13.8 Alternative Layout Plans

(1) Required Scale for the Cargo

According to the cargo handling systems adopted for the new port, the necessary area for each type of cargo is as follows:

Phosphate:	50,000	m^2(including silo, loader, belt conveyers)
Pellet:	31,000	m^2(including shed and office)
Clinker:	31,000	m^2(shed and office)
Scrap:	24,000	m^2(shed and office)
Fertilizer:	24,000	m^2(shed and office)
Sulphur	37,000	m^2(shed and office)
General(1)	9,000	m^2(for steel factory)
General(2)	18,000	m^2(for coke and others)
General(3)	10,000	m^2(for bagged fertilizer)

In addition, area for land transportation(road, railway, parking), operation, utilities(electricity, sanitary, water supply) is necessary.

(2) Location

The location of the port is suitable between Hamidieh and Kharabi. Part of the coast(the length of 1200m) is already occupied by the government. In order to avoid problems in relation to land acquisition, the new port will include the occupied area. It is better that the distance between the port and Hamidieh is as far as possible to keep area for future expansion. The suitable location is decided also based on the seabed condition. According to the observation by divers, the bed condition in front of the proposed location is mainly sandy.

(3) Terminal allocation

The new port consists of eight types of cargo terminals. Each terminal is located based on the following concepts.

- Terminals where cargoes that have a high impact on the environment - sulphur, coke or phosphate- are handled, will be concentrated on the northern edge of the port. Since the prevailing wind blows from the south-west, the dust from the cargo is blown into the north-east direction where land use is very small.

- Terminals for steel related cargo - pellet, scrap and general cargo- will be concentrated in the south of the port, because pellet tends to be influenced by sulphur and phosphate.

- Clinker and fertilizer terminals that will not affect other terminal's cargo and that will not themselves been affected, are located between above two types of

terminals.

- Operational facilities -headquarter building, main entrance, utility facilities- are concentrated in the south area of the port.

(4) Alternatives

Since the location of the terminals are decided, the alternatives are proposed in relation to the dredging volume. (See Fig. 13.8.2)

Alternative 1: Least Reclamation Volume
Alternative 2:Shift Off-shore by 150m
Alternative 3:Shift Off-shore by 300m
Alternative 4:Shift Off-shore by 450m
Alternative 5:Shift Off-shore by 600m

In alternative 1, though the reclamation volume is the smallest, the dredging volume is the largest. On the contrary, in alternative 4, the dredging volume is smallest among the alternatives. In alternative 4, the usable land area is the largest. The farther the facilities shift from the coast, the longer the distance of the access transportation will become.

(5) Evaluation

Since the location of each terminal is the same, the alternatives are evaluated mainly from the viewpoint of total cost. The alternative 3 is the most economical.

(billion SP)

Alternative No.	1	2	3	4	5
Civil Work	7.13	7.23	7.15	6.86	6.82
Dredging	5.18	3.88	2.87	2.67	2.47
Reclamation	0.28	1.49	2.50	3.63	4.52
Other Facilities	3.20	3.20	3.20	3.20	3.20
Others	3.87	3.87	3.87	3.87	63.87
Grand Total	19.66	19.67	19.59	20.23	20.88
INDEX	101	101	100	103	107

(1,000 m^3)

Dredging Volume	6,532	5,254	4,303	3,906	3,508
Reclamation Volume	933	5,008	8,445	12,278	15,328

Note) "Others" includes works on land, port service facilities and contingency/engineering fee.

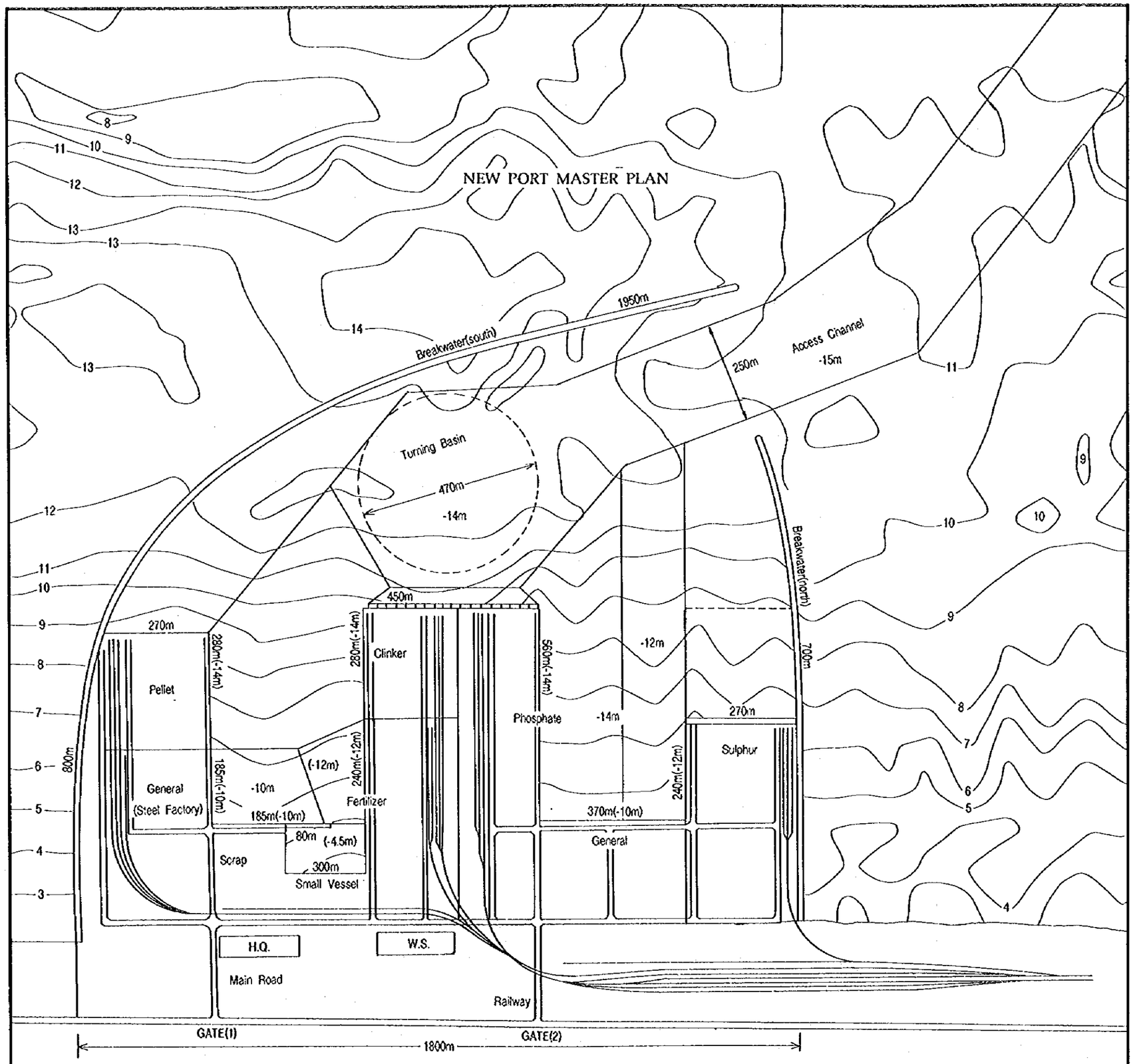


Fig.13.8.1 Master Plan of the NEW PORT - Alternative (1) -

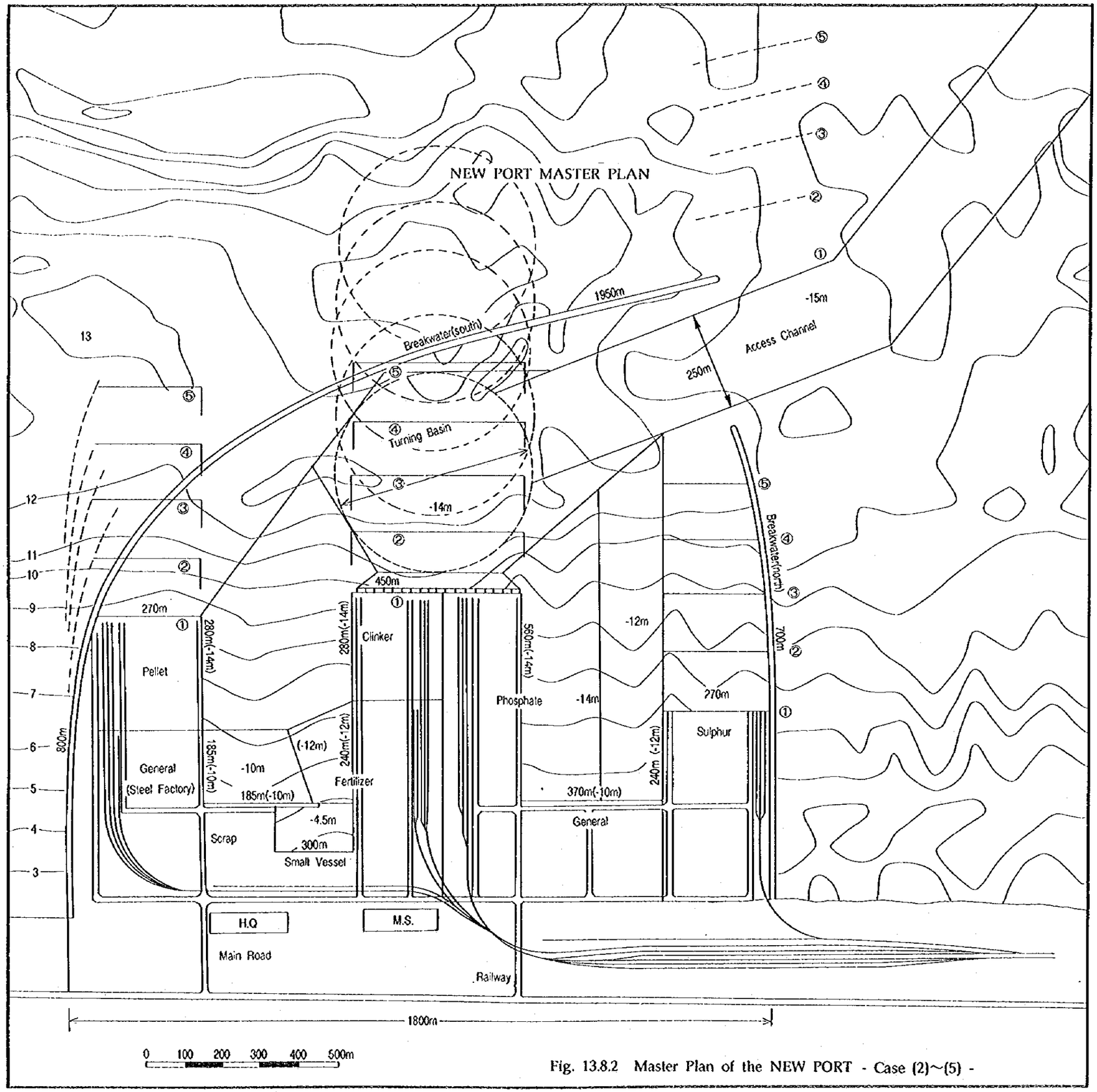


Fig. 13.8.2 Master Plan of the NEW PORT - Case (2)~(5) -

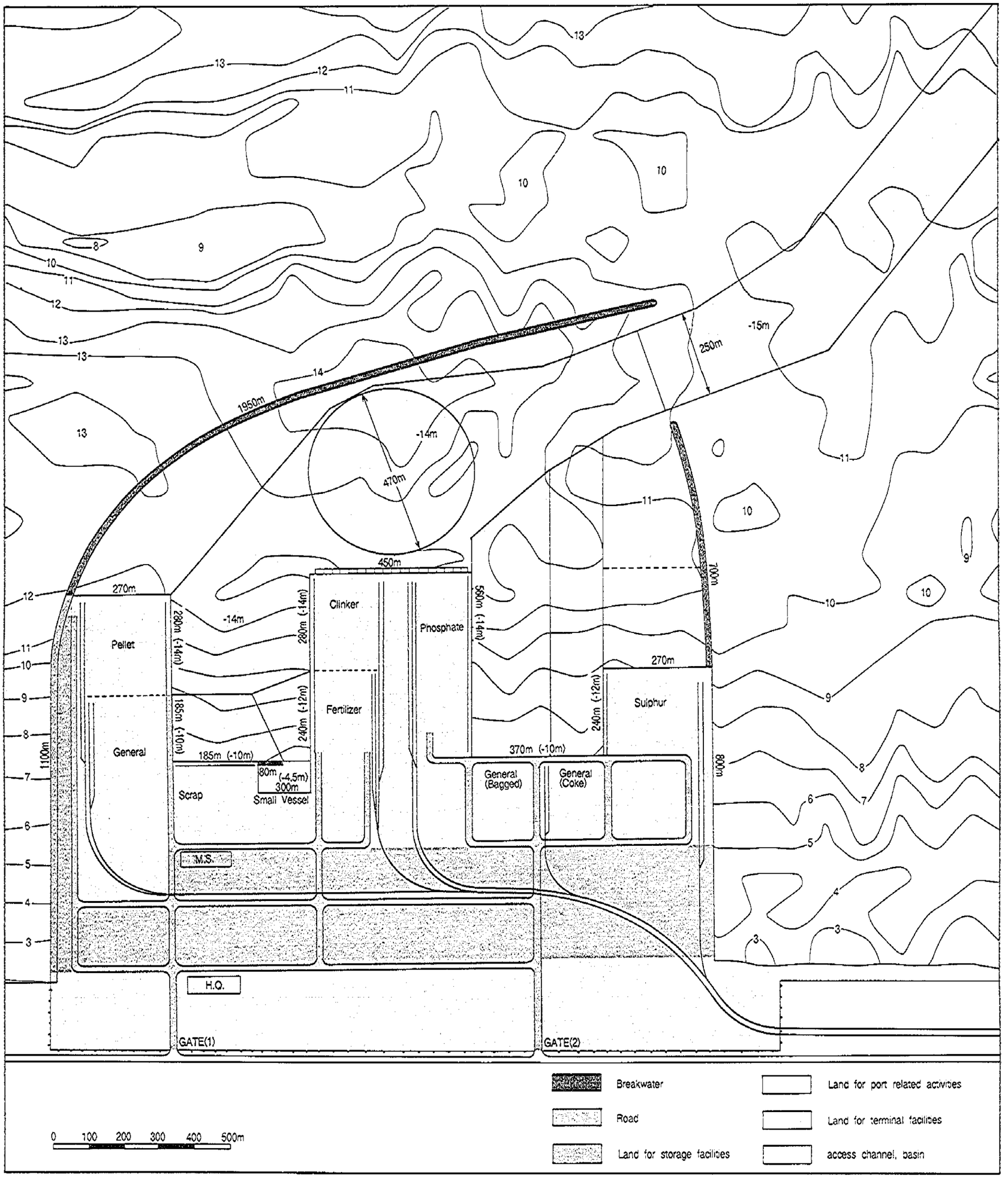


Figure 13.8.3 Master Plan of the NEW PORT - Alternative (3) -

13.9 Initial Environmental Examination

13.9.1 Existing Situation

The area under consideration for the location of the new port is included in the Syrian Coastal Resources Management Plan as shown in Figure 13-9-1. The area was visited for an initial reconnaissance. The area is composed of a sand and rock foreshore with extensive low sand dunes. The hinterlands is mainly agricultural land under intensive farming for vegetables and cereals. The main north south road to Lebanon forms a distinct boundary between the coastal strip and the agricultural area. The main area of residential occupation is Hamidie and Shatalarab to the north of the selected area. To the south is the small river which forms the boundary with Lebanon. To the east is a small wetlands area. At the time of the first site inspection it was relatively dry, little wildlife was observed and it is not marked on the Coastal Resources Management Plan as a Specially Protected Area for ecological reasons. During a later visit after rains the site was flooded over a large area.

The main highway and railway are located some 5km inland from the site and run in a north south direction. Existing environmental data compiled by the Ministry of Environment and Ministry of Irrigation, Coastal Department Center of Water Pollution Control was reviewed. According to survey data compiled by the local authorities, the nearest water quality monitoring station is located at Amrit, to the north of the site. Based on 1994 data, the water quality is as follows. The value for **pH** was 7.93 which is acceptable. The **dissolved oxygen** figure was 6.2 mg/l which at a temperature of 29℃ represents 80% saturation. **Salinity** was 38 ppt which is high but typical of Mediterranean waters. The **faecal coliform** count was $11X10^3/100ml$ which shows a high degree of bacterial contamination from urban sewage sources. In general the water quality can be classed as moderate to good although not suitable for swimming.

No other data on water quality parameters or sediments was available but is necessary for an EIA. Consequently the seawater quality, seabed sediment quality, freshwater quality and air quality were assessed by means of a site survey. Also an ecological survey was conducted to ascertain the existing flora and fauna. The area to the west of the road will be used for the new port construction. The area to the east will not be used for the new port construction but was surveyed to establish the ecological value in case the land may be affected by the new port construction. The survey took one week in February 1996 mainly during the day although on occasion the survey recorded nocturnal animals during dawn. Botanical samples were taken and identified in the laboratory. In all cases Genus was identified and where possible species. The findings are discussed in the EIA. (Section 17.14)

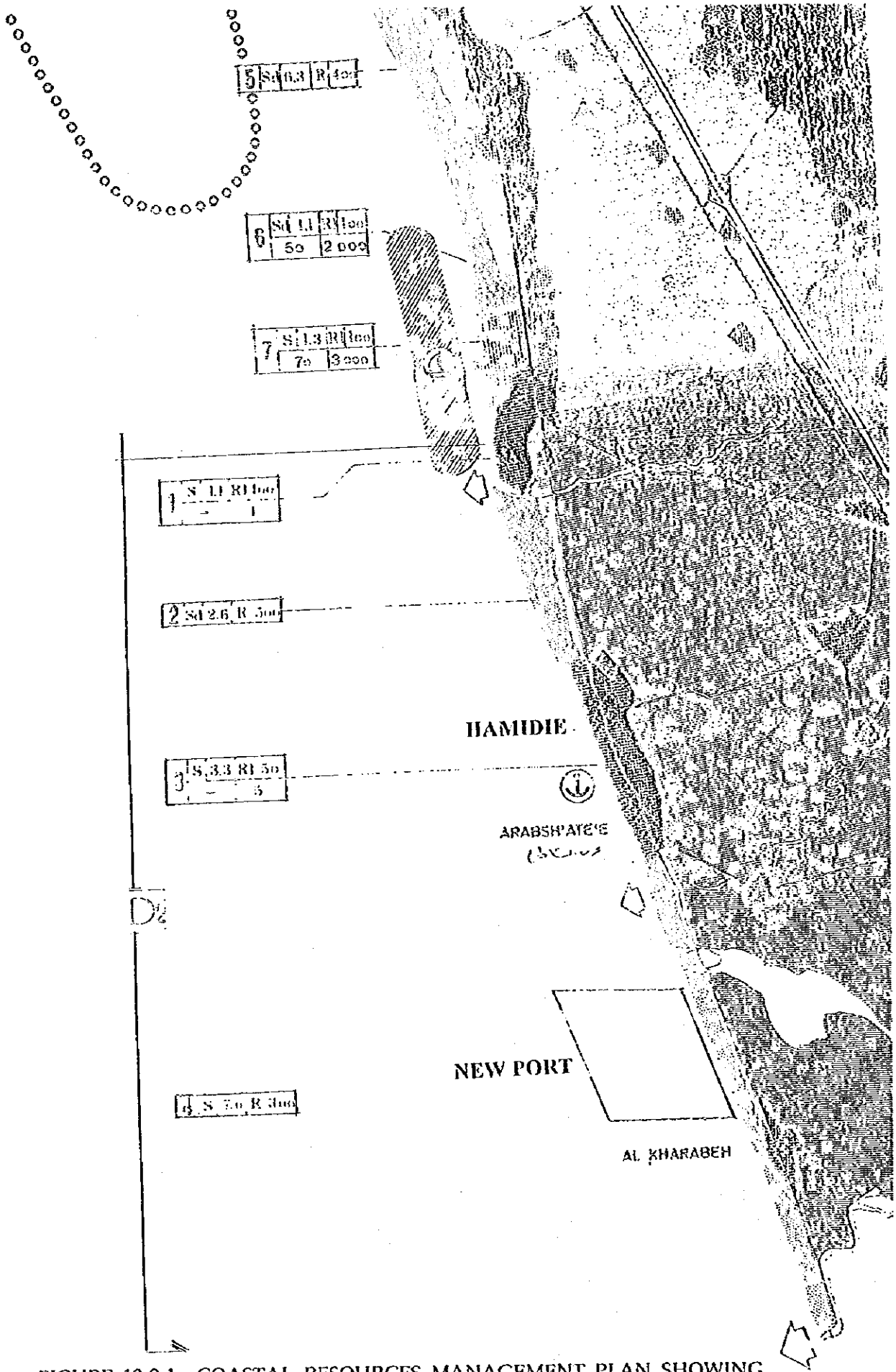


FIGURE 13-9-1 COASTAL RESOURCES MANAGEMENT PLAN SHOWING PROPOSED LOCATION OF NEW PORT

13.9.2 New Port Construction

The new port will have two breakwaters total length of 2,650m. In order to secure the necessary depth for vessels berthing reclamation will be constructed out to a distance of 1,100 meters. Some dredging will also be necessary. In addition there will be areas for storage of bulk materials and handling facilities. These will be located on the western side of the main road. Access roads and the railway line connection will be located on the eastern side of the main road.

13.9.3 Initial Environmental Examination

The Initial Environmental Examination(IEE) has been assessed in a tabular form in accordance with the layout recommended by OCDI in their publication "Environmental Assessment for Port development Projects", OCDI, December 1993. This is shown in Table 13-9-1. The significance of impacts are shown by the entries in the tables; those in the left column representing no impact and those in the right column representing major impacts. The potential major impacts could be:

- Dredging of sediments. The needs to be assessed in detail and it will be necessary to determine the heavy metal concentrations of the sediments by field survey.
- Disturbance due to construction of breakwaters and increased turbidity of water. This may affect the depth of light penetration.
- Restriction of seaway to coastal vessels.
- Dust from loading/unloading operations
- Interruption to free flowing coastal current. Concerns have been expressed by the local authorities over effects on littoral drift. The significance of this has not yet been established.
- Noise from access traffic.
- Effects on flora and fauna. This needs to be assessed as road and rail access will require land acquisition.
- Construction camp of workers.
- Borrow areas. The reclamation may require infill material that may have to be transported from quarries.
- Social effects. The introduction of new workers may cause social disruption.
- Cultural aspects. Are historical, religious or cultural artifacts in the immediate vicinity which may be affected should be identified.
- Visual impact.
- Economic impacts. The land along the coastal plain is valuable to Syria as there is a shortage of good agricultural land. The avoidance of taking farm land is a high priority and reclamation which avoids using fertile land is preferable.

13.9.4 IEE Overview

The IEE given in Tables 13-9-1 is quite comprehensive and a synopsis and overview is given in Table 13-9-2. This is in accordance with JICA requirements given in the Checklist for Scoping Port and Harbours, "Environmental Guidelines for Infrastructure Projects- Ports and Harbours",JICA environmental Guidelines, September 1992.

As can be seen in the figure there are several environmental impacts associated with the planned development which require further investigation, and an EIA is considered necessary.

13.9.5 Conclusion

The planned activities at the new port that may have a significant impact are dust, dredging, quarrying of material for reclamation, transportation infrastructure, and the construction activities. The degree of these impacts is not yet quantitatively established but as each can be controlled by appropriate mitigation measures they should not prevent the port proceeding. These impacts should be considered in more detail and an EIA is considered necessary. This is included in section 17.14.

TABLE 13-9-1 IEE OF NEW PORT

After OCDI 1993

Environmental Impact Factors	Environmental Impact	Countermeasures	Size of Impact				Reason	Recommendation
			None	Small	Large	Major		
1. Impact from construction works								
1.1 Operation of working boats, construction machines	1.1.1 Air pollution	1.1.1 Management of construction process, selection of working hours, smoke prevention fence.	O					
	1.1.2 Generation of noise and vibration	1.1.2 Selection of construction methods/machines, selection of working hours, placement of sources of noise/vibration	O					
	1.1.3 Changes in terrestrial ecosystem	1.1.3 Selection of construction methods/machines.	O					
1.2 Dredging, stirring of bottom soil, soil dumping into water.	1.2.1 Pollution of water and bottom sediments (SS, hazardous materials)	1.2.1 Settling pond, sedimentation coagulant, selection of construction methods/machines, silt curtains.				O	Dredging of berths. Dredged material to go to recl	Assessment of sediments
	1.2.2 Offensive odor	1.2.2 Selection of construction methods /machines, introduction of odor treatment methods.	O					
	1.2.3 Reduction of aquatic lives	1.2.3 Settlement pond, sedimentation coagulant, selection of construction methods/machines, silt curtains, selection of construction period, monitoring of alternative habitats.		O			No fishing grounds or shellfish beds nearby. Loca fishing only.	Check with local fishermen
	1.2.4 Pollution of marine products	1.2.4 Settlement pond, sedimentation coagulant, selection of construction methods/machines, silt curtains, selection of construction period, monitoring pollution of fishery products.	O				No fishing grounds or shellfish beds nearby.	
	1.2.5 Devaluation of tourism resources	1.2.5 Settlement pond, sedimentation coagulant, selection of construction methods/machines, silt curtains,	O					
1.3 Soil removal	1.3.1 Changes in topography, underground water system	1.3.1 Prior elucidation of underground water system			O		Need for reclamation material	Assess location of borrow pits
	1.3.2 Extinction of terrestrial ecosystem	1.3.2 Transplantation of important species, vegetation.	O					
1.4 Generation of surplus soil, wastes, dumping of dredged soil on ground	1.4.1 Pollution of water/bottom sediments	1.4.1 Treatment site planning	O				Spoil to be used for reclamation	Check quantities needed.
	1.4.2 Impact on terrestrial ecosystem	1.4.2 Disposal site planning	O					
1.5 Employment of laborers	1.5.1 Inflow of alien cultures	1.5.1 Employment planning, disclosure of information	O					
	1.5.2 Change in economic activities	1.5.2 Employment planning, vocational training	O					
1.6 Congestion of work vehicles and boats	1.6.1 Economic loss (traffic jam)	1.6.1 Construction of access roads			O		Roads already exist but may be too small.	Construct new temporary roads
	1.6.2 Devaluation of fishing ground	1.6.2 Alternative fishing ground	O					
2. Impact from port facilities and site								
2.1 Emergence of site (including landfill)	2.1.1 Pollution of water and bottom sediments	2.1.1 Change of face lines, dredging sludge, promotion of seawater exchange		O			Not known at this stage	To be assessed
	2.1.2 Beach erosion and accretion	2.1.2 Change of face lines, construction of breakwaters against beach erosion, littoral nourishment			O		Concerns over littoral drift. Not quantified yet.	To be assessed
	2.1.3 Changes in coastal currents	2.1.3 Change of face lines, construction of breakwaters, selection of type of offshore structure			O		Concerns over littoral drift. Not quantified yet.	To be assessed
	2.1.4 Decrease of habitats for aquatic lives	2.1.4 Transplant, discharge of seeds and saplings	O				No effects anticipated	None

TABLE 13-9-1 IEE OF NEW PORT

After OCDI 1993

	2.1.5 Decrease of habitats for terrestrial lives	2.1.5 Change of face lines, designation of nature conservation areas, artificial tidal flats, transplant			O	Wetlands adjacent to site	To be assessed
	2.1.6 Change in scenic beauty	2.1.6 Location of facilities, selection of color, plantation	O				
	2.1.7 Resettlement of local residents and culture	2.1.7 Transfer planning, information disclosure		O		Very small number of residents	
	2.1.8 Extinction of fishing grounds	2.1.8 Expansion of functions of fishing ports, marine products transportation functions	O				
2.2 Emergence of external facilities	2.2.1 Pollution of water and bottom sediments	2.2.1 Change of face lines, dredging sludge, promotion of seawater exchange	O				
	2.2.2 Beach erosion and accretion	2.2.2 Change of face lines, construction of breakwaters against beach erosion, littoral nourishment	O				
	2.2.3 Change in coastal currents	2.2.3 Change of face lines, construction of breakwaters for wave prevention , selection of type of offshore structure	O				
	2.2.4 Decrease of habitats for aquatic lives	2.2.4 Transplant, discharge of seeds and saplings	O				
	2.2.5 Change of scenic beauty	2.2.5 Changes in shape of facilities and selection of colors	O				
2.3 Emergence of sea route	2.3.1 Change in coastal currents	2.3.1 Change of face lines, construction of breakwaters for wave prevention		O		Construction of breakwaters	Not significant
	2.3.2 Decrease of habitats for aquatic lives	2.3.2 Transplant, discharge of seeds and saplings	O				
2.4 Emergence of anchorage	2.4.1 Change in coastal currents	2.4.1 Change of face lines, construction of breakwaters for wave prevention , selection of type of offshore structure	O				
	2.4.2 Decrease of habitats for aquatic lives	2.4.2 Transplant, discharge of seeds and saplings	O				
3. Impact from utilisation of facilities in water area and anchorage							
3.1 Impact from boats	3.1.1 Air pollution	3.1.1 Reduction of stoppage time in ports, compulsory use of high quality oil	O				
	3.1.2 Water pollution (bilge)	3.1.2 Strengthening of laws and regulations		O		New shipping expected	Enforcement of harbour regulations
	3.1.3 Beach erosion caused by furrow wave	3.1.3 Speed limit, beach protection structure	O				
	3.1.4 Generation of wastes (dredged material included)	3.1.4 Strengthening of laws and regulations, recycling/disposal systems		O		Extra waste to municipal tip	Authorities to initiate correct waste disposal practices
	3.1.5 Obstruction to fisheries activities	3.1.5 Alternative fishing ground and artificial fishing sites, expansion of function of fishing ports and transportation of marines products	O				
4. Impact from cargo loading and utilisation of storage facilities							
4.1 Cargo loading and utilisation of storage facilities	4.1.1 Air pollution (dust)	4.1.1 Establishment of buffer zone, enclosure, surface treatment, selection of loading machines			O	Major impact possible from bulk materials handli	Design to include dust control
	4.1.2 Pollution of water and bottom sediments	4.1.2 Establishment of buffer zone, enclosure, surface treatment, selection of loading machines, shape of apron		O		Some impacts from normal port operations	
	4.1.3 Generation of noise	4.1.3 Zoning, sound proof fence/hood	O				
	4.1.4 Generation of offensive odor	4.1.4 Zoning, sealing of storage facilities, deodorisation facilities	O				
	4.1.5 Change in coastal ecosystem	4.1.5 Establishment of buffer zone, enclosure, surface treatment, selection of loading machines, shape of apron, monitoring of pollution of marine products	O				
	4.1.6 Generation of wastes	4.1.6 Planning for collection, treatment and disposal of wastes			O	Wastes from new port	Need correctly operated municipal waste disposal site
	4.1.7 Employment effect	4.1.7 Vocational training	O				

TABLE 13-9-1 IEE OF NEW PORT

After OCDI 1993

5. Impact from operation of facilities handling hazardous materials							
5.1 Operation of oil distribution base and facilities handling hazardous materials	5.1.1 Air pollution	5.1.1 Reduction of air pollutants (dust collection, desulphurisation, denitrification) promotion of dispersion	O				
	5.1.2 Pollution of water and bottom sediments (oil)	5.1.2 Facilities for waste oil treatment, oil fence	O				
	5.1.3 Generation of offensive odor	5.1.3 Change of zoning, containment of offensive odor, deodoriser	O				
	5.1.4 Change in coastal ecosystem	5.1.4 Facilities for waste oil treatment, oil fence, monitoring of pollution of marine products	O				
	5.1.5 Change in terrestrial ecosystem	5.1.5 Facilities for waste oil treatment, oil fence, establishment of nature conservation area	O				
	5.1.6 Decrease in amount of agricultural products, fisheries products and price	5.1.6 Facilities for waste oil treatment, oil fence, monitoring of pollution of marine products	O				
6. Impact from waste treatment and disposal							
6.1 Operation of waste treatment facility	6.1.1 Air pollution	6.1.1 Reduction of air pollutants (dust collection, desulphurisation, denitrification)	O				
	6.1.2 Pollution of water and bottom sediments	6.1.2 Reduction of discharge, drainage treatment facilities	O				
	6.1.3 Generation of offensive odor	6.1.3 Zoning, containment of offensive odor, deodoriser	O				
	6.1.4 Change in coastal ecosystem	6.1.4 Prevention of water pollution	O				
	6.1.5 Change in terrestrial ecosystem	6.1.5 Prevention of air/water pollution	O				
6.2 Impact from waste disposal facility	6.2.1 Air pollution	6.2.1 Establishment of buffer zone, surface treatment, fence	O				
	6.2.2 Pollution of water and bottom sediments	6.2.2 Sheet cover (rain prevention) settling ponds selection of bulkhead structure	O				
	6.2.3 Generation of offensive odor	6.2.3 Zoning	O				
	6.2.4 Change in coastal ecosystem	6.2.4 Prevention of water pollution	O				
	6.2.5 Change in terrestrial ecosystem	6.2.5 Prevention of air/water pollution	O				
	6.2.6 Formation of slums	6.2.6 Management plans for disposal site	O				
7. Impact from Traffic function							
7.1 Road Traffic	7.1.1 Air pollution	7.1.1 Improvement of transportation system routes, establishment of buffer zone, road pavement, green belt, cover on a bed of trucks			O	Some increase in road traffic, new railway line	Need for further study
	7.1.2 Generation of noise and vibration	7.1.2 Correction of routes, establishment of buffer zone, selection of road/trackage, structure road pavement, soundproof fence			O	Some increase in road traffic	Need for further study
	7.1.3 Change in terrestrial ecosystem	7.1.3 Correction of routes, establishment of buffer zone/nature conservation area, prevention of air pollution			O	Some land take may be necessary	Need for further study
	7.1.4 Change in local population distribution	7.1.4 Information disclosure, enlightening the local people on the concerned project		O		Some minor relocation may be necessary of tempo dwellings and livestock.	Need to quantify
	7.1.5 Traffic jams/accidents	7.1.5 Relocation of routes/overpass	O				
8. Impact from industrial production activities							
8.1 Operation of factories and plants	8.1.1 Air pollution	8.1.1 Reduction of air pollutants (dust collection, desulphurisation, denitrification) promotion of dispersal			O	Need to study phosphate handling	Need to quantify
	8.1.2 Pollution of water and bottom sediments	8.1.2 Reduction of discharge, drainage treatment facilities	O				
	8.1.3 Generation of noise and vibration	8.1.3 Zoning, establishment of buffer zone, sound proof fence/hood	O				
	8.1.4 Generation of offensive odor	8.1.4 Zoning, containment of offensive odor, deodorisation facilities	O				
	8.1.5 Ground subsidence	8.1.5 Regulation on the use of underground wate	O				
	8.1.6 Change in coastal ecosystem	8.1.6 Prevention of water pollution, dredging of sludge	O				
	8.1.7 Change in terrestrial ecosystem	8.1.7 Establishment of nature conservation area			O	Encroachment of nearby wetlands	Need to quantify
	8.1.8 Generation of wastes	8.1.8 Planning for collection treatment and disposal of wastes		O		Generation of waste from new port	Need for local authorities to establish waste disposal site

TABLE 13-9-1 IEE OF NEW PORT

After OCDI 1993

	8.1.9 Change in local population distribution	8.1.9 Establishment of employment planning, information disclosure	O				
	8.1.10 Employment effect	8.1.10 Vocational training	O				
9. Impact from storage and distribution functions							
9.1 Storage functions (including outdoor storage)	9.1.1 Air pollution (dust)	9.1.1 Zoning, establishment of buffer zone, containment, sprinkling, sheet cover, surface treatment			O	Storage area on land may give rise to dust problem	Need to quantify and review dust control procedures
	9.1.2 Pollution of water and bottom sediments	9.1.2 Zoning, containment, sheet cover, establishment of drains, and settling ponds	O				
	9.1.3 Generation of offensive odor	9.1.3 Zoning, containment of odor, deodoriser	O				
9.2 Cargo handling	9.2.1 Generation of noise	9.2.1 Zoning, establishment of buffer zone, selection of machines, sound proof fence and sound proof hoods	O				
	9.2.2 Employment effect	9.2.2 Vocational training	O				
10. Impact from operation of recreational facilities							
10.1 Utilisation of hotels, marinas, artificial beaches	10.1.1 Pollution of water and bottom sediments	10.1.1 Water quality control through laws and regulations, water quality improvement in the shallow coastal area including artificial beaches		O		Some temporary disturbance during construction to recreational users of beach	Temporary control measures to be employed by contractors
	10.1.2 Change in coastal ecosystem	10.1.2 Prevention of pollution of water and bottom sediments	O				
	10.1.3 Generation of wastes	10.1.3 Planning for collection treatment and disposal of wastes	O				
	10.1.4 Inflow of alien culture	10.1.4 Selection of project location, information disclosure, enlightening the local people on the concerned project	O				
	10.1.5 Employment effect	10.1.5 Employment planning, vocational training			O	Positive economic benefit to area	
	10.1.6 Obstruction to fishing activities	10.1.6 Securing of alternative fishing grounds	O				

TABLE 13-9-2 IEE OVERVIEW

After JICA 1992

CHECKLIST FOR SCOPING (PORTS AND HARBOURS)			
PORT:	NEW PORT		
	ENVIRONMENTAL ITEM	EVALUATION A/B/C/D	REASON
SOCIAL ENVIRONMENT			
1	RESETTLEMENT	B	Some relocation of temporary dwellings may be necessary.
2	ECONOMIC ACTIVITIES	D	Impact is positive.
3	TRAFFIC/PUBLIC FACILITIES	B	Some increase due to railway and road.
4	SPLIT OF COMMUNITIES	D	New roads will pass between villages, not through them.
5	CULTURAL PROPERTY	D	None in immediate vicinity.
6	WATER RIGHTS AND RIGHTS OF COMMONS	B	Some minor loss of common grazing land for sheep.
7	PUBLIC HEALTH CONDITIONS	D	None anticipated.
8	WASTE	B	Some increase; need for waste disposal facility and strategy.
9	HAZARDS(RISKS)	D	None anticipated as not Dangerous Goods port.
NATURAL ENVIRONMENT			
10	TOPOGRAPHY AND GEOLOGY	D	Landscape flat.
11	SOIL EROSION	D	No evidence of erosion at present.
12	GROUNDWATER	D	Currently subject to salinity problems, not affected by port.
13	HYDROLOGICAL SITUATION	D	Port will not disturb current hydrological regime.
14	COASTAL ZONE	C	To be examined in EIA
15	FAUNA AND FLORA	C	To be examined in EIA
16	METEOROLOGY	B	Area is subject to strong winds which cause high natural dust levels.
17	LANDSCAPE	B	Minor visual impact
POLLUTION			
18	AIR POLLUTION	C	To be examined in EIA
19	WATER POLLUTION	C	To be examined in EIA
20	SOIL CONTAMINATION	D	None anticipated.
21	NOISE AND VIBRATION	B	Some minor impact anticipated
22	LAND SUBSIDENCE	D	None anticipated.
23	OFFENSIVE ODOR	D	None anticipated.

A=Serious impact is expected
B=Some impact is expected
C=Extent of impact is unknown. Examination is needed.
D=No Impact is expected. IEE/EIA not necessary.

13.10 Facility Design

The port facilities needed for the Master Plan of the new port are planned in the previous chapter. In this section, the preliminary designs for the main facilities are proposed.

13.10.1 Design Conditions

(1) Oceanographic Conditions

1) Deep Water Waves

The water area of the new port is exposed to strong off-shore waves in the S-W and NW-N directions. The wave fetches amount to 500 km from the S-SSW, 700 km from the SW, and 1,100 km from the WSW-W. The Cyprus island is located in the W-NW direction 150 km apart from the planned area, and the island partially shields the area from heavy swell attacks of this direction. The fetch in the NW direction does not exceed 200 km. The heaviest swells occur caused by the maximum wave fetches from the south to the west directions.
The synoptic situations of the wind fields in the eastern part of the Mediterranean Sea are specified as follows:
The winds are grouped by direction, S, SW, W, and NW, and by velocity range, 8-12, 12-16, 16-20, 20-24 and more than 24 m/sec. (Presented here are the average anemometric wind velocities at the sea level +10 m above the sea level.) The most characteristic and frequently observed winds are chosen out of each group and served as a standard unit for calculation of the deep water wave elements. Counting a number of storms by wind direction and by wind velocity enables to determine the wave regime in the eastern part of the Mediterranean Sea.

Table 13.10.1-1 Frequency of Stormy Winds over the Eastern Part of the Mediterranean Sea in Event per Year

(%)

Wind Velocity (in m/sec)	Wind Direction (in azimuth)			
	S	SW	W	NW
24-	-	0.03	0.03	-
20-24	0.02	0.09	0.06	0.03
16-20	0.10	0.38	0.16	0.09
12-16	0.55	1.70	0.55	0.40
8-12	3.00	9.50	2.90	2.00

Note: Average time duration of a storm - "event" - is assumed to be 14 hours. It was determined by the time of cyclone which caused storms in the northern part of the Mediterranean Sea.

The provable wind velocities for the frequency level of single event per 50 years (F=0.02) are extrapolated according to data presented in the Table 13.10.1-1. They show that stormy winds near the planned water area may reach the following velocities as S-20m/sec, SW-27m/sec, W-27m/sec, and NW-23m/sec. (Ref. Extension of the Port of Latakia, 1980, USSR State Design and Research Institute of Sea Transport)

Consequently, Deep water waves corresponding to above wind elements are estimated by using SMB method by S, SW, W and NW directions based on the eight azimuth as shown in Table 13.10.1-2.

Table 13.10.1-2 Deep Water Waves in 50 Years Return Period

Wave Characteristics	Deep Water Wave Direction (in azimuth)			
	S	SW	W	NW
Ho(m)	6.0	7.0	7.0	6.0
To(sec)	9.0	10.0	10.0	9.0
Lo(m)	126	156	156	126

2) Design Waves

In a shallow water area, waves are subject to refraction due to local change of the wave velocity with change of the water depth so that the resulting changes of the wave direction and wave height should be taken into consideration.
In an area where the water depth is greater than about one-half of the wave length, i.e., a region of deep water, waves propagate without being affected by the sea bottom. When waves enter into a region of shallow water, however, the direction of wave propagation gradually shifts and the wave crestlines are bent into the pattern of the depth contours of the sea bottom.
Wave elements in the zone of the breakwaters at depth of -15m can be determined based on their deep water characteristics using reduction coefficient for refraction, energy losses and wave transformation at lesser depths.

There are no exact bathymetric maps over the whole Syrian coastal areas. However, Syrian coastal line stretches north and south, and by assuming the Syrian coastal area with straight, parallel depth-contours, the variation of the wave direction and the refraction coefficient of the waves can be obtained by following formulas.

$$\sin\alpha = \sin\alpha_0 \tanh\frac{2\pi h}{L}$$

$$Kr = \sqrt{\frac{\cos\alpha_0}{\cos\alpha}}$$

where L, α and α_0 denote the wave length at the depth h, the incident angle of the wave to the contour line at the planned depth h, and the incident angle of the deep water wave to the off-shore contour line, respectively.

Wave elements in the zone of the breakwaters at depth h can be determined based on their deep water characteristics using reduction coefficient for refraction, energy losses and wave transformation at lesser depths.
The following table shows the values of refraction coefficient of regular waves (K_r) and the incident angle α at the -15m depth.

Table 13.10.1-3 Refraction Coefficient and Incident Angle of Waves

Wave Characteristics	Deep Water Wave Direction (in azimuth)			
	SSW	SW	W	NW
H_0(m)	6.0	7.0	7.0	6.0
T_0(sec)	9.0	10.0	10.0	9.0
L_0(m)	126	156	156	126
H_0/L_0	0.048	0.045	0.045	0.048
α_0 (degree)	68	45	0	45
h(m)	15	15	15	15
K_r	0.72	0.90	1.00	0.91
α (degree)	45	30	0	32

The south direction wave undergoes the most intensive refraction due to the slanting approach towards isobaths; the least refracted waves are those of the W direction which extend towards isobaths perpendicularly.

Where the water depth is less than about 3 times the equivalent deep water wave height, attenuation of the wave height due to wave breaking shall be considered. The wave elements regime in the area of the breakwaters construction at the depth of -15 m is given in the following Table by assuming the sea bottom slope to be 1/100. The relations, h/H_0'-$H_{1/3}/H_0'$ and h'/H_0'-H_{max}/H_0' are calculated according to a theoretical model of wave breaking. In this Table, H_0' represents the equivalent deep water wave height, $H_{1/3}$ the significant wave height, H_{max} the maximum wave height and L_0 the wave length of deep water waves.

Table 13.10.1-4 Design Wave Heights

Wave Characteristics		Deep Water Wave Direction (in azimuth)			
		SSW	SW	W	NW
H_0(m)		6.0	7.0	7.0	6.0
T_0(sec)		9.0	10.0	10.0	9.0
L_0(m)		126	156	156	126
h(m)		15	15	15	15
K_r		0.72	0.90	1.00	0.91
H_0'(m)*1		4.3	6.3	7.0	5.5
$H_{1/3}$	h/H_0'	3.47	2.38	2.14	2.75
	h/L_0	0.119	0.096	0.096	0.119
	$H_{1/3}/H_0'$	0.93	0.92	0.88	0.92
	$H_{1/3}$	4.0	5.8	6.1	5.1
H_{max}	h'(m)*2	15.2	15.3	15.3	15.3
	h'/H_0'	3.52	2.43	2.19	2.79
	H_{max}/H_0'	1.67	1.53	1.40	1.60
	H_{max}(m)	7.2	9.6	9.8	8.7

*1: $H_0' = H_0 \times K_r$
*2: $h' = h + 5H_{1/3} \times (1/100)$

It is evident that the stormiest months are December-March. During these periods, the maximum values of wave parameters were recorded in Latakia Port. The maximum wave height during the period under investigation was 6 m. It was observed at the south-west storm on the 13th of December, 1979.

The design wave heights by depth of the planned breakwater are estimated as follows based on the hydraulic experiments. The critical wave conditions can be disignated depending on the marine facilities arrangement.

Table 13.10.1-5.(1) Design Waves by Depth- Wave Direction: SSW

H0 (m)	α o (degree)	Depth (m)	H1/3 (m)	Hmax (m)	α (degree)
6.0	68	-15	4.0	7.2	45
		-12	3.9	7.0	40
		-10	3.9	6.8	37
		-8	3.8	5.9	33
		-6	3.5	4.7	29
		-4	2.7	3.5	24

Table 13.10.1-5.(2) Design Waves by Depth- Wave Direction: SW

H0 (m)	α o (degree)	Depth (m)	H1/3 (m)	Hmax (m)	α (degree)
7.0	45	-15	5.8	9.6	30
		-12	5.7	8.3	27
		-10	5.3	7.4	25
		-8	4.6	6.3	22
		-6	3.7	5.0	19
		-4	3.0	3.7	16

Table 13.10.1-5.(3) Design Waves by Depth- Wave Direction: W

H0 (m)	α o (degree)	Depth (m)	H1/3 (m)	Hmax (m)	α (degree)
7.0	0	-15	6.1	9.8	0
		-12	5.8	8.4	0
		-10	5.4	7.3	0
		-8	4.7	6.1	0
		-6	3.9	5.1	0
		-4	2.7	3.8	0

Table 13.10.1-5.(4) Design Waves by Depth- Wave Direction: NW

H0 (m)	α o (degree)	Depth (m)	H1/3 (m)	Hmax (m)	α (degree)
6.0	45	-15	5.1	8.7	32
		-12	5.0	8.0	29
		-10	4.8	7.2	27
		-8	4.3	6.0	25
		-6	3.7	4.8	22
		-4	2.7	4.1	18

3) Wave Direction

The prevailing wind directions at the planned area in summer (May-September) are from the south and south-west, in winter (October-March) from the east and north-east. The wave directions are assumed to be almost same as the predominant wind directions.

4) Tides

The tides of the Latakia area have a correct semidiurnal pattern, i.e., high and low water occur twice daily, but the tides are unequal. The diurnal influence appears to be the greatest during times of neap tide when tidal range is relatively small. The tide variation value is small and does not exceed 50 cm for spring rise and 15 cm for neap rise. The mean tide rise is about 35 cm.
It is apparent that there is little difference in tidal range along the Syrian coast. So, the following tidal conditions can be applicable to the new port site.

Mean High Water Spring (H.W.L.)	+0.50 m
Mean High Water Neap (M.H.W.N.)	+0.15 m
Mean Sea Level (D.L.)	±0.00

(2) Geological Conditions

According to the boring data carried out by the study team at the planned new port area, sub-soil conditions are supposed to be widely composed of upper sandy layer of around 1 m and lower hard layer.
This sub-soil characteristics are favorable to the gravity type structures but unfavorable to the dredging.

(3) Seismistic Conditions

The past earthquakes in Syria have been estimated based on the related information. (see, 2.2) According to this analyses, few earthquakes are estimated at the area including Latakia. Furthermore, records of big earthquakes at the coastal area in Syria do not exist. For the design of port facilities in this study, seiamic coefficient 0.03 is adopted referring to the preceding case of Latakia Port. The seismic forth acting on the structure will be calculated by the seismic coefficient method.

13.10.2 Structural Design

(1) Breakwaters

The layout of the breakwaters and revetments is governed by the requirements of maximum protection of the water area of the new port. The overall length of the planned breakwaters will be around 2,650 m with maximum depth up to -13 m.
Based on the technical and economical assessment, the design of the breakwaters shall be analogous to that of the existing breakwaters of Latakia and Tartous which are the rubble mound type with outer slopes armored by concrete blocks.
Provision is made for rubble mound protection with a core of 50-300 kg stones and outer slopes are armored with 1,000-3,200 kg stones. A core stones can be provided from the land side. ("forward" method). These stones are available from the quarries at the hinterland.

1) Determination of Cross Section

The breakwaters are designed by taking appropriate account of safety and broad economic implications.
In determining the cross sections of the breakwaters, the following premises are taken into consideration.

1. The crown height of the breakwater is determined to be about 0.6 times the design significant wave height above H.W.L. The maximum crown height is assumed to be +4.2 m. This crown height may allow overtopping to some extent, but this overtopping has little effect according to the experience.

2. In the rubble mound type, the gradients of the slopes are recommended to be 1:4/3 in the seaward side, and 1:1.5-2 in the harbor side. The gradients of the slopes of the rubble mound in the caisson type are designed to be 1:3 at the seaward side and 1:2 at the harbor side respectively considering the stability of the rubble mound.

3. In the rubble mound type, the crown width of the wave dissipating works using in situ concrete is determined to be equal to the equivalent width of two lanes of vehicle considering the construction method "forward method" and the maintenance after completion.

4. In the caisson type, breakwaters having the incident angle less than 15 degrees are designed with wave dissipating concrete blocks to prevent the increase of caisson weight.

5. An inspection platform shall be provided at the breakwater head for the turning of vehicles and mounting of navigational aids.

2) Weight of Armored Stones

The weight of concrete blocks covering the slope surface of the structure receiving the wave action is calculated using the following formula:

$$W = \frac{\gamma H^3}{KD(Sr-1)^3 \cot\alpha} \quad *$$

W : Minimum weight of rubbles or concrete blocks (tons)
γ : Unit weight of rubble or block in air (t/m^3), 2.65
Sr : Specific gravity of rubble or block to sea water 2.65/1.03
α : Angle of the slope to horizontal plane (degrees), 37
H : Significant wave height $H_{1/3}$ at the water depth where the structure is constructed (m)
KD : Constant determined by the armoring material and damage rate, 4
* : Hudson, R.Y, "Laboratory Investigation of Rubble-Mound Breakwater", proc. ASCE, Vol.85.

The weight of concrete blocks are calculated to be 2.5-29 tons depending on the sea depths.

3) Dimensions of Breakwater

The main dimensions of breakwater are summarized in the Table 13.10.2-1. In this table, the crown height is decided to be 0.6H1/3 above H.W.L. and this level allows overtopping waves to some extent.

Table 13.10.2-1 Main Dimensions of Breakwater

Depth (m)	$H_{1/3}$ (m)	Crown Height (m)	Weight of Armored Block (tons) Gradient of Slope 1:4/3
-15	6.1	+4.2	29
-12	5.8	+4.0	25
-10	5.4	+3.9	20
-8	4.7	+3.3	13
-6	3.9	+2.8	8
-4	2.7	+2.1	2.5
-2	1.7	+1.5	0.6

The standard cross sections of the breakwaters are shown in Fig.13.10.2-1,-4.

(2) Berths

The berths for bulk cargoes are designed with water depths of -12 m, and -14 m deep enough to accommodate 40,000 DWT ships, and 65,000 DWT ships respectively. The water depth of berths in the inner port is -5.0 m which can accommodate small size ships such as service boats.
The design conditions should be based on the results of the sub-soil surveys and requirements for future port planning. But at present, these sub-soil surveys at the proposed site of the new port are not implemented yet. So, the soil conditions are roughly supposed from the imformations of the visual observation and the analogy of neighboring Tartous and Latakia ports.

1) Dimensions of Berths

The berths are designed under the conditions below:

Table 13.10.2-2 Design Conditions of Berths

Items	Ship Size		
	65,000 DWT	40,000 DWT	under 1,000 DWT
Water Depth (m)	-14.0	-12.0	-5.0
Berth Length (m)	280	240	70
Berth Crown Level (m)	+2.8	+2.8	+2.0
Tidal Plane: H.W.L (m)	+0.5	+0.5	+0.5
M.S.L (m)	0.0	0.0	0.0
Surcharge: Ordinary (t/m^2)	2.0	2.0	1.0
Extra (t/m^2)	1.0	1.0	0.5

2) Proposed Structural Type

Although sub-soil conditions at the site are not surveyed yet, the structural types of berthing facilities that use the piles or sheet piles might not be appropriate because of the hard sub-soil materials.
Therefore, types of berthing facilities at the new port are tentatively the same as that of the existing berths in Latakia Port and Tartous Port. The typical cross sections of the berths are shown below:

Bulk Cargo Berth	:	Block Type Marginal Wharf	:	Fig.13.10.2-6,-8
Small Boats Berth	:	Block Type Marginal Wharf	:	Fig.13.10.2-9

(3) Revetment

At the end of the reclaimed area, a revetment is planned. The revetment will absorb the invading wave energy and also protect the land area from the slope failure.
The revetment will be armored with around 3,200 kg stones to protect the surface from the wave attacks.
The wave overtopping quantity can be estimated below by the data obtained from the hydraulic model experiments carried out in Japan.

Table 13.10.2-3 Overtopping Quantity

Items	Planned Depth of Revetment		
	-10m	-6m	-4m
H.W.L (m)	+0.5	+0.5	+0.5
$H_{1/3}$ (m)	5.4	3.9	2.7
Design Depth (m)	-10.5	-6.5	-4.5
Crown Level (m)	+3.5	+3.0	+2.5
Overtopping Quantity ($m^3/m/sec$)	2x10-4	3x10-3	2x10-2

Above overtopping quantity is allowed for the port area according to the following standard.

Table 13.10.2-4 Standard of Overtopping Quantity

Area	Overtopping Quantity ($m^3/m/sec$)
Densely Inhabited District	0.01
Important Area	0.02
Others	0.02-0.06

The standard cross section is shown in Fig.13.10.2-10.

(4) Pavement

The standard cross sections of the yard and Apron are assumed for the Master Plan as follows.

1) Open Yard, Apron

Open Yard and apron planned to be paved by asphalt concrete. The design load are set as follows.

Truck T-14
Tractor trailer 20 ft, 40 ft

The composition of the bituminous pavement is shown below.

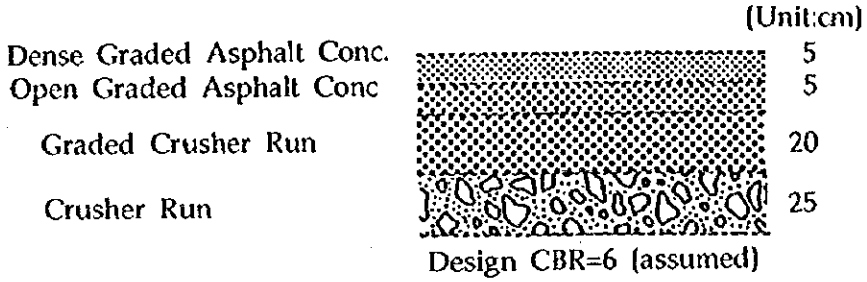


Figure 13.10.2-11 Standard Cross Section of Yard, Apron

2) Road

Road is paved by asphalt concrete. The composition of the bituminous pavement is assumed as the same as open yard and apron.

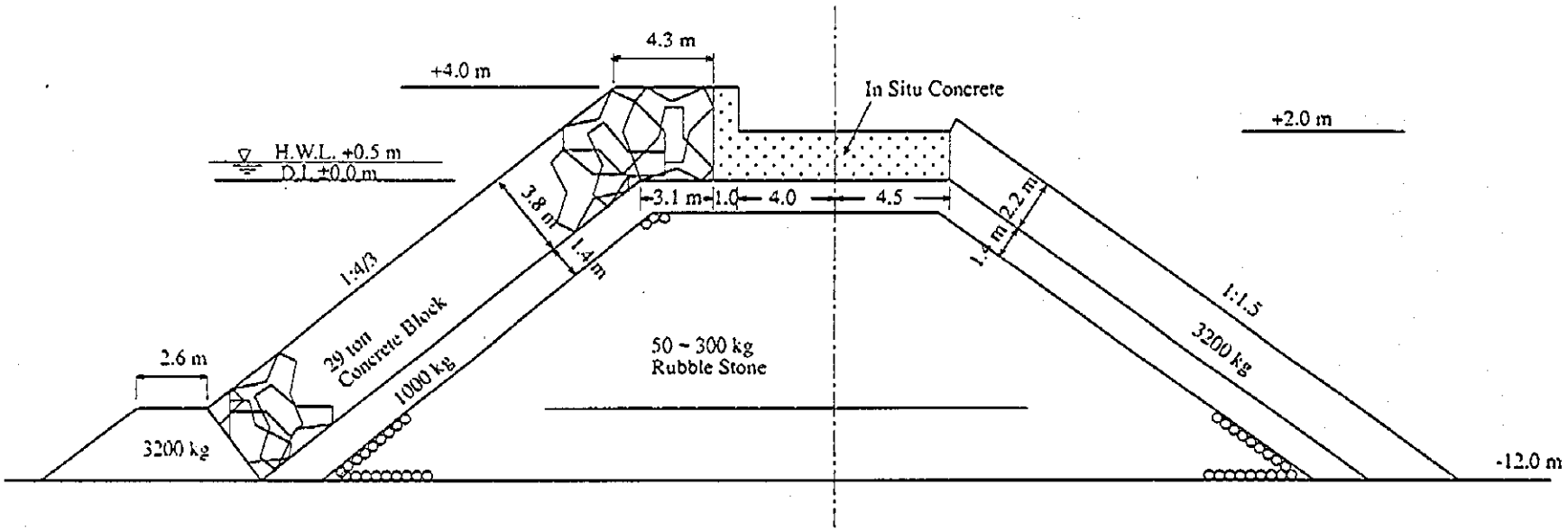


Fig. 13.10.2-1 Standard Cross Section of Breakwater
Rubble Mound Type (-12.0m)

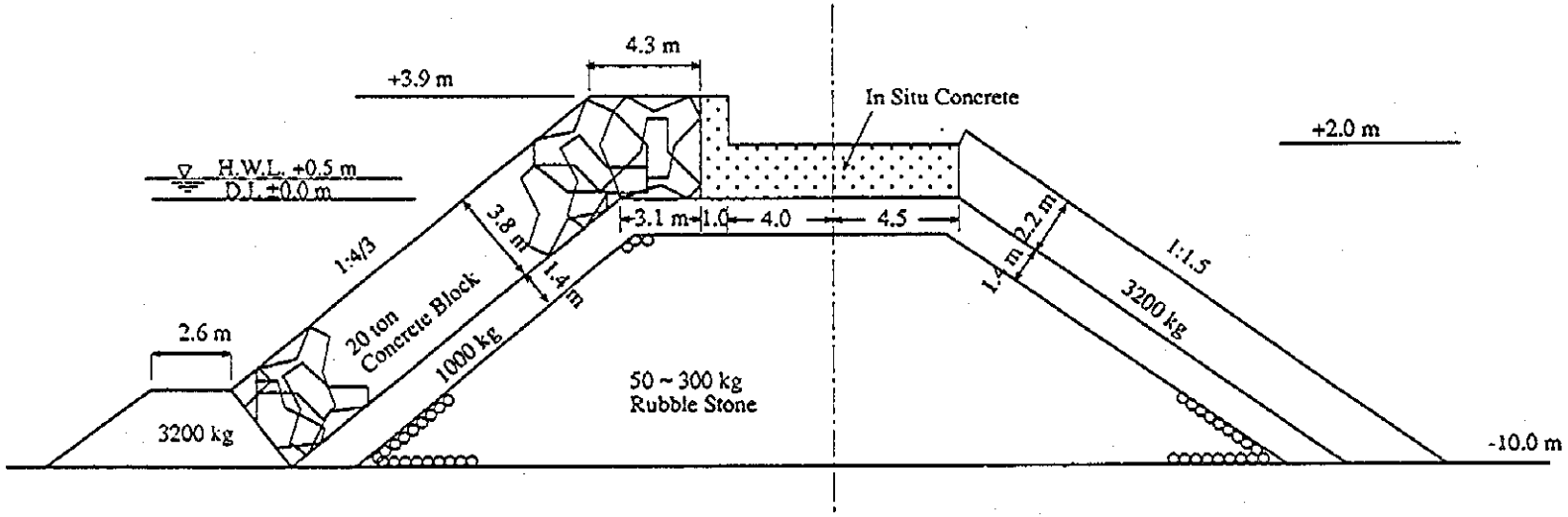


Fig. 13.10.2-2 Standard Cross Section of Breakwater
Rubble Mound Type (-10.0m)

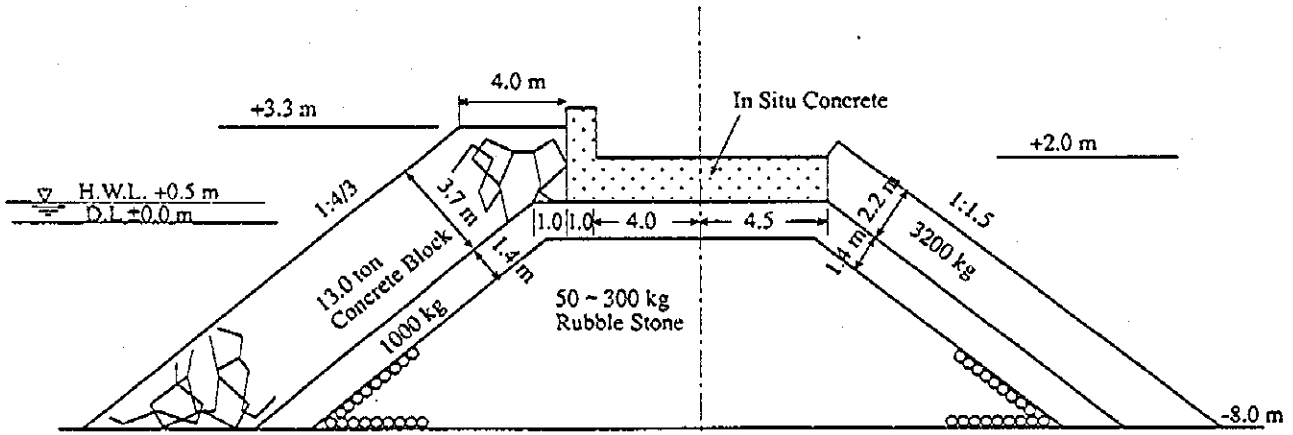


Fig. 13.10.2-3 Standard Cross Section of Breakwater
Rubble Mound Type (-8.0m)

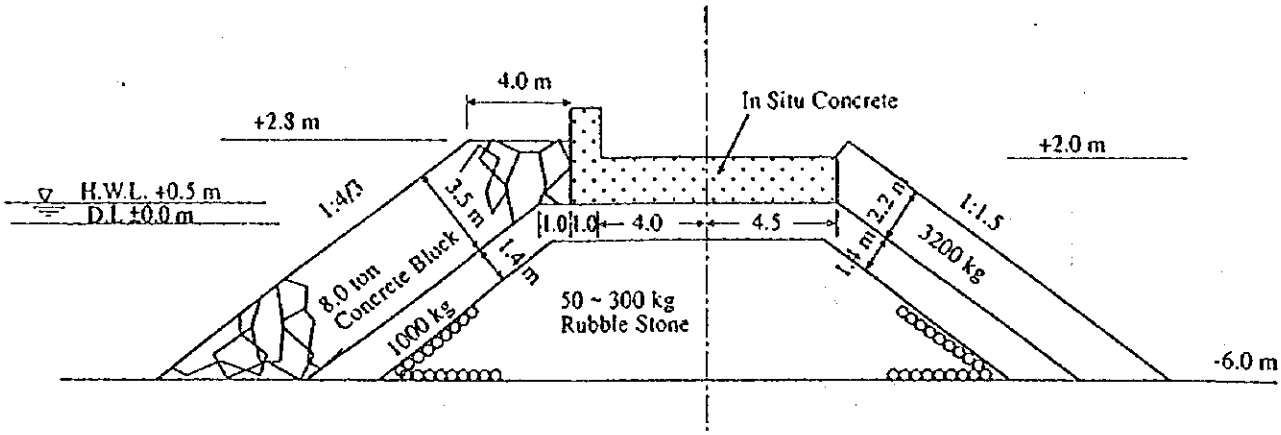


Fig. 13.10.2-4 Standard Cross Section of Breakwater
Rubble Mound Type (-6.0m)

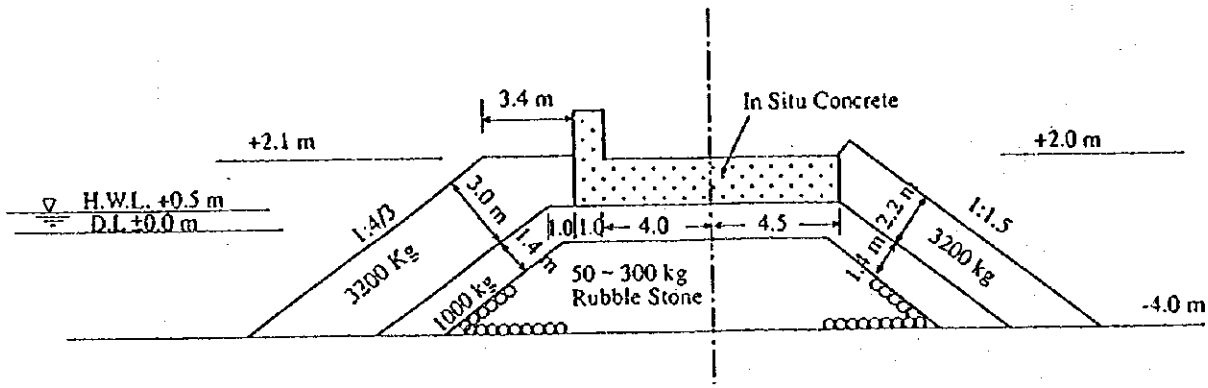


Fig. 13.10.2-5 Standard Cross Section of Breakwater
Rubble Mound Type (-4.0m)

CONCRETE BLOCK QUAY (-14.0m) S 1:200

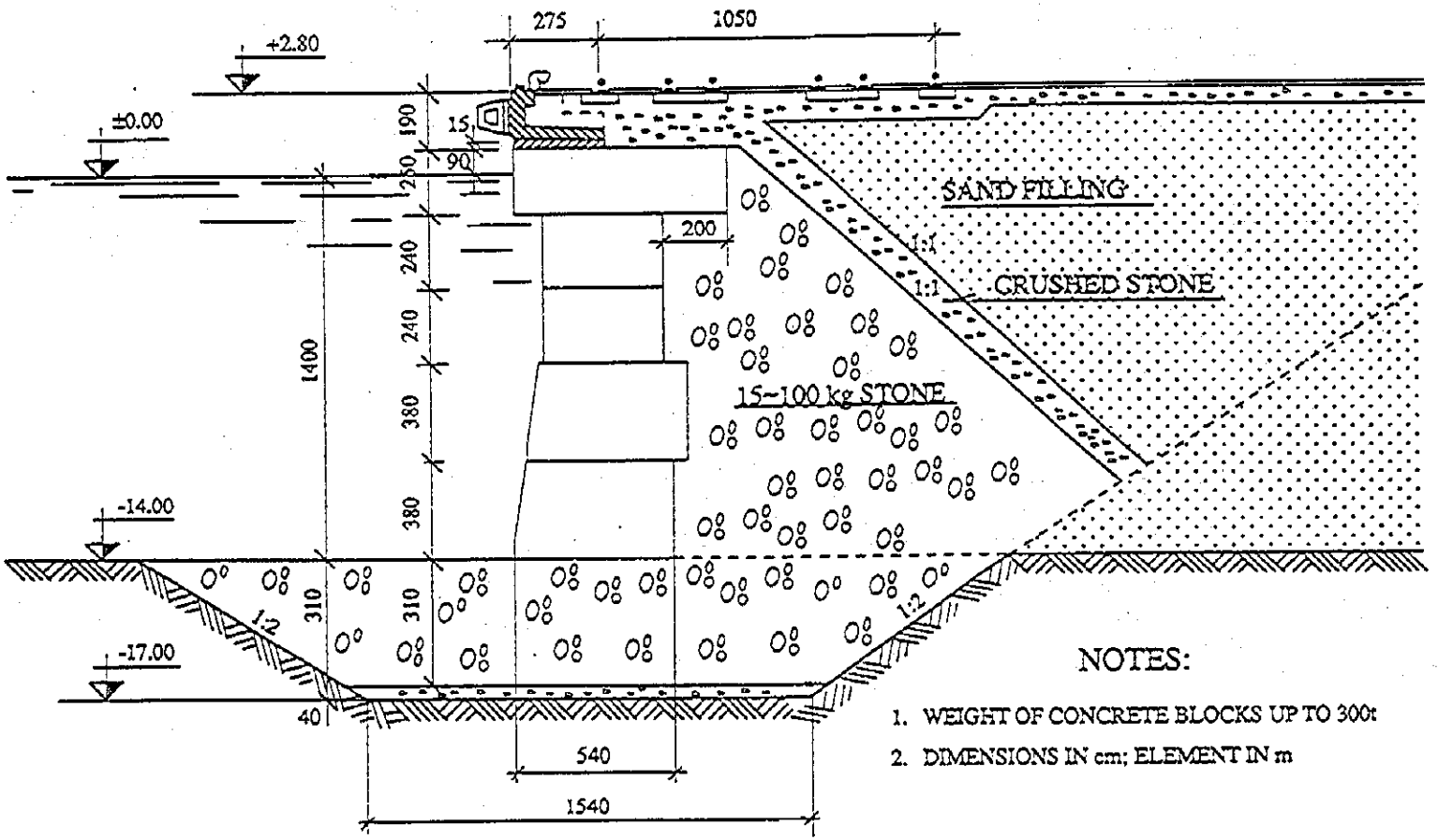


Figure 13.10.2-6 Standard Cross Section of Quay Block Type (-14.0m)

CONCRETE BLOCK QUAY (-12.0m) S 1:200

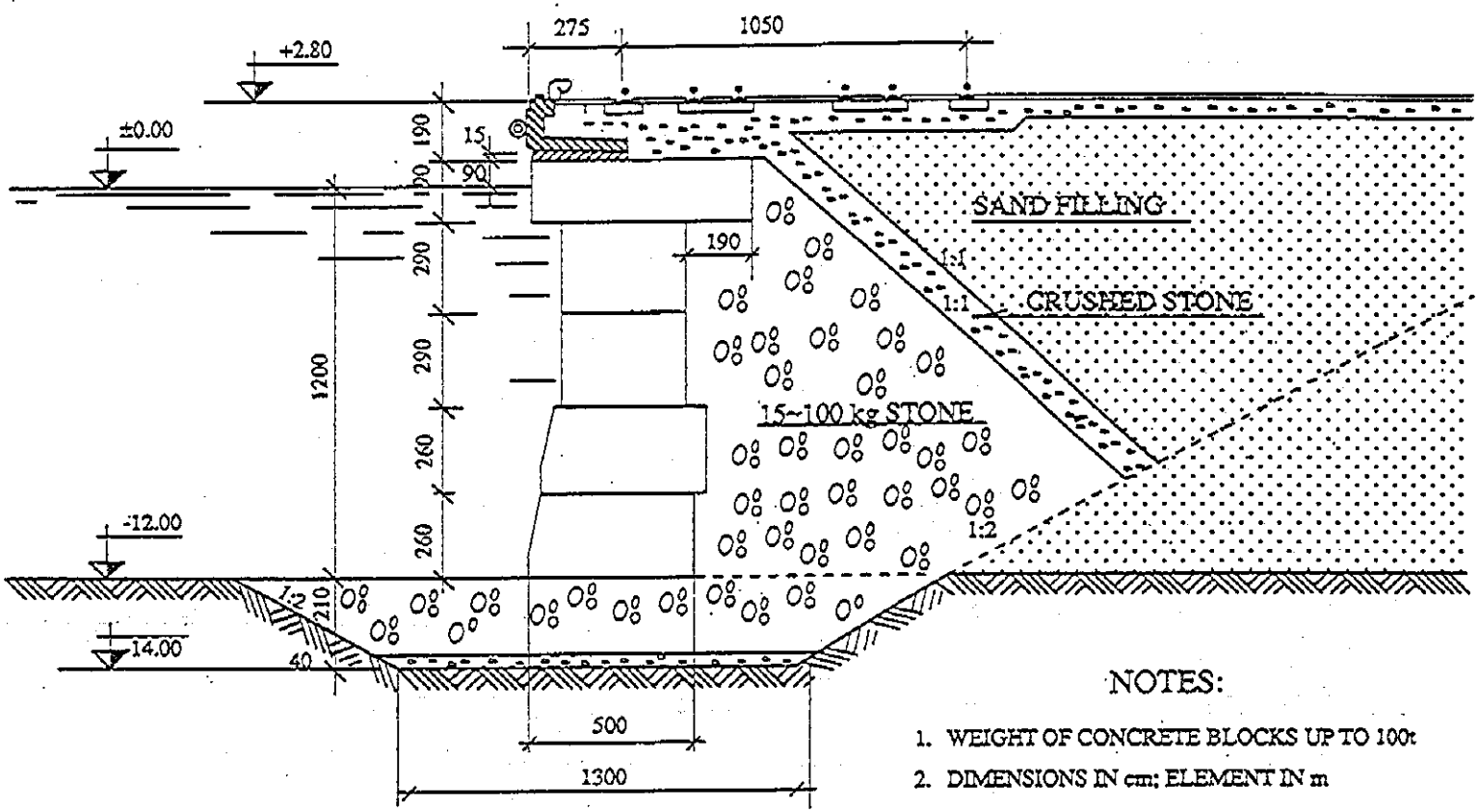


Figure 13.10.2-7 Standard Cross Section of Quay Block Type (-12.0m)

CONCRETE BLOCK QUAY (-10.0m) S 1:200

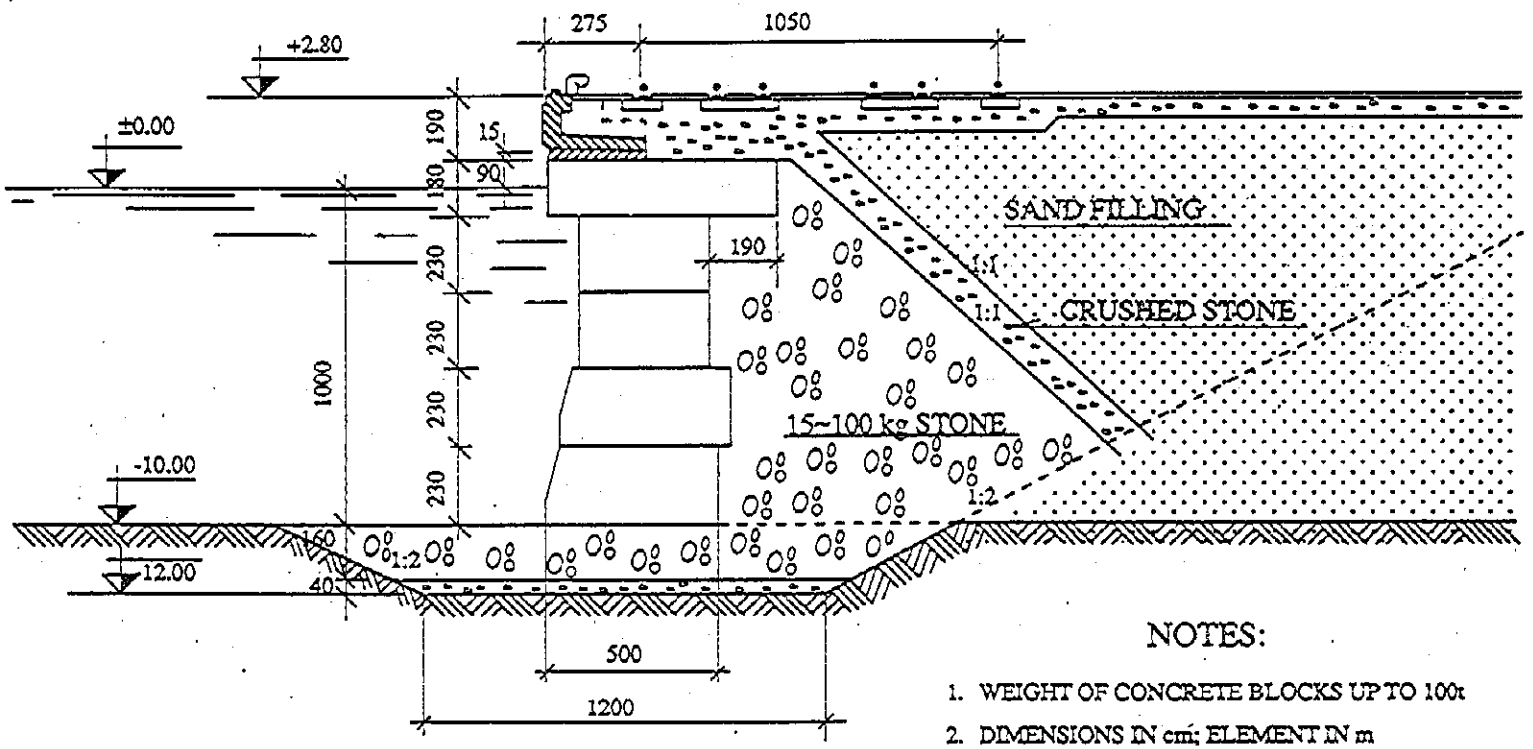


Figure 13.10.2-8 Standard Cross Section of Quay Block Type (-10.0m)

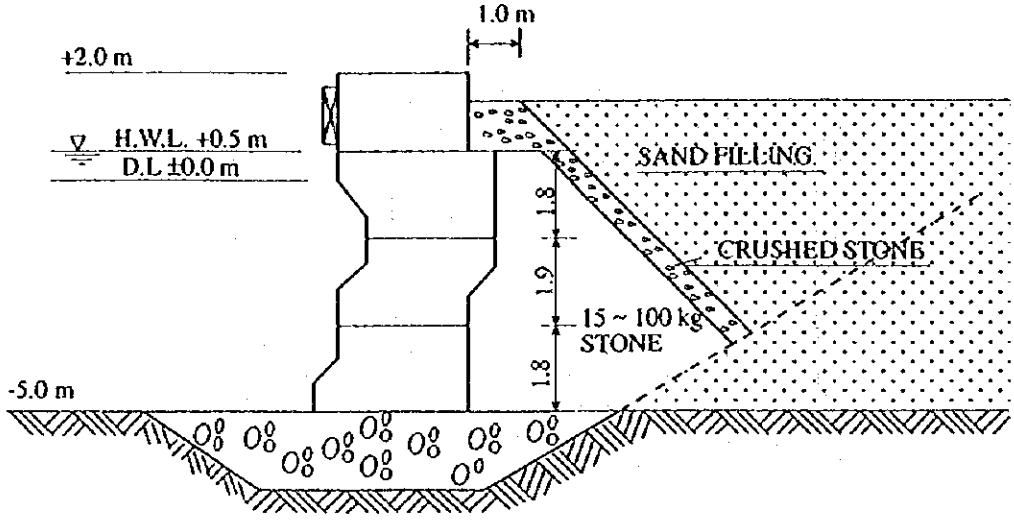


Figure 13.10.2-9 Standard Cross Section of Small Berth Block Type (-5.0m)

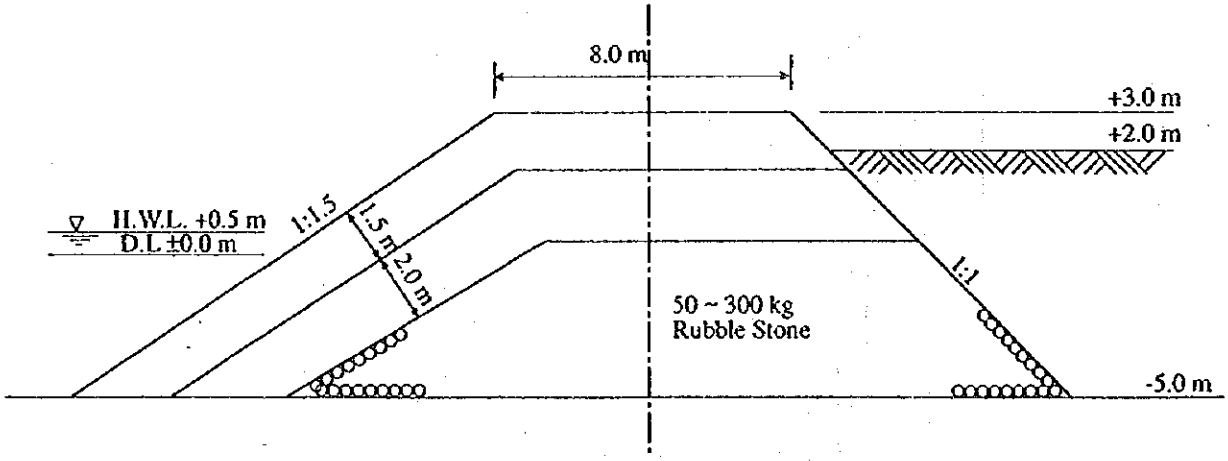


Figure 13.10.2-10 Standard Cross Section of Revetment

13.11 Cost Estimate

13.11.1 Conditions of Cost Estimate

General conditions of cost estimate are mentioned in Chapter 6.3, and the estimate is carried out based on the design the quantities of each facility.

13.11.2 Total Cost

Five alternative layout plans are proposed in Master Plan as mentioned in Chapter 13.8, and total cost of each alternative is summarized as follows:

Alternative No.	1	2	3	4	5
Civil Works	7.13	7.23	7.15	6.86	6.82
Dredging	5.18	3.88	2.87	2.67	2.47
Reclamation	0.28	1.49	2.50	3.63	4.52
Cargo Handling Equipment	3.20	3.20	3.20	3.20	3.20
Others	3.87	3.87	3.87	3.87	3.87
Grand Total	19.66	19.67	19.59	20.23	20.88

Dredging Volume	6,532	5,254	4,303	3,906	3,508
Reclamation Volume	933	5,008	8,445	12,278	15,328

Note : Other includes works at land, port service facilities and contingency / engineering fee.

As the comparison of merit and demerit of each plan, the alternative 3 is selected as layout of New Port, and the detail of cost is shown in Table 13.11.2-1. As concerns the cargo handling equipment, the breakdown is tabulated in Table 13.11.2-2. As mentioned above, all facilities will be completed within the short term period.

Table 13.11.2-1 Total Cost of New Port

NEW PORT

No.	Facilities	Unit	Q'ty	Unit Cost (S.P)			Cost (Unit: 1,000 S.P)		
				F.C	L.C	Total	F.C	L.C	Total
A	Civil Works				19,345,112				
1	Breakwater								
	Main Breakwater	m	1,950	0	1,225,000	1,225,000	0	2,388,750	2,388,750
	Sub Breakwater	m	700	0	980,000	980,000	0	686,000	686,000
	Breakwater (Small Vessel)	m	80	130,000	510,000	640,000	10,400	40,800	51,200
	Sub-Total						10,400	3,115,550	3,125,950
2	Dredging								
	(Rock)	m^3	2,111,105	1,000	0	1,000	2,111,105	0	2,111,105
	(Sand)	m^3	2,191,845	350	0	350	767,146	0	767,146
	Sub-Total						2,878,251	0	2,878,251
3	Reclamation								
	(Reclamation)	m^3	7,870,000	0	300	300	0	2,361,000	2,361,000
	(Add. Recla)	m^3	575,000	0	250	250	0	143,750	143,750
	Sub-Total							2,504,750	2,504,750
4	Wharf								
	Pellet(-14m)	m	280	350,000	898,000	1,248,000	98,000	251,440	349,440
	General Berth(-10m)	m	185	170,000	690,000	868,000	31,450	127,650	159,100
	Scrap(-10m)	m	185	170,000	690,000	868,000	31,450	127,650	159,100
	Clinker(-14m)	m	280	350,000	898,000	1,248,000	98,000	251,440	349,440
	Fertilizer(-12m)	m	240	380,000	800,000	1,180,000	91,200	192,000	283,200
	Phosphate(-14m)	m	560	350,000	898,000	1,248,000	196,000	502,888	698,888
	General/Coke(-10m)	m	370	170,000	690,000	860,000	62,900	255,300	318,200
	Sulphur(-12m)	m	240	380,000	800,000	1,180,000	91,200	192,000	283,200
	Small Vessel(-4.5m)	m	300	136,000	474,000	610,000	40,800	142,200	183,000
	Sub-Total						741,008	2,042,560	2,783,560
5	Revetment								
	(1)	m	650	0	800,000	800,000	0	520,000	520,000
	(2)	m	270	0	200,000	200,000	0	54,000	54,000
	(3)	m	450	350,000	898,000	1,248,000	157,500	404,100	561,6000
	(4)	m	270	0	160,000	160,000	0	43,200	43,2000
	(5)	m	450	0	128,000	128,000	0	57,600	57,6000
	Total of Revetment						157,500	1,078,900	1,236,4000
6	Apron/Yard/Open Space								
	(Pavement)	m^2	1,343,050	0	750	750	0	1,007,287	1,007,287
	(Add. Pave)	m^2	810,000	0	750	750	0	687,500	607,500
	Sub-Total						0	1,614,788	1,614,788
7	Railway	m	12,550	0	1,664	1,664	0	20,883	20,883
8	Road	m	4,100	0	1,200	1,200	0	4,920	4,920
9	Mobilization	LS	1	5,000,000	0	5,000,000	5,000	0	5,000
	Total of Civil Works						3,542,251	10,382,351	13,924,601
B	Building								
1	Storage	m^2	66,300	0	10,000	10,000	0	663,000	663,000
2	Phosphate Silo (Concrete)	LS	1	0	420,000,000	420,000,000	0	420,000	420,000
3	Machinery Tower	LS	1	0	115,500,000	115,500,000	0	115,500	1115,5000
	Total of Build						0	1,198,500	1,198,500
C	Utilities	LS	1				0	272,011	272,011
D	Cargo handling Equipment								
	Total of H.E	LS	1				3,200,000	0	3,200,000
E	Port Service Facilities	LS	1				130,000	20,000	150,000
F	Physical Conti/Engineering	LS	1				360,000	240,000	600,000
G	Grand Total						7,482,151	12,112,861	19,595,012

Table 13.11.2-2 Cargo Handling Equipment
New Port

Unit:1,000SP

Items	Capacity	Unit Price	Short Term Plan	
			Q'ty	Cost
1. Phosphate Terminal(Exclude Silo & M.T)				961,800
1-1 Loaders	400t/h	54,600	4	218,400
1-2 Handling Equipment		743,400	1	743,400
2. Cement Clinker Terminal				343,980
2-1 Loaders	350t/h	50,400	2	100,800
2-2 Handling Eqipment		240,912	1	240,912
2-3 Minor Handling Equipment		2,268	1	2,268
3. Pellet Terminal				817,366
3-1 Unloaders	500t/h	210,000	2	420,000
3-2 Stacker/reclaimer	500t/h	92,400	3	277,200
3-3 Handling Eqipment		118,108	1	118,108
3-4 Minor Handling Eqipment		2,058	1	2,058
4. Scrap				573,300
4-1 D.L level luffing Cranes	11t	117,600	3	352,800
4-2 Mobil Cranes	65t	31,500	7	220,500
5. Sulphur Terminal				84,000
5-1 Handling Eqipment		84,000	1	84,000
6. Oil Cokes				
All equipment are included in common equipment				
7. Fertilizer Terminal				63,000
7-1 Handling Equipment		63,000	1	63,000
8. Common Equipment				356,580
8-1 Movable Ship Loader	150t/h	18,900	7	132,300
8-2 Trucks		2,100	20	42,000
8-3 Shovel Loaders		3,780	14	52,920
8-4 Mobile Cranes	45t	23,100	4	92,400
8-5 Forklift Trucks	5t	2,100	6	12,600
8-6 Tractors		4,200	3	12,600
8-7 Trailers		1680	7	11,760
Total				3,200,000

13.12 Stage Plan

According to the demand forecast, the volume of all cargoes planned to be handled in the new port is estimated to be considerable amount in the year 2003. The volume of pellet and scrap is the same as that in the year 2010, because the new steel factory will start its production before 2003. The volume of phosphate is estimated to exceed capacity of existing facility at Tartous Port. The volume of clinker is estimated to be 1.1 million tons in the year 2003.

Consequently, all cargoes need cargo handling facilities and storage areas in the year 2003. All facilities of the new port are planned to be completed at the First Stage (- 2003).

13.13 Preliminary Economic Analysis

13.13.1 Methodology

The method of analysis in this case is the same as that of Latakia Port mentioned in Chapter 11.14.1.

13.13.2 Prerequisites of Analysis

(1) Base Year

1995 is set as the "Base Year" for this study.

(2) Project Life

Taking into consideration the depreciation period of the main facilities of 30 years and the construction period of 5 years, the period of calculation (project life) in the economic analysis is assumed to be 35 years from the beginning of construction.

(3) Foreign Exchange Rate

The exchange rate adopted for this analysis is US$ 1.00 = 42 S.P., the same rate as used in the cost estimation.

(4) "With"case

The "With" case scenario includes all expansions of port facilities for the master plan.

(5) "Without"case

If the new port is not constructed, it is the most reasonable to assume that the cargoes which are planned to be handled in the new port would have to be handled in Tartous Port because those cargoes are handled there now. Therefore, in the "Without" case, the handling cargoes of Tartus Port combined with the cargoes handled in New Port are set as objects of economic analysis.
After calculating the combined benefits, the benefits of New Port are estimated by subtracting the substantial benefits of Tartus Port from the combined benefits.
In this study, the following conditions are adopted as the "without" case.

i) No investment is made for the port excluding the investment in the silo of phosphate rock. The silo with the capacity of 60,000 tons is set up more in order to handled the cargo volume of 3,100,000 tons.
ii) The materials for an ironworks will be newly handled in Tartous Port from 2003.
iii) Transit cargoes in export are not handled.

iv) Bulk cargoes are given priority in the cargo handling. Therefore, the overflowed general cargoes are assumed to be handled in a foreign port and carried by truck between Tartus Port and a foreign port, if the handling volume will fill the maximum capacity.
v) As for the bulk terminal project, the size of vessels and the working efficiency of cargo handling are not the same as "With" case.

The results of forecast on the handling volume by categories of berth are shown in Table 13.13.2-1.
As for the bulk terminal project, the size of ships and the working efficiency of cargo handling in the "With" and "Without" cases are shown in Table 13.13.2-2.

Table 13.13.2-1 Handling Cargo Volume by Categories of Berth in New Port

["Without"case: Handled in Tartus Port] (Unit: thousand ton)

Classification of Berth		1994	2003	2004	2005	2006	2007	2008	2009	2010
Phosphate Terminal		777	2,200	2,267	2,391	2,521	2,657	2,799	2,949	3,100
Container Terminal		170	528	619	720	830	950	1,083	1,226	1,387
Grain Terminal: Export		57	600	600	600	600	600	600	600	600
: Import		294	390	420	453	489	500	500	500	500
Grain	Export	0	0	0	0	0	0	0	0	200
	Import	0	0	0	0	0	27	68	112	160
General			907	941	978	1,017	1,057	1,098	1,142	1,187
Food			497	499	502	504	506	508	511	513
Animal			191	206	223	241	260	280	303	327
Steel		2,228	546	599	659	725	797	876	964	1,060
Wood			351	387	426	469	517	570	628	692
Machine			169	183	198	214	232	251	272	295
Chemical			290	312	335	360	387	415	446	479
Ro/Ro			68	77	86	97	109	123	138	155
Clinker		0	1,100	1,085	1,070	1,056	1,042	1,028	1,014	1,000
Oil Cokes		0	100	110	122	135	149	164	181	200
Fertilizer		0	680	727	721	714	708	702	696	690
Pellet		0	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Scrap		0	200	200	200	200	200	200	200	200
Materials for Iron		0	150	150	150	150	150	150	150	150
General Berth Total		2,228	6,498	6,726	6,919	7,131	7,390	7,685	8,007	8,558
Total		3,526	10,216	10,632	11,083	11,571	12,097	12,667	13,282	14,145

Table 13.13.2-2 Size of Ship and Working Efficiency of Cargo Handling in both Cases

		"Without"	"With"
Ship Size (DWT)	Phosphate	10,000	40,000-65,000
	Clinker	15,000	32,200-65,000
	Pellet	15,000	65,000
	Scrap	6,500	10,000
	Materials	6,500	10,000
	Fertilizer	10,000	10,000-40,000
	Oil Cokes	10,000	15,000
Working Efficiency (ton/hr)	Phosphate	250	672
	Clinker	128	448
	Pellet	146	455
	Scrap	9.6	73
	Materials	33	67
	Fertilizer	45	Ex:176/Im:67
	Oil Cokes	84	126

13.13.3 Costs of the Projects

The items that should be considered as costs of the projects are construction costs and maintenance costs.

(1) Construction Costs

Construction costs are divided into such categories as civil costs and mechanical costs. Main mechanical costs are purchasing of handling equipment.

(2) Maintenance Costs

The costs of maintaining the port facilities are estimated as a fixed proportion (1 % for structures, 4 % for handling equipment) of the original construction costs excluding the costs of dredging and reclamation costs.

Table 13.13.3-1 Costs of the Projects in New Port

(Unit: million S.P.)

Items		Costs
Construction Costs (Total)		19,595.0
Maintenance Costs per Year		236.6
	Structure	102.6
	Equipment	134.0

13.13.4 Benefits of the Projects

Items and methods of calculation of benefits are as mentioned in Section 11.14.4(2). In the overflowed general cargoes, the cargoes originated from Asian countries are assumed to be handled in Aqaba Port with the share of 20 % and others in Beirut Port. The results of calculation of benefits are shown in Table 13.13.4-1.

Table 13.13.4-1 Benefits of the Projects in New Port

(Unit: million S.P.)

Item / project	Waiting Cost	Mooring Cost	Land Trans-portation	Ship Size	Total
Phosphate	0.0	548.1	0.0	325.5	873.6
Clinker	68.1	488.1	0.0	104.6	660.8
Pellet	136.5	752.5	0.0	238.8	1,127.8
Scrap	40.1	165.5	0.0	16.0	221.6
Iron Materials	39.9	21.1	0.0	12.0	73.0
Fertilizer	87.8	450.8	0.0	81.8	620.4
Oil Cokes	12.5	10.3	0.0	5.6	28.4
General Cargo	597.4	0.0	260.7	0.0	858.1
Total	982.3	2,436.4	260.7	784.3	4,463.7

13.13.5 Evaluation of the Projects

(1) Calculation of the EIRR

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the project.

The EIRR of the master plan is calculated as 15.6 %. Result of calculation is shown in Table 13.13.5-1.

(2) Evaluation

As for this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR exceeds 10 %. Therefore, this master plan development project is feasible from the viewpoint of the national economy.

Table 13.13.5-1 Cost/Benefit Analysis of Master Plan in New Port

(Unit: million S.P.)

	Year	Cost			Benefit	Benefit - Cost	Net Present Value (NPV)		
		Construction	Maintenance	Total	Total		Benefit	Cost	Benefit - Cost
1	2005	3919	0	3919	0	-3919	0	3919	-3919
2	2006	3919	0	3919	0	-3919	0	3390	-3390
3	2007	3919	0	3919	0	-3919	0	2932	-2932
4	2008	3919	0	3919	0	-3919	0	2537	-2537
5	2009	3919	0	3919	0	-3919	0	2194	-2194
6	2010	0	237	237	4464	4227	2162	115	2047
7	2011	0	237	237	4464	4227	1870	99	1771
8	2012	0	237	237	4464	4227	1618	86	1532
9	2013	0	237	237	4464	4227	1399	74	1325
10	2014	0	237	237	4464	4227	1210	64	1146
11	2015	0	237	237	4464	4227	1047	56	992
12	2016	0	237	237	4464	4227	906	48	858
13	2017	0	237	237	4464	4227	784	42	742
14	2018	0	237	237	4464	4227	678	36	642
15	2019	0	237	237	4464	4227	586	31	555
16	2020	0	237	237	4464	4227	507	27	480
17	2021	0	237	237	4464	4227	439	23	415
18	2022	0	237	237	4464	4227	379	20	359
19	2023	0	237	237	4464	4227	328	17	311
20	2024	0	237	237	4464	4227	284	15	269
21	2025	0	237	237	4464	4227	246	13	233
22	2026	0	237	237	4464	4227	212	11	201
23	2027	0	237	237	4464	4227	184	10	174
24	2028	0	237	237	4464	4227	159	8	151
25	2029	0	237	237	4464	4227	138	7	130
26	2030	0	237	237	4464	4227	119	6	113
27	2031	0	237	237	4464	4227	103	5	97
28	2032	0	237	237	4464	4227	89	5	84
29	2033	0	237	237	4464	4227	77	4	73
30	2034	0	237	237	4464	4227	67	4	63
31	2035	0	237	237	4464	4227	58	3	55
32	2036	0	237	237	4464	4227	50	3	47
33	2037	0	237	237	4464	4227	43	2	41
34	2038	0	237	237	4464	4227	37	2	35
35	2039	0	237	237	4464	4227	32	2	31
	Total	19595	7098	26693	133911	107218	15810	15810	-0

EIRR= 0.15604

Chapter 14 Port Management and Operation in the Long-term Plan

14.1 Existing Two Ports

14.1.1 Basic Concept on Management and Operation

In order to implement the proposed projects in the Master Plan, adequate management and operations need to be achieved together with provision of required physical facilities comprising infra-structures and cargo-handling equipment.

In adequate management and operations, it is essential to modify organization, to improve operational procedures and systems, and to develop human resources so as to resolve the present problems and meet the future demand which are represented as a considerable increase in the volume of port cargo including the New Port and introduction of the new container terminal operation lsystem in the existing two Ports (referred to as the closing terinal operations system).

In the meantime, from the farsighted point of view, it seems to be useful to see prospects of privatization in cargo-handling operations as its tendency is found worldwide except for public services inherent to a port authority.

14.1.2 The Present Problem in the Existing Two Ports

(1) Imbalanced personnel-arrangement of the organization

Once an organization is matured and enlarged, its functions tend to be inflexible and it loses clarity and promptness in decision-making.

When it comes to Syrian commercial ports, more than 40 years have passed since the general company of Latakia Port was established and more than 20 years already since the general company of Tartous Port was established. Both organizations have matured : in each case, the number of workers exceeds 2500, even though recruitment has been cut back in recent years.

The number of administrative sections or other survice sections including supervission staff members is relatively fixed, whereas the number of operating or storage sections needs to be increased as the cargo handling volume increases.

Hence, unexceptionably, Syrian ports will surely face the need for rationalization in the long run.

(2) Time - consuming documentation procedures

Documentation procedures to get berthing permission, application of stevedoring / longshore operations, delivery orders of imports, etc. are often tim-consuming and complicated. The fact possibly induces ship waiting ofshore even if berths are

available; inefficient cargo-handling operations and consequent long berthing hours; delay of delivery order issues, etc.. Average offshore ship waiting times in the ports of Latakia and Tartous in 1994 are 1.6 days and 2.6 days, respectively, though their berth occupancy rates in the same year still remained on the level of around 50 % from the port saturation level. The reason for the above fact is presumably due to the following:

1) Complicated documentation procedures especially for imports,

2) Delay and mistakes of documentation procedures especially for imports,

3) Complicated planning of stevedoring / longshore operations with the linkage of gang formation.

(3) Insufficient maintenance of cargo-handling machines

Syrian commercial ports including the planned new port will treat a total cargo volume of 26 million tons in the target year. Containerization, the dominant trend in cargo transport, will be also developed at the same time.

In order to deal with forecast cargo, out-dated facilities in Syrian ports need to be renovated and they have to be managed and operated smoothly and systematically.

(4) Insufficient maintenance of cargo handling equipment

1) Latakia Port

A) Lack of statistics for maintenance and working on each handling equipment
There are some records and/or documents for above items but no available statistic which is indispensable for establishment of the effective maintenance system.

B) No preventive maintenance system
The preventive maintenance system is not introduced but it must be introduced.

C) Long brokendown days
Repair periods are very long in some equipment at present. It must be shorten drastically without special case.

2) Tartous Port

A) Long brokendown days due to very aged equipment
The average procured age of the rail-mounted cranes are 22.4 years old. The number of available equipment, the average age, the average working hours per year and the average staying days per year in maintenance shop of the tire-mounted handling equipment are shown in the under Table

	No of equipment	Average Procured age	Average working hours	Avrg stying days in maintenance shop
Mobile cranes	47	18.8	426	51
Mobile tower	9	13.4	1,455	37
Straddle	3	15	1,888	-
Forklift	57	14.9	586	73
Average		16.4	622	

For mobile cranes and forklift trucks, the average working hours are same as staying hours in the maintenance shop.

B) Insufficient preventive maintenance
The results of interview, a preventive maintenance is carried out but the level of the maintenance is insufficient because of many brokendown days.

(5) In sufficient computerization in the port field.

Insufficient introduction of computers into the port field contributes to the following problems:

1) The absence of a computer system means that swift transmission and exchange of correct information among the authorities concerned in port business does not occur resulting in the long turnaround time of necessary documentation procedures,

2) Insufficient port statistics due to lack of computer systems, making it difficult to make a long-term port promotion strategy,

3) Insufficient introduction of computer systems to port management comprising arrival and departure control of vessels, berth control and planning of cargo-handling operations to upgrade the service level.

(6) Insufficient training system

Currently, there exists no general training system for the port corporations.

In order to improve the above mentioned current problems and to prepare for the future demand in the Master Plan, the countermeasures for management and operations including maintenance system are shown in the following section.

14.1.3 Countermeasures

14.1.3.1 Organization

Public sector generally adopts a 'Seniority' system rather than 'Result and Ability' system to guide its organization. Bureaucratic formalism makes it difficult to rationalize operations.
Therefore both port companies should check the number of workers and it is advisable that a task force consisting a few experts will be established to pursue a rational organization.

(1) Number of Employees for the Operation

1) Cargo Handling at Latakia Port

A) Basic Concept on Organization of Cargo Handling

a) Conventional Break Bulk Cargo

- Present Organization for cargo handling of conventional break bulk cargo is not drastically revised in the Master Plan Stage.

- Number of cargo handling workers including drivers of cargo handling equipments at present should be adjusted to the Master Plan.

b) Grain Terminal

- Management and operation system at present is not drastically changed in the Master Plan stage.

- Present organization and number of employees at the grain terminal should be adjusted to the Master Plan.

c) Container Terminal

- In the Master Plan stage, the container terminal is operated by Container Terminal Division which is established in exploitation directorate.

- Closed terminal operation system should be adopted for container terminal operation.

- Major functions of container terminal in the Master Plan stage are as follows:
    1. Cargo handling between vessel and marshalling yard.
    2. Sorting and storing of containers.
    3. Delivery/receiving of container/container cargo between the terminal and consignee.
    4. Simple maintenance and repair of container and container handling equipment.
    5. Making the stowage plan for loading and the storage plan at marshalling yard for unloading.

6. Necessary document work for execution of the above items.
7. Receiving charges for loading and unloading containers, storage, repairing etc..

B) Number of Cargo Handling Workers for Conventional General Cargo.
The procedure and method to calculate the number of cargo handling workers for conventional general cargo except the drivers of cargo handling equipment is shown in the following flow chart.
(Figure 14.1.1).

The cargo handling volume by packing type of conventional break bulk cargo per commodity in the Master Plan which is already mentioned in 11.2 is shown in Table 14.1.1.

The cargo handling productivity per commodity and number of workers per gang per commodity are shown in Table 14.1.1.

Required number of gangs and required number of workers per packing style in a year are calculated by the following expression:

Ngy = Vp/Pv
Nwy = Ngy X Nwg

Ngy: Required number of gangs per commodity in a year
Vp : Cargo handling volume per commodity by packing style
Pv : Cargo handling productivity per gang per shift for each commodity
Nwy: Annual required number of workers per commodity
Nwg: Number of workers per gang for each commodity by packing style

Total required number of workers in a year is calculated by the sum of annual required number of workers per each commodity.

Total required number of gangs in a year is calculated by the sum of required number of gangs per each commodity in a year.

Standard number of workers per gang at Latakia Port is calculated by the following expression:

Nsw = Ntw/Ntg

Nsw: Standard number of cargo handling workers per gang except drivers for cargo handling equipment
Ntw: Annual total required number of workers
Ntg: Annual total number of gangs

Required number of cargo handling workers for conventional break bulk cargo except operator of cargo handling equipment is calculated by the standard number of workers, number of conventional break bulk berths, average berth occupancy rate of general cargo berths and ratio of required number of shifts per commodity of

cargo at Latakia Port. The expression is as follows:

Nwc= Nsw x Gnc

Gnc= Nsc x Ngc

Nsc= Nsd x Rsy

Nsd= Bn x Nsv x Rb

Nwc: Required number of workers per commodity per day.
Gnc: Required number of gangs per commodity per day.
Nsc: Required number of shifts per commodity per day.
Ngc: Required number of gangs per commodity per shifts.
Nsd: Required number of shifts per day.
Rsy: Ratio of required shifts per commodity.
Bn : Number of conventional break bulk berths at Latakia Port.
Nsv: Average Number of shifts per ship per day.
Rb : Average berth occupancy rate at conventional break bulk berths.

Required number of cargo handling workers for conventional break bulk cargo is calculated by sum of required number of workers per commodity per day for commodities.

Ratio of required number of shifts per commodity of cargo is calculated by following expression.

Rsy= Scy/Sy

Scy= (Vc/Pc)/Ts

Scy: Required number of shifts per commodity in a year.
Sy : Total required number of shifts for conventional break bulk cargo in a year.
Vc : Annual cargo volume per commodity.
Pc : Cargo handling productivity per commodity.
Ts : Working hour per shift.

Total required number of shifts in a year is calculated by sum of required number of shifts in a year per commodity of cargo.

Result of the calculation is shown in Table 14.1.2.

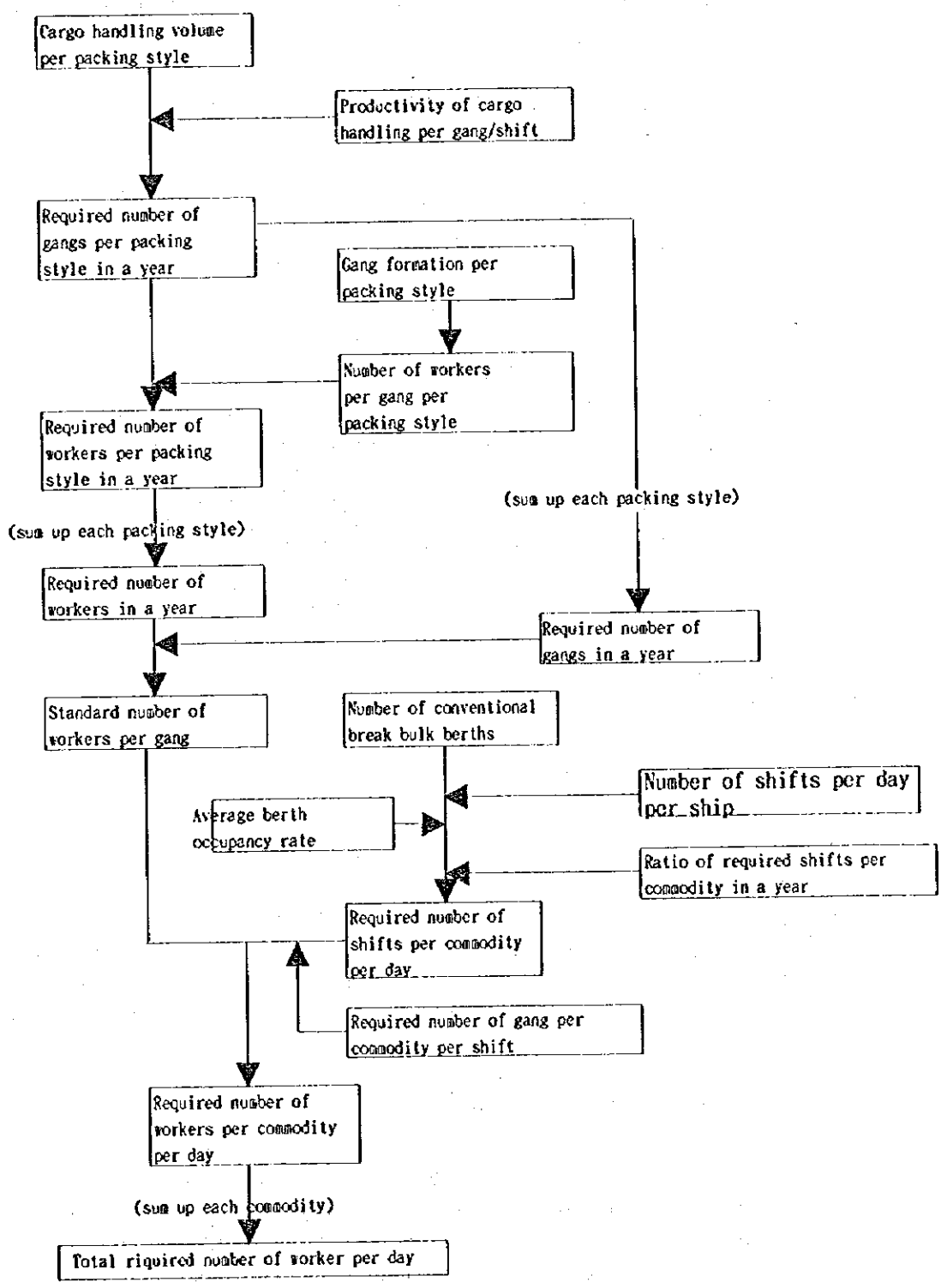


Figure 14.1.1 Estimation Procedure for Required Number of Cargo Handling Workers

Table 14.1.1 Cargo Handling Volume and productivity of Conventional Break Bulk cargo at Latakia Port in 2010

Type of vessel	Unit	G.C. Vessel	G.C. Vessel	G.C. Vessel	G.C. Vessel	G.C. Vessel	G.C. Vessel	Total
Commodity	-	Foodstuffs or agriculture products	Steel	Wood	Car, machine and equipments	Chemical	Various	
Packing style	-	Cased	Bundle, Rolled and Cased	Bundle and Cased	Cased and No packed	Bagged and Drum	Cased, carton and bagged	
Cargo Volume	tons	452,000	617,000	500,000	281,000	250,000	1,157,000	3,257,000
productivity/gang	tons/hour	50	60	60	75	35	41	321

Table 14.1.2 Required Number of Cargo Handling Workers in 2010 (Except cargo handling drivers)

Commodity	Worker
Food stuffs or agriculture product	About 230
Steel	About 440
Wood	About 140
Car, machine & equipment	About 30
Chemical	About 245
Various	About 725
Total	About 1,810

C) Number of Drivers of Cargo Handling Equipment for Conventional General Cargo

Number of drivers of cargo handling equipment in the Master Plan is calculated by number of cargo handling equipment in the Master Plan at Latakia Port, number of cargo handling shifts of conventional break bulk cargo and average berth occupancy rate at conventional general cargo berth in Latakia Port. The expression is as follows:

$$Nd = Sum.\{Ne \times Nde \times Sn \times Rb\}$$

Nd : Total number of drivers of cargo handling equipment
Ne : Number of each kind of cargo handling equipment
Nde: Number of drivers per each kind of cargo handling equipment
Sn : Number of cargo handling shifts at Latakia Port(3 shifts)
Rb : Average berth occupancy rate of general cargo berths

The result of calculation is shown in Table 14.1.3.

Table 14.1.3 Total Number of Drivers of Cargo Handling Equipment

Kind of equipment	Number of equipments (number)	Shifts	Number of drivers (person)
Forklift 3tons	77	3	231
Forklift 5tons(sp)	8	3	24
Forklift 5tons	41	3	123
Forklift 10tons	15	3	45
Mobile crane 45tons	34	3	204
Mobile crane 65tons	4	3	24
Quay side cranes	31	3	185
Trailer	34	3	102
Total			938

D) Number of Employees at Grain Terminal in the Master Plan Stage
Organization of the Grain Terminal in the Master Plan is a modification of the present organization of the grain terminal at Latakia Port. The Mechanical Section, Electricity Section, Control Section and Fumigation Section should be established for the new grain terminal at New Port area. Table 14.1.4 shows the number of employees at the Grain Terminal Section.

Table 14.1.4 Number of Employees at Grain Terminal

Organization		Employees
Director of silo		1
Old port	Assistant Director	1
	Mechanical Section	11
	Electricity Section	8
	Control Section	3 or4
	Fumigation Section	4 or 5
New Poet	Assistant Director	1
	Mechanical Section	11
	Electricity Section	8
	Control Section	3 or 4
	Fumigation Section	4 or 5
Total		56 or 60

E) Number of Employees at Container Terminal in the Master Plan Stage
Personnel organization of the container terminal in the Master Plan is modelled on a Japanese container terminal in this section.

a) Function of the Container Terminal at Latakia Port
It is assumed that the function of container terminal at Latakia Port in the Master

Plan is as follows:

1. Cargo handling between vessel and marshalling yard.
2. Sorting and storing of containers.
3. Delivery/receiving of container and container cargo between the terminal and consignee.
4. Simple maintenance and repair of container and container handling equipment.
5. Making the stowage plan for loading and the storage plan at marshalling yard for unloading.
6. Necessary document work for carrying out the above items.

b) Organization of Container Terminal

An example of the organization chart for doing above function is shown in Figure 14.1.2.

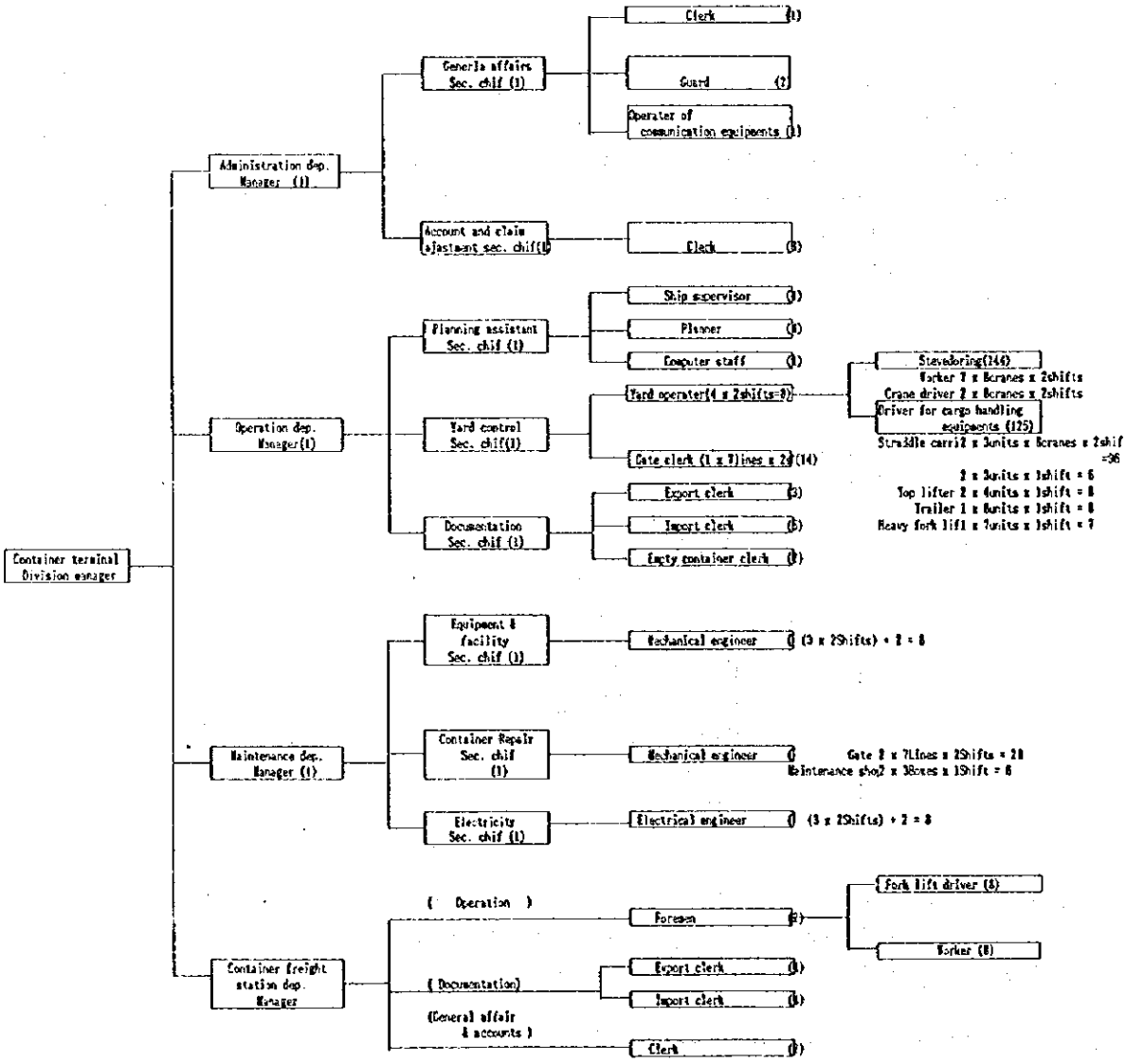


Figure 14.1.2 Organization Chart of Container Terminal at Latakia Port for the Master Plan

The function of each section is mentioned below:

1. Administration Department
   - General affairs section
     Administration of terminal properties and costs, labor costs and flow of general administration funds. Other general affairs.

   - Accounting section
     Issuing bills for loading and unloading containers, storage, delivering and repairing. Receiving charges.

   - Claim section
     Dealing with all claims which are concerned with human injuries, container ship, terminal facilities, and equipment, containers, vehicles, etc..

2. Operational department
   - Planning section
     Planning of stevedoring, container marshalling in the container terminal, shifting within the container terminal.

   - Yard control section
     Arrangement of necessary equipment and their drivers, and other workers and performing the above operations.
     Controlling yard operation at the control center in the office.
     Controlling road trailers arranged for by shipper/consignee, in the container terminal area.
     Clerical work of container delivery and receiving at a gate house, inspection of the exterior condition of loading containers, and damage inspection of empty containers which are returned from the consignee, or unloading from a ship.

   - Documentation section
     Issuing and typing of necessary document for import/export containers. Inventory control of empty containers, and the documentation of their delivery. Arrangement for government official's inspection.

3. Maintenance Department
   - Equipment and facilities section
     Maintenance of terminal equipment and facilities.

   - Container section
     Inspection of damaged and dirty containers which are returned to a gate house or unloaded from a container ship. Cleaning and repair of containers, and inventory control of repairing materials.

- Electricity section
  Maintenance, checking and repair of electrical equipment which is related to the transformer substations, illumination of the terminal, refrigerated containers, and cargo handling equipment.

4. Container Freight Station Department
   - CFS operation section
     *Planning of cargo operation such as delivery/receiving, storage, container stuffing and unstuffing at the CFS.

     *Arrangement, operation, supervising of necessary equipment, their drivers and other workers.

     *Control of shipper/consignee's vehicles at the CFS.

   - CFS documentation section
     Issuing of necessary documents for import/export cargoes. Arrangement for government official's inspection.

   - CFS general affairs section
     Bill issuing all charges for CFS operation and collection.

Required number of employees of the container terminal is shown in Table 14.1.5.

Table 14.1.5 Required Number of Employees at Container Terminal in the Master Plan

unit:persons

Department	Employees
Maneger of Container Terminal Division	1
Administration Department	10
Operation Department	311
Maintenance Department	54
C. F. S. Department	29
Total	405

2) Cargo Handling at Tartous Port

A) Basic Concept on Organization of Cargo Handling

a) Conventional Break Bulk Cargo
Present Organization for cargo handling of conventional break bulk cargo is not drastically revised in the Master Plan Stage.

Number of cargo handling workers including drivers of cargo handling equipments at present should be adjusted to the Master Plan.

b) Grain Terminal
In the Master Plan stage, management and operation is conducted by the same company as at present.

Present organization and number of employees at the grain terminal should be adjusted to the Master Plan.

c) Container Terminal

In the Master Plan stage, the container terminal is operated by Container Terminal Division which is under the Exploitation Directorate.

Closed terminal operation system should be adopted for container terminal operation in Master Plan stage.

Major functions of container terminal in the Master Plan stage are as follows:

1. Cargo handling between vessel and marshalling yard.
2. Sorting and storing of containers.
3. Delivery/receiving of container/container cargo between the terminal and consignee.
4. Simple maintenance and repair of container and container handling equipment.
5. Making the stowage plan for loading and the storage plan at marshalling yard for unloading.
6. Necessary document work for execution of the above items.

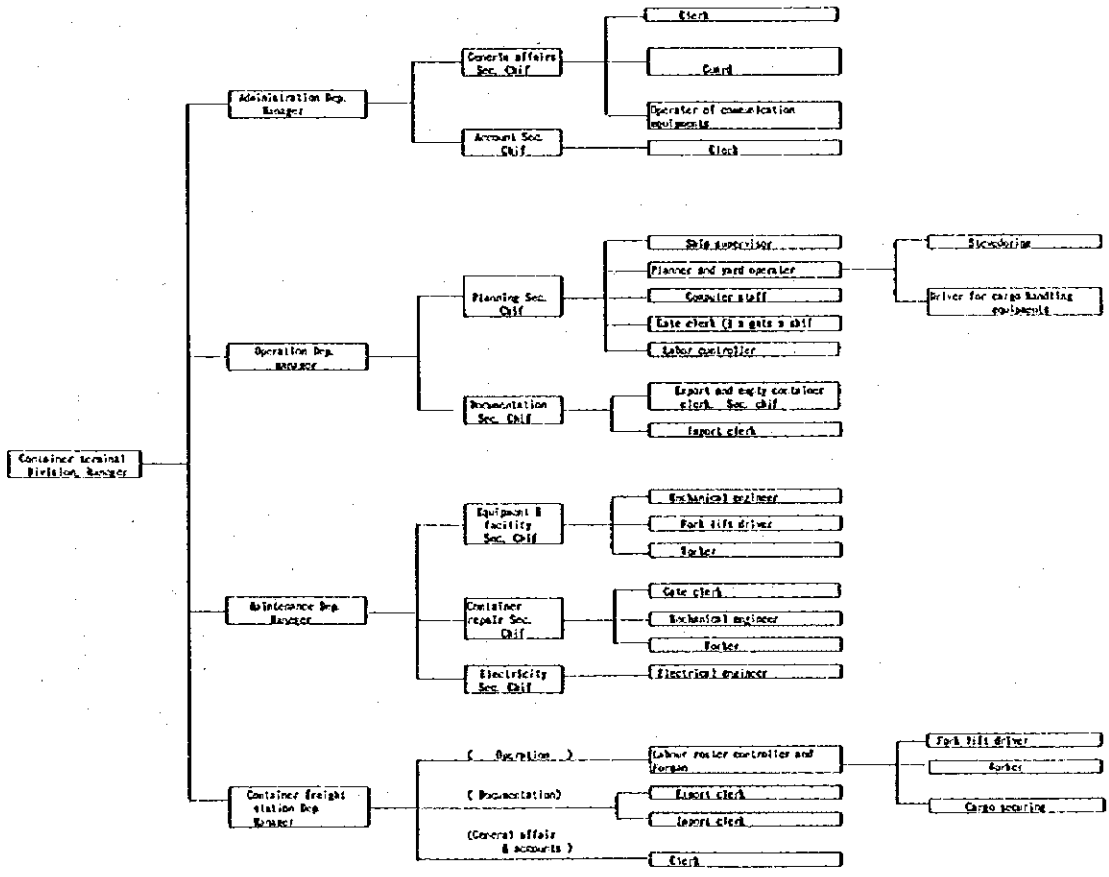


Figure 14.1.3 Organization chart of Container Terminal Department at Tartous Port in the Master Plan

B) Number of Cargo Handling Workers for Conventional General Cargo.
The procedure and method to calculate number of cargo handling workers for conventional general cargo is the same as at Latakia Port.

Required number of cargo handling workers for conventional break bulk cargo except operator of cargo handling equipment in the Master Plan is shown in Table 14.1.6.

Table 14.1.6 Required Number of Cargo Handling Workers for Conventional General Cargo at Tartous Port in 2010.

Commodity	Worker(person)
Food stuffs or agriculture products	About 190
Steel	About 550
Wood	About 145
Car, machine & equipment	About 20
Chemical	About 340
Various	About 545
Total	About 1,790

C) Number of Drivers of Cargo Handling Equipment for Conventional General Cargo
The procedure and method to calculate number of drivers for cargo handling equipment for conventional break bulk cargo in the Master Plan is the same as Latakia Port.

The result of calculation is shown in Table 14.1.7.

Table 14.1.7 Total Number of Drivers of Cargo Handling Equipment

Kind of equipment	Number of equipments (number)	Shifts	Number of drivers (person)
Forklift 3tons	57	3	171
Forklift 5tons(sp)	17	3	51
Forklift 5tons	33	3	99
Forklift 10tons	20	3	60
Mobile crane 45tons	57	3	342
Mobile crane 65tons	2	3	12
Quay side crane	16	3	98
Trailer	35	3	105
Total			938

D) Number of Employees at Grain Terminal in the Master Plan Stage

Organization of grain terminal in the Master Plan is adjusted by modification of present organization of the grain terminal at Tartous Port. Therefore, Mechanica Section, Electricity Section, Control Section, Fumigation Section and Operation section should be added for new grain terminal at former phosphate terminal area.

Table 14.1.8 shows the required number of employees for above sections.

Table 14.1.8 Required Number of Employees at New Grain Terminal in Tartous Port

Section	Number of employees
Assistant Director	1 (persons)
Mechanical Section	4
Electricity Section	3
Control Section	3
Fumigation Section	4
Operation Section	45-50
Total	60-65

E) Number of Employees at Container Terminal in the Master Plan Stage

Organization of container terminal in the Master Plan is modelled on a Japanese container terminal as in the Master Plan of Latakia Port in this section.

a) Organization of Container Terminal

An example of the organization chart is shown in Figure 14.1.3.

The function of each section is mentioned below:

1. Administration Department

a.General Affairs Section

- Administration of terminal properties and costs, labor costs and flow of general administration funds. Other general affairs.

- Dealing with all claims which are concerned with human injuries, container ship, terminal facilities, and equipment, containers, vehicles, etc..

b.Accounting Section

- Issuing bills for loading and unloading containers, storage, delivering and repairing. Receiving charges.

2. Operational Department

a.Planning Section

- Planning of stevedoring, container marshalling in the container terminal, shifting within the container terminal.

- Arrangement of necessary equipment and their drivers, and other workers for performing the above operations.

- Controlling yard operation at the control center in the office and controlling road trailers arranged for by shipper/consignee, in the container terminal area.

- Clerical work of container delivery and receiving at a gate house, inspection of the exterior condition of loading containers, and damage inspection of empty containers which are returned from the consignee, or unloading from a ship.

b.Documentation Section

Issuing and typing of necessary document for import/export containers. Inventory control of empty containers, and the documentation of their delivery. Arrangement for government official's inspection.

3. Maintenance Department

a.Equipment and Facilities Section

Maintenance of terminal equipment and facilities.

b.Container Section

Inspection of damaged and dirty containers which are returned to a gate house or unloaded from a container ship. Cleaning and repair of containers, and inventory control of repairing materials.

c.Electricity Section

Maintenance, checking and repair of electrical equipment which is related to the transformer substations, illumination of the terminal, refrigerated containers, and cargo handling equipment.

4. Container Freight Station Department

a.CFS Operation Section

- Planning of cargo operation such as delivery/receiving, storage, container stuffing and unstuffing at the CFS.

- Arrangement, operation, supervising of necessary equipment, their drivers and other workers.

- Control of shipper/consignee's vehicles at the CFS.

b.CFS Documentation Section

Issuing of necessary documents for import/export cargoes and arrangement for government official's inspection.

c.CFS General Affairs Section

Bill issuing all charges for CFS operation and collection.

b) Required Number of Employees of the Container Terminal.

Required number of employees of the container terminal is shown in Table 14.1.9.

Table 14.1.9 Required Number of Employees of Container Terminal Department at Tartous Port in the Master Plan

unit:persons

Section	Employees
Manager of Container Terminal Division	1
Administration Department	9
Operation Department	126
Maintenance Department	26
C. F. S. Department	14
Total	176

(2) Maintenance Organization

1) Latakia Port

To propose maintenance organization in the target year, the following items must be considered.

i. Establishment of the effective maintenance system for the equipment as possessor

ii. The role of maintenance engineers of LPGC

iii. The role of maintenance shops of LPGC

The details of the above items shall be discussed with personals concerned both inside and outside of LPGC who have sufficient experience in the matter.

The basic opinion in study team for above items are as follows;

A) Maintenance system

It is essential to keep the equipment in good conditions for safe operations and high cargo handling productivity.

The effective maintenance system results in reasonable maintenance costs.

The maintenance is divided into two categories ; corrective maintenance and preventive maintenance. The effective maintenance is achieved by good combination of preventive maintenance and corrective maintenance.

In case of large or expensive equipment such as rail-mounted cranes, preventive maintenance should be put more weight than corrective maintenance because those cranes can not be replace even if they brokendown. The loss introduced by brokendown is serious especially in container cranes.

The preventive maintenance system, however, is not yet introduced at Latakia Port.

The preventive maintenance system shall be introduced and its merits are as follows;

i. The total workable days of the each equipment will be increased.
ii. The total maintenance cost will be reduced.
iii. The interruption and accident of the cargo handling operations due to the brokendown of the equipment will be reduced.
iv. Present problems on shortage of spare parts will be reduced owing to the reduction of unexpected spare parts requirement.
v. The idle time at maintenance shop will be reduced

B) The role of maintenance engineers of LPGC

The maintenance engineers are divided into two groups, one belonging to Operation Department and the other belonging to Work shop. The main works of former group are as follows;

i. To establish effective maintenance system.
ii. To make preventive maintenance schedule
iii. To decide the method, term and place(maintenance shop or out side) for corrective maintenance.

The main works of the latter group are as follows;

i. To study and develop more effective maintenance technique
ii. To make and review the maintenance manual
iii. To implement maintenance work with technicians
iv. To direct the maintenance technicians

C) The role of maintenance shop

The maintenance shop is indispensable for the effective and economical maintenance for the cargo handling equipment. The organization shall be as slim as possible to achieve economical repairs. Considering the capability of the maintenance shops of private companies out side the port, the scope of work for the work shop shall be strictly decided. The scope of works at the maintenance shop recommended by the study teamand the points to be considered by the port are as follows;

i. Preventive maintenance
ii. Corrective maintenance with in the maintenance capability.
The corrective maintenance beyond the capability of the port maintenance shop shall be ordered to out side.
iii. The work for making of the spare parts shall be reduced limited to a special case.

D) Maintenance organization in the target year

i. Maintenance shop for container handling equipment
In the stage of master plan, the maintenance shop specialized for container handling equipment shall be established within the new container terminal. Required engineers and technicians shall be arranged.
ii. Establishment of a new section of Machinery Division under Operation Department for making the maintenance schedule and statistics on working days(hours) of each handling equipment.
iii. Establishment of a new division for Technical Affairs

The work items on the above new division are as follows:

* To prepare statistics on maintenance for each equipment
* To study and develop on more effective maintenance technique on existing equipment.
* To make or review the maintenance manual
* To establish the maintenance technique on new equipment.

iv. Review of existing maintenance organization

* The maintenance organization shall be reviewed periodically and if necessary, the organization shall be modified together with rearrangement of engineers and technicians.
* The maintenance organization has to be flexible to cope with the change of the number and types cargo handling equipment.

v. Maintenance engineers to be hold

* Forty (40) engineers graduates of universities are engaged in mainly maintenance work at present. The number of the engineers is not insufficient in the future.

vi. Maintenance technicians to be hold

* One hundred and Sixty (160) technicians are engaged in maintenance work at present. According to interview, the number of technicians is partially insufficient at present. However it is advisable that the technicians shall be rearranged at first and after that it shall be considered to employ the necessary technicians.

  The number of technician will not be so increased in the future.

2) Tartous Port

To propose maintenance organization in the target year, the following items must be considered:

Refer to Latakia Port

A) Maintenance system

Refer to Latakia Port

The preventive maintenance system is introduced at Tartous Port. However the maintenance level is insufficient.

The sufficient preventive shall be done and its merits are as follows;

Refer to Latakia Port

B) The role of maintenance engineers of TPGC

Refer to Latakia Port

C) The role of maintenance shop of TPGC

Refer to Latakia Port

D) Maintenance organization in the target year

i. Establish of a new division for Technical Affairs
   The work items on the above new division are as follow:
   Refer to Latakia Port

ii. Review of existing maintenance organization
   Refer to Latakia Port

iii. Maintenance engineers to be hold
   Thirty four(34)engineer who are graduates of universities are engaged mainly maintenance work at present. The number of the engineers is not insufficient in the future.

iv. Maintenance technicians to be hold
   Two hundred and eighty three(283) technicians are engaged maintenance work at present.
   The number of technicians will be reduced in the future.

14.1.3.2 Operational Procedures

The essential points for port management and operation are well-functioning facilities, high level of services and reasonable port charges. In addition, operations must be safe, reliable and systematic. If there is even one inefficient sector, a bottleneck in the cargo flow is created and this will have a detrimental effect on the entire operation.or instance, inefficient documents procedures lower the efficiency of all sections, even if the efficiency of each individual section is excellent. As a result, demurrage occurs, causing consignees financial losses.

In particular, containerization demands 'swift, cheap and safe' operation. In order to cope with it, streamlining and standardizing documentation must be introduced. This would save time for all bodies concerned.

It is thus a good chance for the two Ports to promote streamlined documentation in accordance with building up the port system. This reexamination of documentation should be done on the basis of international standards and the forms of applications should be unified.

14.1.3.3 Information System

Wharves, sheds, yards, cargo handling equipment and all other port facilities need to be organized and operated systematically in order to handle the huge amount of cargoes safely and swiftly. To complement systematic operations, accurate and prompt information needs to be available at all times. Therefore administrative bodies of the ports in Syria should introduce a port information system in the long run to give information services to the bodies concerned.

(1) Purposes of the port information system

1) Improvement of efficiency and accuracy in daily works
Improvement of efficiencies in the works of posting, documentation, calculations etc.

2) Efficient management of port facilities
Streamlining of permission works, simplified management of in and out flow of cargoes' information, efficient running of port facilities

3) Improving services to the users
Providing information or permission, cargo flows, and billing data, cargo accepting and offering without papers

(2) Main components of the system

Examples are illustrated as follows;

1) Cargo System
① Documentation System
② Cargo Inventory System
- Loading System
- Delivery System

2) Port System
① Ship Movement Information
② Pilotage and Tug Boats Information
③ Piers' and Sheds' Information

3) Labor System
① Workers' registration
② Information of wages
③ Worker's Arrangement Information

(3) Work Schedules for System Development

Typical work schedules for system development are as follows.

Phase ① Fundamental Survey
Preparatory investigation
- Port affairs analysis
(The conception of the system needs to be accomplished at this stage.)

Phase ② Basic Planning
Functional analysis
- Development plan
- Operating plan
(Cost and effect analysis needs to be done at this stage.)

Phase ③ Basic design

Functional analysis

- Code plan, File plan, Data-base plan, Shift plan, Input and output plan, Communicating system plan

(The basic plan of the system needs to be accomplished at this stage.)

Phase ④ Detailed design

Design Plan

- Program divisions, Physical design of file and data base
- Design of network

(Equipment needs to be installed at this stage.)

Phase ⑤ Design of programs

- Design of interface

(Hardware needs to be brought in and operational manual also needs to be made at this stage.)

Phase ⑥ Programming

Coding

- Compile, Debug

(Test data needs to be prepared at this stage.)

Phase ⑦ Test

-Single test, Synthetic test, Test run

(Operator and user training needs to be implemented at this stage.)

Phase ⑧ Shift and Implementation, Maintenance

As mentioned in chapter 8, the General Company of Latakia Port has approved introduction of the system, which is in the first phase. Meanwhile, the General Company of Tartous Port has already finished the selection of hardware. Both Companies need to study the fundamental items such as the cost performance, legislative atmosphere, operating rules, and operating procedures including the training for system operators and users. Concerning the planned hardware of the General Company of the Tartous Port, should be check to ensure that the port can be properly covered.

If there is a shortage of capacity, the Port Company could install only the port charge system and the fixed assets system for depreciation at the first stage, both of which can be easily and inexpensively installed compared with other port systems. New systems can be subsequently added, creating a comprehensive port system in the long run.

Therefore the Port Company can first buy the cheaper packaged software.

After the first systems are well operated, the other system program can be consigned to the outer software company in order to develop the other systems.

When it comes to the system set-up, it is very important to maintain integrity and ensure that the data base is not contradictory.

As errors (bugs) are sure to crop up in the early stages after installation, it is indispensable to prepare for such contingencies by introducing a regular maintenance system or entering a maintenance contract.

Outside support of experts will be needed in case of the two Port Companies because there are few internal specialists and experience in port systems is limited. However outside experts have little knowledge and information about the actual port affairs such as container and cargo flow, billing system, handling system etc.. Tie-up and collaboration between the outside and the inside staffs are required just like the entrustment contract in Latakia.

(4) Computerized Operation in the Container Terminal

Generally speaking, 60000TEU/a year is the limit to handle containers accurately, safely and quickly by manual procedure. Latakia port has already handled 134000TEU in the year 1994, and Tartous Port will surpass 60000TEU in the year 2002. Many ports in the world firstly introduced small computer system for the purposes of tally and statistics. However many of the ports which handle more than 120000TEU/ a year introduced the computer system mainly for the purposes of the following 8 categories.

1) Stacking plan
2) Vessel calling schedule
3) Receiving of gate-in container
4) Delivery of gate-out
5) Vessel loading planning
6) Discharging planning
7) Loading operation
8) In-yard movement and CFS container control

Figure 14.1-1 and figure 14.1-2 show container loading and unloading planning flow and figure 14.4-3 shows container total terminal system.

14.1.3.4 Human Resources Development in the Master Plan

(1) The Basic Concept of Training

Currently, there exists no general training system in the port companies. In the long run, it is advisable to conduct comprehensive training programs for ports' employees in the respective port companies covering various fields including management using computers cargo-handling operations, maintenance for port facilities. In the first step, it is necessary to implement skill acquisition training for operations of cargo-handling machines, mechanics of maintenance shops and

operators of computer system along with the planned introduction of new cargo-handling machines and computer's hard ware from the Short Term Plan. Such skill acquisition is essential to achieve swift, economical, reliable and safe cargo-handling for port users apart from knowledge acquisition on a desk. The only way to get skill acquisition mentioned above is on-the-job-training in the ports which is recognized in port terminal operators internationally.

To implement the training programs fruitfully in the respective ports, training of trainers for port employees is essential. There are the following two ways of the "trainers' " training:

1 Training by experts from abroad
2 Overseas training

In case of overseas training, the member of trainees and period of training are generally limited, and hence the training by experts from abroad should be put emphasis on.

Together with the training for skill acquisition, it is also essential to get knowledge on modern port management including financial management, personnel number control, yard planning, cargo-handling planning, information control by computer system, etc. In this case, the only way to get the useful knowledge is to dispatch competent officials of the port companies to abroad so as to get first-hand information.

Along with the on-the-job-training, the basic training in the field of port is significant to raise average technological level of the employees of the ports.

These trainings will also be adopted for the new port.

14.2 The New Port

14.2.1 Basic Concept on Management and Operation

The following 4 terminals and 2 berths for exclusive use are planned to be built at the new port.

1) Exclusive terminal for phosphate
2) Exclusive terminal for clinker and other cargoes of cement factories
3) Exclusive terminal for fertilizer
4) Exclusive terminal for pellets, bricks and scraps of steel factory
5) Exclusive berth for transit cargo
6) Berth for public use

The berths of 5) and 6) are to be for public use and for transit cargo. Therefore berths for transit cargo and for public use should be run by the newly established port corporation. On the other hand, the terminals from 1) to 4) are planned to be exclusive terminals which are equipped with special facilities, for instance loader

and unloader or warehouse for special use, in order to load or unload, from vessels or trains swiftly and effectively, products, unfinished products and materials of steel, fertilizer, clinker, phosphate etc. dealt with by each state-owned company. In order to run the above mentioned exclusive terminals, there exist several options in schemes of construction, administration, land and facility ownership. The most suitable scheme should be adopted to make the terminals run effectively, taking into consideration the current Syrian situation.

(1) Land Ownership

The land of port is generally owned by public sectors given the public nature of port activities. In cases where a private company operates a marine terminal for exclusive use, the port land is leased to the private company on a long-term contract basis rather than outright transfer of ownership. Under this view, the land of the new port to be created by reclamation should be kept as state-owned land.

(2) Construction of the new port infrastructure

Port infrastructure such as navigational channel, basins, breakwaters, berths, roads and railways in the port limits, etc. is generally constructed and maintained by port corporations throughout the world. In the new port, it is proposed that infrastructure should be constructed by the port corporation to be newly established including the infrastructures of terminals for exclusive use.

(3) Operations of the Exclusive Terminals for bulk cargoes

There are two options in terms of operation in the exclusive terminals of phosphate, clinker, fertilizer and pellet. One is for each state-owned company which represents not only the consignor and consignee of the port cargoes but also the producers at their factories or mines inland to operate the marine terminal directly. The other is for the above state-owned companies to entrust the port corporation with the operation of the terminal.

Comparing the two methods, the former is better than the latter, because operations at each terminal will be done consistently under a state-owned company which can control the process from start to finish, from production at their factories or mines inland to loading/ unloading their cargoes in the marine terminals.

On the other hand, the latter is superior to the former operational form in terms of safety and environmental matters. In addition, the port corporation can administer the new port comprehensively. However, in this operational form, complementary operations between the cargo handling site of the port and the producing site inland are hard to achieve.

The main purpose of the new port is to handle the bulk cargo effectively and contribute to the development of the Syrian economy by means of enhancing the

international competitiveness or decreasing the domestic production prices. Accordingly it is proposed that the exclusive terminals should be operated by state-owned companies. Most of these kinds of terminal throughout the world are operated by this system.

(4) Procurement of Cargo-handling Machinery and Construction of Storage Facilities for Exclusive Terminal

In the case of operation by the port corporation, everything is done by the port corporation from construction of the facilities to procurement of the equipment. On the other hand, in the case of operation by state-owned companies operation, there can be two ways in terms of construction of storage facilities and procurement of cargo-handling equipment. One is for the state-owned companies to construct and procure them, and the other is for the port corporation to do so, and lease them to the state-owned companies. In the case of operation by state-owned companies, each company can introduce their favorite handling equipment and implement renewal plans smoothly and independently based on their production plans. This is superior to direct operation by the port corporation and is prevalent throughout the world. However, the peculiarities of the Syrian situation must be considered in this project. When it comes to opening the new port, huge amount of materials, services, etc. must be supplied. The point is that budget of the procurement for the opening must be implemented properly to prevent dual investment. The various views and voices must be transformed into one coherent vision.

Accordingly, it is advisable that construction of the storage facilities and procurement of cargo-handling equipment are done by the port corporation and that facilities are then leased to the state-owned companies to unify the different opinions and achieve smooth implementation.

Detailed contract and pre-agreement will prevent problems coming from dual administration.

(5) Huge Initial Investment and Interests

From the viewpoint of financial autonomy, it is desirable that port is constructed, managed and operated from the profits of port activities. However, it might not be expected that sufficient income to run the port will be generated in the earlier stage. In addition, considering that the cargoes handled in the new port are mainly bulk and primary products, it might be necessary to lower port charge so as to keep international competitiveness of Syrian exporters. Thus suitable countermeasures for the expected shortage of funds, for instance, introduction of subsidy from the central government, must be considered.

14.2.2 Number of Employees at New Port

14.2.2.1 Basic Concept

- Iron pellet, iron scrap, phosphate, Cement clinker, export fertilizer and flake sulphur are handled at exclusive terminals for each commodity.

- Closed terminal operation system should be adopted for each exclusive terminal.

- Iron pellet, iron scrap and iron related cargo(break bulk cargo) are handled by the same operator.

- Major functions of exclusive terminals in the Master Plan stage are as follows:
  1. Cargo handling between vessel and storage area.
  2. Sorting and storing.
  3. Delivery/receiving.
  4. Simple maintenance and repair of cargo handling equipment.
  5. Necessary document work for execution of the above items.

- General cargo berths(main commodities:bagged fertilizer, fire bricks and oil coke) are operated using public use system(open system) by General Port Company.

14.2.2.2 Number of employees at exclusive terminal

(1) Organization

1) Steel Terminal (Iron pellet, iron scrap and iron related cargo)
The major function of each department(or each section) is as follows:

A) Administration Department

a) General Affairs Section
Administration of terminal properties and other general affairs.

b) Accounting Section
- Administration of administrative cost(including miscellaneous expenses), labor cost and flow of general administration funds.
- Issuing bills and receiving charges from incidental terminal operation.
- Administration with payment for incidental terminal operation.

B) Operation Department

a) Planning section
Planning of stevedoring, transporting the cargoes between apron and storage facility, sorting the cargoes in storage facility and shifting the cargoes within the storage facility.

b) Pellet Terminal Section
- Arrangement of necessary equipment and their drivers, and other workers for performing the above operations at the pellet terminal.
- Controlling the cargo handling and transportation works at the apron and storage facility in the pellet terminal.
- Clerical work of delivery/receiving of import/export cargoes at the pellet terminal.

c) Scrap terminal section
The functions of this section are the same as in Pellet Terminal Section.

d) Documentation section
- Issuing and typing of necessary documents for import/export cargoes.
- Arrangement for government official's inspection.

C) Maintenance Department
a) Equipment and facility section
Maintenance of equipments and facilities at Steel Terminal.

b) Electricity section
Maintenance, checking and repair of electrical equipment.

2) Phosphate Terminal
Organization of the Phosphate terminal during the Master Plan stage is the same as at present.

Major functions of each section are mentioned as follows:

A) Technical Department
a) Maintenance section
To maintain and repair all equipment at the phosphate terminal.

b) Loading/storing section
- Discharging phosphate from trains and trucks.
- Loading phosphate to calling ships
- Daily supervising of the loading equipments

c) Laboratory section
Analyzing the stored phosphate

d) Industrial security section
- Accident prevention, safety of workers etc.

Those who work in the technical section should wear protective gear including a face mask and fire extinguishers should be close at hand in cash of accident. All possible safety measures should be taken.

B) Administrative Department

a) Service section
Responsible for correspondence and access to facilities.

b) Working affairs section
Health and welfare of workers.

c) Garage Division
To provide transport for workers engaged in official duties and to maintain all vehicles.

C) Finance Department

a) Financial affairs section
In charge of payroll and budget allocation.

b) Accuracy section
To observe all expenditures of the administration.

c) Warehouses section
For storage of all required materials.

D) Commercial Department

a) Commercial affairs section
- Regulating all lists of purchase orders belonging to the directorate.
- Regulating all documents of vessels concerned with phosphate shipping.
- Making the required contracts and public invitations.

b) Clearance section
- To give clearance to phosphate vessels from Customs and to do all the related paper works.

E) Inventory Department

a) Material section
Keeping stock of all newly stored materials and spare parts.

b) General accounting section
To regulate bills of registration and present monthly reports.

F) Planning Department
Making the reports and production schedules every month for what is stored and what is exported. Also responsible for reports on administration expenses of fuel, oil, and electricity, location of machines and general information about the directorate and its security.

G) Internal Observation office
Responsible for investigating all internal violations and also for making recommendations on safety, management and etc.

3) Fertilizer (Export) and Cement Clinker Terminals

The fertilizer terminal and the cement clinker terminal will be organized in a similar manner. Therefore, organization of these terminals considered to be the same in this report.

Major functions of each section are mentioned as follows:

A) Administration Department

a) General Affairs Section

Administration of terminal properties and other general affairs.

b) Accounting Section

- Administration of administrative cost(including miscellaneous expenses), labor cost and flow of general administration funds.
- Issuing bills and receiving charges from incidental terminal operation.
- Administration with payment for incidental terminal operation.

B) Operation Department

a) Planning section

Planning of stevedoring, transporting the cargoes between shed and apron.

b) Research section

- Regulating all list of purchase orders belonging to the directorate and keeping them safe.
- Researching all information of bulk carriers.
- Making the required contracts and public invitations.

c) Operation Section

- Arrangement of necessary equipment and their drivers, and other workers for performing the above operations at the terminal.
- Controlling the cargo handling and transportation works between the shed and apron and in the terminal.
- Clerical work of receiving of export cargoes from wagons at the receiving facility in the terminal.

d) Documentation section

- Issuing and typing of necessary documents for import/export cargoes.
- Arrangement for government official's inspection.

C) Maintenance Department

a) Equipment and facility section

Maintenance of equipment and facilities at the terminal.

b) Electricity section

Maintenance, checking and repair of electrical equipment.

4) Sulphur Terminal

1) Organization
The major function of each section(or each department) is as follows:

A) Administration Department
a) General Affairs Section
Administration of terminal properties and other general affairs.

b) Accounting Section
- Administration of administrative cost(including miscellaneous expenses), labor cost and flow of general administration funds.
- Issuing bills and receiving charges from incidental terminal operation.
- Administration with payment for incidental terminal operation.

B) Operation Department
a) Planning section
Planning of stevedoring, transporting the cargoes between Wagons and open yard and from the open yard to apron on the quay.

b) Research section
- Regulating all list of purchase orders belonging to the directorate and keeping them safe.
- Researching all information of vessels concerned with sulphur shipping.
- Making the required contracts and public invitations.

c) Operation Section
- Arrangement of necessary equipment and their drivers, and other workers for performing the above operations at the terminal.
- Controlling the cargo handling and transportation works at the apron and open yard in the terminal.
- Clerical work of receiving of export cargoes at the receiving facility for wagons.

e) Documentation section
- Issuing and typing of necessary document for export of sulphur.
- Arrangement for government official's inspection.

C) Maintenance Department
a) Equipment and facility section
Maintenance of equipment and facilities at the Terminal.

b) Electricity section
Maintenance, checking and repair of electrical equipment.

2) Required Number of Employees
Required number of employees at each exclusive terminal is shown in Table 14.2.1.

Table 14.2.1 Number of Employees of Exclusive Terminal

Commodity	Worker(person)
Phosphate	About 210
Steel Terminal	200-210
Export Fertilizer	110-120
Cement Clinker	100-110
Sulphur	115-120
Total	735-770

(Details are shown in Appendix-16 and 17.)

14.2.2.3 Number of Cargo Handling Workers at Public Berths

(1) Conventional General Cargo Berths(Public berths)

Conventional general cargo berths for import bagged fertilizer, fire bricks, oil coke and etc. are operated using public open use system by General Port Company.

1) Number of Cargo Handling Workers(excluding drivers of cargo handling equipment) at General Cargo Berths in the Master Plan stage
The procedure and method to calculate the number of cargo handling workers for conventional general cargo is the same as at Latakia Port and Tartous Port.

The result of the calculation is shown in Table 14.2.2.

Table 14.2.2 Number of Cargo Handling Workers for General Cargo Berths at New Port in the Master Plan

Commodity	Worker(person)
Steel & others	45-50
Oil coak & others	70-75
Fertilizer & others	85-95
Total	200-220

(Details of calculation are shown in Appendix 17)

2) Number of Drivers of Cargo Handling Equipment for Conventional General Cargo
The procedure and method to calculate the number of drivers of cargo handling equipments for conventional general cargo is the same as at Latakia Port and Tartous Port.

The expression is as follows:

Nd = Sum.(Ne x Nde x Sn)

Nd : Number of drivers of cargo handling equipment
Ne : Number of each kind of cargo handling equipment
Nde: Number of drivers per each kind of cargo handling equipment
Sn : Average number of cargo handling shifts per vessel per day at New Port(1 shifts)

The result of calculation is shown in Table 14.2.3.

Table 14.2.3 Number of Drivers of Cargo Handling Equipment for General Cargo (including Oil Coke) at New Port in The Master Plan

Kind of equipment	Number of equipment (number)	Shifts	Number of drivers (person)
Forklift 7tons	5	1	5
Shovel Loader	3	1	6
Movable Ship Loader	3	1	6
Mobil crane 45tons	4	1	8
Truck	9	1	9
Total	24		34

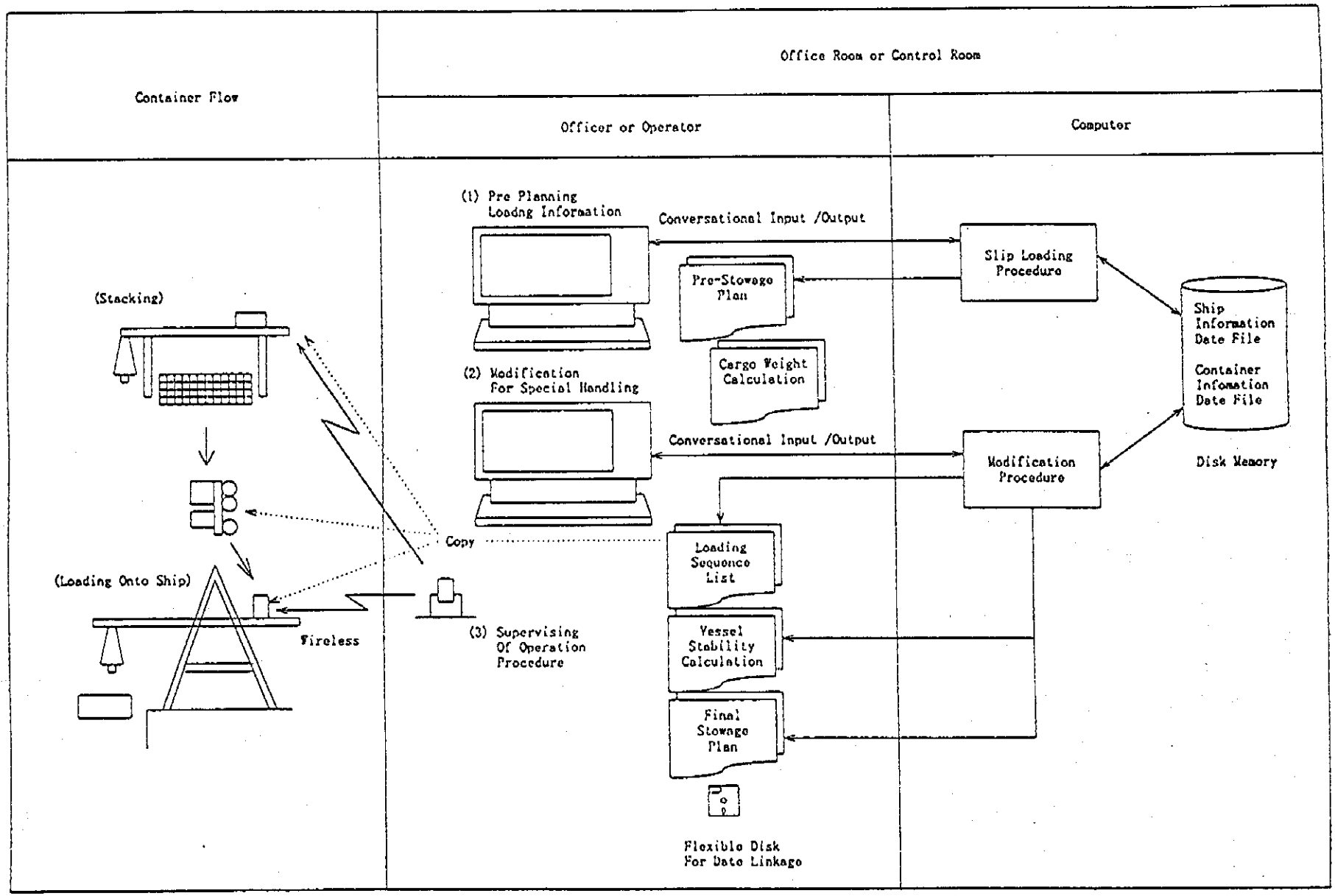


Figure 14.5.1 Container Loading Planning

Source: Nihon Yusen Joho Kaihatsu Ltd.

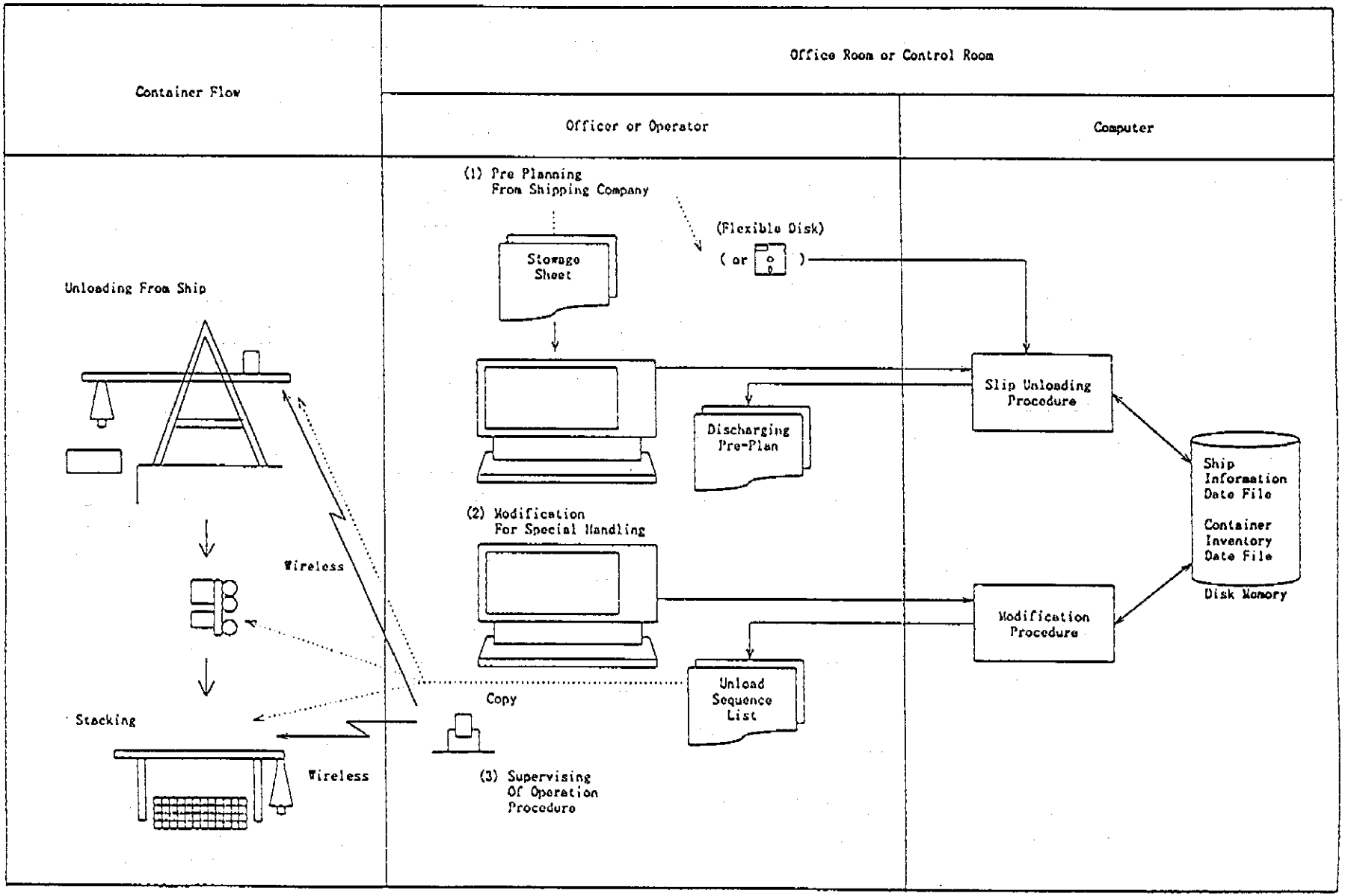


Figure 14.5.2 Container Unloading Planning
Source: Nihon Yusen Joho Kaihatsu Ltd.

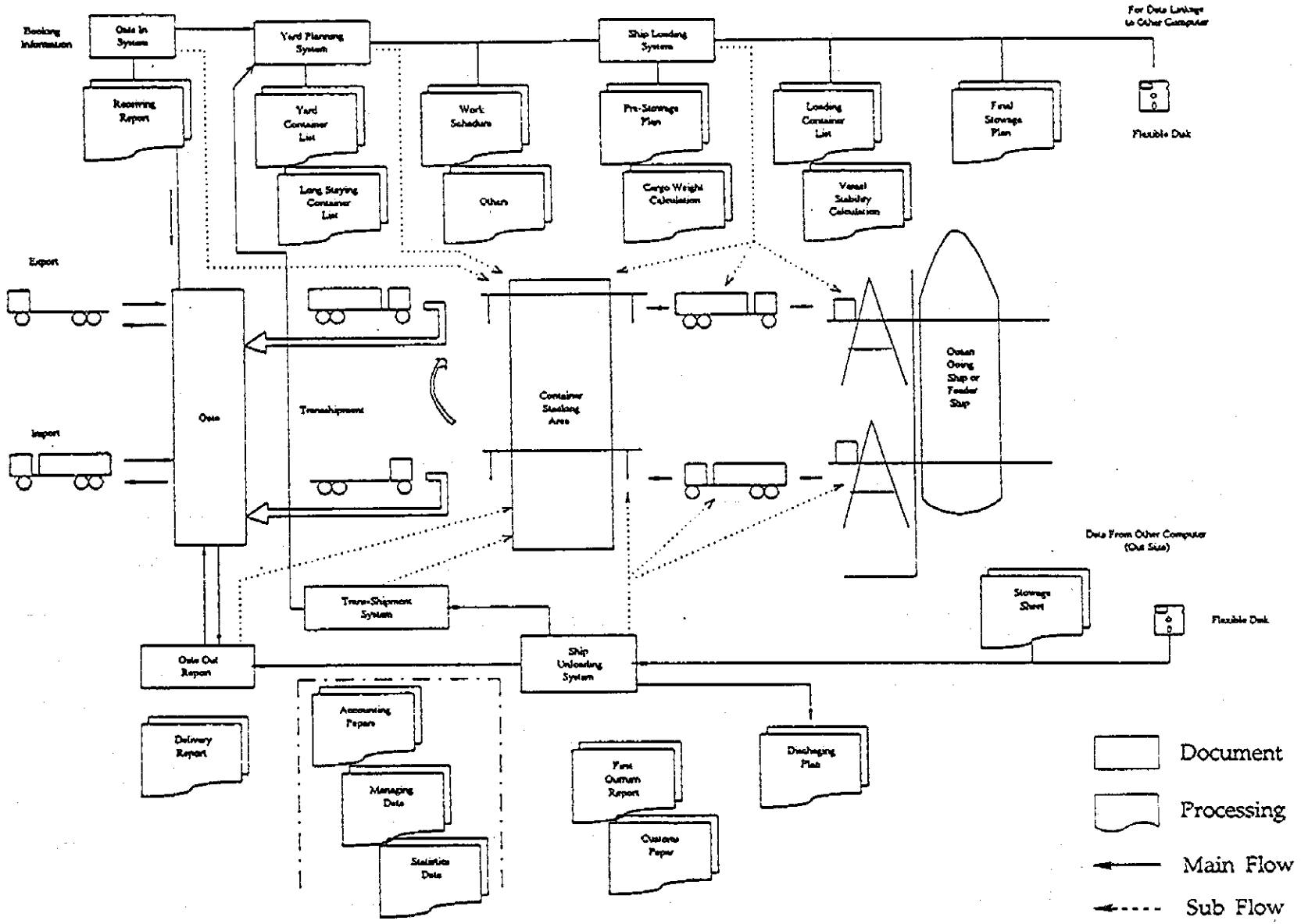


Figure 14.5.3 Conputerized Total System of Container Terminal
Source: Nihon Yusen Joho Kaihatsu Ltd.

PART III

SHORT-TERM PLAN

PART III

SHORT-TERM PLAN

Chapter 15 Short-Term Plan of Latakia Port

15.1 The Basic Concept of the Port Development Plan

The Short-Term Plan is prepared as a first-phase plan with a target year of 2003 for the development of Latakia Port. The Short-Term Plan is made within the framework of the Master Plan described in Chapter 11 and whose project components are summarized as follows:

- Modernization of the existing container terminal at the new port zone
- Modernization of the current grain-handling operations
- Establishment of a new container terminal north of the new port zone
- Preparation of additional conventional berths north of the new port zone
- Extension of the existing breakwaters in the direction of north west, construction of a sub-breakwater, widening and deepening of the existing access channel and preparation of basins enclosed by the new breakwaters

According to the results of the rough economic appraisal of the Master Plan, it is judged that the projects listed above are economically viable as a whole (see Section 11.14). Investment for the projects will be needed at some stage by the target year of the Master Plan, and the timing of the investment for the above projects must be determined individually according to the respective conditions. In the process of the above economic appraisal, it was revealed that it is economically viable to implement the following two projects (first phase) as the short-term projects with the target year of 2003:

- Modernization of the existing container terminal at the new port zone

In the year 2003, the number of containers handled at the existing terminal, Terminal-1, is expected to exceed 300,000 TEUs. Hence, the existing terminal needs to be modernized to increase container-handling capacity through the installation of container gantry cranes, rearrangement of yard facilities and the introduction of a closed terminal system by the year 2003.

- Modernization of current grain-handling operations

The current inefficient grain-handling operation is required to be improved by the installation of the new grain unloaders/loaders connected with silos through belt conveyors. According to the forecast volume of grains to be handled in bulk at Latakia Port, it is economically viable to implement the modernization project as the short-term project: the savings of grain transportation costs induced by the project throughout its project life starting in the stage of the Short-Term Plan exceed the investment costs.

The remaining three projects are required to be implemented as next phase projects towards the target year of the Master Plan. The project to establish the new

container terminal, Terminal-2 is required to be started just before the saturation of the modernized existing container terminal, Terminal-1; the saturation of Terminal-1 is forecast to come soon after the year 2003.

On the other hand, the timing of investment for the additional conventional berths to be constructed north of the new port zone is determined taking account of a saturated condition of the existing conventional berths located at the old and new port zones. The saturated condition of the existing berths is defined to be the point when savings of transportation costs for conventional cargoes induced by preparation of additional berths come to exceed the investment costs to construct the additional berths. The saturation of the existing conventional berths is forecast to come before the year 2010.

Extension of the existing breakwater and construction of a sub-breakwater together with preparation of new basins will have to be completed before the preparation of the new container terminal and additional conventional berths.

15.2 Usage Plan for the Existing Port Facilities

Vessels calling at Latakia Port at present are divided into the following ten categories as in Chapter 11.

- eneral cargo vessel laden with various kinds of cargoes
- General cargo vessel laden with one kind of commodity
  - Foodstuffs or agricultural products
  - Steel products
  - Wood
  - Car, machine and equipment
  - Chemical products
- Ro/Ro vessel
- Grain carrier(Import)
- Grain carrier(Export)
- Container vessel

The volume of cargoes estimated in the demand forecast(see Chapter 10) is distributed to vessels categorized above. The usage plan for the existing port facilities by vessel type is proposed as follows.

(1) General Cargo Vessel (Various Kinds of Cargoes)

The total volume of cargoes to be transported by the vessel of this type through Latakia Port is estimated as one million tons in 2003, an increase of nearly 300,000 tons from 1994. In making the plan for berth allocation for the vessels, the following premises are adopted considering the actual operations. Average cargo handling volume and hourly cargo handling productivity are the same as that at

present.

- Average dwelling time of cargoes : 7 days
- Total volume of cargoes: unloaded : 808,000 tons
  loaded : 153,000 tons
- Average cargo handling volume : 1,390 tons per vessel
- Number of calling vessels : 692 vessels per year
- Cargo handling productivity : 33 tons per hour
- Storage : Shed
- Land transport : 100% by trucks

The following berths are allocated:

- Quay No.1, No.2, No.3, No.4 (4 berths)
- Passenger Quay (2 berths)
- Quay No.7, No.8, No.9, No.10, No.11, No.12, No.12A (7 berths)

(2) General Cargo Vessel (Foodstuffs or agricultural products)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 394,000 tons
- Average cargo handling volume : 1,950 tons per vessel
- Number of calling vessels : 203 vessels
- Cargo handling productivity : 35.4 tons per hour
- Average dwelling time : 7 days
- Storage : Shed
- Land transport by trucks

Foodstuffs and agricultural products show similar cargo handling conditions to general cargo. The following berths are planned to serve the vessels.

- Quay No.1, No.2, No.3, No.4 (4 berths)
- Passenger Quay (1 berths)
- Quay No.7, No.8, No.9 (3 berths)

(3) General Cargo Vessels (Steel products)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 246,000 tons
- Average cargo handling volume : 1,880 tons per vessel
- Number of calling vessels : 131 vessels
- Cargo handling productivity : 80 tons per hour
- Average dwelling time : 9 days
- Storage : Open yard

- Land transport by trucks

Since wide area is already developed for heavy cargoes, present berths for heavy cargo in the New Port area, Quay No.10, Quay No.11, Quay No.12 are allocated preferentially for steel vessels.
Average dwelling time is same as the present condition.

(4) General Cargo Vessels (Wood)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 264,000 tons
- Average cargo handling volume : 1,370 tons per vessel
- Number of calling vessels : 193 vessels
- Cargo handling productivity : 22.2 tons per hour
- Average dwelling time : 9 days
- Storage : Open yard
- Land transport by trucks

The following berths are allocated:

- Quay No.7, No.8, No.9, No.10, No.11, No.12(6 berths)

(5) General Cargo Vessels (Car, machine,equipment)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 221,000 tons
- Average cargo handling volume : 340 tons per vessel
- Number of calling vessels : 651 vessels
- Cargo handling productivity : 15.4 tons per hour
- Average dwelling time : 7 days
- Storage : Open yard
- Land transport by trucks

Since car, machine and equipment are handled through the entire area, similar berthing condition should be kept in the year 2010. The following berths are allocated:

- Quay No.2, Quay No.3, Quay No.4 (3 berths)
- Passenger Quay (1 berth)
- Quay No. 7, Quay No.8, Quay No.9 (3 berths)

(6) General Cargo Vessels (Chemical products)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 120,000 tons
- Average cargo handling volume : 2,550 tons per vessel
- Number of calling vessels : 48 vessels
- Cargo handling productivity : 36.8 tons per hour
- Average dwelling time : 7 days
- Storage : Shed
- Land transportation by trucks

The following berths are planned to serve the vessels;

- Quay No.1, No.2, No.3, No.4 (4 berths)
- Quay No.7, Quay No.8, Quay No.9 (3 berths)

(7) Ro/Ro Vessels

Ro/Ro vessels are berthing mainly at one berth in the Old Port, and one berth in the New Port (Passenger Quay, Quay No.13). The following premises are adopted considering the record of actual operations.

- Total volume of cargoes : unloaded : 104,000 tons
  loaded : 25,000 tons
- Average cargo handling volume : 990 tons per vessel
- Number of calling vessels : 131 vessels
- Cargo handling productivity : 36.4 tons per hour
- Average dwelling time : 5 days
- Storage : Open yard
- Land transportation by trucks

(8) Grain Carrier(Import)

The volume of grain to be unloaded at the port in the year 2003 is estimated as 260,000 tons.

The productivity of unloaders is as follows:

- Type : pneumatic unloader
- Nominal productivity : 400 tons per hour and unit(new)
  200 tons per hour(existing)
- Number of units : 2(each)
- Cargo handling efficiency : 0.7
- Operation ratio : 0.5(new)
  0.69(existing)
- Actual productivity per berth :
  400 tons/hr/unit X 2 units X 0.7 X 0.5 = 280 tons/hr/berth
  200 X 2 X 0.7 X 0.69 = 193
  (280+193)/2 = 236 tons/hr/berth

The following premises are adopted considering the record of actual operations.

- Average cargo handling volume : 27,000 tons per vessel
- Number of calling vessels : 10 vessels
- Average dwelling time in silo : 10 days
- Land transport by trucks

Silo Quay in the Old Port are allocated for Grain Carriers.

(9) Grain Carrier (Export)

Wheat exports are expected to amount to 1.4 million tons in the year 2003. The exported grain is handled both in Terminal(1) and Terminal(2). Actual productivity is computed as follows:

- Nominal productivity : 400 tons per hour per unit
- Number of units per berth : 2
- Cargo handling efficiency : 0.8
- Operation ratio : 0.5
- Actual productivity per berth :
  400 tons/hr/unit X 2 units X 0.8 X 0.5 = 320 tons/hr/berth

In addition, the following premises are adopted considering the vessel size and other conditions.

- Average cargo handling volume : 19,500 tons per vessel
- Number of calling vessels : 72 vessels
- Average dwelling time in silos : 10 days
- Land transport by railway

(10) Container Vessel

The number of containers to be handled at the container terminal of the New Port zone is estimated as 316,000 TEUs in 2003, three times greater than that in 1994. In order to handle these containers, gantry cranes are indispensable. Fifteen percent of the total containers to be handled at the port, (those are loaded by general cargo vessels), are assumed to be handled behind the Old Port.

In the next step, the proposed usage plan for the existing port facilities is determined by using a simulation method, excluding containers that are planned to be handled at the container terminals. In this study, reference to the actual statistical distribution forms for ship arrivals and mooring periods at the Latakia Port is made. Operational conditions at the port are as follows.

- Annual working days : 365 days
- Daily working hours : 24 hours

Result of the simulation is summarized as follows.

- Average ship waiting time :

1	General cargo vessels(Various kinds of cargoes)	: 9.3 hrs
2	General cargo vessels(Foodstuffs/agricultural products)	: 10.6 hrs
3	General cargo vessels(Steel products)	: 22.3 hrs
4	General cargo vessels(Wood)	: 18.2 hrs
5	General cargo vessels(Car, machine and equipment)	: 11.8 hrs
6	General cargo vessels(Chemical products)	: 10.1 hrs
7	Ro/Ro vessels	: 9.9 hrs
8	Grain carrier(Import)	: 9 hrs
9	Grain carrier(Export)	: 4.2 hrs

- Percentage of berth occupancy

Silo Quay	: 32.0 (%)
Quay No.1	: 86.8
Quay No.2	: 84.3
Quay No.3	: 86.9
Quay No.4	: 80.5
Passenger Quay No.5	: 83.6
Passenger Quay No.6	: 75.0
Quay No.7	: 86.7
Quay No.8	: 83.4
Quay No.9	: 80.8
Quay No.10	: 83.2
Quay No.11	: 80.0
Quay No.12	: 76.3
Quay No.12A	: 52.2
Quay No.13	: 46.5

Areas of public sheds and open yards occupied by various cargoes fluctuate according to daily arrivals, dwelling time and departures of the cargoes. When estimating the required areas for storing them, a daily maximum occupied area is adopted. The result of the simulation is as follows.

- Area in sheds : 4.4 ha
- Area in open yards : 3.3 ha
- Total area : 7.7 ha

Existing sheds occupied 10.5 ha and open yards occupied 13.3 ha. The total area, 23.8 ha, exceeds the necessary storage area. Consequently, the existing scale of storage area is sufficient for the future cargo.

Total ship waiting days in 2010 excluding container vessels are estimated as 1018 days, a 30 % reduction from the 1,440 days in 1994.

15.3 Modernization Plan of the Existing Facilities

15.3.1 Container Terminal

To cope with 316,000 TEUs of containers passing through Latakia Port in 2003, it is necessary to increase container-handling capacity as much as possible by modernizing the existing container terminal (Terminal-1) through the installation of four units of dock-side gantry cranes, rearrangement of yard facilities and introduction of the closed terminal operation system.

In the closed terminal operation system, container-handling operations are wholly controlled by a terminal operator who takes full responsibility for handling and storing containers after receipt or before delivery at its terminal gates by conducting yard planning and inventory control of containers based on data/information interchange with customers or the authorities concerned.

The layout of terminal facilities is proposed in Fig. 15.3-1. According to the layout plan under straddle carrier system which is currently adopted, the ground slots are estimated as follows:

- Marshaling yard: 1,490 TEUs
- Backyard: 760 TEUs for empty containers.

On condition of 3 high and 4 over stacking by straddle carriers, and by curtailing dwelling times of containers at the marshaling yard to the international level of leading container ports and preparing off-dock yards for empty containers, the Terminal-1 could receive the projected massive containers in the stage of the Short-Term Plan.

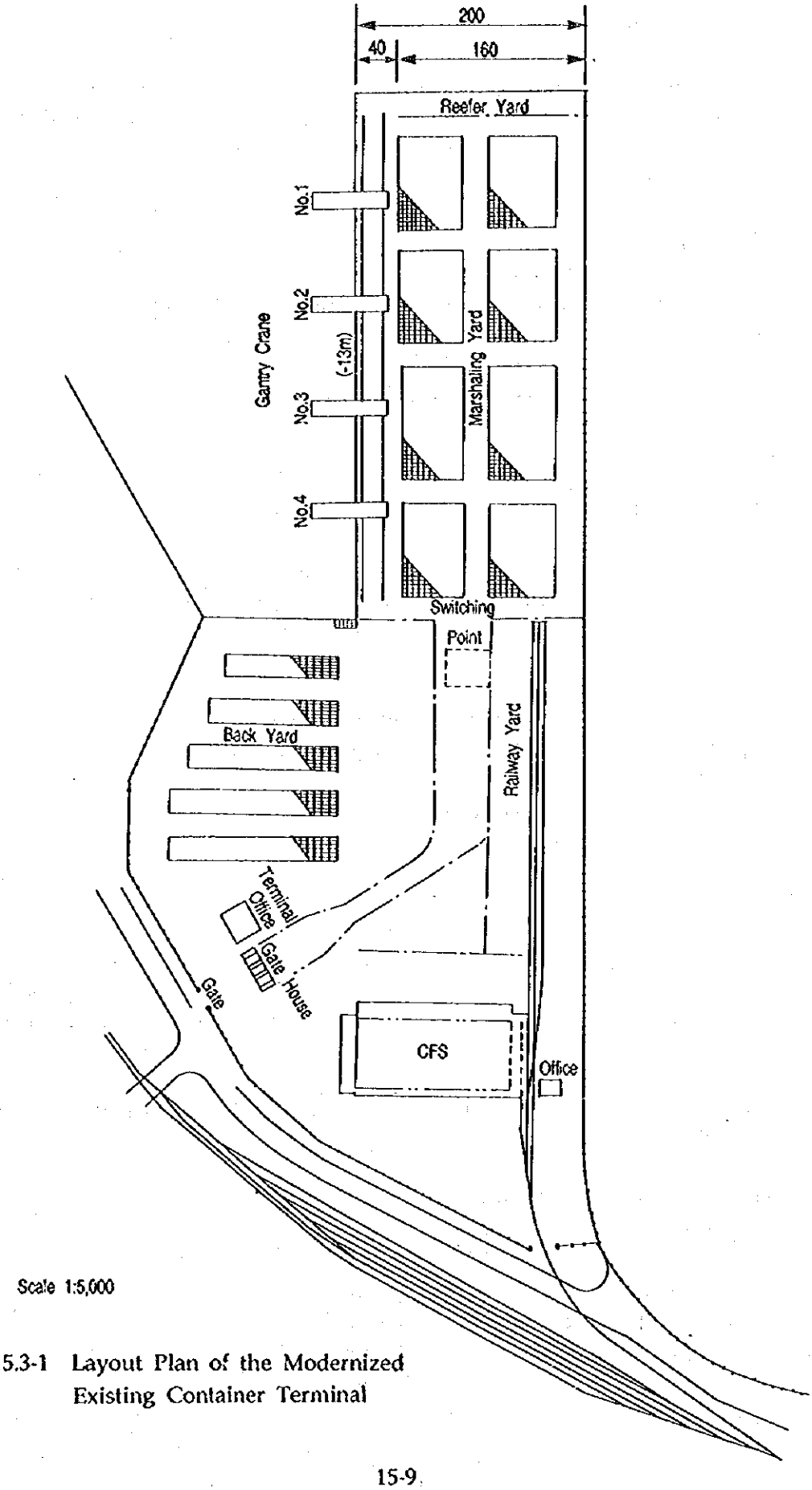


Figure 15.3-1 Layout Plan of the Modernized Existing Container Terminal

15.3.2 Grain Terminal

Modernization of the Grain Terminal in the Old Port area is planned in the stage of the Short-Term Plan to handle 1.6 million tons grains together with the new grain terminal to be constructed at the New Port area. The following terminal at the Old Port area will start operation by the year 2003.

Terminal (1) :

Location	:	Old Port
Berth capacity	:	Depth -12m, Length 210m (30,000DWT)
Loader	:	400 ton/hour
Unloader	:	200 ton/hour
Silo capacity	:	35,000 ton (existing silo)

15.4 Expansion Plan

15.4.1 Grain Terminal

In order to avoid a stoppage in grain handling, the new terminal must be completed by the time when improvement work in the Old Port area starts. The following terminal will be completed by the year 2003.

Terminal (2) :

Location	:	New Port (behind Berth No.12A)
Berth capacity	:	Depth -13m (existing berth)
Loader	:	400 ton/hour
Unloader	:	400 ton/hour
Silo capacity	:	65,000 ton

15.4.2 Passenger Terminal

Since the existing passenger terminal is already superannuated and the accessibility is not good, the terminal will be completed in the short-term. Assuming the estimation condition is the same as that in the year 2010, the yearly passenger number in 2003 is 50,000, and peak passenger number is 1,000.

Referring to a similar passenger terminal plan in Japan, the terminal will consist of the following facilities.

- Terminal Building (2,300 m^2)

Passenger Waiting Room	:	1,000 m^2
Office, Custom, Quarantine	:	400 m^2
Operation,		200 m^2
Stairs, utilities,machine		400 m^2
Restaurant		200 m^2
Shops		100 m^2

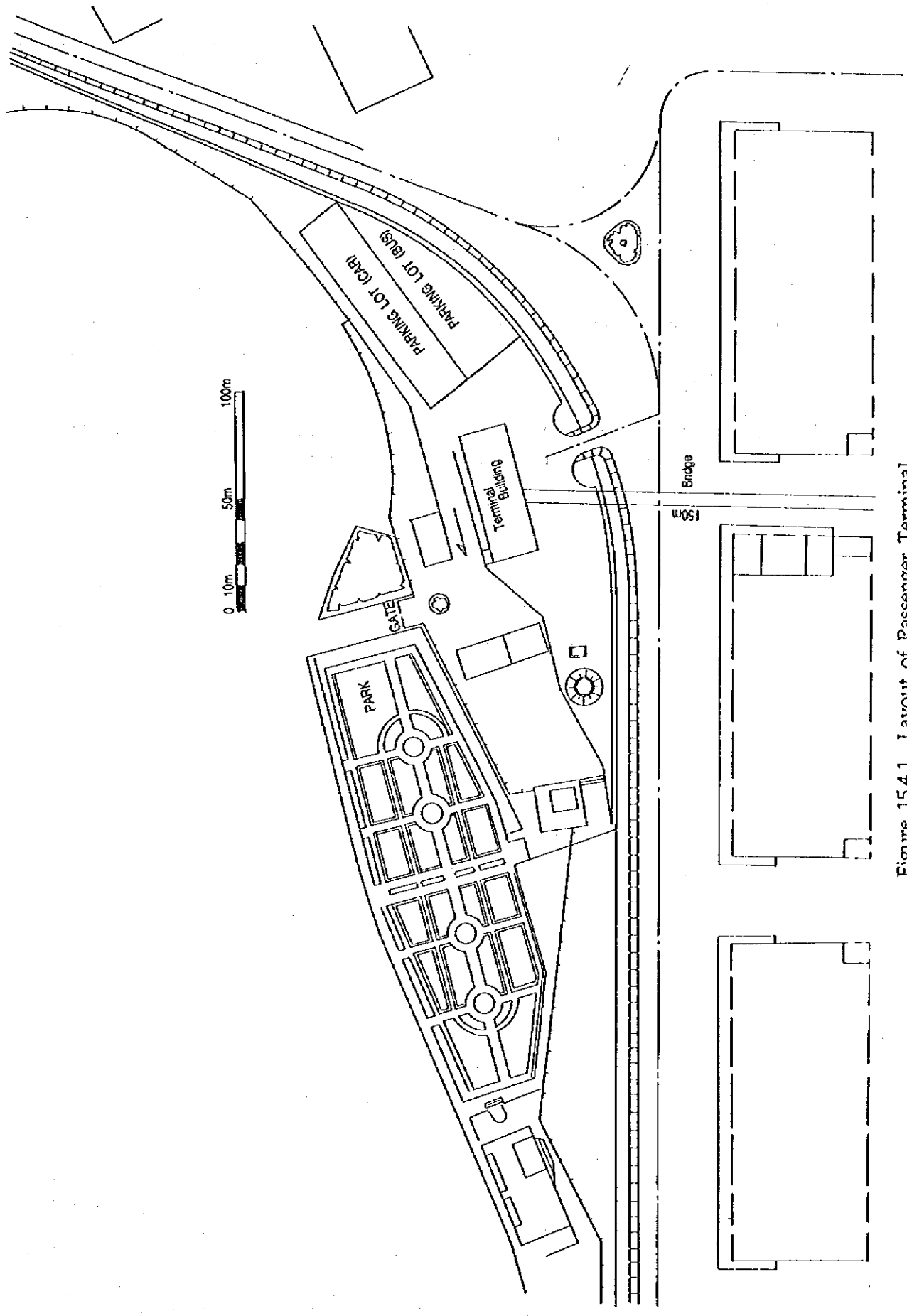


Figure 15.4.1 Layout of Passenger Terminal

Total	2,300 m^2

- Passenger Bridge

Bridge (berth-terminal bld.)	150 m
Bridge (bld.-parking)	5 m

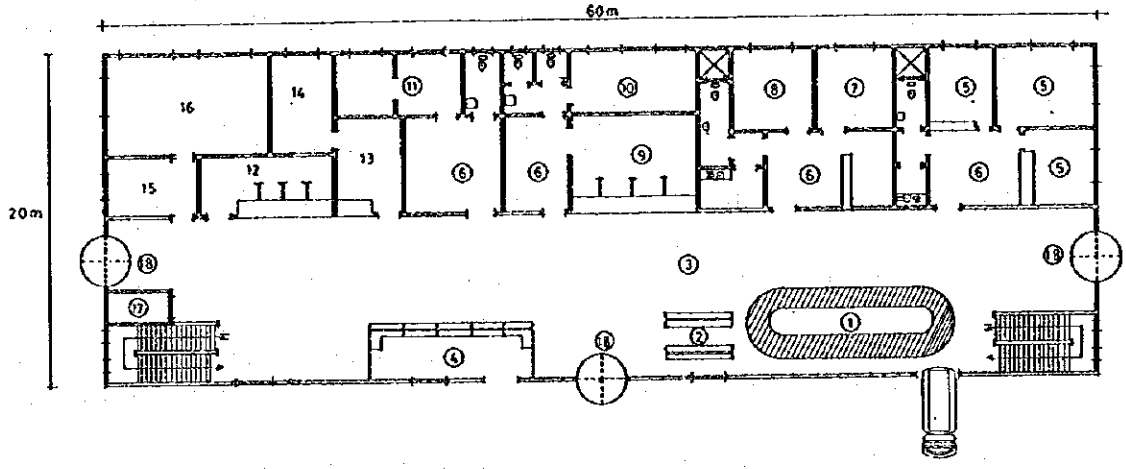
- Parking Place

Small-medium car	80 lots
Bus	10 lots

Passengers can access terminal building from the vessel by passenger bridge. First floor of the building is used mainly for passengers, while ground floor is used for office, operation and machines.

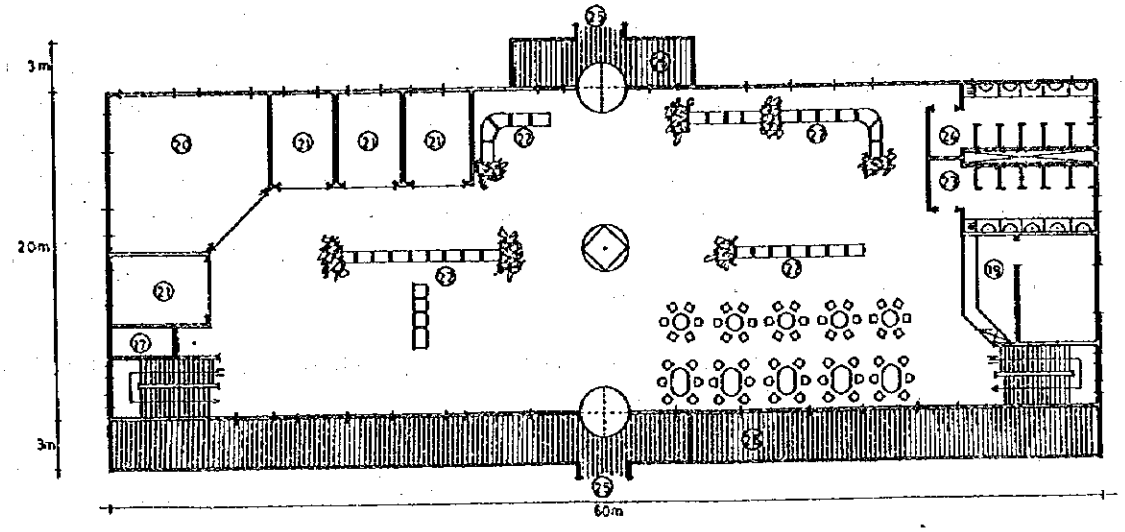
Small car park is planned for staff members, taxi and car. Bus park is for tourists. Passengers who visit downtown can access directly by very short walk.

1 – LUGGAGE CONV BELT
2 – LUGGAGE CHECK
3 – PASSENGERS HALL
4 – WEIGHING DEPART LUGGAGE
5 – CUSTOM OFFICE
6 – HALL
7 – IMMIGIRATION DIRECTOR
8 – ASS. IMMIGIRATION DIRECTOR
9 – IMMIGIRATION OFFICE
10 – BED ROOM
11 – CLINIC
12 – TICKETS OFFICE
13 – SECURITY OFFICE
14 – SECURITY CHIEF
15 – DUMP CHIEF
16 – DUMP
17 – ELEVATOR
18 – ENTRANCE – EXIT



FIRST FLOOR PLAN

19 – COFEE SHOP – SNAK
20 – FREE SHOP
21 – SHOP
22 – SEATS
23 – WC.M
24 – WC.W
25 – DEPARTURE TUNNEL
26 – BALCONY



SECOND FLOOR PLAN

15.5 Cargo Handling System

The cargo handling systems for container cargoes and grain are mentioned in 11.3 and 11.4 for the Master Plan and 15.3 and 15.4 for the Short-Term Plan. The basic trend of cargo handling system for each major commodity in future is already mentioned in 11.5. Therefore, in this chapter, the condition of cargo handling for conventional style break bulk cargo at the Short-Term Plan stage is mainly mentioned.

15.5.1 Cargo Handling System for Break Bulk Cargo

Modernization of cargo handling system at port is prompted by the following:

1. Shortage of facilities to meet the increasing cargo volume.

2. Worldwide trend of modernizing cargo transportation to reduce cargo handling cost at port and allow quick dispatch of calling vessels from port.

According to the cargo forecast, increase in the cargo handling volume at the Short-Term Plan stage will represent about half the total increase anticipated at the Master Plan stage of Latakia Port. Therefore, it is assumed that the existing major port facilities and equipment except those for handling containers and grains will be sufficient for the Short-Term Plan stage if old cargo handling equipment is replaced at the beginning of the Short-Term Plan stage and improvement of the actual cargo handling time (introduction of three shift system for cargo handling, namely, expansion of cargo handling time from 16 hours to 24 hours)is sought.

Therefore, the improvement of delivery/receiving system (abolishment of the direct delivery/receiving at quay side.) which is mentioned in 11.5 of chapter 11 will not be strongly promoted during the Short-Term Plan stage.

The grain handling capacity will be increased with construction of the new silo and through repairing the old silo and preparation of new loaders and unloaders at the request from the Syrian government. As to container cargo handling at the existing terminal in the New Port area(Terminal-1), additional cargo handling equipment including straddle carriers and top lifters, together with quay side container cranes, will be introduced during the Short Term Plan stage to complement the modernization of sea transportation.

Therefore, present condition of delivery/receiving system at Latakia Port will be continued in the Short-Term Plan stage.