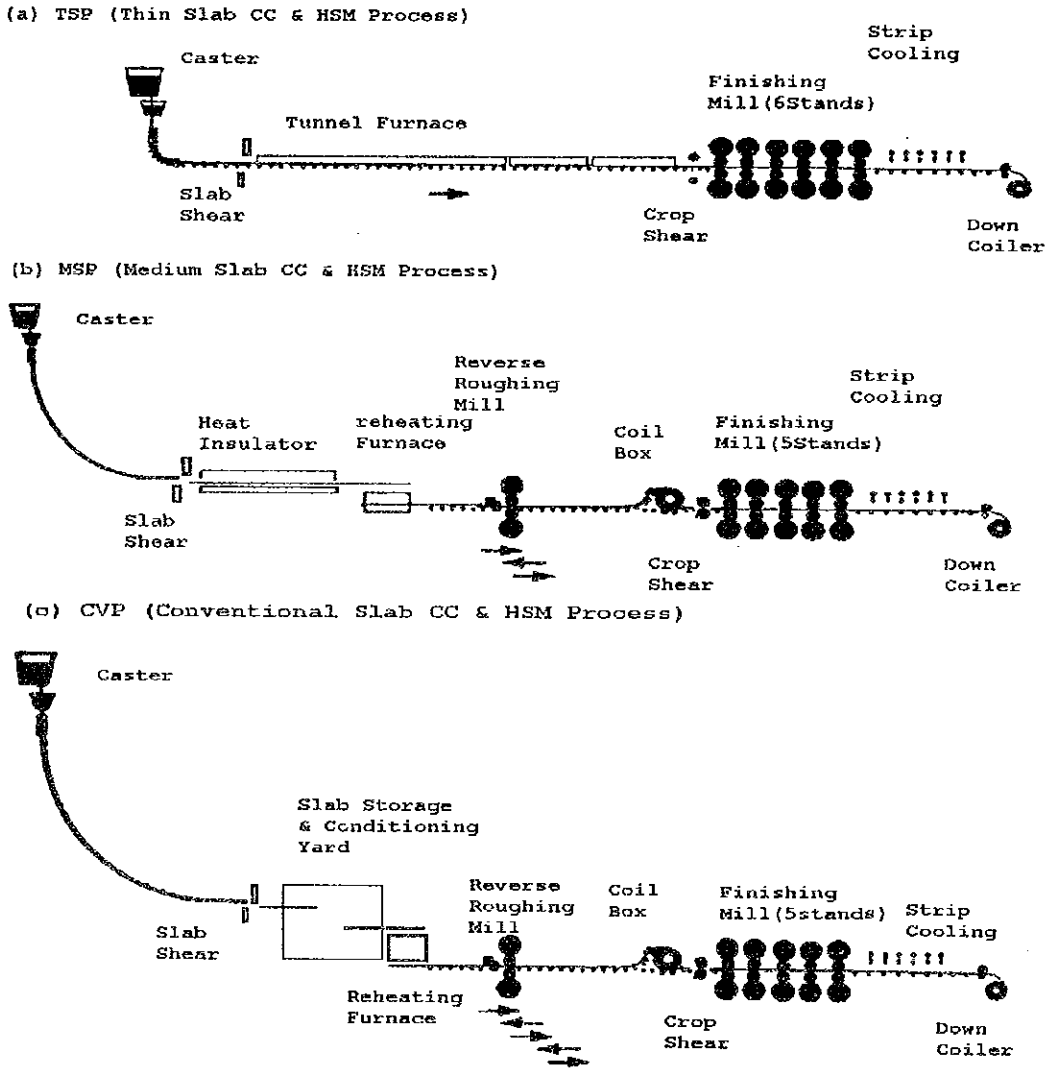


Table 5-3-2 Comparison of Specification of CCM and HSM

	TSP	MSP	CVP
1. Products in the flat product plant			

Products	Thickness	Width	Production tons per year
Hot rolled coil	1.6 – 13.0 mm	610 – 1,600 mm	approx. 370,000
Skinpassed coil	1.6 – 6.0 mm	610 – 1,600 mm	approx. 170,000
Plate	13.0 – 24.0 mm	610 – 1,600 mm	approx. 100,000
Cold rolled coil	0.4 – 2.5 mm	610 – 1,250 mm	approx. 220,000
Galvanized coil	0.4 – 1.6 mm	610 – 1,250 mm	approx. 70,000

2. Main equipment	EAF ×1(DRI 90%) Thin slab CC ×1 (t=50mm) V=5mpm HSM Tunnel Furnace ×1 Finishing Mill ×6std Down Coiler ×1	EAF ×1 (DRI 90%) Midi Slab CC ×1 (t=90–150mm) V=2.5–3.5mpm HSM WB Furnace ×1 Roughing Mill ×1std Coil Box ×1 Finishing Mill ×5std Down Coiler ×1	EAF ×1(DRI 90%) Conventional CC ×1 (t=210mm) Av=1.8mpm HSM WB Furnace ×1 Roughing Mill ×1std Coil Box ×1 Finishing mill ×5std Down Coiler ×1
3. Capacity	(one furnace) approx. 1,000,000 t/y (two furnaces) approx. 2,000,000 t/y	(one furnace) approx. 1,000,000 t/y (two furnaces) approx. 2,000,000 t/y	(one furnace) Over1,000,000t/y (two furnaces) Over2,000,000t/y
4. Works in operation (Example)	Nucor (USA) Hamboo (Korea) POSCO (Korea)	BHP/North star (USA) Trico (USA)	Almost integrated works adopted
5. Available products	1. Mainly commercial quality 2. not suitable for tin & automobile outer parts 3. Width > 800 mm	1. high quality is difficult due to impossibility of slab conditioning 2. Suitable for all use (not clear in actual plant)	1. high quality possible) 2. Suitable for all use.
6. Flexibility of small orders	Difficult to accept small orders due to no edger (width can not be changed at HSM)	Difficult to accept small orders due to weak edger (difficulty of width change at HSM)	Possible to accept small orders due to edger (width can be changed at HSM)
7. Capital cost	Low	Middle	High
8. Operating Cost (CC & HSM) (Yield, Energy, Manpower)	Base	Higher Base +0.5–1.0 us$/t	Higher Base + 1.0–2.0 us$/T

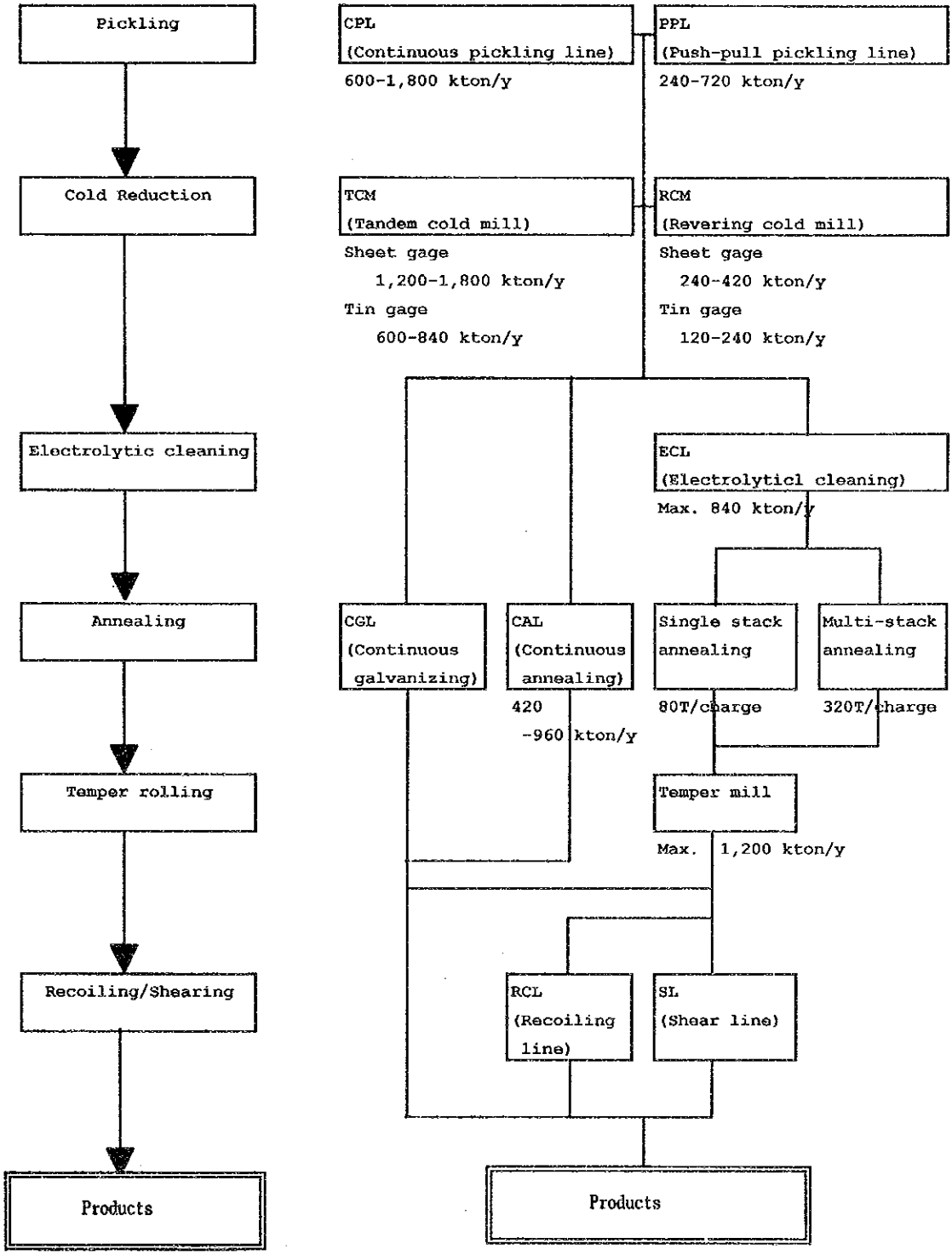
Table 5-3-3 Comparison of TSP, MSP and CVP (Summary)

	TSP	MSP	CVP
1. Advantage	1.Energy saving & low operating cost 2. Low initial equipment cost	1. Middle Quality (Higher than CSP) 2. Middle equipment cost between TSP & CVP 3. Equipment cost per steel ton may be the lowest	1. High quality 2. Easy to change Strip width at HSM 3. High productivity of narrow slab casting (Double width casting is possible)
2. Disadvantage	1. Difficulty of slab conditioning 2. Width adjustment at HSM is impossible. 3. Usage for Tin and Automobile is not possible 4. Can't use tapered slabs	1. Difficulty of slab conditioning 2. Under development process	1. High initial equipment cost 2. High operating cost
3. Comment	1. Strip width should be 800–1600mm 2. Kind of strip width should be minimized 3. Very useful process under 1.0 million tons per year. 4. Suitable for production of commercial products mainly for building construction in large markets such as USA etc.	1. Hot Rolled Coil Quality is not clear (Under development) 2. Suitable for small production of medium class products in medium or large markets. 3. This technology is still under development. No good process for EGYPT flat project at present	1. Very useful process to produce narrow size(especially TMBP) and wide range of strip width 2. Best process for high quality products and high production. 3. Suitable for small production of various products in small or medium markets.

(4) Cold strip mill

1) Process and equipment for cold rolled and galvanized products

The following shows some representative equipment.



2) Selection on appropriate equipment

(a) Pickling process

The PPL (Push pull pickling line) shall be selected taking the production capacity into consideration.

(b) Cold rolling process

The RCM (Cold reversing mill) shall be selected due to the production capacity. However, as the maximum production by the RCM is about 350,000 ton/year, additional RCM or the alternative equipment should be considered in the 2nd stage.

(c) Electrolytic cleaning process

This process shall be omitted because tin plate is not planned in this project. (Severe surface cleanliness is not required.)

(d) Annealing process

Among CAL (Continuous annealing line), UAS(Uniflow annealing system), Multi-stack annealing furnaces and single stack annealing furnaces, the single stack annealing furnaces shall be selected taking the product mix and capacity into account.

(e) Temper rolling process

As a single stand temper mill has much surplus capacity, the combination type temper mill shall be selected so that it can be used as a reversing mill also in the 2nd stage.

(f) RCL(Recoiling line) and SL(shearing line)

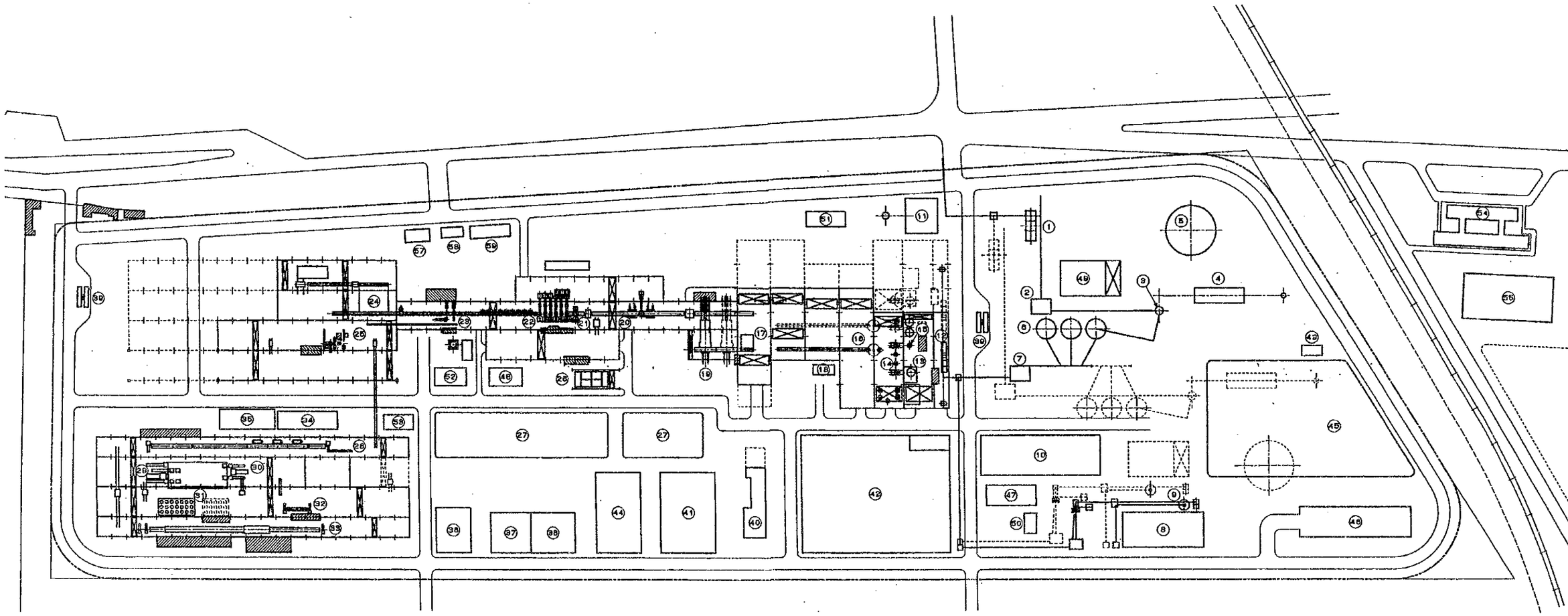
One RCL shall be installed but SL shall not be installed because it is considered more cost-effective to make some profilers have the function.

(g) CGL

Among recently popular four types - Wheeling type, Horizontal NOF type, Vertical RT type, Vertical DFF type -, Horizontal NOF type shall be selected considering quality and capacity.

5-4 Plant General Layout

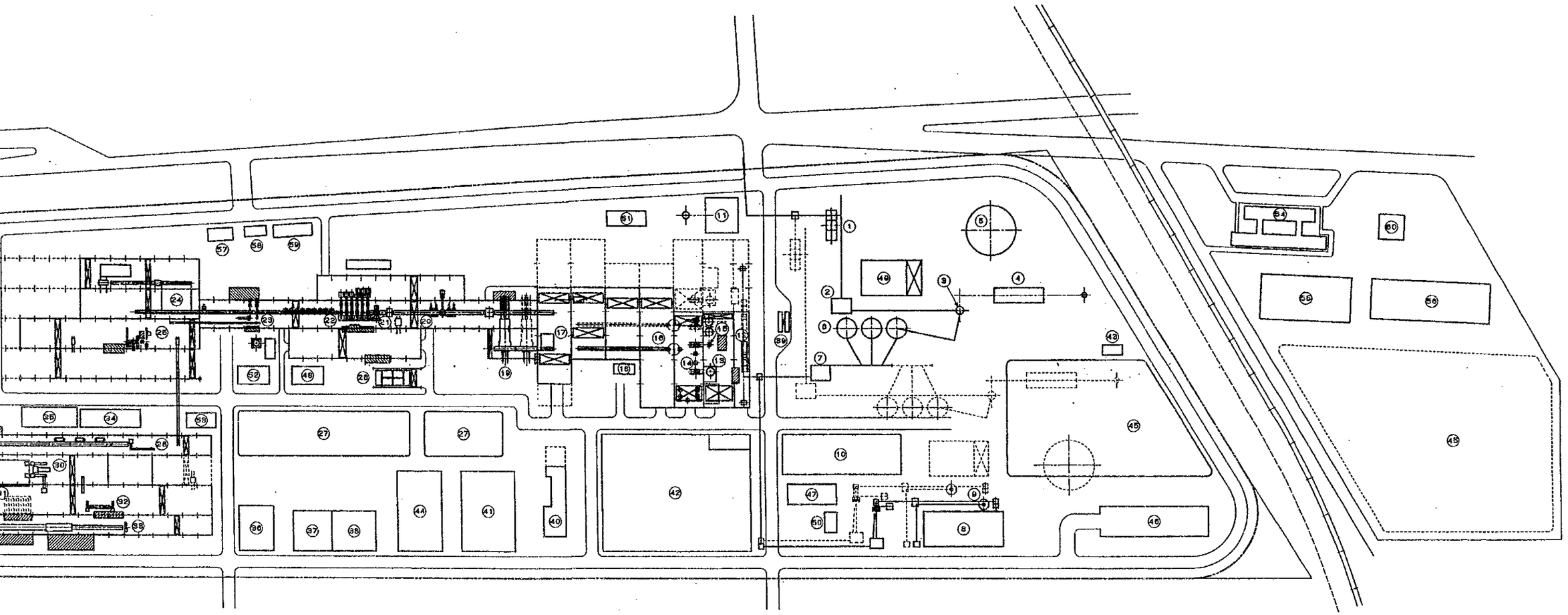
The general plant layout is shown in Figure 5-4-1.



1	OXIDE PELLET STORAGE BIN	11	DUST COLLECTOR	21	COIL BOX	31	BATCH ANNEALING FURNACE	41	RAW WATER RECEIVING STATION	51	SMP OFFICE
2	OXIDE PELLET SCREEN	12	MATERIAL HANDLING SYSTEM	22	FINISHING MILL	32	RECOILING LINE	42	MAIN SUBSTATION	52	HSM OFFICE
3	REDUCTION FURNACE	13	ELECTRIC ARC FURNACE	23	DOWN COILER	33	HOT DIP GALVANIZING LINE	43	NATURAL GAS RECEIVING STATION	53	CRM OFFICE
4	REFORMER	14	LADLE TRANSFER CAR	24	PLATE LINE	34	ACID REGENERATION	44	SEWAGE TREATMENT STATION	54	MAIN OFFICE
5	CLARIFIER	15	LADLE FURNACE	25	SKINPASS MILL	35	UTILITY PLANT	45	SCRAP YARD	55	MAINTENANCE SHOP
6	DRI STORAGE BIN	16	SLAB CASTER	26	SCALE PIT FOR HSM	36	WATER TREATMENT FOR CRM	46	SLAG YARD	56	REFRACTORIES WAREHOUSE
7	DRI SCREEN	17	SLAB CONVEYOR	27	WATER TREATMENT FOR HSM	37	OIL STORE	47	ADDITIVE WAREHOUSE	57	GUARD OFFICE
8	LIME STONE STORAGE YARD	18	SCALE PIT FOR CCM	28	PICKLING LINE	38	WASTE STORE	48	LABORATORIES	58	CLINIC
9	LIME CALCINING PLANT	19	REHEATING FURNACE	29	REVERSING MILL	39	TRUCK SCALE	49	DRP OFFICE	59	FIRE FIGHTING STATION
10	WATER TREATMENT FOR SMP	20	ROUGHING MILL	30	TEMPER MILL	40	AIR COMPRESSOR ROOM	50	LCP OFFICE	60	RESTAURANT

0 50 100m

Note



TORAGE BIN	11	DUST COLLECTOR	21	COIL BOX	31	BATCH ANNEALING FURNACE	41	RAW WATER RECEIVING STATION	51	SMP OFFICE
CREEN	12	MATERIAL HANDLING SYSTEM	22	FINISHING MILL	32	RECOILING LINE	42	MAIN SUBSTATION	52	HSM OFFICE
ACE	13	ELECTRIC ARC FURNACE	23	DOWN COILER	33	HOT DIP GALVANIZING LINE	43	NATURAL GAS RECEIVING STATION	53	CRM OFFICE
	14	LADLE TRANSFER CAR	24	PLATE LINE	34	ACID REGENERATION	44	SEWAGE TREATMENT STATION	54	MAIN OFFICE
	15	LADLE FURNACE	25	SKINPASS MILL	35	UTILITY PLANT	45	SCRAP YARD	55	MAINTENANCE SHOP
N	16	SLAB CASTER	26	SCALE PIT FOR HSM	36	WATER TREATMENT FOR CRM	46	SLAG YARD	56	REFRACTORIES WAREHOUSE
	17	SLAB CONVEYOR	27	WATER TREATMENT FOR HSM	37	OIL STORE	47	ADDITIVE WAREHOUSE	57	GUARD OFFICE
RAGE YARD	18	SCALE PIT FOR CCM	28	PICKLING LINE	38	WASTE STORE	48	LABORATORIES	58	CLINIC
PLANT	19	REHEATING FURNACE	29	REVERSING MILL	39	TRUCK SCALE	49	DRP OFFICE	59	FIRE FIGHTING STATION
T FOR SMP	20	ROUGHING MILL	30	TEMPER MILL	40	AIR COMPRESSOR ROOM	50	LCP OFFICE	60	RESTAURANT

0 50 100m

Note: Future expansion plan is shown by doted lines.

Figure 5-4-1

FLAT PRODUCT PROJECT OF EGYPT		
TITLE	PLANT GENERAL LAYOUT	
DWG NO. EFP-PGL-001		
DATE	JUL.31.1997	SCALE

5-5 Raw Materials

The raw materials required in a direct reduction process (DR) of iron oxide and an electric arc furnace (EAF) route of a steel making plant include iron ores (lump ore and oxide pellet), scrap and sub-materials such as limestone, ferro-alloys, aluminum and fluorite.
Typical standard quantities of the raw materials required for the flat product plant of one million tons per year production basis are shown in Table 5-6-1.

Table 5-5-1 Main Raw Materials for Flat Product Plant

(Unit: tons/y)

Raw Materials		Quantity	Remarks
Iron ores	Lump ore	300,000	Mixing ratio of lump ore and pellets will be 20% and 80%, respectively
	Oxide pellets	1,200,000	
Scrap		170,000	Return scrap = 104,000 t/y Purchased scrap = 64,000 t/y
Limestone		80,000	
Ferro-alloys	Ferromanganese	3,500	
	Ferrosilicon	200	
Aluminum		600	
Fluorite		500	

Generally, feasibility study is based on the principle that these raw materials are of local origin or production. However, in this study, with consideration given to the present status of the resource researches and the developments being conducted in Egypt, the raw materials are classified into three categories as follows, depending on supply sources:-

1) Domestic supply
   a) Limestone
   b) Fluorspar
   c) Ferro-silicon
   d) Aluminum (shot and bar)

2) Domestic and importation, together
   a) Ferro-manganese
   b) Refractories

3) Importation
   a) Iron ore and oxide pellet
   b) Scrap

c) Graphite electrode

The required iron ores in the DR/EAF route must be of high quality (67 % Fe content or more preferably). Consideration was given to the properties of iron ores and also to other industrial and economic factors, and in conclusion, iron ores have been selected as supply sources from other countries in this study.

Although locally produced scrap and ferro-manganese are utilized in the domestic industries, their quantities do not suffice more than that required by the existing Egypt steel industry, so it has been concluded that these raw materials are also imported.

Limestone, fluorspar, ferro-silicon and aluminum are produced in Egypt. Limestone and ferro-silicon have been exported for chemical industry and steel making use and they are the most reliable ones among all the raw materials in respect of the supply capacity.