Chapter 5 Present Condition of Tartous Port

5.1 Port Facilities

5.1.1 Port Limits

Port administration system of Tartous Port is the same as Latakia Port. (see Chapter 4.1.1)
The land area administrated by the Tartous Port Company between the basins and the existing shore line amounts to about 750,000 m^2; total available land area including piers is 1,100,000 m2. The total water area is 1,300,000 m^2. Almost half of Pier C is exclusively used by the military , and adjacent water area is also controlled by the military.

5.1.2 Infrastructures

(1) General

Tartous Port was planned as an all-weather deep-water port with breakwaters, approach channel, and turning basin for large ships as well as small ships.
The most important point to consider when planning the deep-water port is to avoid as far as in any way possible dredging in rock, due to the very high construction cost for such dredging. At Tartous Port, sufficient water depths in the different basins could be secured without costly dredging.
The rock surface in the basins and at the quays is furthermore sloping from east to west; i.e. from shore to sea; it is therefore natural to design the basins and quay walls with less depth at their eastern ends close to the shore than at their western and other ends.
The main direction of the piers and basins is chosen parallel to the sub-breakwater, mainly in order to obtain the most favorable conditions with regard to sheltering of the basins against wave penetration.
Tartous Port consists of Bulk Terminal, Pier A, Pier B, Pier C and inner area. Following the construction of breakwaters, phosphate pier and southern quays of Pier A were constructed until 1968. Tartous Port has since been developed in accordance with the increase of port cargo. Cargo handling volume of Tartous Port amounts to 3.5 million tons as of 1993.
Tartous Port was thus built as a larger Mediterranean port with very ample water depths and quay lengths for international shipping.

(2) Breakwater

Tartous Port is protected by two breakwaters, a main breakwater facing south and west and a sub-breakwater facing northwest. These breakwaters enclose an outer basin with sufficient area for water areas described below. Furthermore, the port contains deep-water quays, a dolphin pier for handling of phosphate, etc.

The main breakwater has a total length of 2,630 m, the sub-breakwater of 1,630 m. The main breakwater is carried about 540 m past the port entrance with the purpose of sheltering the ships navigating in the approach channel, and preventing heavy swells from penetrating into the port. As strong swells may attack ships in the approach channel sideways, this channel has an ample width, and the main breakwater affords good shelter, especially to ships navigating close to the port entrance.

(3) Water Areas

Approach channel having 200 m width and 14.5 m depth was constructed with a turning basin being 450m diameter and 13.5 m depth at the end of channel.
Along the main breakwater 10 mooring buoys are provided. The depth is minimum 11 m. Between four piers, four water basins are provided. Above water areas were dredged by using cutter suction dredger with delivery pipe. The total dredging volume amounted to 1.4 million cubic meters. These dredged materials were used for the reclamation of the port.
At the start of the Access channel, two light buoys are placed. The purpose of these buoys is only to mark the start of the access channel and ships can always pass with a enough distance from the buoys. A front leading light is set on the pier A.

(4) Pier A

Pier A has southern quays that stretch 800 m in length, northern quays of 906 m in length, and west quay of 160 m at the root of the pier.
The southern side of quay is used primarily for traditional ships and deals with all types of cargo. Pier A is equipped with quay cranes with tracks and sidings. Direct transfer ship-trucks/railway is carried out, which results in a lot of trucks and railway wagons on the quay apron congesting the whole quay. The railway tracks and the road access on the rear side of the transit sheds are seldomly used, which also adds to congestion on the quay apron.
On the northern side of Pier A, quays ranging from -12.0m to -4.0m are provided. The 240 m quay of -12.0m depth is used exclusively for the grain handling. Behind the quay, there are grain silos made of 36 cells of 2,800 cubic meters each with the total storage capacity of 80,000 tons of grain. The northern side and the end of Pier A is used for grain, break bulk cargoes like timber, iron, steel and bagged cargoes. On the Pier A, there are four transit sheds behind the southern quays, and two transit sheds behind the northern quays.

(5) Pier B

Pier B has southern quays of 890 m in length and northern quays of 540 m in length.
The southern quays of Pier B are mainly used for general cargo and the northern

quays are for unit load and Ro/Ro cargo. Southern side of the pier is paved by asphalt concrete and northern side by cement concrete. But, container cargo is not always handled at the northern quays. There is no shed on the pier, so, all spaces are being used as open storage areas except sidings at the center of the pier. Railway is seldom used. Additional open storage areas are available at the root of the pier. This open yard continues to container marshalling yard.
The Ro/Ro berths are provided on both sides of Pier B.

(6) Pier C

Pier C has southern quays of 660m in length including Ro/Ro berth for commercial use.
Pier C was planned to be used for unit load carriers and Ro/Ro ships originally. But, the western end of the pier (220 m in length) and the northern side of the pier are occupied by the military. The present commercial part of Pier C, i,e, the strip south of the present fence along the military zone, is only about 18,000m^2 with 66 m width, and this width is very small for the container terminal. Consequently, a main container terminal with the marshaling yard is located at the root of the pier instead of the rear part of the quay. At present, Pier C handles break bulk cargoes like timber, iron, steel and cars which do not require closed storage space as well as container.
CFS having the area of 15.120 square meters was constructed at the eastern part of the port next to the marshaling yard.

(7) Bulk Terminal

There are silos for phosphate which are made of 22 cells of 3,170 cubic meters each with the total storage capacity of 90,000 tons of phosphate. The silos can receive from trucks or rail wagons. Two conveyor belts are connected between the silos and dolphin type quays. Unloaders are equipped along the quays. The present capacity is 10,000 tons per day with the doubling the capacity by installing an extra conveyor belts, etc. and using both sides of the dolphin pier, and by constructing the other half of the silo unit. Before this extension was made, the northern side of the dolphin pier was used for other bulk commodities.
Adjacent to the phosphate terminal, sulphur quay of 250m in length and -11.0 m in depth was constructed. But, it is not used and the planned open yard behind the quay is not paved yet.

(8) Warehouses

At the inland area, next to container yard, there are 5 warehouses. Another 3 warehouses are now under construction. These warehouses are each 168m x 30m having the same structural type of precast concrete blocks wall with prefabricated concrete roof. There is sufficient space around the warehouses. Next to warehouses, agricultural quarantine was built.

(9) Siding

Railways between Tartous and Lattakia (80 km), and between Tartous and Homs (55 km) are available. The main shunting yard for the port of Tartous is located at the central station in Tartous. A subsidiary shunting yard is provided in the eastern part of the port and tracks are laid to Bulk Terminal, Pier A, Pier B and Pier C. on the quay apron and behind the sheds.

(10) Road

A main access road is running almost parallel to the shore line. From this road, inner port roads are leading to all piers. This main access road is connected with the hinterland through the town of Tartous by four-lane road.

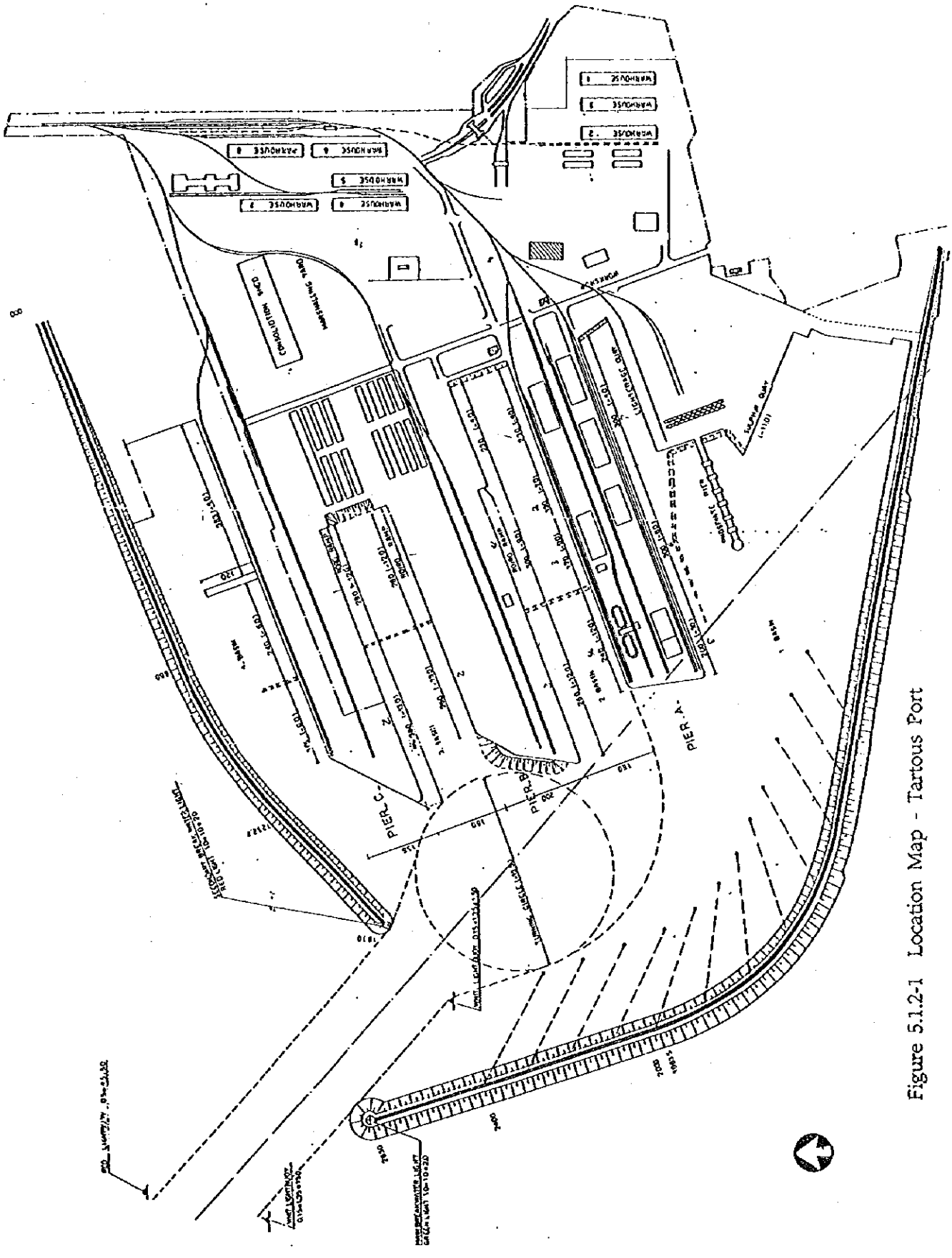


Figure 5.1.2-1 Location Map - Tartous Port

Table 5.1.2-1 Main Port Facilities
Tartous Port

Area	Facilities	Dimension	Structural Type	Design, Supervision	Construction	Year of Const.
	Main Breakwater	2,630m, Max.-11.0m	Rubble mound	Denmark KAMPSAX	Yugoslavia	1965
	Sub-Breakwater	1,630m, Max.-11.0m	Rubble mound	Denmark	Yugoslavia	1965
	Approach Channel	W200m, -14.5m		Denmark	Italy	1966
	Turning Basin	D450m, -13.5m		Denmark	Italy	1966
Bulk Terminal	Phosphate Pier	269m, -11.0m	Concrete pillars with pre-packed concrete foundation	Denmark	Many countries including Syria	1968
	Lighterage Quay	300m, - 4.0m	Concrete block	Denmark	ditto	1982
	Sulphur Quay	250m, -11.0m	Concrete block	Denmark	ditto	1982
Pier A	South Quay	200m, -10.5m	Concrete block	Denmark	ditto	1966
	South Quay	300m, - 8.0m	Concrete block	Denmark	ditto	1966
	South Quay	300m, - 4.0m	Concrete block	Denmark	ditto	1966
	West Quay	160m, -10.5m	Concrete block	Denmark	ditto	1978
	North Quay for grain	240m, -12.0m	Concrete block	Denmark	ditto	1978
	North Quay	170m, - 9.0m	Concrete block	Denmark	ditto	1978
	North Quay	130m, - 7.0m	Concrete block	Denmark	ditto	1978
	North Quay	230m, - 4.0m	Concrete block	Denmark	ditto	1978
	West Quay	160m, -10.5m	Concrete block	Denmark	ditto	1978
Pier B	South Quay	360m, -12.0m	Concrete block	Denmark	ditto	1980
	South Quay for Ro/Ro	300m, - 9.0m	Concrete block	Denmark	ditto	1980
	South Quay	230m, - 4.0m	Concrete block	Denmark	ditto	1980
	North Quay	260m, -13.0m	Concrete block	Denmark	ditto	1980
	North Quay for Ro/Ro	280m, -12.0m	Concrete block	Denmark	ditto	1980
Pier C	South Quay	380m, -13.0m	Concrete block	Denmark	ditto	1982
	South Quay for Ro/Ro	280m, -12.0m	Concrete block	Denmark	ditto	1982

Table 5.1.2-2 Buildings, Yard
Tartous Port

Port Area	Facilities	Location	Dimension	Structural Type	Year of Const.
Bulk Terminal	Silos for phosphate	Behind Dolphin	70,000m3, 90,000t D11.6mxH30mx 22cells	Reinforced concrete	1975
	Open Yard for sulphur	Behind Sulphur Quay	20,000m^2	Unpaved	1982
Pier A	Transit Shed	Behind South Quay -10.5m	9400m2, 3stories	Concrete blocjk with fabricated roof	1969
	Transit Shed	Behind South Quay -8.0m	9000m2, 3stories	ditto	1969
	Transit Shed	Behind South Quay -4.0m	100mx40m	ditto	1969
	Transit Shed	Behind South Quay -4.0m	100mx40m	ditto	1969
	Silos for grain	Behind North Quay -12.0m	100,000m3,77,000t D8.9mxH45mx 36cells	Reinforced concrete	1978
	Transit Shed	Behind North Quay -9.0m	100mx40m	Concrete blocjk with fabricated roof	1990
	Transit Shed	Behind North Quay -4.0m	100mx40m	ditto	1990
	Open Yard	Behind South Quay	19,200m^2	Asphalt concrete paved	1980
	Open Yard	Behind North Quay	17,900m^2	Portland cement concrete paved	1980
	Open Yard	Behind West Quay	53,700m^2	ditto	1980
Pier B	Open Yard	Behind South Quay	30,500m^2	Asphalt concrete paved	1982
	Open Yard	Behind North Quay	13,400m^2	Portland cement concrete paved	1982
	Ro/Ro Marshaling Yard	Next to North Quay	17,400m^2	ditto	1982
Pier C	Open Yard	Behind South Quay	30,000m^2	ditto	1982
	Container Yard	Next to South Quay	118,000m^2	ditto	1982
	CFS	Next to Container Yard	250mx60m	Concrete block one-story building with prefabricated roof	1982
Inland	Warehouse 1	Inland area	168mx30m	Reinforced concrete	1997
	Warehouse 2	ditto	168mx30m	ditto	1997
	Warehouse 3	ditto	168mx30m	ditto	1997
	Warehouse 4	ditto	168mx30m	ditto	1992
	Warehouse 5	ditto	168mx30m	ditto	1992
	Warehouse 6	ditto	168mx30m	ditto	1992
	Warehouse 7	ditto	168mx30m	ditto	1994
	Warehouse 8	ditto	168mx30m	ditto	1992

Note: Dimensions include the estimation by the study team.

5.1.3 Cargo Handling Equipment

(1) Cargo Handling Equipment

1) Existing Cargo Handling Equipment

Most of the general cargoes handled at the port are not yet palletized. At pier A, the general cargoes are loaded/unloaded on to/from ship by rail mounted portal jib cranes installed on the quay side or by a combination of the jib cranes and ship gears.
On the other hand, on the quay side of piers B and C, where there are no rail mounted cranes, the cargoes are handled by the mobile cranes of tower type/ordinary type, ship gears or their combination.
Containers are loaded /unloaded onto/from a container ship or a general cargoes vessel by their own gears or the floating cranes with 100 t capacity possessed by the port company. In case of Ro/Ro vessels, containers are brought out /into the vessels by forklift trucks directly or by combination of tractor-trailers and forklift trucks which are operational on the Ro/Ro vessels decks.
Grains are unloaded/loaded from/onto grain carriers at the grain terminal located at the west end on the northern side of pier A. The terminal is equipped with ship unloader/loaders specialized for grains connected with the silos behind the quay.
Those upper structures of the grain terminal belong to the Ministry of Food Supply (see Paragraph (6))
Phosphate is handled at the phosphate terminal located at the south of the port. The terminal has ship loaders connected with silos behind the pier.
Those upper structure of the phosphate terminal belong to the General Company of phosphate under the Ministry of Petroleum and Mineral Resources (see Paragraph (5)).
The main cargo handling equipment possessed by the port company excluding the equipment of the grain and phosphate terminals are as follows (see Table 5.1.3-1):

A. Quay side cranes (portal jib crane)

Ten(10) portal jib cranes and seven(7) portal jib cranes are installed at berth 14 and 12 respectively. They are very old with their average age exceeding 22 years. Some of them are in poor condition. The main dimensions of each portal jib crane are the same except lifting capacity and are as follows:
Capacity: 6t and 3t x 25m, Rail gauge: 5.6m, Lifting height: 20m, Length of the captire cable for crane traveling: 40m, Distance from sea side rail to front of quay: 1.78m.

B. Floating cranes

There is no quay-side crane for containers. Two(2) large floating cranes are used

for container handling for a container ship without her own gears or cranes.

C. Tire-mounted equipment

a. Mobile tower cranes
Nine(9) units of large-sized mobile tower cranes are possessed by the port. Since there are no quay side cranes on pier B, they are mainly used to ease ship handling.

Table 5.1.3-1 Cargo Handling Equipment at Tartous Port

Type & Name	Capacity	Procured Year	No. of			Location	Remarks
			Total	Avail-able	Non-Avail.		
Floting Crane	100t	1971	1	1			acce Hungary
	32t	1976	1	1			acce Hungary
Portal Jib crane	6t	1973	4	4		No.14 3,4,7,8	acce Takraff
	6t	1977	2	2		No.12 2,4	acce Hungary
	3t	1968	3	3		No.14 1,3,9	bad Italian
	3t	1973	8	8		No.14 5,6,10	acce Takreff
						No.12 1,3,5,6,7	
Mobile crane	75t	1975	2	2			acce P & H
	25t	1988	3	0	3		bad & Slow
	15t	1977	25	25			acce P.P.M
	15t	1980	2	2			acce P.P.M
	12t	1973	8	0	8		bad rechier
	12t	1975	9	3	6		bad rechier
	12t	1975	16	16			acce P&H riso
Mobile Tower	40t	1981	2	2		No. 9 (- 12)	acce
crane	27t	1980	3	3			acce
	20t	1981	4	4			acce
Straddle Carrier	35t	1980	3	3			acce
Fork-lift	35t	1980	2	2			less than acce
	32t	1991	1	1			good Kalnar
	10t	1991	3	3			good Kalnar
	8t	1980	2	2			acce Climax
	6t	1980	6	6			acce Mitsubishi
	3t	1977	12	12			
	3t	1980	32	32			
	1.5t	1980	5	5			
Twing Tractor	40t	1977	2	2			acce
	40t	1981	4	4			acce Plan
	40t	1991	3	3			good Otawa
Dump Truck	12t	1975	10	10			less than acce
	12t	1977	8	8			acce Volvo
	8t	1975	9	9			Less than acce
	6t	1968	1	1			bad
Pnewmatic	125 t/h	1991	6	6			good

Remarks: Acce=Acceptable

b. Mobile cranes

At open yards, general cargoes are handled mainly by mobile cranes. On the quay side, the mobile cranes are partly used for loading/unloading general cargoes onto/from a vessel.

There are sixty-five mobile cranes at present, which seems to be too many considering the present volume of the port cargo, though the cranes are very old.

c. Straddle carriers

Three(3) straddle carriers are used at the container yard.

d. Large-sized and middle-sized forklift trucks

Three(3) large-sized forklift trucks (32t、36t)are used for handling full containers and heavy general cargo at aprons and open yards and eleven(11) middle-sized (6t、10t) forklift trucks are used for handling empty containers and general cargo at open yards, in transit sheds and warehouses.

e. Small-Sized forklift trucks

Forty-nine(49) small-sized forklift trucks are used within the port.

2) Working Hours of the Existing Cargo Handling Equipment

The records of the actual working hours in 1994 of the existing tire-mounted cargo handling equipment at the port are as Table 5.1.3-3 and that of portal jib cranes are as per Table 5.1.3-2.

Table 5.1.3-2 Working Hours of the Portal Jib Crane at Tartous Port

No. of	Location	Working Hours													
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Broken
1	No. 14	223	157	252	320	279	338	277	277	246	108	122	32	2.631	272
2	"	234	143	231	321	274	356	224		84	206	253	216	2.542	464
3	"														all years
4	"	246	146	136	336	168	340	332	43					1.747	2.448
5	"		246	384	248	264	166	155	303	302	224	240	205	2.737	544
6	"	237	237	244	402	288	387	127	367	232	343	157	161	3.232	
7	"	282	198	53	83	344	296	225	291	313	333	279	212	2.909	924
8	" -10	249	290	314	198	295	322	212	342	327	346	281	281	3.527	292
9	" -10	195	218	272	376	192	32	72	277	136	205	216	60	2.251	1872
10	" -10	207	160	360	397	289	401	238	341	120	209	209	140	3.071	
1	No 12	241	324	287	148	294	296	168	262	185	287	209	205	2.906	
2	"	220	329	170	294	192	331	184	334	285	150	184	163	2.834	
3	"	210		28	273	108	88				272	233	136	1.348	2700
4	"	204	278	254	303	239	305	247	365	280	345	269	257	3.346	50
5	" -9	185		131	125	32	255	221	232	176	278	101		1.736	1776
6	" -9	284	293	325	326	226	264	230	235	296	280	287	246	3.292	
7	" -9	135	277	325	368	298	224	187	272	324	209	304	214	3.137	288

Remarks: Broken-down for one working day is 16 hours.

Table 5.1.3-3 Working Hours of the Tire-Mounted Cargo Handling Equipment

Type & Name		Capacity	Procured Year	Working (Hours)	Stay in Maintenance	Remaks
Mobile crane	1	75	1975	246	99 (Day)	P & H
	2	75	1975	517	100	
	1	15	1977	596	31	P.P.M
	2	15	"	654	71	
	3	15	"	73	79	
	4	15	"	596	53	
	5	15	"	630	44	
	6	15	"	387	36	
	7	15	"	43	87	
	8	15	"	848	30	
	9	15	"	689	11	
	10	15	"	181	7	
	11	15	"	564	60	
	12	15	"	642	36	
	13	15	"	623	22	
	14	15	"	237	58	
	15	15	"	444	72	
	16	15	"	513	61	
	17	15	"	594	49	
	18	15	"	371	22	
	19	15	"	441	50	
	20	15	"	443	69	
	21	15	"	612	50	
	22	15	"	399	40	
	23	15	"	204	17	
	24	15	"	632	46	No. 27 is not used for
	25	15	"	811	21	cargo handling
	26	15	1980	577	33	
	1	12	1975	528	63	PH R 150
	2	12	"	553	31	
	3	12	"	333	102	
	4	12	"	854	53	
	5	12	"	3	4	
	6	12	"	60	16	
	9	12	"	371	39	
	10	12	"	622	27	
	12	12	"		205	
	13	12	"	493	57	
	14	12	"	5	3	
	15	12	"	487	103	
	16	12	"	342	52	
	17	12	1975	248	135	
	18	12	"	740	17	
	20	12	"	334	44	
	5	12	"	77	20	RECHER
	13	12	"	33	46	
	19	12	"	364	46	
Mobile tower	6	40	1981	385	15	COLES

Type & Name	Capacity	Procured Year	Working (Hours)	Stay in Maintenance	Remaks
Mobil tower crane 7	40	1981	100	80	
3	27	1980	1,730	20	DEMANG
4	27	"	2,091	20	
5	27	"	1,369	20	
8	20	1981	1,500	31	
9	20	"	2,366	41	
10	20	"	1,795	62	
11	20	"	1,763	40	
Stradlle 1	35	1980	2,129	160	
Crane 2	35	"	1,481	370	It is shown in hours
3	35	"	2,055	80	
Fork-Lift 1	35	"	264	210	
2	35	"	198	240	
4	32	1991	2316	160	KALNAX
5	10	"	2586	80	"
6	10	"	2072	230	
7	10	"	2557	48	
1	8	1980	204	215	"
2	8	"	320	154	"
3	1.5 、6	1977 、80	478	22	MHI
4			378	20	
5			232	103	
7			938	5	
9			92	140	
10			500	32	
11			930	30	
13			373	94	
14			860	23	
15				210	
16			79	27	
17			25	11	
18			280	113	
20			642	40	
21			720	40	
22			800	49	
23			134	27	
24			387	15	
25	"1.5 、6t	1977 、80	426	28	MHI
26	"		574	16	
27	"		464	135	
28	"		596	78	
29	"		15	150	
30	"		36	2	
31	"		693		
34	"		569	25	
35	"		956	27	
36	"		847	29	
37	"		491	111	
38	"		89	130	
39	"		558	15	

Type & Name		Capacity	Procured Year	Working (Hours)	Stay in Maintenance	Remaks
Fork-Lift	40	"		569	54	
	41	"		789	58	
	42	"		278	70	
	43	"		240	39	
	44	"		107	95	
	47	"		517	99	
	49	"		677	24	
	50	"		763	74	
	51	"		431	40	
	52	"		549	23	
	53	"		631	45	
	54	"		132	138	
	55	"		529	60	
	56	"		106	35	
	57	"		107	5	
	58	"		1686	24	
	60	"		26	157	
	61	"		562	11	
Towing tractor	1	40	1981	2418	60	
	2	"	"	2124	48	
	3	"	"	2060	70	
	4	"	"	2318	160	
	5	"	"	2089	90	
	6	"	"	2351	50	
	7	"	"	1957	180	
	8	"	1977	2691	30	
	9	"	"	2827	28	
Dump Trucks		8 ~ 12t	1975	14662	1056	Total 26 units
Pnewmatic		125t /h	1981	563.9	40.6	6 units

From the records in 1994, it can be said that the cargo handling equipment with larger lifting capacity was used for longer periods than smaller equipment. In this sense, container handling equipment with larger lifting capacity seems to be in short supply while the equipment for handling conventional cargoes seems to be ample.

3) Procurement Plan and Disposal Plan

There is a procurement plan at the port. The five-year procurement plan is as per Table 5.1.3-4. However the actual procurement is controlled by the budget.
There is no disposal plan at the port and the procedure for disposal is very severe. Requests for disposal of equipment are examined by the disposal committee consisting of at least five(5) members who belong to financial department, operation department and maintenance department. After approval, the disposal plan is carried out. As a result of such a complicated procedure, a lot of equipment is found at the port.
Although the service life table of the cargo handling equipment of the port is not

available, the service lives of the equipment can be estimated by using "Table of Depreciation". The estimated figures are in the range from eight(8) to ten(10) years corresponding to the depreciation from 12.5% to 10% per annum.

Table 5.1.3-4 The 7th 5year Plan (1991-1995) for Machinery at Tartous Port

Item	Capacity	Total	Procured	Under procedure
Portal Jib Cranes	16t	4	0	0
Portal Jib Cranes	6t	20	0	0
Container Cranes		4	0	2
Mobile Tower Cranes	20t	4	0	4
Mobile Cranes	35t	2	0	0
Mobile Cranes	15t	20	0	0
Truck crane for power supply mainte		1	0	0
Gantry crane for yard stacking		1	0	0
Straddle Carriers		2	0	2
Fork lift trucks	32t	1	0	0
Fork lift trucks	10t	10	0	5
Fork lift trucks	3.0t	5	0	5
Fork lift trucks	1.5t	5	0	5
Trailers 10 units with tractors		13	0	0
Towing tractors	40	7	0	5
Trailers and trucks		4	0	0
Railway wagon scales		2	1	1
Truck scale		6	0	1
Dump trucks	12-15t	10	0	0
Auto-Sweepers		5	0	0
Micro bus		3	0	0
Bus		3	0	0
Pick up		10	0	0
Ambulance		1	0	0
Car		1	0	0
Compute system (central one)		1	0	1
Power station	5 MW	1	0	0
Power transformer station	66KV	1	0	0
Grab buckets	8-10t	4	0	0
Tug boat	2000ps	1	0	1
Tug bort	700ps	1	0	1
General service bort		1	0	0
Water supply barge (self-propelled)	200-250t	1	0	0
Garbage barge (self-propelled)	150t	1	0	0
Industrial tractors		20	0	0
Dust collector		1	1	0
VHF		1	0	1

(2) Maintenance/maintenance shops

1) Maintenance system

According to the interview, preventive maintenance system has been introduced and it is carried out according to the manufacturer's manual. Some equipment ,however, has been left in unworkable condition without repair for a long period. It seems to be very difficult to keep all equipment in good condition because most equipment is too old.
The organization for maintenance is divided into four departments (Land Machinery Dept, Electric Dept, Fabrication Dept and Sea Machinery Dept)

2) Maintenance Cost

The maintenance cost of all equipment including floating cranes, tug boats and pilot boats are shown in Table 5.1.3-5. It is ,however, difficult to identify the cost for cargo handling equipment only.

Table 5.1.3-5 Maintenance Cost for Cargo Handling Equipment at Tartous Port

Units 1,000 S.P

	1991	1992	1993
Spare parts Cost	16,000	18,200	19,800
Personel Cost	20,000	26,200	27,800
Out-side Ordered Cost	1,900	2,000	3,000
Total	37,900	46,400	50,000

Remarks 1. The cost for port floating cranes ,tug boats and pilot boats maintenance is included
2. The cost for power units maintenance is excluded
3. The cost for bus, car and etc is excluded.

3) Maintenance Shops

The port has many maintenance shops belonging to each department. 34 engineers and 283 workers work in the maintenance shops. The organization chart is shown in Fig 5.1.3-1. The total floor area of the maintenance shops is about 1000 sq m and main machines in each maintenance shops are as per Table 5.1.3-4. The working hours in the shops is 07.00、15.00 with over time of 2、4 hours.The personnel in charge of container and/or Ro/Ro handling remain if cargo handling operations continue beyond the official working hours.

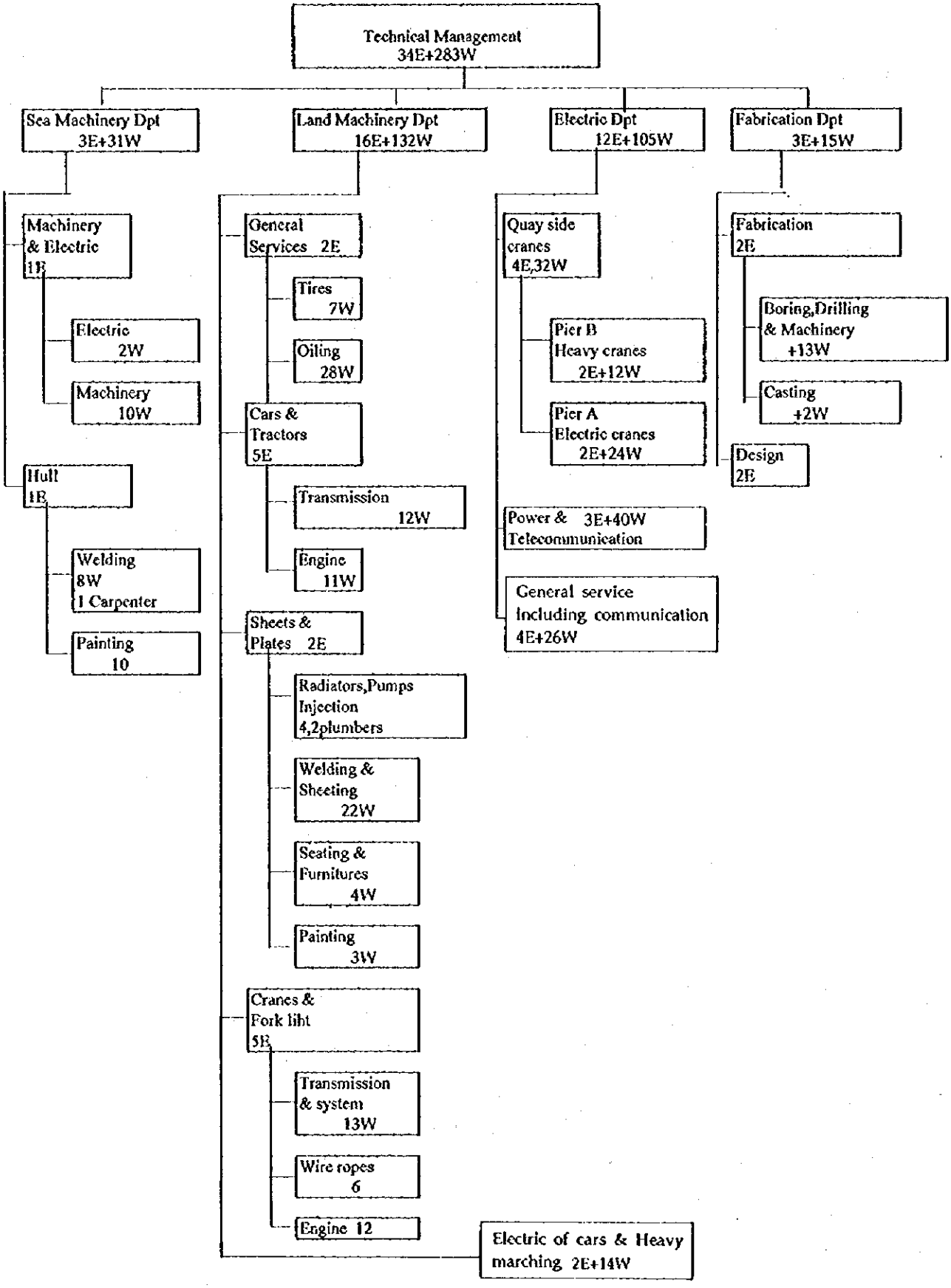


Figure 5.1.3-1 Organization Chart of Maintenance for Port Equipment at Tartous Port

Table 5.1.3-6 List of main machinery in the maintenance shops at the Tartous Port

Lathes	6 units	Milling Machine	1 unit
Electric Welders	7 units	Radial Drilling Machine	1 unit
Oxygen Welders	2 units	Gas Cutting Apparatus	1 unit
Air Compressors	2 units	Battery Chargers	2 units
Plate Cutter	2 units	Electric Drills	4 units
Air Drill	1 unit	Hydraulic Press	1 unit
Dynamo-meter	1 unit	Portable Diesel Welder	1 unit
Others	1 Set		

(3) Spare parts

1) Procedure for spare parts procurement

The procurement of spare parts is done by the financial department and then procured spare parts are delivered to the maintenance department (ticket system) The kind of items and quantity of spare parts to be kept are decided based on experience. According to interviews ,about 45,000 items are stored in spare parts stores at present. A computer system for spare parts management has not been introduced yet and they are managed by card system. If the delivery term of the spare parts ordered to outside is longer than the requested term, the spare parts could be made in the maintenance shops.

2) Spare parts storages

The spare parts are kept in two storages by equipment type and by parts number. New big spare parts storage is under construction.

(4) Garage/Parking Lots for the Cargo Handling Equipment

Large garage (approx. 14,000 sq m) for cargo handling equipment is located nearby the port gate and lot of equipment both is available and unavailable for work is parked at the garage.

(5) Phosphate Terminal

Outline of the terminal is as follows: (from the interview to the phosphate company)

Nature of the phosphate

Bulk density 1.5, Grain size 0~2mm less than 95% 2~5 mm 5%
Angle of repose 20~45(?)

Silo capacity 90.000 ton, Number of silo bins 22

Receiving system from land side and their capacity

Opening the bottom door, the phosphate on the wagon (50t) is dumped to under-ground hopper(s) and it is transported to top of the silo bins by belt conveyors (450 t/h x 2 lines) and stored in each bin by belt conveyor with tripper car.

Loading system to ship

The phosphate which is discharged from silo bins is loaded on to ship via belt conveyors and ship loaders.

Dust control

A dust control system with dust collectors was installed at the terminal in consideration of the dust problem. But phosphate dust is still emitted due to insufficient know-how for dust control at the design stage and consequent incomplete system.

(6) Grain terminal

Outline of the terminal is as follows: (based on interview at the terminal)

Productivity

8,000t/d

Number of silo bins

Large (1,900~2,000t) 36 bins and Small 40 bins

Loading /receiving system to/from wagons and trucks

Underground pits and three(3) lines (240t/h, 120t/h x 2lines) are installed for receiving from wagons and tucks and two(2) lines (240t/h x 2) are installed to loading to wagons and trucks.

Loading/unloading system to /from ship

Two(2) lines and two(2) loader/unloader are installed for loading to ship and unloading from ship and their capacity (except unloader) is 240t/h each. Each unloader has two(2) suction nozzles for pneumatic system and their capacity is 120t/h.

Others

All transportation in the terminal is carried out via vertical elevators and horizontal chain conveyors and all lines (except chain conveyor for ship loader/unloader) are closed lines system. Bypass line (via 150 buffer tank) and recycle line and required silo bins control facilities (including weighing system) are installed.

5.2 Port Activities

5.2.1 Cargo/Passenger Traffic

(1) Cargo Traffic

1) Outline of Cargo Traffic

Trends of Export, Import and Transit Cargo Volume are shown in Table 5.2.1-1, Figure 5.2.1-1.

The share of bulk cargo volume in the total cargo volume handled of Tartous Port is high compared with that of Latakia Port.
The total cargo volume has fluctuated in line with the growth or stagnation of the Syrian economy, the activity of export industries and relations with surrounding countries.

In the first half of the 1980s, handling cargo volume decreased sharply due to the stagnation of the Syrian economy except for a lot of grain imports in 1984 due to a poor harvest. Since then, import cargo volume has increased steadily along with the recovery of the Syrian economy while export cargo volume has been influenced by the activities of phosphate and cement industry and has decreased since 1989.

Transit cargo volume increased slightly in the latter half of the 1980s and has not shown a remarkable change since.

Trends of Export/Import Cargo by main commodities are shown in Table 5.2.1-2, Table 5.2.1-3 and Figure 5.2.1-2.

Major cargoes among export commodities are phosphate rock and cement & clinker. Handling volume of phosphate rock had increased until 1988 but then decreased until 1993 due to the economic confusion that reigned in East European countries. In the last decade, exports of cement & clinker began to rise from 1988 but have deceased since 1990 when the peak handling volume was recorded due to an increase in domestic consumption. Most other export cargoes are grain, foodstuffs and textiles like those of Latakia Port.

Major cargoes among import commodities are grain, iron & steel, fertilizer & chemicals, foodstuffs and sugar. Import volume of grain has fluctuated sharply due to alternating the poor and rich harvests. Roughly speaking, handling volume of these major cargoes except for grain has increased since the middle of the 1980s.

Table 5.2.1-1 Trend of Export, Import and Transit Cargo Volume in Tartous Port

(Unit : thousand ton)

	Export	Import	Total	Transit	Toatl
1974	330	875	1,204	118	1,322
1975	515	1,225	1,741	225	1,966
1976	646	1,838	2,485	396	2,881
1977	1,067	2,235	3,301	208	3,509
1978	1,052	2,018	3,070	362	3,432
1979	1,519	3,344	4,863	917	5,780
1980	1,029	3,646	4,676	860	5,536
1981	1,015	3,569	4,584	892	5,476
1982	990	2,321	3,311	538	3,849
1983	1,111	2,221	3,332	221	3,553
1984	965	3,297	4,263	494	4,757
1985	1,282	2,427	3,709	158	3,867
1986	1,398	1,739	3,137	64	3,201
1987	1,586	1,743	3,329	79	3,408
1988	1,972	1,779	3,751	73	3,824
1989	2,295	2,184	4,479	57	4,536
1990	2,072	2,397	4,469	90	4,559
1991	1,578	2,558	4,137	116	4,253
1992	1,334	2,160	3,494	117	3,611
1993	833	2,655	3,488	113	3,601
1994	899	2,649	3,548	115	3,663

Data: General Company of Tartous Port

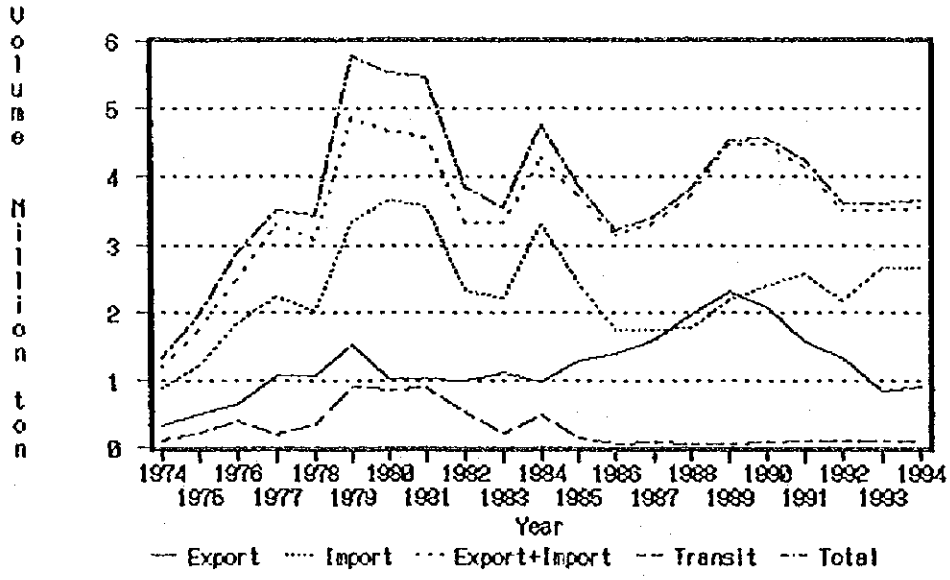


Figure 5.2.1-1 Trend of Cargo Handling Volume in Tartous Port

Table 5.2.1-2 Trend of Export Cargoes by Main Commodity Categories

(Unit: thousand ton)

Commodity \ Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Grain	0	0	0	0	0	0	0	0	0	0	57
Phosphate	857	887	1265	1534	1824	1634	1257	1103	926	607	777
Coal	0	233	17	0	0	0	8	6	2	0	0
Cement	0	0	0	0	71	56	90	21	0	0	0
Clinker	0	0	0	0	0	534	679	392	357	115	0
Petroleum Residues	0	36	2	0	2	0	0	0	0	0	0
Orange	0	0	0	0	0	0	1	3	0	0	0
Cotton & Textiles	4	2	5	6	7	8	4	5	5	11	18
Foodstuff	12	29	67	2	38	52	10	19	21	71	7
Machine & Equipment	5	2	4	6	10	2	2	1	0	0	3
Vehicles & Trailer	0	0	2	2	2	0	0	0	0	0	1
Empty Containers	3	9	4	3	4	3	2	8	20	20	21
Empty Trucks	54	42	9	10	1	0	0	0	0	0	0
Others	31	42	24	23	14	7	18	20	4	9	15
Export Total	965	1282	1398	1586	1972	2295	2072	1578	1334	833	899

Data: General Company of Tartous Port

Table 5.2.1-3 Trend of Import Cargoes by Main Commodity Categories

(Unit: thousand ton)

Commodity \ Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Grain	1343	603	656	661	602	1040	1143	1226	358	101	0
Maize & Feed	0	0	0	0	0	0	0	0	0	363	294
Sub-total	1343	603	656	661	602	1040	1143	1226	358	464	294
Iron & Steel	543	578	335	221	247	231	220	335	298	641	784
Cement	1	1	1	1	11	6	2	8	5	6	7
Rice	2	93	97	95	1	0	19	16	34	23	32
Sugar	204	217	172	213	207	213	204	230	181	205	341
Foodstuff	422	331	55	60	96	205	333	84	392	413	385
Wood & Wooden Products	166	103	116	54	62	76	69	82	121	155	141
Fiber & Textiles	87	2	0	0	121	92	0	0	0	0	0
Paper	60	24	19	12	15	13	10	26	16	15	16
Tiles & Marbles	8	11	6	3	9	1	4	0	0	0	0
fertilizer & Chemicals	108	156	104	265	315	229	309	447	539	506	312
Vehicles	36	26	15	17	2	0	3	8	39	38	43
Machine & Equipment	148	139	89	83	51	35	37	41	48	102	185
Others	169	143	74	58	39	45	44	57	131	88	108
Sub-total	1954	1824	1083	1082	1177	1144	1254	1333	1802	2192	2355
Import Total	3297	2427	1739	1743	1779	2184	2397	2558	2160	2655	2649

Data: General Company of Tartous Port

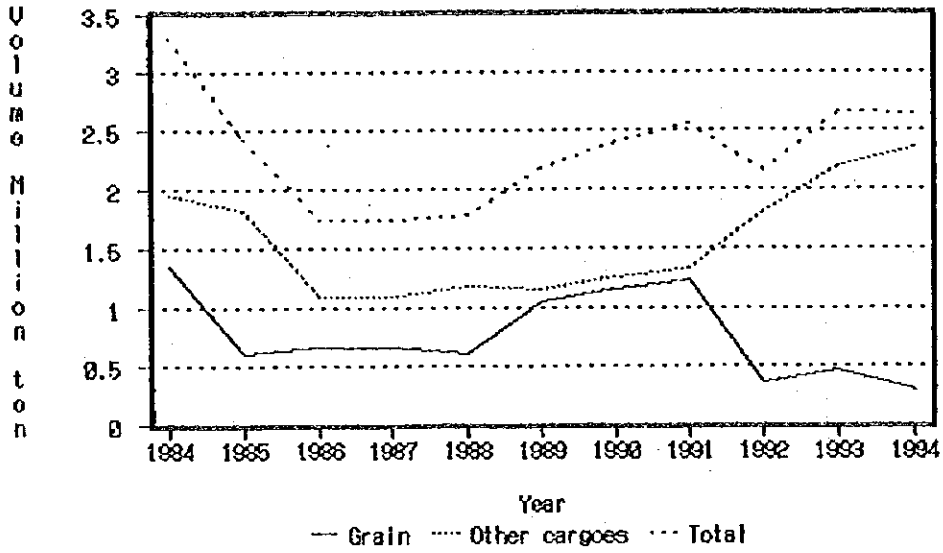


Figure 5.2.1-2 Trend of Import Cargoes in Tartous Port

2) Container Cargo

Container cargo volume and percentage of containerization are shown in Table 5.2.1-4.

Major container cargoes among export commodities are cotton & textiles and foodstuffs like those of Latakia Port. The percentage of containerization in cotton & textiles reached 85% in 1994 and in other containerizable cargoes ranged from 30% to 40% while the share of containerized cargoes in the volume of containerizable cargoes was 54% in 1994.

As for the import, major container cargoes are foodstuffs and machine & equipment. The percentage of containerization of each containerizable cargo has been lower than that of export cargoes about 10% to 30%, while the shares of containerized cargoes in the volume of containerizable cargoes was 12% in 1994.

Numbers of container by size, numbers of empty/laden container and volume per TEU are shown in Table 5.2.1-5, Table 5.2.1-6 respectively.

The share of 40 foot containers was 29% of the total box number in 1994 and slightly lower than that of Latakia Port. The share of empty containers was about 2% in the import and about 82% in the export of 1994.

Table 5.2.1-4 Container Cargo Volume and Shore of Container by Commodities in Tartous Port

(1) Export (Unit : ton, %)

Items / Commodities \ Year	Container Cargo Volume 1993	Container Cargo Volume 1994	Total Cargo Volume 1993	Total Cargo Volume 1994	Share of Container 1993	Share of Container 1994
Cotton & Textiles	10,165	15,150	11,317	17,777	89.8	85.2
Foodstuff	5,797	2,929	70,596	6,690	8.2	43.8
Machine & Equipments	28	1,108	135	3,373	20.7	32.8
Others	3,306	4,096	9,141	15,088	36.2	27.1
Containerizable cargoes Total	19,296	23,283	91,189	42,928	21.2	54.2
Grain	0	0	0	57,161	0.0	0.0
Phosphate	0	0	606,543	776,727	0.0	0.0
Clinker	0	0	114,830	0	0.0	0.0
Vehicles & Trailer	56	18	440	820	12.7	2.2
Empty Container	0	0	19,888	20,886	0.0	0.0
Empty Truck	0	0	8	0	0.0	0.0
Grand Total	19,352	23,301	832,898	898,522	2.3	2.6

Data: General Company of Tartous Port

(2) Import (Unit : ton, %)

Items / Commodities \ Year	Container Cargo Volume 1993	Container Cargo Volume 1994	Total Cargo Volume 1993	Total Cargo Volume 1994	Share of Container 1993	Share of Container 1994
Sugar	22,887	9,688	205,251	341,379	11.2	2.8
Foodstuff	41,487	45,620	413,251	385,007	10.0	11.8
Paper	3,534	3,100	14,891	16,003	23.7	19.4
Machine & Equipments	49,251	37,254	101,749	185,284	48.4	20.1
Others	25,768	29,723	87,769	108,261	29.4	27.5
Containerizable cargoes Total	142,927	125,385	822,911	1,035,934	17.4	12.1
Grain	946	1,525	463,711	294,087	0.2	0.5
Iron & Steel	1,124	2,301	640,575	784,232	0.2	0.3
Cement	21	36	6,049	6,984	0.3	0.5
Rice	0	494	22,601	32,393	0.0	1.5
Wood & Wooden Products	1,147	723	155,366	140,736	0.7	0.5
Fiber & Textiles	4,207	2,364	0	0	-	-
Tiles & Marbles	0	147	0	0	-	-
Fertilizer & Chemicals	7,389	13,437	506,485	311,985	1.5	4.3
Vehicles	241	112	37,586	42,840	0.6	0.3
Total	158,002	146,524	2,655,284	2,649,191	6.0	5.5

Data: General Company of Tartous Port

Table 5.2.1-5 Number of Container Handled in Tartous Port

		1993			1994		
		Export	Import	Total	Export	Import	Total
Laden Container	20foot(box)	1,140	6,509	7,649	1,052	5,765	6,817
	40foot(box)	254	2,051	2,305	508	2,822	3,330
	Total(TEU)	1,648	10,611	12,259	2,068	11,409	13,477
Empty Container	20foot(box)	6,214	444	6,658	5,775	130	5,905
	40foot(box)	1,410	32	1,442	1,955	37	1,992
	Total(TEU)	9,034	508	9,542	9,685	204	9,889
Total	20foot(box)	7,354	6,953	14,307	6,827	5,895	12,722
	40foot(box)	1,664	2,083	3,747	2,463	2,859	5,322
	Total(TEU)	10,682	11,119	21,801	11,753	11,613	23,366
Share of Empty Container	20foot(%)	84.5	6.4	46.5	84.6	2.2	46.4
	40foot(%)	84.7	1.5	38.5	79.4	1.3	37.4
	Total(%)	84.6	4.6	43.8	82.4	1.8	42.3

Data: General Company of Tartous Port

Table 5.2.1-6 Volume per TEU

		Laden Container			Empty Container		
		Volume (ton)	Number (TEU)	Volume per TEU	Volume (ton)	Number (TEU)	Volume per TEU
1993	Export	19,352	1,648	11.7			
	Import	159,665	10,611	15.0	20,958	9,542	2.20
1994	Export	23,301	2,068	11.3			
	Import	146,524	11,409	12.8	19,873	9,889	2.01

Data: General Company of Tartous Port

3) Transit Cargo

Historical trends of transit cargo volume by main countries are shown in Table 5.2.1-7.

The transit cargo volume which reached about 890,000 tons in 1981 but decreased rapidly after that. Recently the volume has remained steady at around 100,000 tons.

As for the countries, the transit cargoes destined for UAE and Iraq had a remarkable share in 1981 but in the last decade the flow to these countries has virtually stopped. Most transit cargoes have been destined for Jordan in the last decade.

Table 5.2.1-7 Trend of Transit Cargo Volume by Main Countries

(Unit: thousand ton)

Countries	1980	1981	1982	1983	1984	1985	1986	1987
UAE	620	436	280	150	447	84	18	23
Lebanon	8	6	2	7	1	1	0	
Iraq	157	313	118					
Jordan	75	136	138	65	46	68	46	55
Kuwait	1	0				1		
Iran		0						
Qatar						0		
Saudi Arabia						4	0	1
Total	860	892	538	221	494	158	64	79

Countries	1988	1989	1990	1991	1992	1993	1994
UAE	5	1	1	1	1	1	0
Lebanon		2	1		0		1
Iraq							
Jordan	67	54	88	115	115	111	112
Kuwait							
Iran							
Qatar							
Saudi Arabia	1	1	0	0	1	1	2
Total	73	57	90	116	117	113	115

Data: General Company of Tartous Port

(2) Passenger Traffic

Historical trend of number of passengers is shown in Table 5.2.1-8.
There were approximately 12,000 passengers in 1994, most of whom guests on board a cargo-passenger ship.

Table 5.2.1-8 Trend of Number of Travel Passengers

(Unit: person)

Year	1992	1993	1994
Number	8,169	13,652	11,612

Data: General Company of Tartous Port

5.2.2 Hinterland

(1) Handling Cargo Volume by Countries

Cargo volume by countries by commodities in export and import are shown in Table 5.2.2-1, table 5.2.2-2 respectively.
As for exports in 1994, most of phosphate rock was destined for West & East Europe and in other cargoes South Europe had a large share. As for imports in 1993, most of the cargoes originated from West & East Europe though a part of grain, sugar and feed originated from North & South America and Asia. In both export and import, the share of Egypt is very small compared with that of Latakia Port.

Table 5.2.2-1 Export Cargo by Country by Commodity in 1994

(Unit: thousand ton)

Commodities / Countries	Phos-phate	Cereals	Cotton Textile	Empty Containe	Food-stuff	Equip-ment	Car & Trailer	Generals	Total
Turkey	26.2		0.1	1.2	0.2			0.5	28.2
Cyprus		13.4	0.6			0.1			14.1
Middle East Total	26.2	13.4	0.7	1.2	0.2	0.1	0.0	0.5	42.3
Russia				0.7					0.7
Ukraine	9.8		0.9	0.6	0.6			2.2	14.0
Bulgaria	2.2			0.1	0.1				2.4
Croatia					0.5				0.5
Romania	197.3					0.5	0.1	0.2	198.0
Yugoslavia	2.1								2.1
East Europe Total	211.4	0.0	0.9	1.3	1.1	0.5	0.1	2.3	217.7
Greece	48.9		1.6	0.6	0.5				51.6
Italy	49.4	2.0	12.7	8.1	1.4	0.8	0.5	9.1	83.9
France	188.6		1.1	3.6	0.6	0.3		0.3	194.5
Spain			0.2					0.2	0.5
Portugal	102.2								102.2
South Europe Total	389.2	2.0	15.6	12.3	2.4	1.1	0.5	9.6	432.6
Netherlands	72.2		0.1	1.4	0.3			0.1	74.0
Belgium	8.5		0.1	1.0	0.2			0.8	10.6
Germany			0.1	1.2	0.1			0.2	1.7
Denmark	49.8								49.8
Middle & North Europe Total	130.5	0.0	0.3	3.6	0.6	0.0	0.0	1.1	136.1
Egypt	1.8	17.7			1.6	1.3	0.3	0.1	22.6
Libya								0.1	0.1
Sudan		24.1	0.2			0.5		0.3	25.0
Africa Total	1.8	41.8	0.2	0.0	1.6	1.8	0.3	0.4	47.7
India	17.7								17.7
Asia Total without Middle East	17.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.7
U.S.A			0.1	1.7	0.2			1.0	3.1
Argentina				0.7	0.3				1.0
North & South America Total	0.0	0.0	0.1	2.3	0.6	0.0	0.0	1.0	4.1
Others	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	776.7	57.2	17.8	20.8	6.6	3.4	0.8	14.9	898.2

Data: General Company of Tartous Port

Table 5.2.2-1 Import Cargo by Country by Commodity in 1993

(Unit:thousand ton)

Commodities / Countries	Car	Machine	Iron	Wood	Cement	Sugar	Foodstuff	Chemicals	Fertilizer	Rice	Grain	Feed	Paper	Other	Total
Turkey	0	0	29	0	0	32	5	10	5	0	29	0	0	7	117
Lebanon	0	0	6	3	0	0	0	0	1	0	11	15	0	1	37
Others	0	0	3	0	1	0	1	0	0	0	0	0	0	0	5
Middle East Total	0	0	37	4	1	32	5	10	7	0	39	15	0	7	159
Russia	3	2	64	15	0	0	6	0	0	0	0	0	0	1	92
Ukraine	3	15	192	5	0	0	2	6	89	0	0	0	0	3	314
Bulgaria	0	4	101	15	0	0	26	4	46	0	1	4	1	9	213
Croatia	1	0	8	9	0	0	4	0	0	0	0	0	0	1	23
Rumania	3	9	71	60	0	0	132	11	19	0	0	0	2	6	313
Others	2	0	5	4	0	0	1	0	0	0	0	0	0	0	11
East Europe Total	11	31	441	108	0	0	170	21	155	0	1	4	3	20	965
Greece	2	2	8	8	1	1	6	2	0	0	0	13	6	5	54
Italy	6	12	20	5	3	23	10	7	14	0	27	4	1	20	152
France	1	0	3	0	0	3	0	0	0	0	137	0	0	0	145
Spain	0	0	6	8	0	0	1	8	0	0	0	0	0	0	22
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Europe Total	9	14	38	20	4	27	16	16	15	0	164	16	7	26	372
United Kingdom	0	12	0	0	0	0	2	2	0	0	0	0	0	5	23
Netherlands	1	6	3	0	0	0	1	0	0	0	0	0	0	2	14
Belgium	0	10	44	5	0	52	13	8	0	0	121	17	1	15	285
Germany	0	2	9	0	0	0	3	0	0	0	0	0	0	4	19
Switzerland	0	0	0	0	0	0	0	0	17	0	0	0	0	0	17
Sweden	0	0	5	11	0	0	0	0	0	0	0	0	0	0	16
Others	0	0	6	2	0	0	0	0	0	0	0	0	0	0	7
Middle & North Europe Total	1	30	67	18	0	52	19	10	17	0	121	17	2	27	382
Egypt	0	2	30	0	0	7	5	0	0	12	1	0	0	4	62
Libya	0	0	5	0	0	0	0	0	54	0	0	0	0	0	59
Tunisia	0	0	0	0	0	0	0	4	111	0	0	0	0	0	115
Morocco	0	0	0	0	0	0	0	0	20	0	0	0	0	0	20
Others	0	0	7	0	0	0	9	0	0	0	0	0	0	0	16
Africa Total	0	2	42	0	0	7	14	4	185	12	1	0	0	5	272
Japan	15	3	9	0	0	0	0	0	0	0	0	0	0	0	28
Korea	5	1	0	0	0	40	0	0	0	0	0	0	0	0	47
Others	0	3	1	0	0	0	5	0	0	0	0	0	0	3	11
Asia Total without Middle East	21	6	10	0	0	40	5	0	0	0	0	0	0	3	86
U.S.A	0	8	0	0	0	0	4	0	20	0	121	13	0	1	168
Cuba	0	0	0	0	0	30	0	0	0	0	0	0	0	0	30
Brazil	2	2	2	0	0	14	10	0	0	0	0	0	2	1	33
Argentina	0	0	0	0	0	0	2	0	0	0	101	53	0	0	157
Others	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
North & South America Total	3	10	2	0	0	45	16	0	20	0	222	66	2	2	388
Oceania Total	0	0	0	0	0	0	0	0	0	10	0	0	0	0	10
Total	44	93	636	150	6	203	247	62	399	22	548	118	14	90	2633

Data: General Company of Tartous Port

(2) Hinterland

Export and import cargo volume by address of exporter/importer are shown in Table 5.2.2-3, Table 5.2.2-4.

Aleppo has the highest share of export cargoes (excluding phosphate rock) followed by Damascus. Their combined share accounts for nearly 80% of the total. These data show that the hinterland of Tartous port is similar to that of Latakia port (see the Table 4.2.2-3).

As for imports, the southern area which includes Damascus, Homs, Hama, Tartous and Jordan has a high share, while the shares of Aleppo and Latakia are not high. These data show that the hinterland of Tartous port is the southern area.

Table 5.2.2-3 Export Cargo Volume by Address of Exporter by Main Commodity Categories

(Unit: ton)

Area / Commodity	Damascus	Homs	Hama	Aleppo	Latakia	Tartous	Others	Total
Rice							501	501
Seeds	381						13	394
Cotton & textile		5		1,160				1,165
Foodstuff	530							530
Phosphate		40,045						40,045
Vehicles & Trailer	88			2		40	1	131
Machine & Equipment	26							26
Chemicals						15		15
Others	13			239				252
Export Total	1,038	40,050	0	1,401	0	55	515	43,059
Share (%)	2.4	93.0	0.0	3.3	0.0	0.1	1.2	100.0
Total (except for Phosphate)	1,038	5	0	1,401	0	55	515	3,014
Share(%)	34.4	0.2	0.0	46.5	0.0	1.8	17.1	100.0

Data: Manifest(December, 1994)

Note: Empty container and empty trailer are excluded from the Table.

Table 5.2.2-4 Import Cargo Volume by Address of Importer by Main Commodity Categories

(Unit: ton)

Area / Commodity	Damascus	Homs	Hama	Aleppo	Latakia	Tartous	Others	Foreign Country	Total
Rice	1,801	1							1,802
Fruits	6,128		2			3,006			9,136
Livestock	189		1,269	3,434				2,077	6,969
Wood	799	1,769		273	772	218		2,405	6,236
Sugar	1,850	12,160				3,015			17,025
Foodstuff	12,426	19	169	1,014	730	138		243	14,739
Paper	421	323		164	45	81			1,034
Cotton & textile	97			357		479		127	1,060
Metal Products	21,301	2,937	1,650	3,123	2,696	16,139		4,038	51,884
Vehicles	1,102	141	65	179	69	1,265		295	3,116
Machine & Equipment	2,887	90	16	158	101	360	1	6	3,619
Chemicals	20,376	6	36	1,125		88			21,631
Rubber & Tyre	78	4,477	20	14				1	4,590
Others	1,116	336	2	164		837	83	45	2,583
Import Total	70,571	22,259	3,229	10,005	4,413	25,626	84	9,237	145,424
Share (%)	48.5	15.3	2.2	6.9	3.0	17.6	0.1	6.4	100.0

Data: Manifest(December, 1994)

Note: Most of the cargo volume in the column of Foreign Country represent transit cargoes to Jordan.

5.2.3 Vessels Calling to Tartous Port

Number of calling vessels in 1994 is 1,707, an increase of 2% over the previous year. The number of calling vessels has been increasing since 1989. In 1994, spring was the peak season for vessels calls (see Figure 5.2.3-1, Figure 5.2.3-2). Figure 5.2.3-3 describes shipsize distribution in 1994. Fifty-eight percent of vessels are under 1,000 DWT, while 2.9% are over 10,000 DWT.

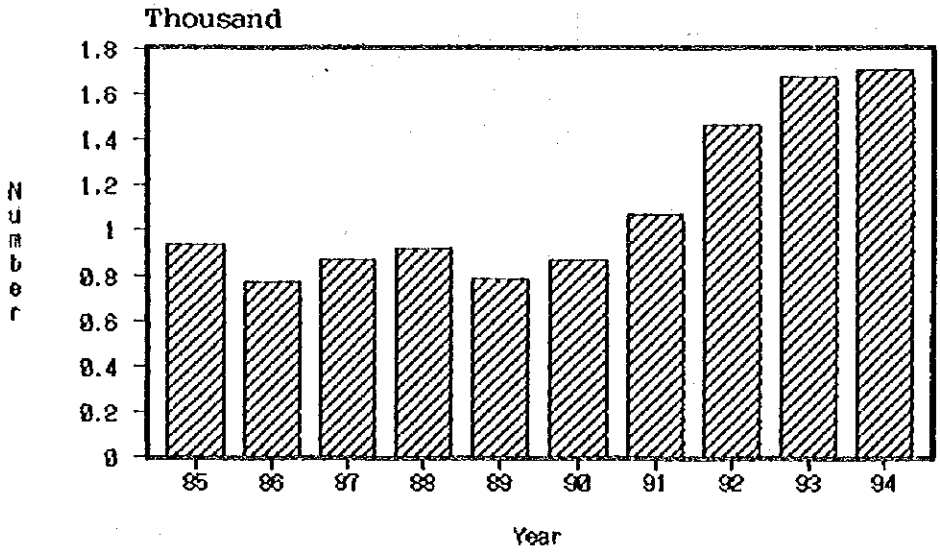


Figure 5.2.3-1 Number of Calling Vessels

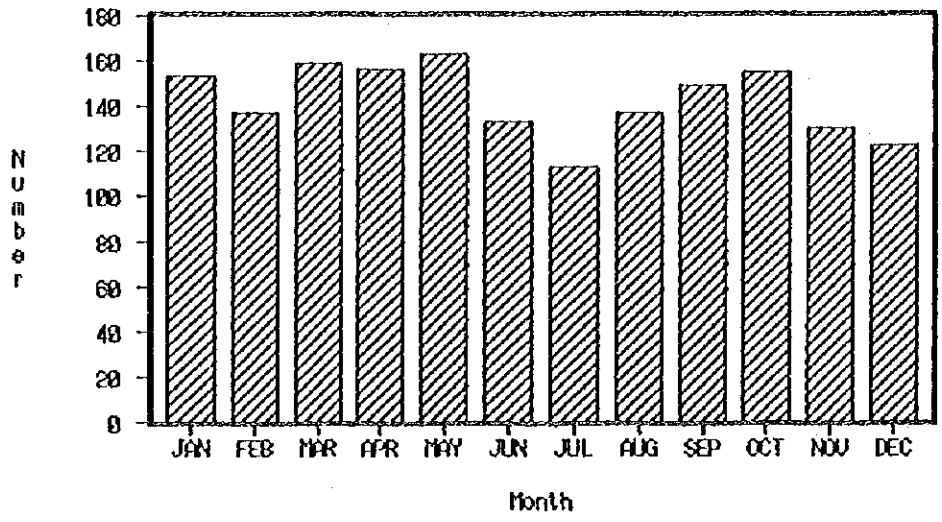


Figure 5.2.3-2 Monthly Distribution (1994)

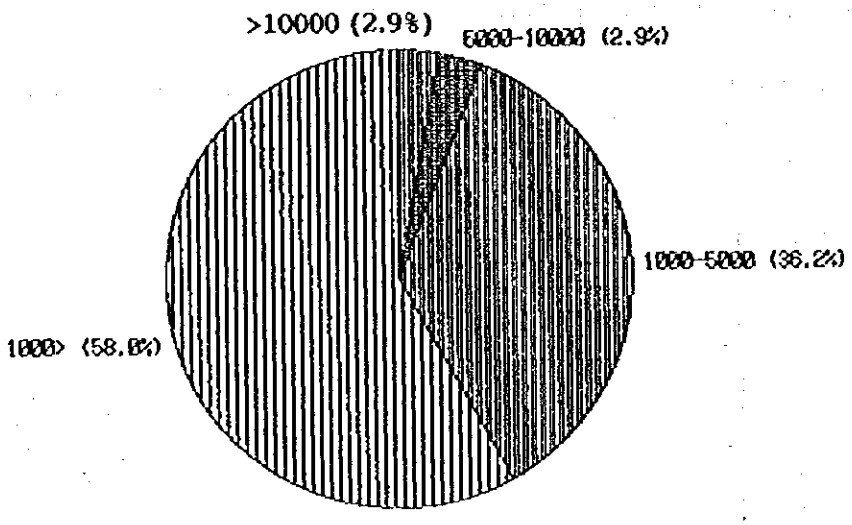


Figure 5.2.3-3 Shipsize Distribution(1994)

5.2.4 Berth Occupancy Rates

(1) Commodities Handled in the Berths

According to vessel records, the berths of Tartous Port are numbered off from 1 to 22. Location of the berths is shown in Fig.5.2.4-1. Nos 4, 7, 9, 10, 12, 13,14, 16, 17, 18 and 19 berths are used for loading and discharging. Major commodities handled in each berth are as follows.

Quay No.4 : Animals(sheep, cow), General, Banana, Container, Sugar, Wood, Steel
Quay No.7 : Container, General, Car, Banana, Steel, Rice, Sugar, Wood, Animals
Quay No.9 : Container, Car, Machine, Spare Parts, Wood, Steel, Passenger, General, Sugar
Quay No.10 : Car, Container
Quay No.12 : Steel, Maize, Wheat, Wood, Barley, Rice, General
Quay No.13 : Steel, General, Animals, Passenger, Sugar, Wood
Quay No.14 : Steel, Wood, Container, Rice, General
Quay No.16, 17 : Mostly Sheep, General
Quay No.18, 19 : Exclusively for Phosphate

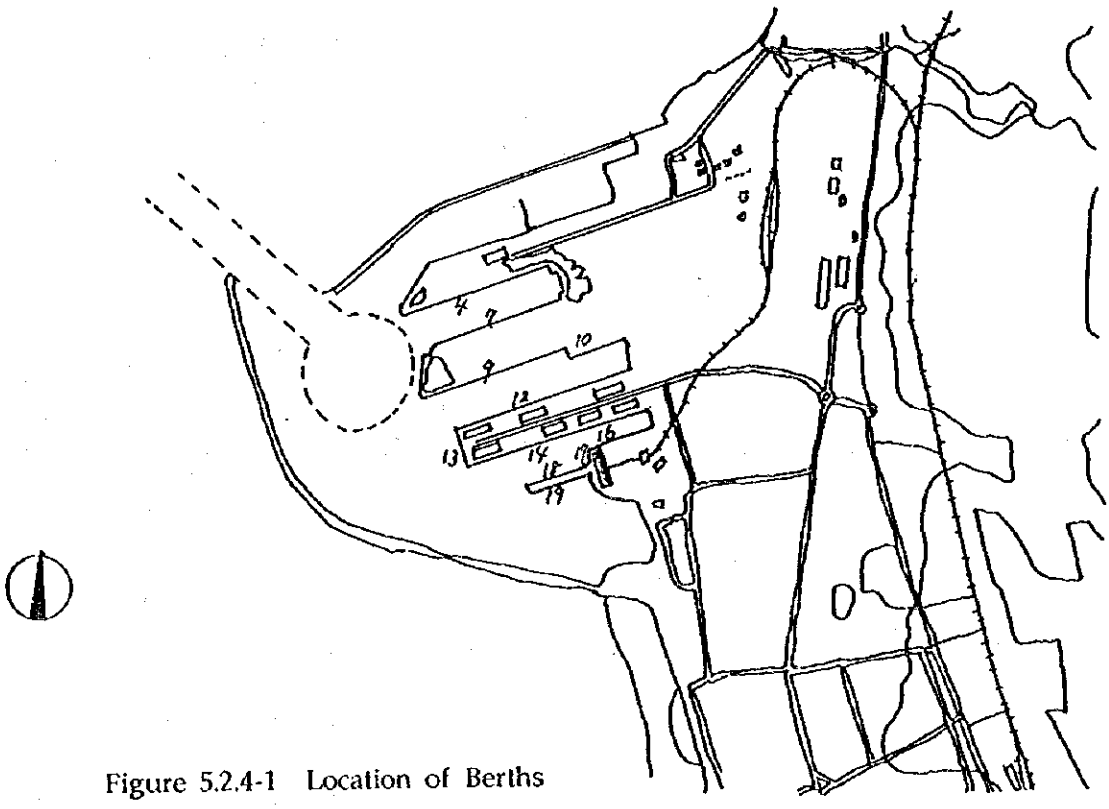


Figure 5.2.4-1 Location of Berths

(2) Berth Occupancy Conditions

Vessel records of the year 1994 are used for the survey. The records of Tartous include the following information.

Vessel Name, Flag, Arrival Time (X), Mooring Time(Y), Departure Time(Z),Origin Port, Destination Port

Since the vessel records are available only from January to June, the calculation is conducted only for the vessels which called Tartous Port during this period. Waiting period and mooring period are calculated as follows.

Waiting Period(WP) = Y - X

Mooring Period(MP) = Z - Y

Vessels which moor for more than 14 days are eliminated, because these vessels moor not only for cargo handling.

Berth occupancy rates are calculated as follows.

BOR = TMP / (TWP*NB)
TMP : Total Mooring Period of vessels
TWP ; Total Observation Period
NB : Number of berths of the area

(3) Berth Occupancy Conditions (See Table 5.2.4-1, Fig.5.2.4-2, Fig.5.2.4-3)

Both average waiting period and average mooring period are longest in No 12, 13 and 14 berth. No 16 and 17 berth record lowest waiting and mooring period. Berth occupancy rate of No 9 and 17 are extremely high. Average occupancy rate is 52%.

Table 5.2.4-1 Berth Occupancy Condition

QUAY NO	No. of Vessels	Average Waiting	Average Mooring	No. of Berth	Berth Occupancy Rate
4	73	2.27day	3.29day	3	43.5 %
7	82	3.39	3.52	3	52.4
9	171	2.88	2.95	3	91.5
12	67	4.22	3.79	3	46.0
13+14	79	3.72	4.52	4	48.5
16	70	0.53	2.27	2	43.2
17	51	0.45	2.63	1	72.8
18	28	2.93	2.21	1	33.7
19	13	1.0	1.69	1	11.9
TOTAL	634	2.62	3.18	21	52.3

Note: Quay No.13 and 14 are considered as one quay because vessel records of mooring place between these two berths is not clear.
No. of Berth is decided considering actual number of vessels that moor at the berths.

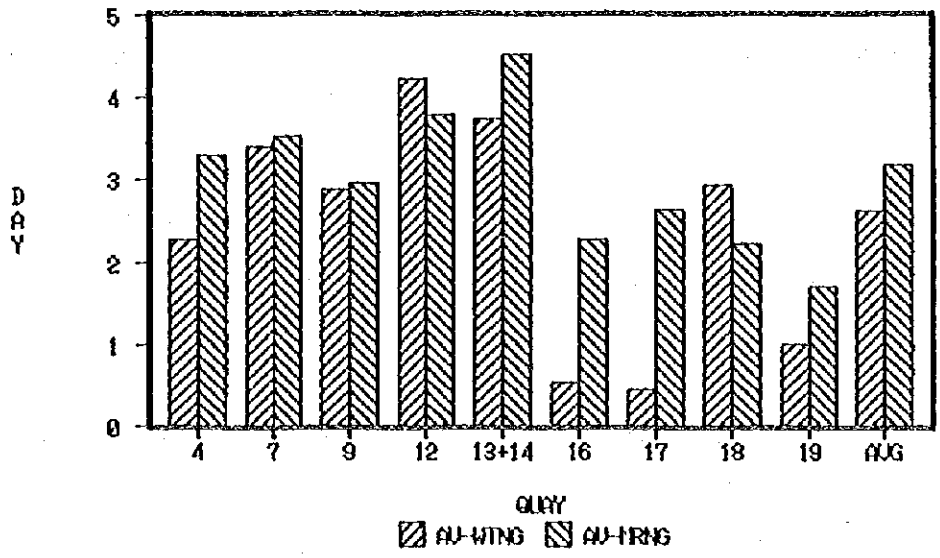


Figure 5.2.4-2 Mooring Condition (Jan. to Jun. 1994)

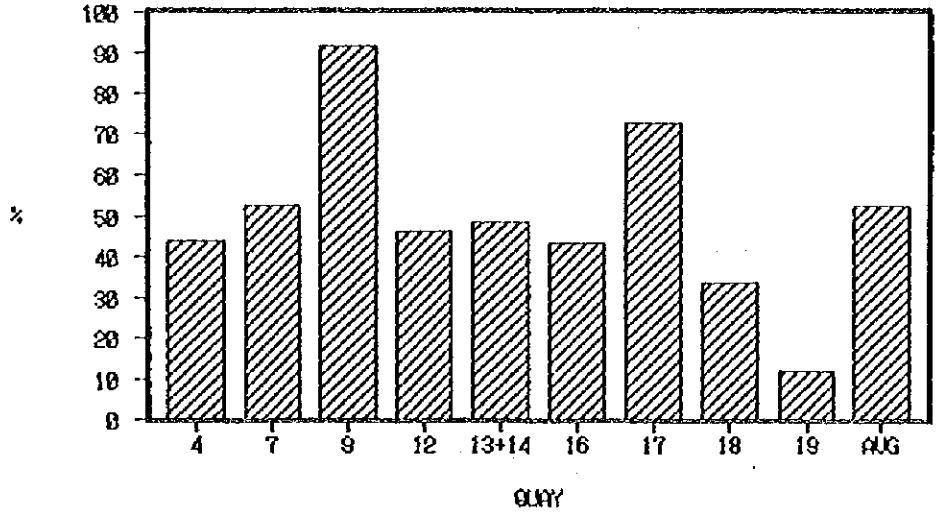


Figure 5.2.4-3 Berth Occupancy Ratio

5.2.5 Cargo Handling Productivities

Commodity-wise cargo handling productivities per vessel are calculated by using the record of vessels berthing and cargo handling operations as follows:

CHPi = VCi / MPi

CHPi : Cargo Handling Productivity by Commodity(i) per vessel laden with the commodity(i)

VCi : Cargo Volume of Commodity(i) discharged/loaded from/onto a vessel laden with the commodity(i)

MPi : Mooring Period of a vessel laden with Commodity(i)

The Resulting average cargo handling productivities by commodity are described in Table 5.2.5-1, Fig.5.2.5-1.

Table 5.2.5-1 Cargo Handling Productivities of Major Cargoes

COMMODITY	VOLUME (ton)	TOTAL MOORING PERIOD(day)	CARGO HANDLING PRODUCTIVITY (ton/hour)
Phosphate	257,017	86	124.52
Steel	178,988	359	20.77
General	170,586	487	14.59
Container	83,680	66	52.83(4.9Box)
Maize	83,184	24	144.42
Sugar	76,812	105	30.48
Flour	62,136	38	68.13
Animals	59,359	519	4.77
Car	22,877	50	19.06
Chemical	21,248	37	23.93
Rice	16,792	45	15.71
Wood	5,878	23	10.65
Cotton	4,100	12	14.24
Plastic	2,882	25	4.80
Cement	1,720	5	14.33

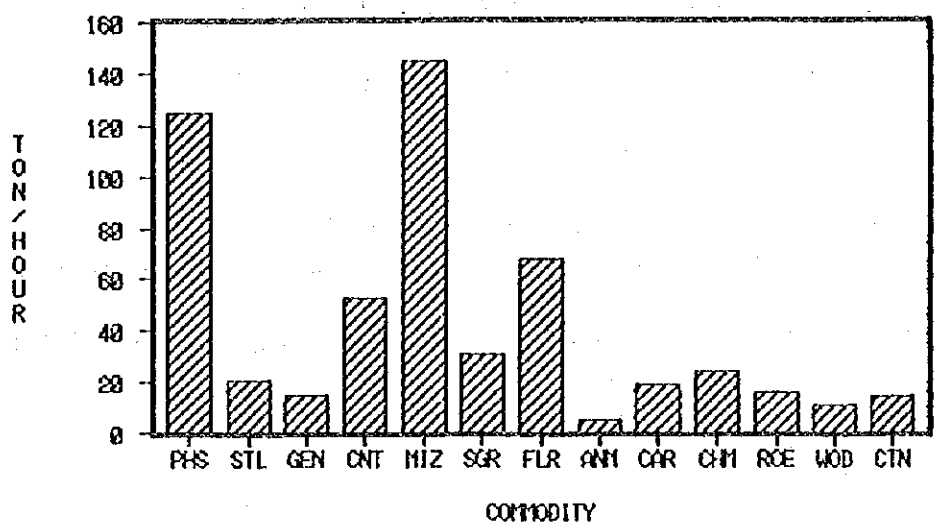


Figure 5.2.5-1 Cargo Handling Productivities

Note:PHS:Phosphate, STL:Steel, GEN:General, CNT:Container, MIZ:Maize, SGR:Sugar, FLR:Flour, ANM:Animals, CHM:Chemicals, RCE:Rice, WOD:Wood, CTN:Cotton

(2) Formulas to Estimate Cargo Handling Productivity

The cargo handling productivity for each cargo handling system on each cargo for short time (taking no account of berthing time, preparation and arrangement time for cargo handling machines, long term interruption due to some troubles or others reasons and required wind-up time) are shown in the following formula. The values which are given by the Tartous Port General Company (or terminals) are shown in single parenthesis [ ] and cycle times which are measured by the study team at site are shown in double parenthesis {[ ]}.
All values are shown in case of delivery to out side indirectly.

1) Dry bulk

A. Grain loading by loaders at the grain terminal.

Qa = Qp x Ko x N x H x Kw
Qa: Actual loading capacity per day (t/d/s)
Qp: Nominal capacity [240t/h]
Ko: Operation efficiency [75 %]
N: Number of loaders or unloaders to be used [2]
H: Working hours per day [20]
Kw: Working time efficiency [75~80%]

B. Grain unloading by pneumatic unloaders at the grain terminal.

Qp: [120 t/h], Ko: {40%}, N: [4], H: [20], Kw: {75~80%}.

C. Phosphate loading by larger loader at the phosphate terminal

Qa: [average No.1:400~500t/h, No.2:700~800t/h]
Remarks: The loading work will be continued until the ship is fully loaded

D. Grain unloading by ship gears using grab bucket at general cargo berth

Qa = V x Kg x B x T x H x Kw x G
V: Grab bucket volume [6~10 cu m]
Kg: Grab bucket efficiency [80 %]
B: Bulk density [...t/cu m]
T: Number of handling [10~15 times/hour]
G: Number of gangs per ship [Average 4]
H: [24?], Kw: {0.75~0.83]

E. Bulk chicken food unloading by quay side cranes with rope basket or cloth basket

Qa = W x T x H x Kw x G
W: Average weight of lifting {1t~1.5t]
T: [15] [[20]], G: [...} [[2]].

2) Break bulk

A. Bagged cargo (sugar and rice)unloading by quay side cranes using rope sling

Qa = Wb x Nb x T x H x Kw x G
Wb: weight of the bag [Rice 25kg, Sugar average 50kg]
Nb: Number of bags per one lifting [Rice average 40, Sugar 24~27] [[sugar 25~27, rice 60]]
T: {16], [{30}], G: [3~5} [[3]].

B. Bagged cargo (sugar and rice) unloading by ship gears using rope sling

All items are nearly same as that of quay side crane.
However the productivity of the ship gear is generally larger than that of quay side crane.

C. Steel Reels unloading by quay side cranes

Qa = Ws x Ns x T x H x Kw x G
Ws = Weight of the steel reel [3~7 t]

Ns = Number of the steel reels per lifting
[depend on quay side crane capacity]
T: [12~13], G: [depend on number of hatch 3~4] [[3]]

D. Steel Reels unloading by ship gears

Ws x Ns: [3~6 t], T: [10~12], G: [3~4]

E. Timber Bundled unloading by quay side cranes

Qa = Wt x Nt x T x H x Kw x G
Wt: Average weight of the one bundle [1~2t]
Nt: Average number of bundle per lifting [1]
T: [8~10]
Remarks: The cargoes are handled by quay side crane, mobile tower crane or mobile crane. There are thus three kinds of handling methods.

F. Loose Timber unloading by quay side cranes

Qa = Wo x T x H x Kw x G
Wo: Average weight per lifting [1~2t]
T: [5~6], G: [3~4] [[1 ship gear + 1 quay side crane for small ship]]

G. Loose Timber unloading by ship gear

All items are the same as that of quay side cranes system.

H. Paper Roles unloading by quay side cranes

Qa = Wr x Nr x T x H x Kw x G
Wr: Average weight of paper role [500kg~1t]
Nr: Average number of paper roles per lifting [2~3] [[2~4]]
T: [6~8], G: [3~4] [[1 ship gear + 1 quay side crane for small ship]]

I. Compressed wood sheets unloading by quay side cranes.

Qa = W c x Nc x H x T x Kw x G
Wc: Average weight of one unit [...500kg~1t]
Nc: Average number of units per lifting [2~3]
T: [6~8], G: [3~4]

3) Container

A. Container handling by ship cranes

Average [5~10 Boxes/h]

B. Container handling by floating crane

Average [3~5 Boxes/h]

C. Container handling by Ro/Ro system

Average {10 boxes/h}

D. Empty container by quay side cranes

Average [[20 Boxes/crane]], [[2 Cranes]]

Table 5.2.5-2 Standard Productivity at Tartous Port

	Direct Delivery		Indirect Delivery	
	ship gear	quay side	ship gear	quay side
Reforcement Iron	100	150	75	100
Steel Plates and Blocks	100	125	100	125
Steel Reels	160	200	100	125
Normal Steel Sheets	100	125	70	80
Break Steel Pieces	50	50	50	50
Timber Bundled	60	75	50	60
Compressed wood Sheets	60	70	35	40
Loose Timber	40	60	40	40
Furniture wood	60	60	30	30
Rice, Flower and Sugar bags	110	130		30
Fertilizer, Soda and Plastic ores	60	80	30	40
Food system Bags	60	80	40	40
Cement Bags on pallets and slings	200	200		
American Food Bags and Bulk	100	100		
Paper Rolls and Parcels	40	60	30	40
Wood and Cotton Bags	40	50	30	40
Hemp Bags (Big Bags)	70	100	50	75
Others Break Bulk Cargo (carton..)			35	35
Foods	40	40		
Containers				
Big Blocks (loads) and Marble	300	380	400	400
Equipment	65	80	50	50
Barrels	70	80	40	50
Boxes	40	40	30	30
Bulk Grain (wheat and corn)	125	125		
Marble aggrigates	100	100	60	60

Source: Tartous general port company

Unit : t/shift/gang

5.2.6 Dwelling Times of Cargo in the Storage

(1) Container Cargo

1) Imports

All of the discharged containers are stored at the container yard. yard. 40% in loose conditions are un-stuffed in the open yard and carried out of the port by trucks. Average dwelling time of these containers is 8 to 12 days. 15% are un-stuffed at the bays of the transit shed and then stored there. Average dwelling time in transit shed is 50 to 60 days. The remaining 45% of imported containers are carried out in boxes. In this case, most of containers are brought out within a couple of days.

2) Exports

Almost all the container cargoes are stuffed to container boxes at the container yard. Average dwelling time of the containers in the port is 12 days.

(2) General Cargo

About 85% of the general cargo, mostly discharged, is stored at the transit sheds or open storage yards. The average dwelling time of these cargoes is about 60 days. The remaining 15% is delivered to consignees immediately within a couple of days. Among the general cargoes, food stuff tends to be stored in transit shed longer than other cargoes due to quarantine and customs clearance. More than half of the foodstuffs is stored nearly three months.

(3) Phosphate

Since the capacity of the silos for phosphate rock is 90,000 tons and the volume of phosphate which was shipped through the Tartous marine terminal in the past decade is in the range of 600 to 1,800 thousand tons, the turnover time of grains in silo in recent years is between 7 to 20 times. However, actually the phosphate is brought in from a block train according to the schedule of the vessels and the silo is filled with phosphate one or two days before the vessel's arrival.

(4) Grain

Since the volume of the imported/exported grain fluctuates drastically every year, the average dwelling time is not fixed. At present, half of the silo, capacity of 85,000 ton is used for storage. 25% is used for imported maize, 25% is used for exported barley. The turnover time of the grains in silo is between 10 to 15 times.

(5) Other Cargo

Average dwelling time of other cargoes are as follows.

Wood : 60 days
Iron : 60 days

5.3 Cargo Handling System

5.3.1 Container-Handling

The yard office of operation is an old two-storied building which is located in the north-west area of the container yard. The ground floor is used as the operation office and the first floor is used by port police. The main functions of the operation office are to control the delivery between the port and consignee for contents of imported containers, registration of unloaded containers and the control of container storage.

The straddle carrier system has been adopted at the container yard in Tartous Port. There is no mark of slots in the yard. The location of storage containers is decided by Chief of yard according to the zoning by the group of shipping lines. Viz.,the storage containers have no address at the yard. After unloading from ship, the container is transported from the apron to the container yard by trailer. Then, the container is stored at each area for the group of shipping companies, namely European Group(Con ship, Ella man, D.S.R. and Merzario), Never Line(argentina) and Service Martini(Italy). The yard is assigned to the groups of shipping companies. The yard operator does not grasp the exact location of each stored container, only storage area of each stored container by the shipping company group.

According to the interview with an officer at the container terminal, the imported container cargoes are stored about two weeks on average at the yard while documents are processed.

All of the unloading container boxes are stored at the container yard in the port. The average period of storage for container boxes at the container yard between unloading from ship and loading to ship is from 50 days to 60 days. The empty containers for unloading do not go outside the port in general.

Fifty-five percent of import container cargoes are un-stuffed at the container yard. Then, these cargoes are transported to outside the port by consignees after customs procedures are completed. Almost all of the remainder is transported to the transit shed for import container cargo after being un-stuffed from container-boxes at the yard. After customs clearance at the shed, the cargo is transported to outside the port.

Almost all export container cargoes are stuffed to container boxes at the container yard in the port. After stuffing, the containers are stored about 10 days on average at the container yard. Then, these containers are loaded to ship.

At present, import containers are unloaded from ship to trailers at the apron of the quay or from ship to the apron. Then, the containers are moved to container yard

by trailers or large forklift. From the view point of cargo handling efficiency and minimizing damage to containers, the combined operation with top-lifter and trailer is more suitable than the trailer operation or forklift operation for moving containers from ship to container yard.

The shed for import container cargo is located at the east side of the container yard. The structure of the shed is a container freight station (C.F.S), but, the shed has eaves. Therefore, the container can't be berthed at the bay by straddle carrier, nor can the shed presently be used for C.F.S..

There is no fixed stand with plug for refrigerated containers at the yard. Therefore, refrigerated containers are stored around the receiving facility of electricity for the container yard using portable generator and tentative stands with plugs. The location of the receiving facility of electricity is in front of the shed for import container cargo

Official cargo handling time of container cargo at Tartous Port the same as at Latakia port.

5.3.2 Handling of Conventional Cargo

(1) Cargo Flow

The cargo handling of conventional cargoes except bulk cargo for import between vessel and quay is done by quay cranes or ship's cranes in general. Then, these cargoes are moved to storage facilities near the area behind the berth of the calling ship in the port or warehouses of consignees out side port. There are three receiving methods used to unload the conventional cargoes at the quay in general: 1)The unloading cargoes are handled from ship to apron. 2)The unloading cargoes are handled from ship to trucks at the apron. 3)The unloading cargoes are handled from ship to wagons at the apron. The main packing styles of the receiving types 2) and 3) are bagged cargo, heavy cargo(such as iron plates, iron bars, pipes and coils) and long goods (for example logs, lumber and timber).

After cargo handling between ship and quay, the cargoes are stored inside the port or directly delivered to consignees. In general, only general sector can be direct delivered. Viz., the private consignees can't directly deliver their cargoes. The percentage of storage cargo volume and directly delivery cargo volume for import general cargo except bagged cargo are about 85 percent and 15 percent, respectively. The percentage of storage volume at sheds and open areas for total import general cargo except bagged cargo are approximately 35 percent and 50 percent, respectively. The average period of storage for the general cargo at these areas is about 60 days. All of the storage bagged cargo is stored at sheds.

The above export general cargo is direct receipt from warehouse of consignees. For

bagged cargo, the ratio of storage cargo volume and direct delivery cargo volume is approximately 30 percent and 70 percent for import and 80 percent and 20 percent for export, respectively.

There are two types of storage facilities for the conventional cargoes, namely a transit-shed(warehouse) and an open yard. The types of cargoes for transit-shed include valuable cargoes(for example electric goods and machinery), bags, cases, wood products, veils, part of barrels and paper in general. Other storage cargoes are stored at open yard. In the storage area, the cargoes are kept per gathering of each B/L.

(2) Cargo Handling Time

Official cargo handling time of conventional cargo at Tartous port is the same as at Latakia port.

(3) Cargo Handling of Break Bulk Cargo

Break bulk cargoes at Tartous port are handled at mainly Pier-A and B. Therefore, Break bulk cargoes can be handled at any berth at Pier-A and B except Number 15, Number 10 and Number 6.

Based on observation and an interview with the exploitation officer, the number of workers per crane and cycle time of crane for cargo handling of cases and bags are shown in Table 5.3.1.

Table 5.3.2 and Table 5.3.3 show the standard gang formation of direct delivery for general cargo and bagged cargo for import.

According to observation, too many bags are loaded on to the truck or the rail wagon, which means that much of the loading time is spent on the protective arrangements of bags to prevent them from falling during transportation.

Much handling time is spent for loading to trucks and paper rolls are offten damaged. because there seems to be a lack of suitable attachments to the fork-lift for cargo handling of paper rolls.

Table 5.3.1 Number of Cargo Handling Workers and Cycle Time of Crane for Break Bulk Cargo

Packing style	Number of workeres			Cycle time of crane	Note
	Crane operater (persons)	Worker (on board) (persons)	Worker (at apron) (persons)	(minutes)	
Cases	1	3	3	2.8	Pallet
Bags	1	7	4	3.4	

Cycle time of crane: Net cycle time.

Table 5.3.2 Standard Gang Formation of Direct Delivery for General Cargo for Import at Tartous Port

	On the ship		On land			
	in the hold	clane Operater	Quay side	Watcher	Crane Driver	Driver of trailer
Use the quay crane	3	-	2	1	1	3
Use the ship crane	3	1	2	1	-	3

Source: Tartous general port company

Note: If the cargoes are stored at the storage facility, 3 workers and a driver of forklift have to be arranged at the facility

Table 5.3.3 Standard Gang Formation for Direct Delivery of Bagged Cargo for Import at Tartous Port

	On the ship		Quay side	Storage area		
	in the hold	Fork lift Operater	Trailer Operater	Worker at storage	Driver of S.carryer	Driver of forlk lift
Container cargo	2 or 3	2	2	-	1	-
Non-container cargo	4 or 8	2	2	1	-	1

Souce:Tartous general port company

(4) Cargo handling of Heavy Cargo/Long Goods

The heavy cargoes and the long goods are handled mainly at Number 9 of Pier-B and Number 12 and 14 of Pier-A.

At Tartous port, the import heavy cargoes and long goods are often directly loaded from the ship to trucks or trailers. In general, the direct loading from ship to truck takes more time than loading from ship to apron at quay because crane operation in the former is more difficult.

Based on observation and an interview with the exploitation officer, the number of

workers per crane and cycle time of the crane for cargo handling of iron bars and lumbers are shown in Table 5.3.4.

Table 5.3.5 shows the standard gang formation of direct delivery for Banded cargo(steel or lumber) for import.

Based on observation, there seeme to be a shortage of large capacity fork-lifts, the attachments to the fork-lift for iron bars, rolls and long bundled cargoes.

Table 5.3.4 Number of Cargo Handling Workers and Cycle Time of Crane for Heavy Cargo/Long Goods

Packing style	Number of workeres			Cycle time of crane
	Crane operater (persons)	Worker (on board) (persons)	Worker (at apron) (persons)	(minutes)
Iron bars	1	3	3	5.3
lumbers	1	3	3	5.1

Cycle time of crane: Net cycle time.

Table 5.3.5 Standard Gang Formation of Direct Delivery for Banded Cargo (Steel or Lumber) for Import at Tartous Port

	On the ship		On land			
	in the hold	clane operater	Quay side	Watcher	Crane Driver	Driver of trailer
Use the quay crane	8	-	6	1	1	3 or 4
Use the ship crane	6	1	4	1	-	3 or 4

Source: Tartous general port company

Note: If the cargoes are stored at the storage facility, a gang of 8 workers must be arranged.

5.3.3 Ro-Ro Operations

The roll-on/roll-off ships(ro-ro ships) are berthed usually at Number 7 at Pier-B. The container cargo handling of Ro-Ro ship is handled by the fork-lifts and the trailers.

According to observation and an interview with the exploitation officer, there are about eight workers engaged in container cargo handling and 14 for conventional cargo handling(such as cases and long goods) including drivers of cargo handling equipment.

The standard gang formation of Ro-Ro cargo for import is shown in Table 5.3.6.

Table 5.3.6 Standard Gang Formation of Ro-Ro Cargo for Import at Tartous port

	On the ship		On land			
	in the hold	clane operater	Quay side	Watcher	Crane Driver	Driver of trailer
Use the quay crane	3	-	2	1	1	3 or 4
Use the ship crane	3	1	2	1	-	3 or 4

Source: Tartous general port company

Note: 1. If the cargo is not banded, the cargo has to be banded in the hold by 3 or 4 workers.

2. If the cargoes are stored at the storage facility, 3 workers and a driver have to be arranged at the facility.

5.3.4 Grain-Handling

There are two types of grain-handling. One is handled at grain silo berth in Pier-A. Then, the cargo is sent to the grain silo facility, directly. Another is handled at general cargo berths by grab or portable pneumatic unloader. Then, the cargo is directly delivered to outside the port or the cargo is sent to the grain silo facility in the port by trucks.

Table 5.3.7 shows the standard gang formation of dry bulk cargo for import.

Grain silo facility at Tartous Port is located at the end of Pier-A. Cargo handling volume of the facility in 1992, 1993 and 1994 is 178 thousand tons, 253 thousand tons and 221 thousand tons respectively.

The total area of the facility is approximately 10,900 sq.meters(silo area:3,500 sq.m, operation and administration area:3,900 sq.meters, receiving/discharging area :2,700 sq.meters, others:800 sq.meters).

Chain conveyors are used exclusively at this facility except for conveyors at sacking facilities.

(1) Silo

There are 36 big bins and 40 small bins. The total storage capacity is 81,000 tons.

(2) Receiving/Discharging System for Land side

The grain silo facilities have two receiving lines, one is for trucks and the other is for wagons. The receiving capacity 8 tons an hour per line.

There are two discharging lines, one is for trucks and the other is for wagons whose capacity is 200 tons an hour per line. There are two shooters for wagons and one shooter for trucks.

The cargo volume carried by wagon is about 15 tons on average. There are generally 20 wagons per train.

The formation of cargo handling workers for receiving /discharging is as follows:

On the wagon/truck---------- 1 worker
At the control panel---------- 1 technical observer

(3) Loading/Unloading System for Ship Side

This facility has one ship loader and two ship unloaders. The capacity is 240 tons per hour for the former and 120 tons an hour per line for the latter.

The formation of workers for loading/unloading between silo and ship is as follows:

On board---------- 1 worker
1 Mechanic
On the quay---------- 1 technician
Loader/unloader---------- 1 operator
At the control panel---------- 1 technical observer

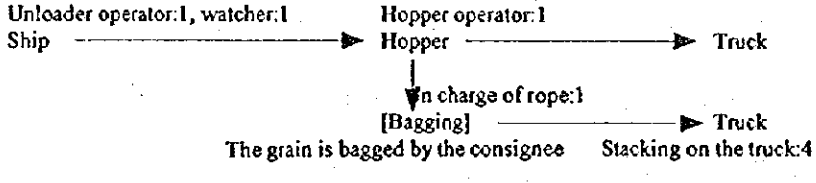
Table 5.3.7 Standard Gang Formation of Dry Bulk Cargo for Import at Tartous Port

	On the ship			On land			
	Driver of bulldozer	Unloader's Operator	Watcher	Hopper's operator	Rope	Stacking on truck	Driver of trailer
Bulk							
Use the pneumatic unloader	1	1	1	1	-	-	3 or 4
Use the grabu	1	1	1	1	-	-	3 or 4
Stuff to bages							
Use the pneumatic unloader	1	1	1	1	1	4	3 or 4
Use the grabu	1	1	1	1	1	4	3 or 4

Souce:Tartous general port company

Note: In the final stage of unloading, a bulldozer is used in the bottom of the hold.

If the grain is stored at silo, the grain is first put on the truck through the hopper. Then, the grain is transported to the silo by trucks.
If the grain is bagged, sewing of the bags is done by consignee.



5.3.5 Phosphate Handling

The Phosphate silo at Tartous Port was constructed in 1974 for the Export of phosphate. The planning capacity of the phosphate silo facility for loading is between 1.5 million tons and 2 million tons per year. The export cargo volumes of phosphate in 1992, 1993 and 1994 are 940, 620 and 800 thousand tons respectively.

(1) Receiving System

There are two receiving lines with dumpers from wagons with capacity of 450 tons an hour per line. The two lines belt conveyor connect the dumpers and the top of silos.

All phosphate at Tartous Port is brought using bottom door type hopper wagons. Because there is no weighing system at the receiving facilities, the received phosphate is weighed by the number of wagons (Capacity of each wagons is 50 tons). Calling train has 16 wagons in general. Therefore, approximately 3 hours per train are required for receiving under normal conditions and 2 hours 15 minutes per train under ideal conditions(including marshaling time) at present.

There is no by-pass from receiving system to loaders. After receiving, the phosphate should go through the silo into the ship.

(2) Capacity of Storage

There are 22 silo bins(12 old bins and 10 new bins) whose total capacity is 90,000 tons.

(3) Area

The total area of the silo facility is approximately 62,400 sq.m excluding loading facilities.

(4) Loading System

There are two lines belt conveyor between bottom of silos and loading bridge through measuring system. The capacity of the belt conveyors is 400-500 tons per hour per line and 700-800 tons an hour per line respectively.

There are two ship loaders with belt conveyor. The capacity of the loaders is the same as the belt conveyors.

(5) Number of Workers for Loading and Storage

There are 3 shifts for loading to ships and formation per shift is as follows:

Tower leaders---------- 4 persons
Carriage---------- 2 persons
Weigh bridge---------- 6 persons
Supervisor---------- 1 person
Chief(takes samples to laboratory)---- 1 person
Total 14 persons

There are also 3 shifts for storage. The formation of the shift is as follows:

Carriage(silo)---------- 1 person
Chief(measurement)---------- 1 person
Supervisors---------- 4 persons
Total 6 persons

(6) Major Issues

1) The belt conveyors between the dumper and top of the silo are not completely sealed.
2) The distribution system to each silo bins uses belt conveyors with tripper. If chain conveyors are used in the system, pollution occurrence from this system is completely stopped.
3) The belt conveyors between the silos and the end of loading bridge are not completely sealed. In addition, there is no feeder at the joint between exits of the silos and belt conveyor. So, the soared phosphate and dropped phosphate from belt conveyors is gathered at the loading bridge. This gathered phosphate is dropped on the quay through dust pipes.
4) The phosphate soars at the dumper at the receiving system and the exit of loader in the ship's hold
5) The outreach of the loaders is not sufficient for present calling ships.
6) There is no system to get the storage volume in the silo. Therefore, the storage volume is measured from the top of silos by man power.

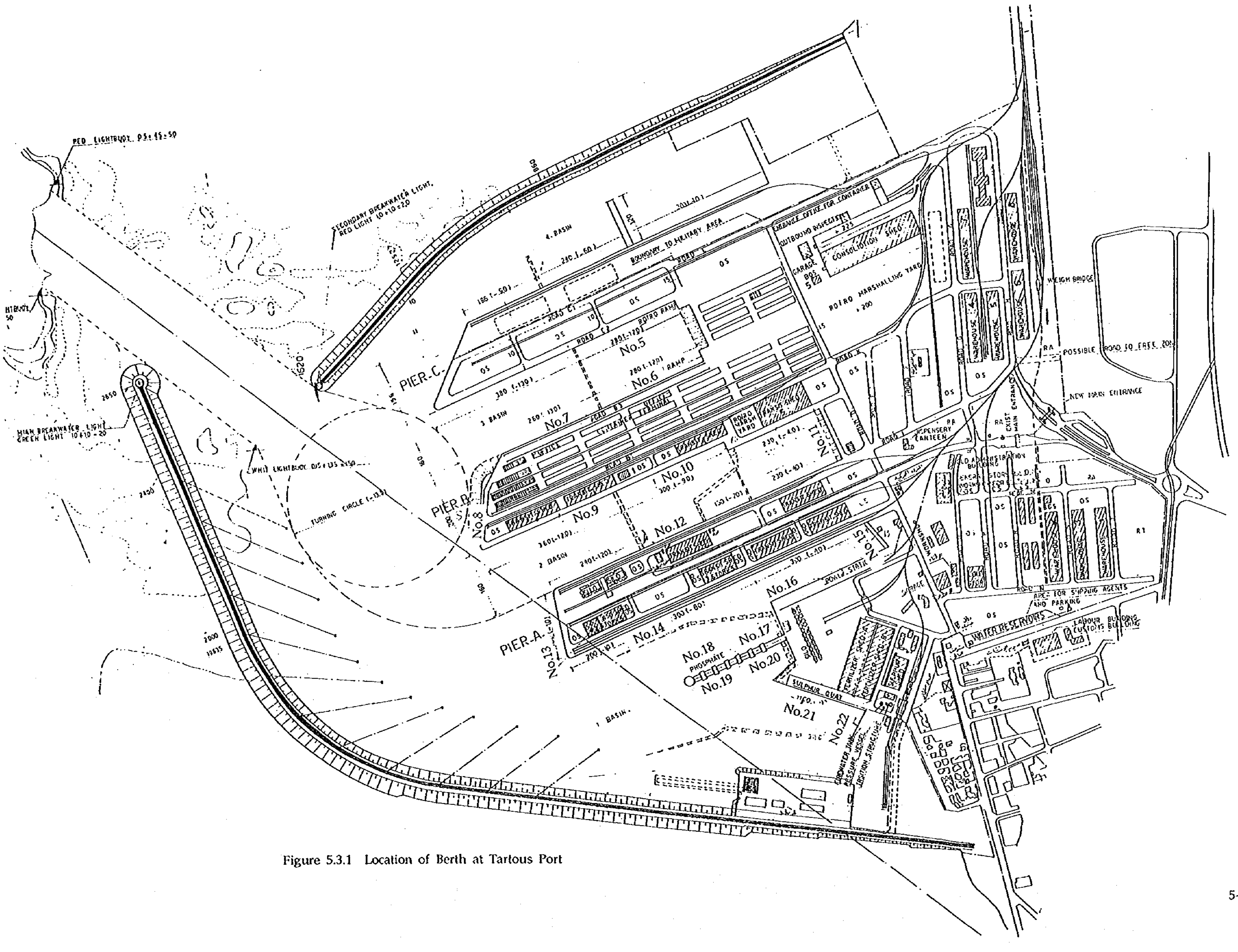


Figure 5.3.1 Location of Berth at Tartous Port

5.4 Port Services

5.4.1 Pilotage/Tug service

(1) Existing Tug boats and Pilot boats

Details of the port service boats in Tartous port are as per Table 5.4.1-1.
The port is equipped with 6 tug boats and 5 pilot/general service boats. However most of them are old, the average age is about 22 years old.

Table 5.4.1-1 Service Boat at Tartous Port

Type	Name	Built Year	Main Dimension			Main Engine	Speed	Material	Re-marks
			L	B	D				
Floating Crane								Steel	
Tug Boat	Al Nairid	1971	28.1	7.33	3.5	1080	11	Steel	
Tug Boat	Al Jala	1971	28.1	7.33	3.5	1080	11	Steel	
Tug Boat	Tichrin	1970	18.5	5.8	3.5	730	11~12	Steel	
Tug Boat	Al Assad	1979	18.65	5.15	3.53	517	10	Steel	
Tug Boat	Azar	1979	15.9	4.6	2.35	289	9	Steel	
Tug Boat	Khabour	1976	15.3	4.5	3.14	325	9	Steel	
Pilot Boat	Alsinn	1968	16	4.5	3.0	300	9	Steel	
Pilot Boat	Al Ghab	1968	16	4.5	3.0	300	9	Steel	
Pilot Boat	Ayyar	1976	13.82	4.0	2.0	149	9		
Pilot Boat	Alassi	1976	14	4.0	1.5	120	9		
Pilot Boat	Tartous	1968	11	3.0	1.5	100			
		1968	10	3	1.5	33		wooden	

Chapter 6 Conditions of Design and Cost Estimate

6.1 Design Conditions and Facility Design

6.1.1 Designed Types of Ships

In the table below are given the main characteristics of designed types of ships assumed for port facilities design at the Ist Stage Area in Latakia Port.

Table 6.1.1-1 Designed Types of Ships at Latakia Port

Ship Type	Carrying Capacity,	Overall Length (m)	Breadth (m)	Molded Depth (m)	Load Draught (m)
"Conventional" Ships	2,450 tons	78.3	13.2	7.0	5.9
	4,030 tons	106.5	15.0	8.2	6.6
	7,250 tons	135.5	17.8	10.4	7.8
	12,000 tons	161.5	22.2	13.4	9.1
	14,600 tons*	173.8	24.0	14.7	9.6
Timber Carriers	5,300 tons	130.3	17.3	8.5	7.3
	9,560 tons	151.1	21.0	11.6	8.5
Dry Bulk Carriers	8,862 tons	139.5	18.0	10.3	8.0
	14,000 tons	149.0	21.7	11.0	8.2
	21,350 tons*	185.2	22.8	14.2	9.8
Ro/Ro Ships	11,000 m^3	124.2	19.2	9.5	6.7
	19,000 m^3	163.0	24.5	16.9	7.2
	53,000 m^3	217.0	29.8	20.9	9.8
Container Ships	400 TEU*	138.0	19.5	10.5	7.7
	776 TEU*	171.8	25.7	15.1	9.1
	1,200 TEU*	230.0	29.0	16.3	10.5

Note: */ Designed ships for future port development (2000).

6.1.2 Design Conditions

6.1.2.1 Design Conditions for Latakia Port

(1) Meteorological Conditions

Latakia Port is situated on the east coast of the Mediterranean Sea on the border between temperate and tropical climatic zones.
Predominant wind direction: in summer, from May to September- South and South-West 29-66%; in winter, from October to March- North-East and East 34-58%. Generally prevailing winds- of Southern directions 17.1%. Maximum wind velocity 27 m/sec was observed in January 1968 from North and in June 1965 from South-West (Period of observation 1960-1970)

(2) Tidal Ranges

Tidal ranges based on the average sea level are observed as follows: The sea level is subject to fluctuations because of tides and wind tides. High water level is +30cm. Low water level is -30 cm. According to observations carried on for 10 years absolute tidal amplitude is 60-80 cm.

(3) Wave Conditions

At the port entrance under the south-western gales, maximum wave parameters are calculated as follows:
Wave height; 6.8m, wave period; 9.5 sec, wave length; 95 m. The probability of the occurrence is once in 50 years.
The north-western and southern gales are less severe.

(4) Siltation

Judging from the estimated coastal sand drift volume and the tendency of beach evolution at the neighboring shore line of the port, the siltation of the port water area can be assumed negligible. The siltation takes place at the entrance of the port, but it is no obstacle to navigation of ships. Insignificant siltation is may be detected beyond the breakwater head.

(5) Geological Conditions

Geological conditions at the Old Port Area (main quay, silo, silo quay, slip, etc.) are summarized below:
Carbonate rocks are accumulated: porous cockle shell limestone and dense parti-colored clays. Some regularity is observed in the stratification of limestones and clays. They are deposited by alternate packets, up to 20m in thickness. Almost every packet of limestone contains much of lime clay in shape of lens, streaks and fillers of gaps. The packets of clay contain streaks and lens of lime-sand and lime

stone.
In the water area, carbonate rocks are overlapped by quartenary sea sediments represented by sands mainly, alternately mixed up with cocke-shells, pebbles and gravel. Sands are silted often. The thickness of silt is not more than 2 m; the thickness of sea sediments is up to 5 m and more.
Similar ground conditions are to be expected for the Ist Stage Area adjacent to the north of the Old Port Area. As a result of study, it might be expected that geological conditions of Latakia Port are favorable for the erection of quays of the gravity type.

6.1.2.2 Design Conditions for Tartous Port

(1) Meteorological Conditions

Tartous Port faces the Mediterranean Sea 90 km southward from Latakia Port. Predominant wind directions throughout the year are south or south-west almost the same as Latakia Port.

(2) Wave Height

The maximum waves at Tartous have been calculated on the basis of the fetches and according to the Iribarren formula for wave heights:

$$2h = 1.2 \times 4\sqrt{F}$$

where, 2h: wave height crest to trough.
F: fetch in kilometers
wave length is taken as $2l = 22 \times 2h$
22 being the normal factor used for storm waves.

The maximum wave height at the breakwater head of Tartous Port from southwest and from west are 7.0 m and 3.5 m respectively, the waves from southwest being decisive for the construction of the main breakwater, and the waves from west with regard to penetration of swell into the port.

(3) Littoral Drift and Current

A few small rivers or streams discharge into the Mediterranean near Tartous. During summer, most of the riverbeds are totally dry. The deposits in the riverbeds consists mainly of gravel. Current velocities along the Syrian coast are small. The direction is generally from south to north. Littoral drift of sand to any considerable degree does not seem to occur.

(4) Geological Conditions

Generally speaking sub-soil conditions are somewhat similar to those at Latakia,

perhaps with a little more sand and clay covering the rock on average. Rock levels seem to be below -9.3 m, except for a boring close to the shore where the rock level is -7.45 m.

It appears that the rock surface is sloping towards the sea. Layers of sand and clay (possibly with some gravel) are at many places of sufficient thickness to provide good anchor ground for ships at the anchorage area along the breakwater.

6.1.3 Seismic Conditions

1. Seismic conditions of Latakia Port are unknown. In design of port facilities of Ist Stage Area, it is said that the seismicity was given tentatively as 6 numbers, and the design seismic coefficient 0.03 was adopted in the seismic coefficient method.

2. Currently in Syria, "The Institute of Geology" Ministry of Petroleum, and "Syrian Atomic Energy Commission" have their own criteria concerning the seismicity. But, the most general criteria is the following code:
   The Syrian Code of the Beton - 1992
   This code is based on the seismic coefficient method and similar to Japanese design criteria for port and harbor facilities.
   In 1994, the regional seismic coefficients in above code have been reviewed by "Engineering Institute" Prime Ministry, and its findings were sent to the concerned agencies including the Ministry of Construction and Buildings.

   The Syrian Code of the Beton is briefly summarized below:

   a. Seismic Probability Zone
      Seismologically, each Arab country is divided into five areas:
      - Area (0); no worth mentioning seismicity. (up to Mag.V degree)
      - Area (1); not exposed to harmful strong seismicity. (up to Mag.VI degree)
      - Area (2); exposed to medial accelerated seismicities causing medial destruction. (up to Mag.VII degree)
      - Area (3); exposed to high percentage of seismicities of high acceleration type causing notable destruction. (up to Mag.VIII degree)
      - Area (4); exposed to high percentage of seismicities of high acceleration type causing disastrous destruction. (more than Mag.VIII degree)

      All areas in each Arab country are classified according to the above mentioned division by resolutions relevant to each country.

   b. Range of Usage
      This code is used initially in the Arab countries which have no available data relevant to the features of the seismic probability within their land. If local code exists, local conditions of the country are to be considered, then the local code could be adopted. In accordance to this code, structures should be designed and constructed on the basis of the ability to resist horizontal forces representing the seismic forces, which is side-horizontal forces impacting

towards the main axes of the structure.

c. Estimation of Seismic Force

The seismic force acting on a structure is calculated by the following formula.

$$V = ZIKCSW$$

whereas:
- V = The total lateral force or shear at the base.
- Z = Regional seismic coefficient. (see Table below)
- I = Occupancy importance coefficient.
- K = Coefficient representing the structure's inflexibility against the seismicity.
- C = Coefficient representing the relativity between seismic acceleration and ground acceleration.
  $C = 1/15/\sqrt{T}$
  $T = 0.10N$
  N: the total number of stories above the base to level n.
- S = Numerical coefficient for site-structure resonance.
  S depends on fundamental elastic period of vibration of the structure and characteristic site period. When these features are not properly established, the value of S shall be 1.5.
- W = The total dead load and applicable portions of other loads.

Table 6.1.3-1 Z-Coefficient

Seismic Zone	0	1	2	3	4
Z-coefficient	0	3/16	3/8	3/4	1

Note: The coastal area of Syria belongs to the seismic zone 4.

6.1.4 Structural Design Criteria

As basis for the design the German codes (DIN) have been chosen with the necessary adjustments to allow for the local conditions in the Tartous Port.
The main adjustment is the increase of the design wind pressure which, due to the unprotected open area at the site, has been increased by 50 % compared with the standard wind pressure in the German code. Besides this, a horizontal earthquake force of about 0.03 % has been taken into account, but since wind and earthquake forces are not assumed to act simultaneously, the wind force controls the design of most of the structures.
The followings are examples of design criteria for the structures at the fertilizer terminal at Tartous Port.

Loads

1. Dead Load
   The dead load shall comprise the weight of the structure and all pertaining permanent loads.

2. Imposed Load
   Storage material:

Table 6.1.4-1 Selected Commodity Characteristics

Material	Bulk Density ton/m³	Repose Angle degree
Triple Superphosphate	1.3	33
Urea	0.8	30
Sulphur	1.3	30

Mechanical equipment:
Loads imposed by mechanical equipment shall be according to suppliers data. These will comprise a dead load, a movable load and horizontal forces.
The movable load shall be multiplied by a dynamic factor of 1.3.

Loads on galleries:
Walkways and galleries will be calculated for a uniform live load of p = 0.1 ton/m² or a concentrated live load of p = 0.3 ton acting at any point.

3. Natural Loads
   Wind load:
   Wind load will be calculated according to DIN 1055, but all forces will be increased by 50 %.

   Earthquake forces:
   Earthquake forces will be calculated according to the American National Standard ANSI A 58.1-1982. The Tartous area will be considered as zone 1. as defined in this standard. (i.e. numerical factor z = 3/16)

4. Load combinations
   The earthquake load will be dealt with in the calculations in the same way as the wind load but will be considered in a separate load case i.e. not acting simultaneously with the wind force.

6.1.5 Specification for Buildings

The specification for the buildings such as transit shed, warehouse, and CFS in Tartous Port is as follows:
One row of columns is in the middle of shed.
The outer wall of shed is made of prefabricated reinforced concrete elements with outer surface made of white cement or painted.
The roof is prestressed concrete elements cover with Aspel (paper, bitumen, sand).
The beams are I-shaped, whereas the roof slabs are double T-slabs.
The floors are made of reinforced concrete or asphalt with a wearing course of "Salviacim". These two types of pavement both give;
1. Hard strong surface which is not easily damaged.
2. Good properties concerning distribution of heavy static loadings.
3. Surface which is resistant against wasted oil or petrol.
4. Light color surface which is advantageous for the illumination of the room.

As for CFS, in each facade 55 doors are provided positioned 4.5 m center to center. All the doors are hand operated overhead rolling doors with a free opening of 3.0 m in width and 4.0 m in height. This dimension of door suits the dimension of the containers parked on one side. The shed floor is elevated to +3.40 fitting to the level of containers placed on trailers (ground level +2.00).

6.1.6 Facility Design

(1) Breakwater

Latakia

In Old Port Area, the rubble mound type breakwaters filled with various types of stones were designed. The standard cross section of the breakwater is shown in Fig.6.1.6-1. This breakwater was damaged in 1968 by storms at the corner across a distance of 340m, and afterward it was improved with an exterior protection of 22.7 ton concrete blocks. (22.7 ton tetrapods) (see Fig.6.1.6-2).
In Ist Stage Area, the breakwater was extended by 1,730m, having armored concrete block along the total length. (see Fig.6.1.6-3)

Tartous

The breakwaters are of the rubble mound type of graded limestone (1:4) having a maximum 15-20 tons armored stone. The typical cross section of the breakwater is shown in Fig.6.1.6-4. A wave height 2h = 7.0 m was assumed when calculating the western part of the main breakwater of the port which was constructed at a water depth of about 10 m. This wave height might perhaps occur in very exceptional cases - say every 50 years. The wave length 2l = 140 m is, due to the smaller depths, a little shorter than on the open sea where the wave length would be 22x7

= 154 m.

(2) Quays

Latakia

The following two types of quay were examined for Ist Stage Area:
- Quay wall of precast concrete blocks.
- Quay wall of steel sheet piles of the angle type.
The former type was finally adopted. The typical cross sections of both type are shown in Fig.6.1.6-5, 6.1.6-6.
Design loads were assumed for all quays as follows:
load on quay apron 4 t/m^2, on transition quay area - 6 t/m^2 and on the rear quay area - 10 t/m^2; load on quay from ship - were assumed considering the depth alongside the quay and the type of the ship to be berthed.

1. Quay wall of concrete blocks (see Fig.6.1.6-5)

The quay well is regular masonry wall of concrete blocks which maximum weight does not exceed 100 tons. The precast blocks were placed in a row along the width of the structure. Behind the concrete wall, a stone backfilling was provided with a slope gradient 1:1, the weight of stones being from 15 to 100 kg. A broken stone fill and sand fill were placed thereon.
Over the concrete block masonry, a precast R.C. superstructure was installed cast in situ by bollard blocks. The railway tracks were laid on the apron with 1,050 mm clearance.

2. Quay wall of steel sheet piles (see Fig.6.1.6-6)

This type of quay consists of the angle type Larsen V sheet piles, the front sheet pile panels resting on precast R.C. slabs 45 cm thick. Weight of slabs does not exceed 50 tons. The front panels were anchored by round steel tie rods to anchor wall of Larsen V steel sheet piles. The tie rods are spaced 2.52 m apart from one another. Backfilling behind the wall is of sand. The quay wall is erected on a rubble bed. The R.C. cast in situ superstructure is faced with precast slabs.

Tartous

The quay walls was constructed by precast concrete blocks same as Latakia Port; They were backfilled with rubble, the coping being constructed in concrete cast in situ.

(3) Road and Yard

Tartous

Pavement was designed according to "AASHO interim guide for design of pavement structures" or other international recognized methods. The average daily traffic on each lane on the most trafficked road in the port was preliminarily estimated to be 80 trucks with 20 foot containers, average total load 30 tons, and 650 trucks with a total load of 12 tons.
Composition of asphalt pavement is summarized as follows:

Table 6.1.6-1 Composition of Asphalt Pavement

(Unit: cm)

Facilities	Subbase	Base	Bituminous Binder Course	Surface Course
Road	30-40	30	6-8	4
Open Yard	15	20-25	6-8	4

Container yard was paved by Portland cement concrete.

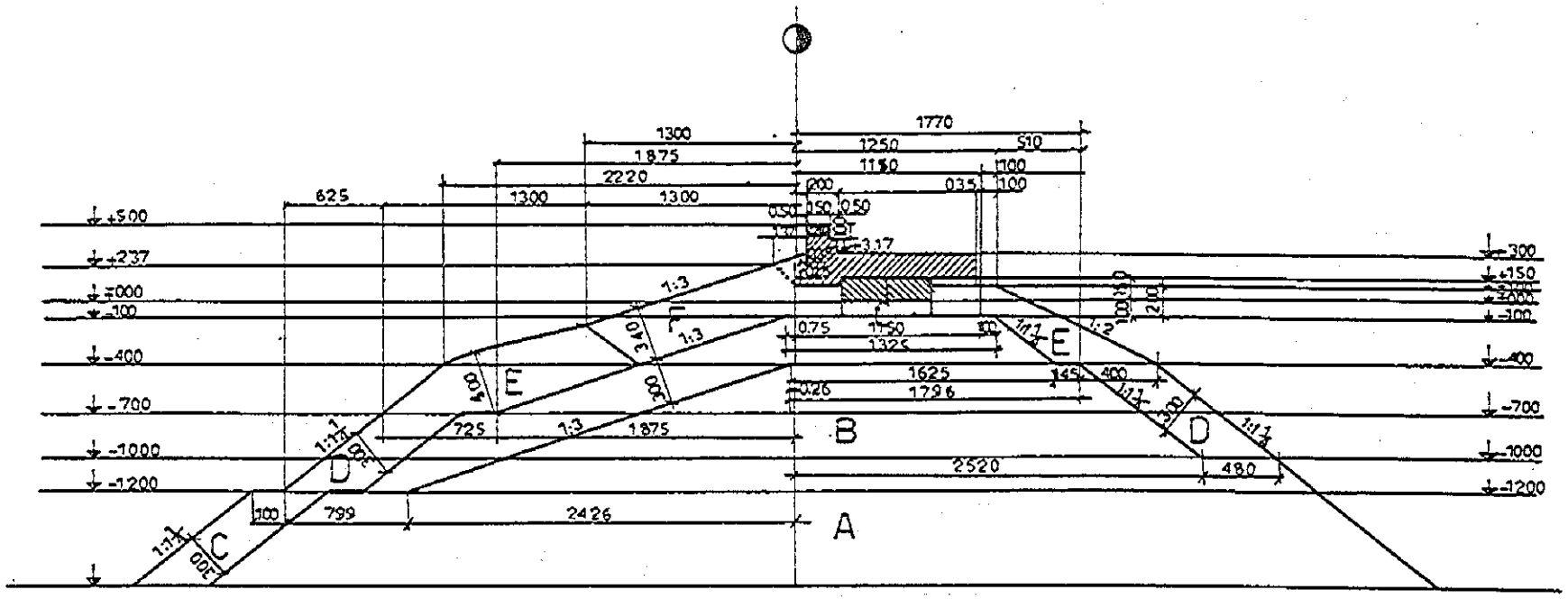
(4) Other Facilities

Latakia

At Old Port Area, there are grain silos with the silo volume being 45,000 m^3 which is capable of storing 35,000-40,000 tons of grain. The location plan is shown in Fig.6.1.6-7. From the silo tower to dolphin pier, conveyor bridge is connected. (see Fig.6.1.6-8) These facilities can be used only for unloading. The Port Company has a plan to develop these facilities to be reversibly used for both loading and unloading.

Tartous

At bulk terminal, there is a dolphin type pier having 269m in length and -11.0m in depth. Both sides of pier are equipped with unloaders and are available for unloading of phosphate. Plan and longitudinal elevation are shown in Fig.6.1.6-9. Dolphin has concrete pillars with pre-packed concrete foundation.



CATEGORY	WEIGHT /Kgs.
A	0-250
B	10-250
C	250-2000
D	2000 - 10000
E	10000-15000
F	15000-20,000

Figure 6.1.6-1 Typical Cross Section of Breakwater in Old Port Area-Latakia Port

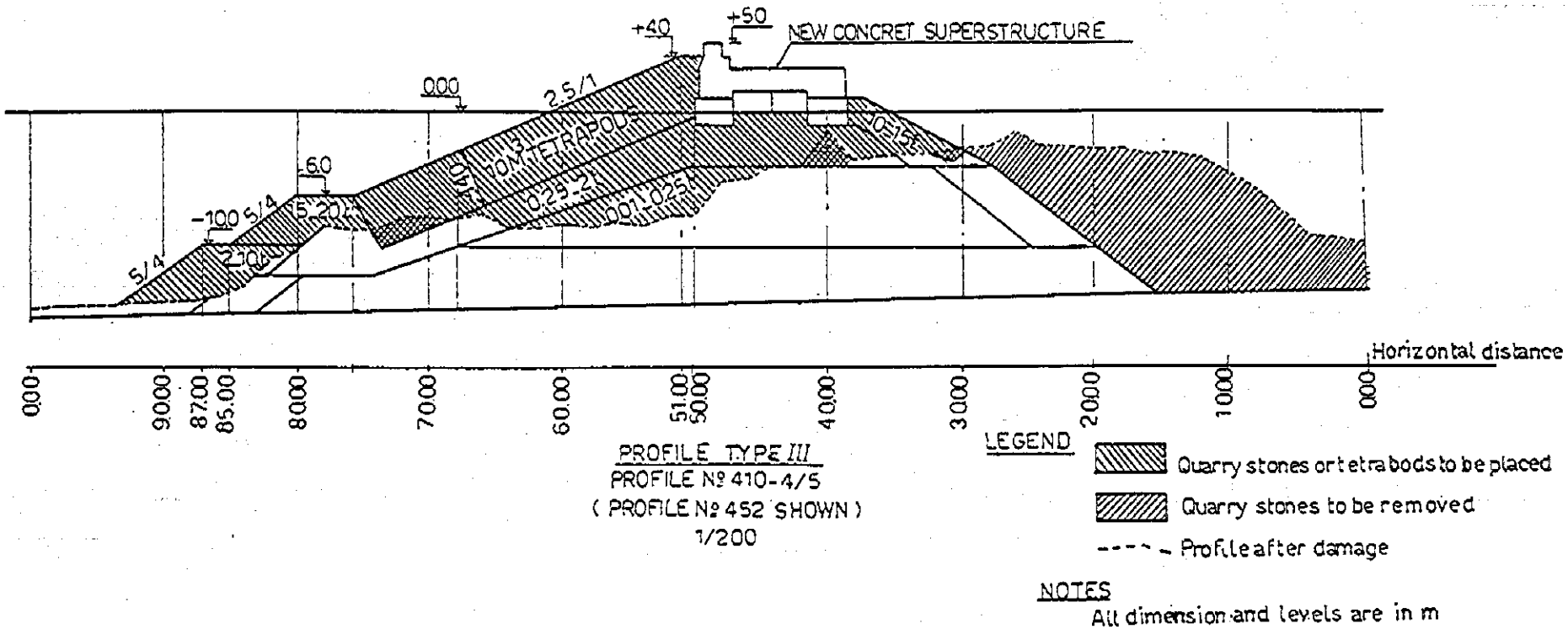


Figure 6.1.6-2 Typical Cross Section of Breakwater at the Corner in Old Port Area-Latakia Port

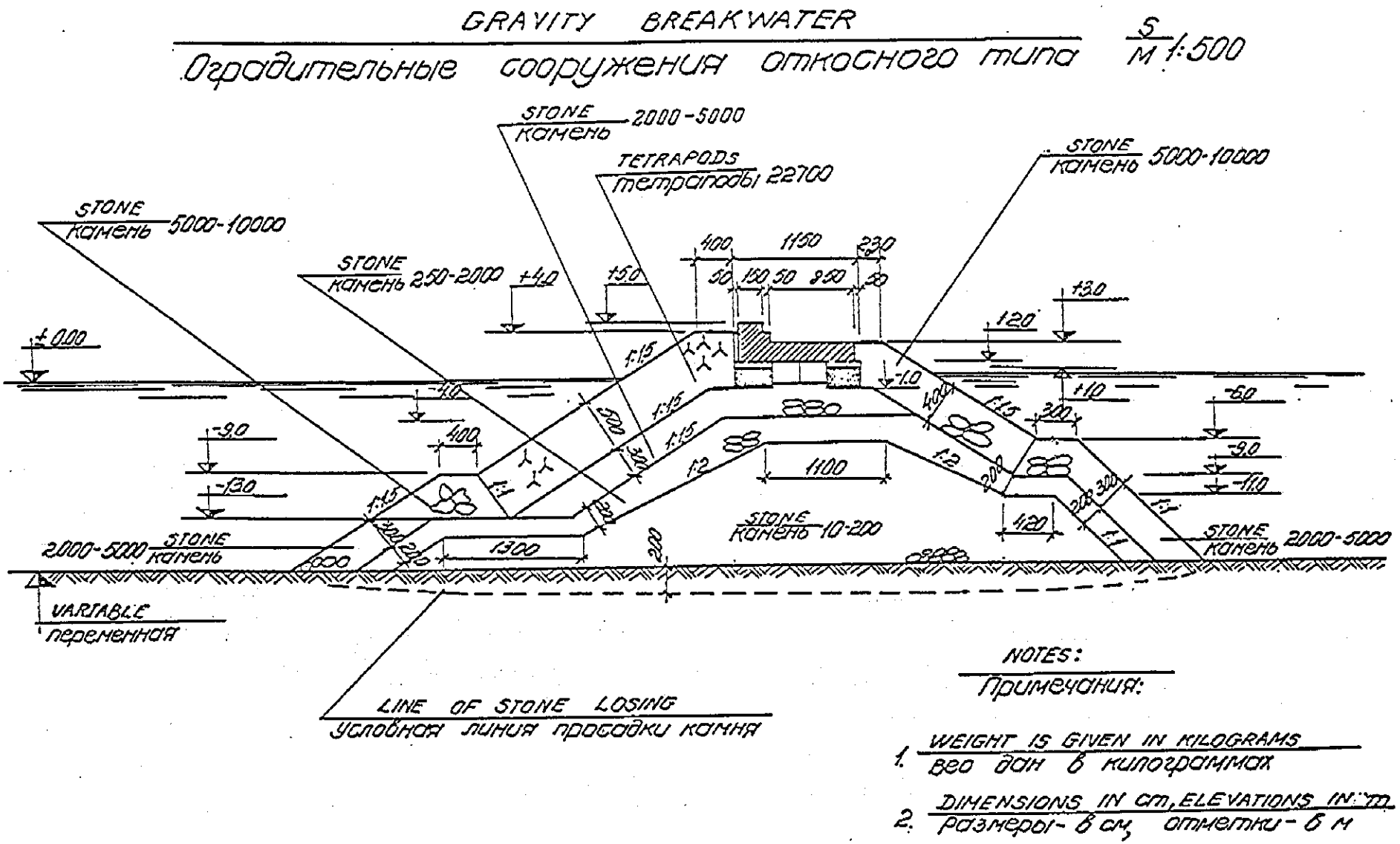


Figure 6.1.6-3 Typical Cross Section of Breakwater in Ist Stage Area-Latakia Port

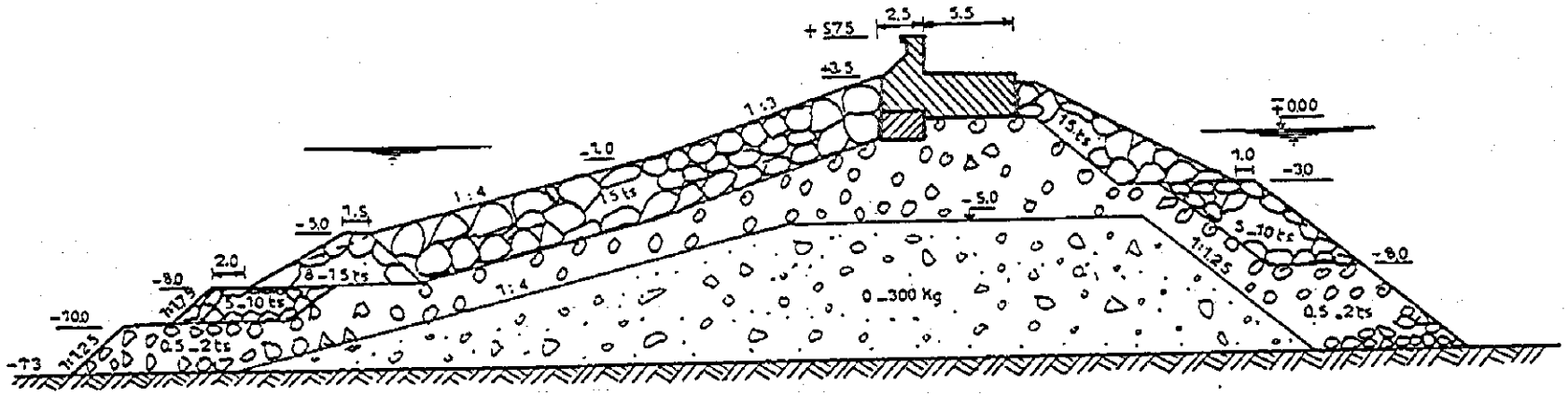


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Figure 6.1.6-4 Typical Cross Section of Breakwater in Tartous Port

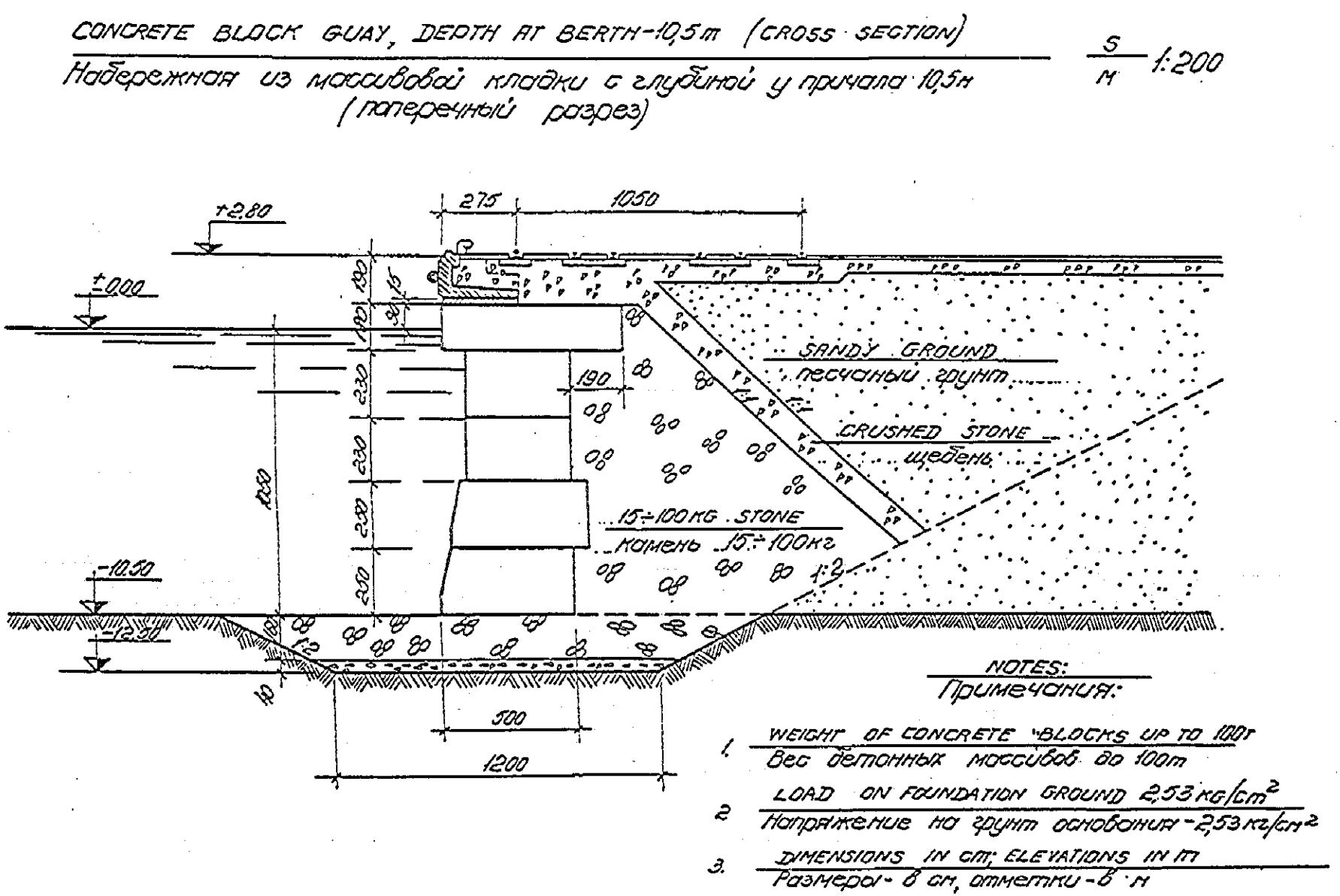
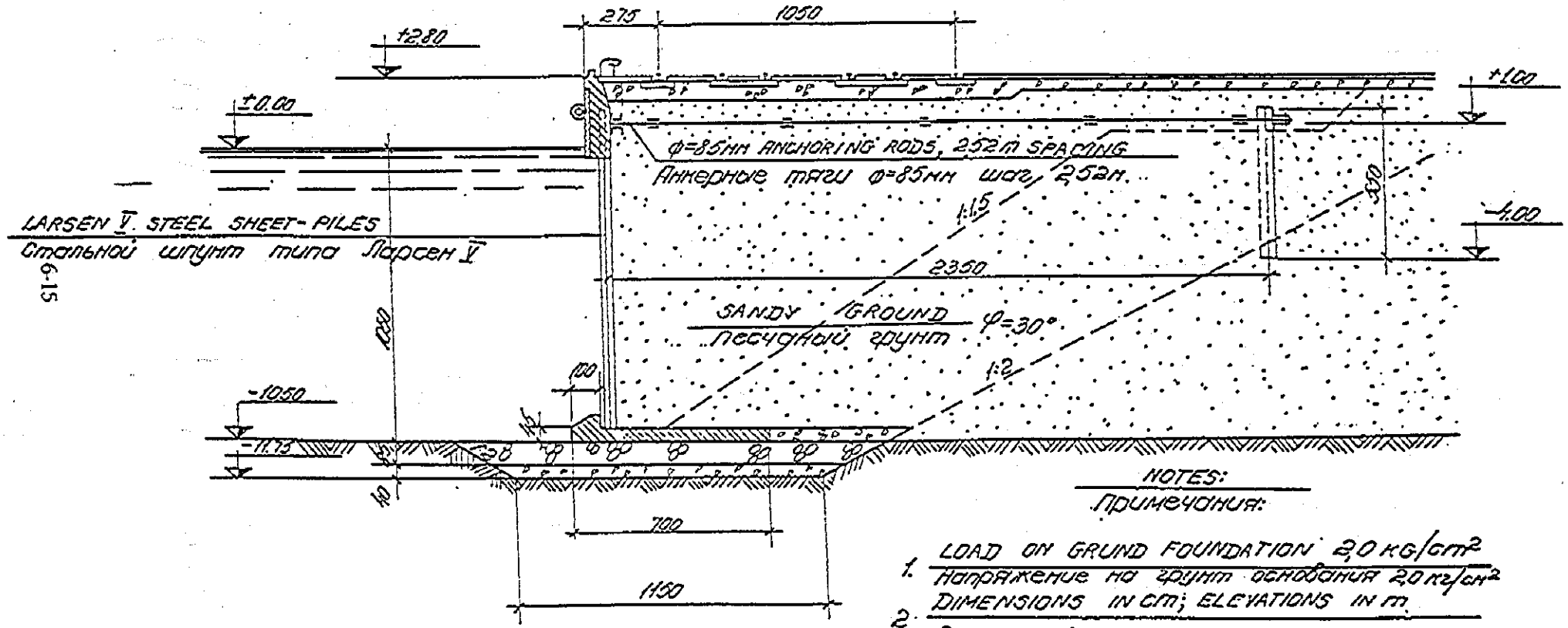


Figure 6.1.6-5 Typical Cross Section of Quay in Ist Stage Area-Latakia Port Block Type(-10.5m)

SHEET - PILE QUAY, DEPTH AT BERTH -10,5m (CROSS - SECTION)

Набережная в виде уголковой стенки с глубиной у причала -10,5м (поперечный разрез)

S/M 1:200



NOTES:
Примечания:

1. LOAD ON GRUND FOUNDATION 2,0 KG/CM²
Напряжение на грунт основания 2,0 кг/см²
2. DIMENSIONS IN CM; ELEVATIONS IN M
Размеры-в см, отметки-в м.

Figure 6.1.6-6 Typical Cross Section of Quay in Ist Stage Area-Latakia Port Steel Sheet Pile Type(-10.5m)

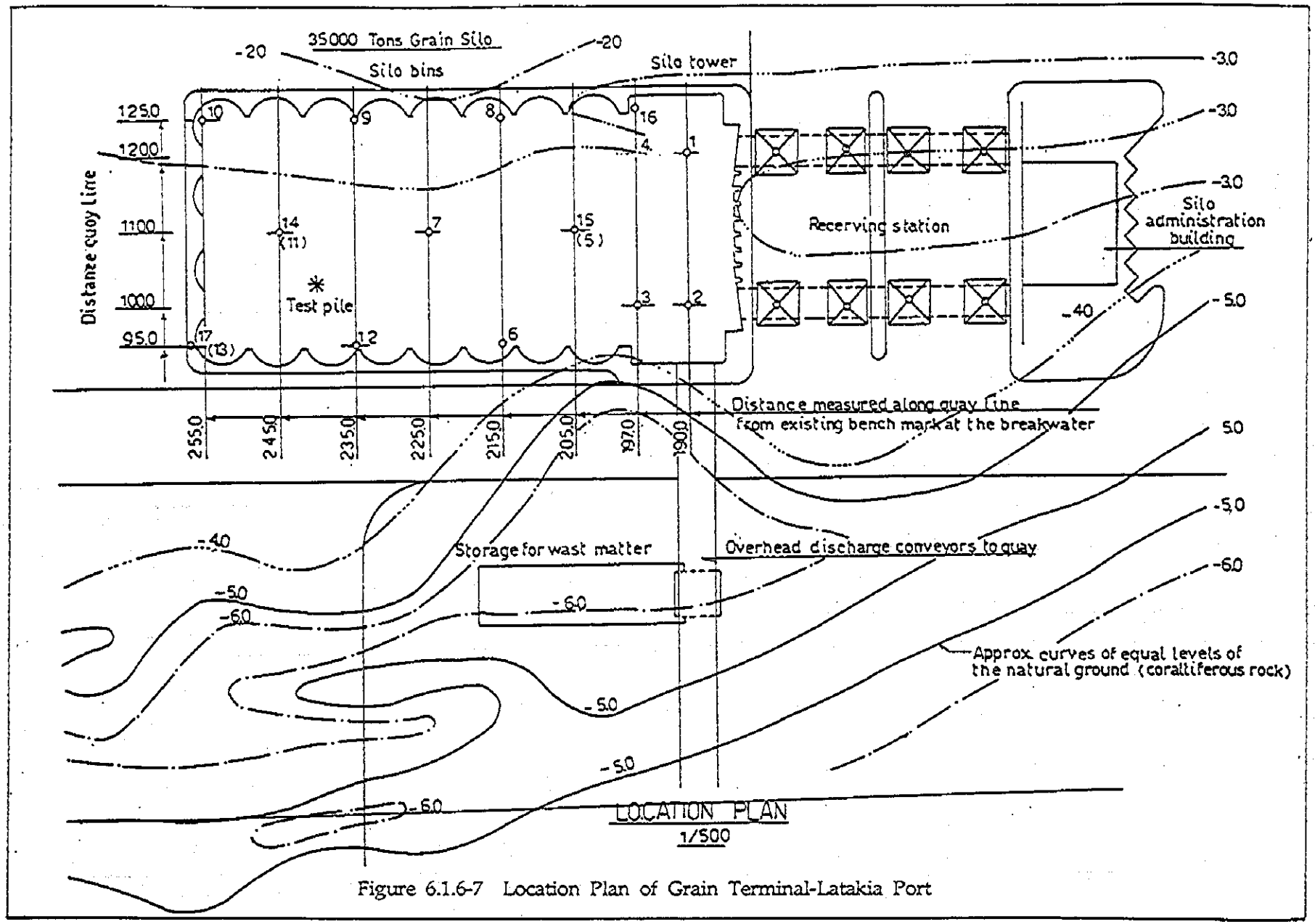


Figure 6.1.6-7 Location Plan of Grain Terminal-Latakia Port

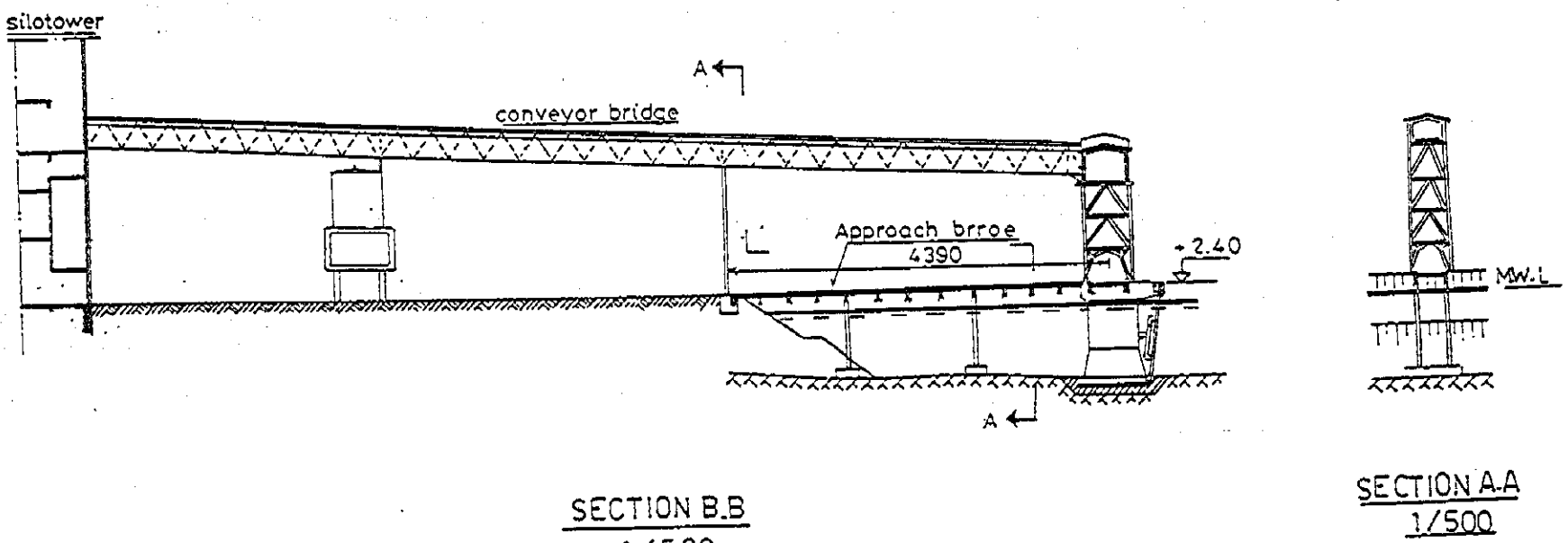


Figure 6.1.6-8 Conveyor Bridge for Grain Terminal-Latakia Port

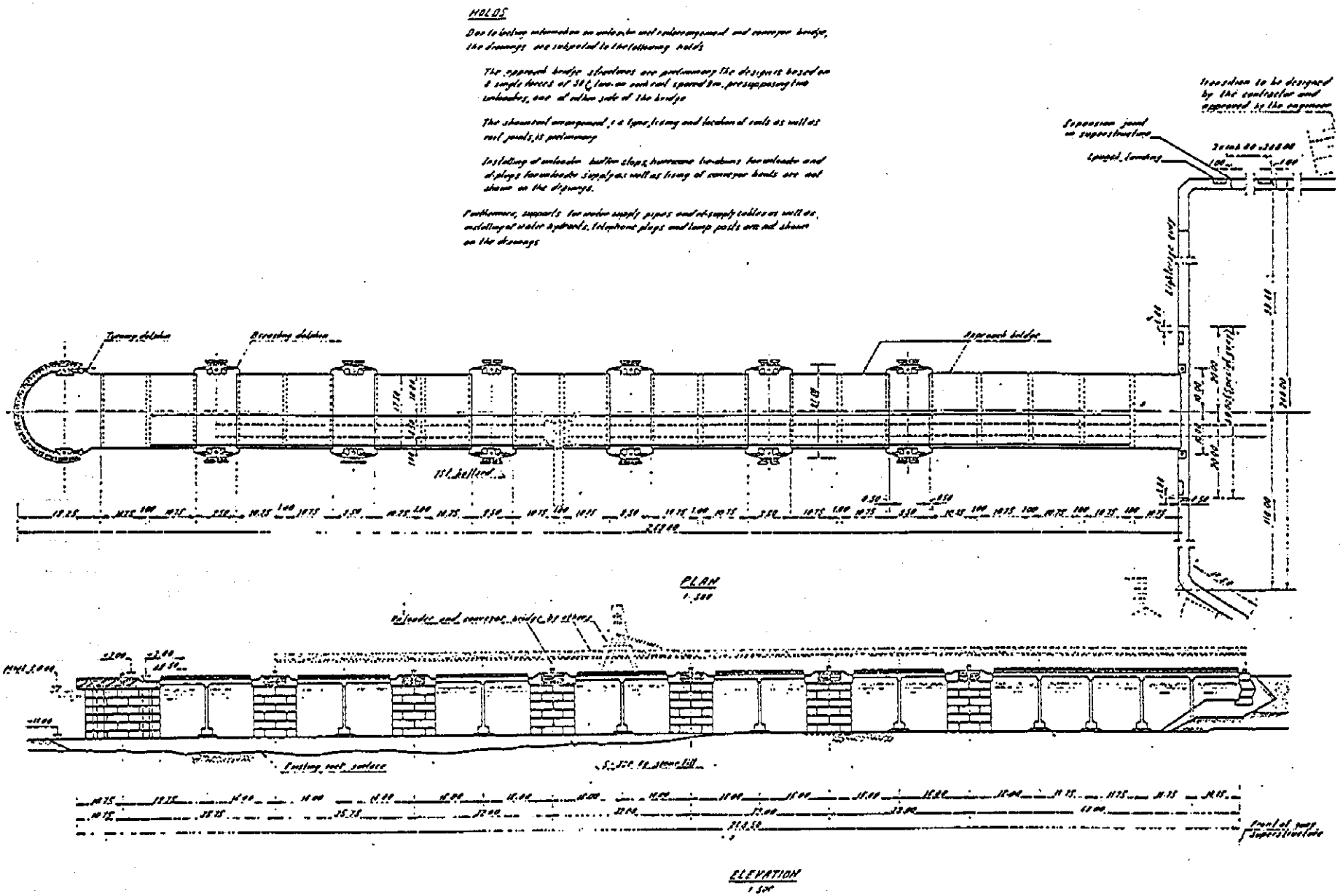


Figure 6.1.6-9 Loading Pier for Phosphate-Tartous Port

6.2 Conditions of Implementation

6.2.1 Review of Implementation in the Past

6.2.1.1 History of Ports

(1) Latakia Port

Initial stage of the Latakia port was originally a small basin with no quay at the southern part of the port in the 1940's. The improvement of the port was carried out as part of the previous stage plan in the 1950's, and after this, the large-scale construction of " First Stage Plan" started in 1976, in which the breakwater was expanded to a length of 1,730 meters, followed by the construction of deep water berths spanning 2,000 meters in length in 1979. These improvements allowed Latakia to serve as both a commercial and container terminal.
The dredging of the basin and the channel (Total Volume : 1.5 M. cu.m) was carried out at the same time by ZANEN VERSTOEP. N.V Co., LTD of the Holland. These works were completed in 1984.
As concerns the first stage plan, the investment costs were, at that time, 1.6 Million Syrian Pounds for breakwater, 1.2 Million L.S for berths, and 65.000 Thousand L.S for dredging.

(2) Tartous Port

The history of the Tartous port began in 1960 with the construction of the southern and northern breakwater, 2,650m and 1,620m in length, respectively. These were carried out by a Yugoslavian contractor, who finished the project in 1965.
After this, the Pier No. 1, No. 2, and Pier No. 3, were constructed one after another between 1966 and 1982 by POMORSKOKRHP from Yugoslavia.
At the same time, the dredging of the access channel and the basin were carried out by a Danish company named STUDINT between 1960 and 1966, and 1974 and 1979, respectively.

(3) The history of Latakia and Tartous is summarized below:

Port	Facilities	Q'ty	1960's	1970's	1980's	Contractor
Latakia	Breakwater	1,730 m		(76) (81)		Yougoslavia
	Berth	2,152 m		(79)	(84)	Syria (1)
	Dredging	1,500,000 m3		(79)	(80)	Holland (4)
Tartous	Breakwater	2,650 m	(60) (65)			Yougoslavia (5)
		1,620 m	(60) (65)			Yougoslavia (5)
	Berth (Pier A)	1,730 m	(66)	(74)		Yougoslavia (2)
	Berth (Pier B)	1,458 m		(79)	(82)	
	Berth (Pier C)	688 m		(79)	(82)	
	Dredging Channel		(60) (66)			Denmark (3)
	Dredging Basin			(74) (79)		Denmark

Note: (1) NATIONAL COMPANY, T.O.E.C.
(2) POMORSKOKRHP CO., LTD.
(3) STUDINT CO., LTD
(4) ZANEN VERSTOP N.V. CO., LTD.
(5) BOMOR SCOGRAD CO., LTD.

Figure 6.2.1.1-1 History of Ports

6.2.1.2 Review of Construction Capability in the Past

To assess the capability of constructing ports in the period of the 1970's and 1980's, macro inspection is carried out as well as the inspection of ability to supply materials during that time.

(1) Macro inspection

Macro inspection is carried out based on Table 6.2.1.2-1.

Table 6.2.1.2-1 Construction Length per Year

Port	Facilities	Length	Construction period	Constructed length per year	Remarks
Latakia	Break water	1730m	6 years (1979 - 84)	290m	
	Berth	2.152m	6 years (1979 - 84)	360m	
Tartous	South B.W.	2.650m	6 years (1960 - 65)	720m	
	North B.W.	1.620m	6 years (1960 - 65)	130m	
	Pier - A	1.730m	9 years (1966 - 74)	420m	
	Pier - B	1.458m	5 years (1979 - 83)		
	Pier - C	688m	5 years (1979 - 83)		No.1 & No.2 berth completed before 1960's, not included

Judging from Table 6.2.1.2-1, the construction capability is assumed at more or less 700 meters per year for breakwater, and some 400 meters per year for berth construction.

(2) Ability to supply material

To investigate the ability to supply materials, the quantities needed for each facility are calculated using their cross section and each constructed length at the peak period of construction in 1980.

The result is as shown in Table 6.2.1.2-2.

Table 6.2.1.2-2 Supplying Ability in 1980

Port	Facility	Period Year	Contracted Length in 1980	Concrete (Block, etc.) m^3	Stone (Crushed) m^3	Stone (2"-8") m^3	Sand m^3
Latakia	Break-water	6 years (1976-81)	290 m	40,000	170,000	150,000	74,000
	Quay	6 years (1979-84)	360 m	28,000	120,000	--	40,000
Total	--	--	--	68,000	290,000	150,000	114,000
Tartous	Pier B & C	5 years (1979-83)	420 m	36,000	50,000	--	42,000

Judging from the table, it is assumed that more than 70.000 cu.m. of concrete and more than 500.000 cu.m. of stone were available to be supplied in the neighborhood of the ports at that time.
Supposing that these materials were supplied within 8 months of 1980, the volume will be 8.750 cu.m. of concrete and 62.500 cu.m. of stones per one month, which is approximately 400 cu.m. and 3.000 cu.m. per day, respectively.

6.2.2 Implementation Capability in the present

6.2.2.1 Procedure of Port Construction

The flow of port construction is as follows:

1) Field survey and Investigation of Soil Materials
2) Design and technical Specification
3) Cost Estimated
4) Contract
5) Construction and supervision

As concerns survey, design and cost estimate, the consultant, being selected and controlled by the government, carries out these works on behalf of the Port General Company. In the past, MESSRA KAMPSAX of Copenhagen, Denmark, and SAYOUZ MORUI PROJECT from Russia, carried out such technical matters of the existing facilities in Latakia and Tartous.

Contract of construction is signed between the government company and contractor which are under control of the construction committee of the government. After the contract is signed, the construction will begin under the supervision of the consultant and the port general company.

6.2.2.2 Construction Industry

The government company named T.O.E.C. constructed some of the existing facilities, but this company has since been dissolved and foreign companies are now used to construct the marine facilities.
Major construction companies in Syria are

1) Iskan (several works on land)
2) Sahel (mainly building works)
3) Kasiyun (works on land)
4) Rima (pipe line project)

6.2.2.3 Production Capacity of Materials

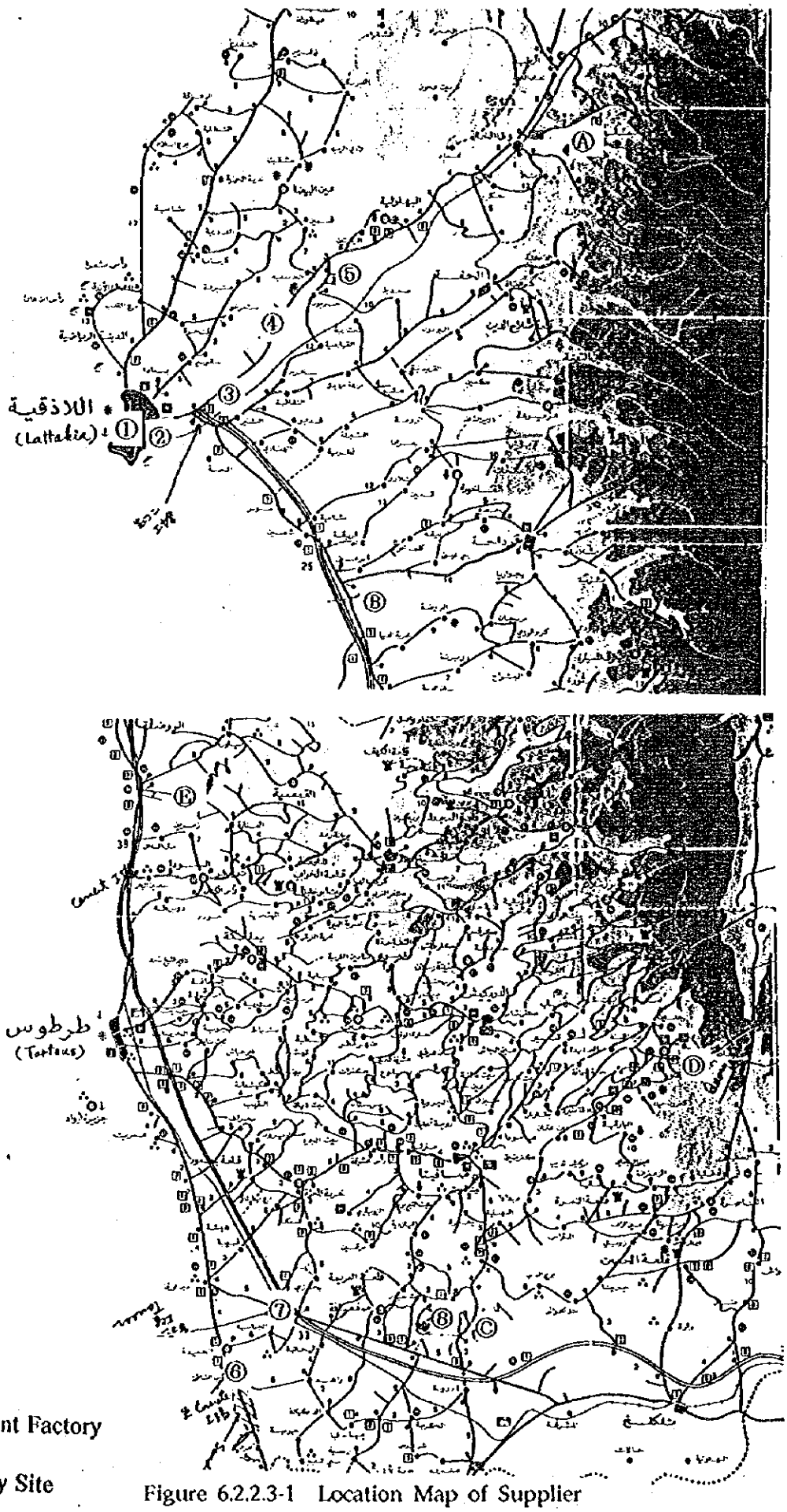
Fig. 6.2.2.3-1 is the location map of the quarry sites and the concrete factories in the neighborhood of Latakia and Tartous.

(1) Stone and sand

Big stone (8 ~ 20 t/piece) adopted for the armored works is produced at some quarries, and the available supply of stone and sand is satisfactory to meet the demand.

(2) Concrete

Although the domestic output of cement is actually 3.800.000 ~ 4.000.000 tons per year at six national cement makers, about 8.000 tons are imported mainly from Italy in 1993.
As concerns Ready-Mixed Concrete, three factories are located near the planned site of the new port, and the name of companies and output of ready-mixed concrete are shown below: (refer to Fig. 6.2.2.3-1)



Note:

① : Cement Factory

Ⓐ : Quarry Site

Figure 6.2.2.3-1 Location Map of Supplier

Nr.	Name	Output Volume	Others
1	SAHEL	20 ~ 40 cu.m. / hour	
2	KASIUM	20 ~ 40 cu.m. / hour	
3	SAHEL	20 ~ 40 cu.m. / hour	
4	ISKAN	---------	
5	RIMA	---------	
6	KASIUM	50 cu.m. / hour	3
7	TAMMER	25 cu.m. / hour	4
8	RIMA	30 cu.m. / hour	

As concerns the concrete products, products of various sizes such as tetrapods (more than 12 ton/piece), concrete piles and concrete beams etc. are produced and are also obtainable by order at the local factories.

(3) Steel

The general company of reinforcement and steel in Homs city produces yearly some 95.000 tons of iron round bar in 1992.

The large scale iron products, such as steel pipe piles and steel sheet piles etc., must be imported; about 1.000.000 tons were imported from Denmark and Germany in 1993.

6.2.2.4 Construction Equipment

(1) Port General Company

Construction equipment which belongs to the port general company in Latakia and Tartous is listed in Table 6.2.2.4-1.

Table 6.2.2.4-1 List of Construction Equipment

Company	Port	Description	Capacity	No.	Age	Remarks
Port General Company	Latakia	Floating Crane	100 t	1	1958	Crane Hungary
		Floating Crane	32 t	1	1976	Crane Hungary
		Mobile Crane	65 t	1	1981	P&H USA
		Tug Boat	1.100 hp	1	1978	Swiss Hungary 11 t
		Tug Boat	800 hp	2	1956	Crane Hungary 8 t
		Tug Boat	200-750 hp	6	1961	Byriche 7.5 t
		Traffic Boat	200-300 hp	9	---	----
		Barge Lighter	150 t	52		
	Tartous	Floating Crane	100 t	1	1971	
		Floating Crane	35 t	1	1980	
		Mobile Crane	75 t	2	1975	P & H. USA
		Tug Boat	1.080 hp	2	1971	Hungary / England
		Tug Boat	300-730 hp	4	1970	Hungary / Lebanon
Private Company	Latakia	Floating Crane	120 t	1		Abu Khater Co. LTD.

(2) Private company in Syria

The equipment of works on sea which belongs to the private company in Latakia and Tartous is shown in the same table.
The standard type and size of construction equipment on land is usually available in Syria. But, as the working vessels are limited to a few types, the major marine equipment such as suction-dredger, large scale floating crane, and pusher barges must be mobilized from abroad if necessary.

6.2.2.5 Necessary Items to be Considered

As the new port site will face the Mediterranean Sea and high waves will attack the seashore during winter, it is noted that a calm basin protected by breakwater should be constructed for working crafts in the first place.
Scale of the basin required will be 5,000 hectares with approximately 100 meters length of berthing facilities of 3 meters depth.
The working space on land which will be necessary for the construction work is yard space for constructing various size of blocks, yard space for temporary place of a huge amount of rocks and sand, and parking area for construction machines etc.
Area of the working space required may be more than 30,000 hectares.
Access roads to the new port are very important to the development of the port it self as well as the construction.

It is supposed that a large number of working vehicles carrying materials, such as ready-mixed concrete and other materials.

6.3 Conditions of Cost Estimate

6.3.1 Conditions of Cost Estimate

Construction cost for the project should be estimated on both the quantity of planned facility and the basis of the preliminary design. Cost estimations are established considering local conditions, available equipment and the suitability of the construction method.
Assumptions and conditions applied for the cost estimate are set as follows:

(1) Workable days

1) Holidays

In Syria, Friday is a holiday, and national holidays are as follows:

Jan. 1/10, Feb. 9, Feb. 20 ~ 22, Mar. 1 ~ 3/8/14/21,
Apr. 4/16/17/29 ~ May. 2, May 1/6/8 ~ 11/21/30,
Jun. 10, Jul. 23, Aug. 15/19, Sep. 1,
Oct. 6, Nov. 1/11/16/22, Dec. 25/30 etc.

This means that normally 295 days are considered to be working days in one complete year in Syria.

2) Unworkable days

In the case of offshore and onshore works, the construction of the port facilities will be affected by weather conditions.
In particular, unworkable days occur when there are dangerous high waves at those areas of the site unprotected by the breakwater.

In this project, unworkable days caused by bad weather are assumed to be about 5% ~ 10 % of the total working days.

3) Workable days

Workable days are as follows:

Working days	295
Unworkable days	15
Workable days	280(23 days per month)

(2) Working Hours

Working hours are usually 7 hours per one day; from 7 a.m. to 3 p.m. except 1 hour rest, and additional work is guaranteed up to 9 p.m.

(3) Current Price

Cost estimates are based on current prices as of April 1995.

(4) Tax

Import taxes for imported construction materials, and equipment mobilized from foreign countries are excluded from the cost estimate.

(5) Exchange rate

The exchange rate of the currency is set as follows:

1US$ = 42 S.P. (Syrian Pounds)
1US$ = 100 Yen (Japanese Yen)

(6) Foreign Portion

Construction costs are divided into a foreign currency portion and a local currency portion, which are defined basically by the following categories:

Foreign Portion:
- Imported construction equipment, materials and goods.
- Salary allowance for the foreign laborers.
- Engineering Fee.
- Overhead

Local Portion
- The remainder

(7) Methodology of Cost Estimate.

The methodology of the cost estimate is carried out in accordance with the international standard.

(8) Others

1) The following ratios of utilities to the direct cost will be used;
Wharf, Yard, Road : 4%
Container Yard : 6%
C.F.S, Office, passenger Terminal :

2) Physical Contingency and Engineering Fee

Although the cost the physical contingency or engineering fee is caluculated basically at the ratio of each item which are shown as follows, the actual costs are estimated based on the local conditions.

Wharf / Building : 8%
Dredging/Reclamation/Pavement of Road, Yard ect. : 4%
Cargo Handling Equipment / Machinery : 0%

Engineering Fee

Civil / Building Work etc. : 5%
Cargo Handling Equipment etc. : 3%

3) The cost of land acquisition is excluded from the cost estimate.

4) Price escalation due to inflation is excluded from the cost estimate.

6.3.2 Unit Price

Unit price of labors, materials and rental fee were collected from three different sources, and suitable prices are derived from them. The various prices are listed in Table 6.3.2-1, and the last column is the derived prices which are adopted in the project

Table 6.3.2-1 Unit Price

(Unit : S.P.)

Items	Unit	(A)	(B)	(C)	(X)
Labor					
Unskilled	Daily	---	250.0	225	250
Skilled	Daily	---	400.0	350	400
Crew	Daily	---	2,500.0	---	2,500
Crew (high)	Daily	---	4,000.0	---	4,000
Operator	Daily	---	500.0	400	500
Material					
Sand	cu.m.	160	400.0	---	200
Crushed Stone	cu.m.	175	350.0	200	200
Stone (10~250 kg)	cu.m.	180	550.0	250	200
Stone (250 ~ 2000kg)	cu.m.	250	600.0	250	250
Stone (2 ~ 5 t)	cu.m.	550	700.0	400	550
Ready-Mixed Concrete	cu.m.	1,750	4,000.0	1,500	1,750
Pavement Asphalt	ton	990	1,000.0	1.50/m²	1,000
Steel Pile	ton	28,000	30,000.0	29,000	28,000
Steel Bar	ton	20,000	20,000.0	18,000	20,000
Steel Sheet Pile	ton	30,000	50,000.0	30,000	30,000
Tetrapod (12 ton)	piece	36,000	4,000.0	---	36,000
Tetrapod (25 ton)	piece	75,000	6,000.0	---	75,000
Prestress Concrete Pile	piece	40,000	---	40,000	40,000
Regular Gasoline	litter	20.1	20.3	20,3	20
Diesel Oil	litter	6,2	6.0	6,2	6
Heavy Oil	litter	50,3	50.0	50	50
Electricity	kwh	4,35	3.0	3.0	3
Rental Fee					
Bulldozer (20t class)	Daily	7,814.4	8,000.0	2,000/hr	8,000
Back hoe (1.0 cu.m. class)	Daily	7,814.4	6,000.0	2,000/hr	8,000
Dump Truck (10t class)	Daily	3,907.2	3,000.0	800/hr	3,000
Truck Shovel (2.2 cu.m.)	Daily	2,931.2	5,000.0	500/hr	3,000
Crawler Crane (25t class)	Daily	7,814.4	10,000.0	2,000/hr	8,000
Tug Boat (65 hp class)	Daily	9,765.6	10,000.0	---	10,000
Work Boat	Daily	5,859.6	5,000.0	---	6,000
Barge (500t class)	Daily	2,441.4	3,000.0	---	3,000
Floating Crane (100t class)	Daily	19,531.6	25,000.0	---	20,000
Traffic Boat (15 t class)	Daily	5,859.6	5,000.0	---	5,000
Small Boat (1t class)	Daily	5,859.6	2,000.0	---	2,000

Note: (A) , (B) , (C) : Information from three difference sources. (X) Derived Price

Chapter 7 Environmental Conditions

7.1 General Environmental Situation in Syria

7.1.1 EIA Capability

In the past responsibility for environmental matters has been fragmented with several organisations having a mandatory and regulatory role. This situation is being redressed under a current project to establish and strengthen an EIA unit in the Ministry of Environment. The project is receiving financial support from the World Bank and the European Investment Bank in the form of a grant under the Mediterranean Technical Action Plan. The project is being implemented by Dutch consultants from the Netherlands and commenced upon contract signing on 19.10.94. The focus of the study will be on implementing EIA procedures in Syria and a pilot project based on the refinery at Dir ez Zor will be used as a basis. Staff are also receiving training in the Netherlands.

7.1.2 EIA Procedures

EIAs are carried out in Syria if deemed necessary but no standard format yet applies. It is intended that the new procedures will be developed along the guidelines given in the following documents :

- o World Bank Operational Directive OD 4.00 Annex A 1989:Environmental Assessment
- o World Bank Environmental Assessment Source Book Volume 3 1992
- o EC Criteria based on Council Directive of 27 June 1985 on the assessment of Certain Public and Private Projects on the Environment 85/337/EEC

The EIA unit will be located within the Engineering Department of the Ministry of State for the Environment and will draw on staff from the General Commission for Environmental Affairs. The existing establishment was set up by Presidential Decree in 1991. The institutional aspects of this are under review as part of the current study and may change in the future, but this is as yet not finalised.

7.1.3 Environmental Standards and Environmental Law

Industrial pollution discharges are required to comply with the Guidelines of the Arab League and UNEP. There are draft National Standards for Ambient Air Quality and Waste Water Discharge. Standards for Drinking Water apply and are basically the same as WHO standards. The Ministry of Irrigation effectively controls water pollution under the law Controlling of Public Water, Law 1245 1971 which was updated under Law 16 of 1983.

A Draft Environmental Law was prepared by the General Commission of Environmental Affairs in November 1994. This has been reviewed by the team. It is a

very comprehensive law and contains considerable detail. It will be referred to later in the project as appropriate.

7.1.4 Fresh Water Supply and Quality

At a national level there is a water shortage in Syria. Water is obtained from rivers, lakes, reservoirs, streams, springs, and groundwater. The coastal zone receives more than sufficient water for its needs and so does not currently have a water budget deficit. However, delivery to the farms requires the use of an irrigation network. The interior region is arid and in order to supplement the available water supply 25 recharge dams are planned. Of these 13 have been completed. These dams are intended to impound discharge to the sea and in so doing they capture the silt load carried by the rivers which would otherwise feed into the ocean. Concern has been expressed by the Ministry for Environment that this may lead to coastal erosion.

There are 7 river basins which supply surface water, and contain 140 storage reservoirs. Each catchment area has its own laboratory and regular monitoring is carried out. Each month 36 locations are checked for the common water quality parameters, every 3 months bacterial checks are made, and every 4 months heavy metal content is assessed. Drinking water standards are essentially the same as WHO with a variation on total dissolved solids content.

Groundwater is extracted from protected groundwater zones. Further water may be supplied by the Euphrates dam project. One concern is the economics of water supply. Provision of potable water costs 100 SP per cubic metre and the consumer is charged 2 SP per cubic metre.

7.1.5 Waste Water and Water Reuse

Most major cities and towns have a sewerage system in place (that is system of underground pipes) but no sewage treatment plant. As a result at the coast raw sewage is discharged to the ocean. In the interior raw sewage is removed from the cities and used as irrigation supply water. Complaints have been reported of illness due to consumption of vegetables watered with untreated effluent but no epidemiological evidence has been viewed in support of this. In winter, due to low temperatures, evapotranspiration losses are low and so the water demand is low. As a result most untreated water finds its way to the sea. It is reported that some hospitals have their own septic tanks.

Waste water treatment plants are planned for Damascus, Tartous, and Latakia. The Damascus plant will produce 500,000 m^3/day of treated effluent that will be used to irrigate 17,000 hectares of farm land.

In the coastal region there is not such a need to reuse treated effluent and discharges may be to the sea. In Latakia, treated effluent will be used for agricultural irrigation.

Treated effluent will meet Bulgarian Discharge Standards, the basis of which is 30 mg/l for both BOD and Suspended Solids. If met, this will give quite a high standard of treated effluent.

7.1.6 Electricity Supply

Power supply is the responsibility of the Ministry of Electricity. There are 6 large units in operation which give 3,400 MW; of this 2,550 MW is thermal and 850 MW hydro. The base load demand is supplied by thermal power stations with the peak load supplemented by hydro. Electricity is supplied to 100% of the urban population and 70% of the rural areas. The price of electricity is low (1 Syrian pound per kilowatt hour) and so electric heating is popular and considered to be wasteful. Demand fluctuates and is highest in the evening.

The power sector is currently receiving funds under the Global Environmental Facility administered by UNEP/World Bank. This aims to reduce Greenhouse Gas Emissions by reducing fuel consumption. The approach is based on improving the power factor at generation, reducing consumption through fiscal measures, and using the surplus base load to replenish hydroelectric reservoirs at off peak times.

A major power station is located at Banias on the coast between Tartous and Latakia.

7.2 Coastal Region Environmental Situation

7.2.1 International Perspective

Under the Un Regional Seas Program the Mediterranean Sea was designated a critical area in 1975 due to high levels of pollution. A strategy was formulated ("Medpol") and implemented by common agreement by the 17 countries bordering the Mediterranean, including Syria.

This strategy requires a Coastal Area Management Plan (CAMP) for all countries. The CAMP consists of 10 components :

- Integrated Development Plan
- Coastal Resources Study
- Study on Implications of Climate Change
- EIA for one main project
- Historical Monuments Study
- Specially Protected Areas Study
- Implementation of GIS system
- Monitoring Program
- Survey of Land Based pollution sources
- Energy Plan

Each member country is required to implement these component parts of the CAMP. Most of these have been carried out by the Syrian teams. The Historical Monuments study, the survey of land based pollution sources and the listing of specially protected areas are not yet completed, although 13 historical sites and 10 ecologically protected areas have been selected and designated.

As part of the above several studies have been completed. The main planning document is "Development/Environment:Systemic and Prospective Approach for the Syrian Coastal Region; Mediterranean Action Plan, UNEP/GCEA, Draft 1994. This is known as the Blue Plan, and represents a fundamental economic planning strategy for the coastal zone.

An international concern at the moment is global warming and the potential associated sea level rise. This has been examined in the report "Implications of Expected Climatic Changes on the Syrian Coast", Mediterranean Action Plan, UNEP 1992.

As part of the "Priority Actions Programme" of the Mediterranean Action Plan a Coastal Resources Management Plan was prepared by UNEP in 1992. This utilised the GIS (Geographical Information System) which has been implemented at the Institute of Remote Sensing at Damascus and this resulted in the "Coastal Resources Management Plan - Land Use and Management Maps" which are a set of 1:50,000 drawings with topographical base and thematic overlays, superimposed onto one map to give a land use planning guide. These have been used in the reconnaissance studies for the possible alternative locations for the new port.

7.2.2 Coastal Environmental Setting

General

The coastal region of Syria covers 145 kms from the border with Turkey in the north to Hamidiay on the border with Lebanon in the south. This study concentrates on the 100km from Latakia to Tartous and the 10 kms south from Tartous to the border. The region is basically a fertile coastal plain experiencing Mediterranean climate, mild winters and abundant rainfall. This contrasts sharply with the rest of Syria which has extremes of climate and in places is extremely arid. In terms of development potential this gives the region considerable comparative advantage over the rest of the country.

Geology and Geomorphology

The area is bounded by the coastal "mountains" of the Jebel Saheiliyeh which are mainly Jurassic and Cretaceous dolomite, limestone and marl. North of Latakia there are igneous rocks of volcanic origin. The rest of the coastal plain is formed of Quaternary sediments of sandstone, sand, gravel, pebbles, and clay. Between Banias and Tartous there are occurrences of basalt and cretaceous limestone, overlain with marine and fluvial sediments.

The area is basically flat rising to coastal hills with two major plains. These are the Latakia to Jableh plain in the north, and the Akkari plain in the south which is very narrow near Tartous and widens out to 10kms near the border with Lebanon. Both plains drain to the sea in a westerly direction and so most wadis and rivers flow east - west, or southwest.

Soils

Soils in the area are generally clay or loams with depths typically 1 metre. Red and brown Mediterranean soils predominate similar to lateritic types with patches of crumusol and alluvial soils present. The most fertile agricultural soils are found in the west of the Jableh and Akkari plains, which together with the abundant water explains their high productivity. Soil erosion is not considered to be a problem in the coastal area as erosion rates have been established to be less than 30 tonnes per hectare per year. Deforestation and overgrazing are not prevalent and the substantial vegetative cover will stabilise any incipient soil erosion due to excessive rainfall runoff. Some areas north of Latakia and inland of Banias-Tartous have been classified as being exposed to "medium" or "strong" erosion at soils loss rates of 30-60 and 50-100 tonnes per hectare per year.

It has been reported that rivers and streams carry a heavy silt load and that these balance the erosion / deposition budget of the coastal sand beaches but no data has been viewed on this.

Beaches and Cliffs

Although the coast line is basically flat and straight with no major bays or indentations it does vary considerably over its length. Major features are sandy beaches of narrow width, extensive sand dunes, low rocky cliffs, and steep rocky cliffs, although their height does not exceed several tens of meters and their appearance is generally low white chalk cliffs in the north and brown sandstone in the south.

The main sandy beaches in the study area are located as follows :

- o A 13km reach of high sand dune stretching south from Latakia
- o A straight sandy beach 25km long from Tartous south to the Lebanon border.
- o Small areas of sandy beaches north and south of Jableh, north of Banias and north of Tartous.

An unusual and attractive low rocky configuration is found north of Jableh leading into the Latakia sand dunes.

Concern has been expressed over rainfall catchment dams withholding silt loads that would otherwise replenish sand beaches.

Another source of environmental stress on the beaches is taking of sand for building materials. Apparently this was common before but is now controlled and has almost ceased.

There is pronounced development of beach homes which in some cases are constructed immediately on the beach. No setback planning controls seem to be observed.

There is evidence of oil pollution on the beaches. Tar balls, which form from weathered crude oil in the sea, were observed on many beaches.

Ocean and Seabed

The seabed alternates between rocky conditions and sand / rock mixture. Reference to the depth contours suggests that the continental shelf is narrow with the 500m contour occurring at approximately 10 km offshore. Longshore drift is to the north. Steady offshore currents have a mean velocity of 0.30 m/s. Maximum significant wave height is 5 m. with a period of 10 seconds. The maximum spring tide does not exceed 0.4 m. Salinity is high at 39,000 ppm.

Agriculture

As stated above the most fertile agricultural soils are found in the west of the Jableh and Akkari plains, which together with the abundant rainfall supplemented by irrigation, and the available transport infrastructure accounts for the high agricultural productivity. Main crops are wheat, peanuts, olives, olive oil, citrus fruit, apples, green peppers, tomatoes, cucumbers and egg plant. There is a trend to convert olive groves into plantations for citrus fruits, as these are financially more attractive to the farmer. It is thought that this may encourage soil erosion.

Agriculture appears to be a primary industry with little downstream activity of an agroindustrial nature such as food processing, although there is a cannery at Jableh. Nevertheless the coastal zone represents almost all the fertile soils in Syria and as a consequence any land take for infrastructure development must represent a loss of prime agricultural (and so valuable) land.

Farming
Farming represents a major source of income for many families supplemented by income from other jobs. Farming takes place on natural soils, on terraces, and under greenhouse cover and is assisted by the use of chemical fertilisers and pesticides. These may be having an adverse impact on groundwater due to overuse.

Silviculture
The government has implemented an afforestation program in the coastal region. This is intended to replace trees lost in forest fires and so avoid soil erosion and landslides, improve timber production by switching to fir instead of oak trees, and increase fruit production. This is a longterm project extending over the last 29 years. Several million trees have been planted around Latakia and Tartous, but many were destroyed in the fires. Species include chestnut, cypress, pine, acacia and robinia.

Aesthetics and Visual Impacts
The natural attractions of the coastal area include beaches (although in town areas these are heavily polluted by garbage), natural rock outcrops such as occur near Jableh, the sand dunes south of Latakia, and the white cliffs north of Latakia. On a quantitative scale these would be classified as of moderate amenity value (when compared with visually striking edifices such as the ruins of Palmyra) but they do form the basis of a tourist trade and have significant environmental value. In addition to natural landscapes several traditional village settlements have been proposed for preservation as typical of local scenic beauty and traditional values. These are :

- Stemerkhou village, 10 km east of Ras Ibn Hani
- Ibn Hani fishing village, 2 km east of Ras Ibn Hani
- Jableh Old Town
- Hilltop village 12 km south of Banias
- Hilltop village 10 km north of Tartous
- Hilltop village 5 km north east of Tartous
- Arwad, the island town off Tartous

At the moment there appears to be little segregation of planning zones with respect to visual impact, for example the view of the cement plant in Tartous from the Golden Sands tourist development beaches.

Flora and Fauna
The low areas of the coastal region (0-400m) are characterised by Mediterranean oaks *Qercus lentiscetum, Q. calliprinos*, and *Q. infectoria*. The dominating plant species and community is *Ceratonia pistacio lentiscetum.*

The higher altitudes north of Latakia are dominated by pines *Pinus brutia* and a second species of oak *Q pseudocerris*. These have been depleted by forest fires in 1990 and felling for timber. The lower plains and river banks are covered with degraded bushes and small stands of Pistacia and Qerus species.

These endemic species have mostly been replaced with artificially introduced cultivated species. Cypress trees are used as windbreaks and fencelines. Olives, cereals and vegetables are now common with citruses dominating. Olives used to be

widespread but are now mainly confined to the more hostile hilly soils and are being replaced on the flat coastal areas by citrus.

The endemic fauna of the area has long been displaced to the inner hinterland. No significant fauna remain other than domesticated animals.

Fisheries

The inland freshwater catch is estimated to be 30-50 tonnes per annum. The marine catch was 1,951 tonnes in 1990 and 1,406 tonnes in 1991 indicating a falling catch. According to 1990 statistics there were 1,145 small wooden vessels fishing in inshore marine waters, and 3 large vessels for fishing outside the territorial limit. Fish caught commercially include sardines, tuna, shrimps and several local demersal species.

There is one aquaculture site located near Banias at the mouth of the Al Sin river, the Al Sin Masub fish farm and hatchery.

Historical Sites

The coastal zone has a rich cultural heritage and many historical sites. The region was under the influence of the Phoenician civilisation and archaeological remains can be found at Ugarit near Latakia, and Amrit near Tartous.

The occupation by the Crusaders left many castles along the coastal zone, many of which are still in a good state of repair and are a major tourist attraction. (The citadel at Krak Des Chevaliers, Homs is regarded as one of the finest remaining examples in the world). The best example on the coast is Marqab castle near Banias.

Several sites have been proposed for designation as sites of special historical interest. These are :

- Ugarit near Ras Shamra
- Amrit between Al Hamadiyah and Tartous
- Marqab Castle near Banias
- Tartous Old Town including the Citadel, palace and cathedral
- Arwad Island including the castle, fort and old village

Although some of these are already undergoing excavation such as the ruins at Amrit, other such as at Arwad are poorly maintained and virtually ignored.

Ecological Sites

There do not appear to be any areas of especially high or unique ecological value along the coast as most endemic species of fauna have retreated to the interior, and natural flora have been replaced after development by pioneer species, and artificially introduced invader species having high commercial value. Nevertheless several areas have been designated as Sites of Special Ecological Importance, if they comprise one of the following :

- Strict Nature Reserves
- Monuments or Landmarks
- Nature Conservation Reserves

- Protected Landscapes
- Natural Biotic areas

The designated locations are :

- Rass'l Bassit Peninsula (north of Latakia)
- Al Fajar Plateau
- Wadi Qandeel coastline
- Sand Dunes south of Latakia
- Rouss River coast
- All-seen river
- Marqab Castle and seashore
- Marqeia river valley
- Hussain river valley
- Arwad Island

In addition to the above, 8 areas have been designated as being worthy of preservation as they are representative of Syrian traditional manmade landscapes. These are :

- Umit'tiur
- Wadi Qandeel
- Ras el Fassouri
- Nahr ar-Rouss valley (Jableh)
- Nahr al Ramla valley (Jableh)
- Nahr al-Marqaba valley (Banias)
- Nahr al-Hussain valley (Tartous)

Although not having specific characteristics these areas are deemed worthy of land use planning controls.

Wetlands

Wetlands are not common along the coastal zone due to the high infiltration capacity of the chalky soils. Two exist, located at Buhairat Al Laha and Buhairat Laraba. They are 5 hectares and 2 hectares respectively.

Tourism

The Government are exerting efforts to promote tourism, both on an international and regional basis. International tourism tends to focus on cultural and historical interests whereas regional tourism seeks to attract visitors from neighbouring countries for relaxation, recreation, and variety of food and drink. Also, of course, local tourists from the interior including Damascus wish to enjoy the coastal climate and amenities.

At the moment tourism has not realised its full potential, although certain large planned developments such as the Golden Sands development near Tartous have been constructed. Several areas have been designated for tourist development to include hotels, tourist villages, and marinas. These planned tourist sites are :

- Badrousiyeh Rasl'bassit
- Umit'tiur

- Wadi Qandeel
- Ibn Hani Bay
- Al Snoubar
- South Banias
- Amrit
- Arwad Island

Also the area from Latakia north to the border is generally classified as being intended for tourism development.

Industrial Areas

The main industrial concentration occurs around Banias. The oil refinery on the northern side of Banias occupies 287 ha. of land and consists of tank farm, refinery, finished product storage, and LPG storage spheres. These feed the nearby oil terminal on the coast. This installation is a major source of air pollution having 3 tall stacks and 3 flares which give rise to strong odours in the vicinity as well as contributing to a general haze. The refinery at Banias has its own industrial waste water treatment plant. Another source of air pollution in the area is the oil fired power station to the south of Banias.

A large cement plant is located at Tartous some 4km from the town near the main highway. Two large stacks emit considerable amounts of dust and the fallout can be seen for several kilometres around the site. Dust control equipment is installed but seems to be ineffective. It is reported that the dust deposition is affecting the productivity of the olive harvest in the area. It was also observed that during operation much dust escapes as fugitive emissions, that is not a planned emission as is produced from the stacks but escapes from the underside of the conveyor cladding.

Tartous port contains the phosphate handling terminal with 90,000 tonne mineral silos. The port also contains a grain silo.

There is some small manufacturing industry along the eastern edge of Latakia. The port contains a grain handling silo and loading facility.

It is acknowledged by the Ministry of Environment Affairs that the coastal strip between Banias and Tartous is under heavy environmental stress, particularly from air pollution.

The national policy on industrial wastewater treatment is that each of the 14 counties in Syria will have its own waste water treatment plant. These will receive effluent from industries and treat it to meet the required discharge standards. Industry will be charged for this and it may be that some degree of pretreatment is required by industry before the discharge is acceptable to the sewer system and so to the waste water treatment plant.

Oil Refineries

Oil refineries are located at Banias and Homs. Crude and oil products are both imported and exported through Banias port. In addition, crude is exported at the oil

terminal just north of Tartous. Refined products such as diesel and kerosene are imported at Latakia. There are no oil exports at Latakia.

Power stations

There are major power stations at Banias and Latakia with smaller installations at Tartous. In additin, a power station is under construction at Jun Dham, and partly in operation. The output from the Banias station represents 38% of Syrian production. There are four units rated at 170 MW, each of which utilises 1600 tonnes per day of heavy fuel oil which contains 3.6% sulphur by weight. There is also a gas fired unit of 30 MW capacity.

At Latakia there are two units using heavy fuel oil rated at 20 MW each. There is a small station on Arwad, the island near Tartous, for local supply, and two smaller mobile units (5 MW)at Tartous and Latakia.

The area is connected to the national grid and receives electricity from Lebanon.

Solar energy is being used at Tichreen University as an experimental government project.

The use of heavy fuel oil along the coastal strip is known to be giving rise to high levels of air pollution. Photochemical oxidant haze can often be viewed in the early morning when stable atmospheric conditions or inversions may exist.

Municipal Centres

The main population centres are : Latakia - population 298,000; Tartous - population 85,000; Jableh - population 62,500; and Banias - population 31,000.

Latakia is an administrative centre and is developing as a base for diversified light industries. It has one of the two major ports in the region which receives much of the sewage discharges from the city. A sewerage system exists but no treatment plant so the sewage is discharged to the sea. A waste water treatment plant is planned for Latakia, the first stage of which should be implemented in 1996/97. The first stage is designed to meet demands up to 2010. The second stage should meet demands up to 2025 and handle 120,000 cubic metres per day.

Tartous is the second administrative centre of the region and is developing as an industrial focus for the country due to the cement plant, phosphate handling, and oil terminal. It has the second of the two major ports on the coast. North of the harbour a second smaller harbour services the offshore oil loading facility. Most of the sewage discharge from the city flows to the sea across the beach south of the port in open surface drains, or outfalls which terminate at the high water mark. A sewerage system exists but no treatment plant. A waste water treatment plant is planned for Tartous under funding from the European Construction Bank. The first stage should be implemented in 1996/97 to meet demand up to 2010 with the ultimate design year being 2025. The second stage should meet demands up to 2025 and handle 45,000 cubic metres per day.

Jableh is growing as the main agricultural centre of the region.

Banias is the fourth largest city but is rapidly becoming the industrial centre of the region. This is due to the location of the oil refinery and the thermal power plant. There is a small port used for oil derivative imports and exports.

Solid waste arising from domestic and commercial activities is bagged and placed in the streets at night. In all cities there is an efficient garbage collection system which removes it every night to the municipal dumping areas. There is no ultimate disposal mechanism and the rubbish is disposed of by surface tipping.

Socioeconomics

The population growth rate of the coastal region is identical to the national growth rate at 3.4% This is a high growth factor and represents a doubling of population in approximately 25 years. The employment growth factor is less than this resulting in unemployment of 8.3% of the labour force. Unemployment is higher among the urban population (11.4%) showing the effects of the "urban pull-rural push" effect as people migrate to the cities in search of jobs.

Transport

The region benefits from a good transportation infrastructure network. The coastal road is classed as highway and provides a north-south link as well as feeder roads to the smaller settlements.

A railway line links Latakia, Tartous and the interior and is used for bulk shipment of materials.

A regional airport is located at Latakia. It has capacity for 500,000 passengers per year and operates well below capacity.

No environmental problems are associated with the infrastructure network and it seems capable of absorbing any future transport demands from a new port or industrial development.

Marine Waters

A monitoring program on water quality has been implemented by the Ministry of Irrigation, Coastal Department, Centre of Water Pollution Control. They monitor at 7 general locations all along the coast, taking up to 11 samples at different places in one general location. They analyse for temperature, pH, dissolved oxygen, salinity, color, and faecal coliforms.

In general the salinity is high, the dissolved oxygen low although not excessively so, and the faecal coliforms on occasion high. It would appear that the sewage discharges into the sea are creating a noticeable organic load effect, and significant bacterial contamination.