1.3 Trends of Containerization in the World, Particularly in Asia and the Pacific Region

1.3.1 Trends of Global Containerization

(1) Container Traffic

According to the 25th edition of the "Containerization International Yearbook" (CIY), the container traffic at a global scale in 1992 had been, with a growth of 7.6% from the previous year and reached to 100,734,472 TEUs through 350 ports in the world against 93,645,989 TEUs for 1991. The Table VII-1-3-1 and 2 show the container traffic in 1992 by country and by ports respectively. From the said tables, it is observed that the major national ports playing key terminals of international shipping lines of container transport and strategic role of national economy as gateway for transshipment of cargoes have handled more than one million of containers in TEUs.

Table VII-1-3-1 World container Traffic of 1992 by Country

Rank	Country	1992 (TEU)	Rank	Country	1992 (TEU)
1	USA America	16,741,880	31	New Zealand	554,566
2	Japan	8,935,101	32	Sweden	517,176
3	Hong Kong	7,972,235	33	Pakistan	510,017
4	Singapore	7,560,000	34	Portugal	467,864
5	Taiwan	6,178,870	35	Turkey	458,691
6	UK	4,378,817	36	Denmark	431,158
7	Netherlands	4,200,587	37	Mexico	397,782
8	Germany	3,601,904	38	Cyprus	357,948
9	South Korea	2,751,006	39	Argentina	342,000
10	UAE	2,506,422	40	Eire	340,708
11	Belgium	2,399,239	41	Finland	339,714
12	Spain	2,246,890	42	Malta	291,754
13	Italy	1,890,961	43	Panama	288,655
14	Australia	1,833,648	44	Chile	288,007
15	Puerto Rico	1,612,958	45	Costa Rica	277,386
16	Indonesia	1,329,365	46	Honduras	203,400
17	Thailand	1,312,604	47	Jamaica	189,213
18	France	1,301,881	48	Coted'Ivoire	188,728
19	Canada	1,269,580	49	Kuwait	186,643
20	PR China	1,240,509	50	Morocco	182,242
21	Malaysia	1,218,339	51	Iceland	177,781
22	Philippines	1,157,912	52	Canary Islands	171,221
23	Saudi Arabia	1,153,761	53	Nigeria	169,435
24	South Africa	888,989	54	Bangladesh	160,000
25	Egypt	769,448	55	Guam	146,947
26	India	760,887	56	Peru	146,360
27	Brazil	738,945	57	Norway	140,235
28	Sri Lanka	676,041	58	Kenya	135,324
29	Greece	645,050	59	Colombia	118,649
30	Israel	610,258	60	Oman	115,717

Note: World Container traffic recorded total 100,734,472 TEUs, which include other countries below ranking 60 are recorded 2,547,065 TEUs in total.
Source: CIY

Table VII-1-3-2 World Containers Traffic of 1992 by Ports

Rank	Port	1992 (TEU)	Country	Rank	Port	1992 (TEU)	Country
1	Hong Kong	7,972,235	Hong Kong	21	Manila	1,157,912	Philippines
2	Singapore	7,560,000	Singapore	22	Seattle	1,151,000	USA
3	Rotterdam	4,122,782	Netherlands	23	Tacoma	1,101,000	USA
4	Kaohsiung	3,960,518	Taiwan	24	Nagoya	1,097,986	Japan
5	Busan	2,751,006	South Korea	25	Tanjung Priok	867,509	Indonesia
6	Kobe	2,608,272	Japan	26	Jeddah	847,252	Saudi Arabia
7	Los Angeles	2,289,038	USA	27	Hampton Roads	830,256	USA
8	Hamburg	2,268,481	Germany	28	Charleston	804,373	USA
9	New York	2,104,055	USA	29	Algeciras	780,336	Spain
10	Keelung	1,940,587	Taiwan	30	Le Harve	746,388	France
11	Yokohama	1,886,789	Japan	31	Port Kelang	677,588	Malaysia
12	Antwerp	1,835,595	Belgium	32	Colombo	676,041	Sri Lanka
13	Long Beach	1,829,457	USA	33	Melbourne	658,797	Australia
14	Tokyo	1,728,548	Japan	34	Honolulu	656,221	USA
15	San Juan	1,567,840	Puerto Rico	35	Osaka	617,184	Japan
16	Felixtowe	1,542,551	UK	36	La Spezia	595,738	Italy
17	Dubai	1,481,807	UAE	37	Durban	459,730	South Africa
18	Bremen	1,315,191	Germnay	38	Sydney	552,186	Australia
19	Bangkok	1,303,308	Thiland	39	Zeebrugge	547,757	Belgium
20	Oakland	1,287,379	USA	40	Montreal	537,256	Canada

Ranking of contaier traffic through major ports of neighbor countries and Asian countries after 40 are as follows,

Rank	Port	1992 (TEU)	Country	Rank	Port	1992 (TEU)	Country
43	Miami	519,954	USA	66	Tanjung Perak	328,012	Indonesia
47	Santos	494,763	Brazil	71	Taichung	277,765	Taiwan
62	Buenos Aires	341,992	Argentina	72	Puerto Limon	277,386	Costa Rica
65	Shanghai	330,000	PR China	78	Valparaiso	246,842	Chile

Source: CIY

In general, at a global scale of container traffic the trend is towards growing and keep on growing. This is due to the fact that the convenience by containers transport for door to door delivery and collecting services with minimum damages and loss of cargoes are now being recognized and their service quality and business field are being improved a lot.

At present, 23 countries are handling more than a million of TEUs units a year. It is obvious that the container traffic through major 230 ports of 60 countries have increased on average 7 % between 1991 and 1993. In the Asian countries the growth rate have been highest among regions and shown around 19 to 30 % increase. The ports in USA have an average growth rate of 7 to 7.6 % and in the Latin American countries its growth rate has been 10 to 30 %. It is expected that the general cargoes will be transported further by containers among continents of Asia, Africa, Europe and America.

The progress of containerization throughout the world is an overwhelming trend in the shipping world, and the annual growth rate of container traffic averaged as high as 9.0 to 9.5 % in the recent 5 years.

The container traffic in the region wide from 1993-1994 is summarized as follows:

a. United States of America

Obviously, the country ranked first is the United States of America (USA) and continues to have the leading role with an average growth rate of 7.1% between 1991 and 1992.

The list of North America's ports is led by Los Angeles with 2,289,038 TEUs, Long Beach, 2.200,000 TEU followed by New York/New Jersey port with 2,104,055 TEUs and Oakland 1,300,000 TEU. Positions have not varied from one year to the other.

b. European countries

England had ranked sixth with a 7.1% growth rate from 1991 to 1992.

The Netherlands made a breakthrough and reached 4.2 million TEUs. They are followed by Germany with 3.6 million TEUs. Belgium and Spain are struggling between the eleventh and twelfth position with a slight difference between them, but the former kept on moving forwards and Spain underwent a slight fall of 1%.

c. Central and South American countries

1) Volume between Latin America and USA

According to the Journal of Commerce Trade Information Service, the traffic volume of containers between USA and Latin American countries in 1991 and 1992 were as follows;

Export from Latin America to USA were 692,584 TEUs and imported from USA 584,286 TEUs in total of 1,276,870 TEUs in 1991 and in 1992, it was 827,703 and 685,360 in total 1,513,680 respectively, which were about 15 % of the total traffic volume of containers handled through USA and about 31% of total traffic through Latin American Countries. The trade with containers between two continents have increased to 18.55 % between 1991 and 1992,

2) South American Countries

In South American countries, first is the port of San Juan de Puerto Rico with 1,576,840 TEUs, leaving Santos and Buenos Aires far behind with 494,763 TEUs and 341,992 TEUs respectively. Ports in Brazil have a total container traffic of 738,945 TEUs. The ten major ports involved in this region reached 3,718,175 TEUs.

Argentina was ranked at 39 in the world container traffic with 341,992 TEUs in 1992 record and kept constant growth with the views of a modern port or of a port under

a modernization process with the aim of attracting more traffic, closely related to foreign trade. (Refer to section 1.2 the port of Buenos Aries handled 532,681 TEUs in 1994).

d. Containerization in Asian Countries and Pacific region

1) Asian countries

Last 10 years, the container traffic in the Asian countries particularly newly industrialized countries like Hongkong, Singapore Korea and Taiwan have increased about 2 to 3 times.

The traffic volume from/to Asian region have shared about 60% of the global container traffic volumes as of 1993-1994.

The leading container terminals port is Hong Kong with 7,972,235 TEUs, which is followed by Singapore with 7,560,000 TEUs. The port of Taiwan, Kaohsiung ranking at 4 and Keelung ports ranking 10. The top ten ports in this region are estimated to handle total of 32,868,455 TEUs in 1992.

Singapore did not stop its evolution, however it experienced a lower increase rate of 19%, with 1,206,000 TEUs. This country is followed by Taiwan being ranked at fifth with a growth rate of just 0.8%;

In the case of Philippines which ranked at 22 in 1992 and handled a traffic of 1,157,912 TEUs.

2) Case of Japanese ports

Container cargo in Japan has been increased at a remarkable growth rate of 12 to 14% per year during 1990-1992. The container cargo volume is more than 125 million tons per annum equivalent to 8,935,101 TEUs in 1992, which was the second largest after USA.

For a long time the majority of cargo has been handled in the 3 largest Japanese bays (Tokyo Bay, Osaka Bay and Ise Bay). It is estimated to handle about 10 million TEUs at these three bays by 2000. However lately other ports located outside the 3 bays have been increasing their shares as economic activities becomes more decentralized.

3) Container traffic through ports in Asian countries

Out of 10 world top ports 6 ports are located in Asian countries. Since the Asian countries are formed in the archipelagos countries and sea transportation have been the essential and practical means of communication. Singapore, Hong Kong, Taiwan and Malaysia are located geographically at the transshipment of the world major shipment routes and function as regional key station. These terminals are located on the main routes

for trade by ship between Latin American and Asian countries. They have adopted naturally the containerization in the sea transportation from the earlier stage of 1979 because of their geographical conditions.

e. Australia

Melbourne port leads the list of ports with traffic of containers in Australia. The total is of 658,797 TEUs. It is followed by Sydney with 552,186 TEUs.

Australia, ranked 14 and has also a sound prospect to be responsible for the container terminal operation. Australia has handled 1,833,648 TEUs as the sum of all the ports of the country.

(2) Comparison of containers traffic and terminal facilities among Buenos Aires Port and major ports in the world

In order to compare the terminal facilities and handling system of the Buenos Aires port with main ports in the world, the Table VII-1-3-3 to 6 are prepared to show the outline of terminal facilities (number of berths, quay cranes, areas of yard, depth alongside wharf), handling volume, terminal handling capacity and development plan of the container terminals of main ports in the Asia, Africa (locating on the main shipping route, connecting between Latin America and Asian countries) and Europe which have been considered as long trade partners with Argentina and USA where the ports handle large container traffic with Asian countries along the Pacific, some of which the study team visited.

Table VII-1-3-3 Container Terminal Comparison of Ports Visited by the Team

Nation	South Africa		Malaysia	Singapore		
Name of Port	Cape Town	Durban	Port Klang	T. Pagar	Keppel	Brani
Size (ha) C. Terminal Area	97	102	67	83	96	80
Depth (ha) Alongside Berth	10.8 - 14.1	11.6 - 12.2	10.5 - 13.0	9.4 - 13.0	10.0 - 13.6	12.0 - 15.0
Number of Berth (Length/m)	5 main 3 feeder	6 main 3 feeder	7 main	7 main 1 feeder	6 main 6 feeder	7 main 2 feeder
Number of Quay Crane	4 (45t) 1 (35t)	9 (40t) 1 (30t)	6 (40t) 5 (35t)	28	33	31
Number of Yard Crane/Type	6 Transtainer	2 (35t) road/rail	8 (40t)	207		101
Name of Straddle Carrier	13 (30t)	25 (30t) 8 (wheeled)	35 (40t) 24 (35t)	none	none	none
Traffic Volume TTL TEUS '93 TTL TEUS '94 Estimate '95 Estimate 2000	 202,810 236,679 284,000 450,000	 635,171 762,205 876,000 1,350,000	 843,846 1,108,000 1,578,000	 8,876,900 10,254,900 12,408,000 24,000,000		
Handling Capacity of terminal	240,000	1,000,000	1,200,000	8.2 mil TEUs		5.5 mil TEUs
Future Plan (Berth/Capacity) Completion (Year)	 110,000 Sept. 1995 *new storage area	73 ha 5 main berth 350,000 2000	8 main berth 1,600,000 1996/2000	129 -226ha 8/16 main berth 5.4 - 12.9 mil TEU 200/2009		
Function	Secondary Port to Durban	Gate Port of Nation	Main National Port	Transshipment of Container located a the major international Ship Lines		

Table VII-1-3-4

Nation	US West Coast			Japan			
Name of Port	Seattle	Oakland	Los Angeles	Tokyo	Yokohama	Nagoya	Kobe
Size (ha) C. Terminal Area	150	222	303	124.8	162.7	72.2	183.1
Depth (ha) Alongside Berth	12.1 - 15.2	10.7 - 12.8	12.0 - 14.0	12.0 - 15.0	11.0 - 14.0	10.5 - 14	12.0 - 14.0
Number of Berth (Length/m)	17 main 4,485	29 main 6,846	27 main 6,322	1 main/3 feder 3,874	10 main/11 multi 5,340	9 main 2,275	17 main 5,850
Number of Quay Crane	23	30	35	24	40	15	38
Traffic Volume TTL TEUS '93 TTL TEUS '94	 1,415,000	1,305,134 1,491,000	21,319,000	1,277,203 1,507,099	2,167,792 2,317,103	1,154,928 1,224,422	2,696,085 2,704,934
Future Plan (Berth/Capacity)	90 ha intermodal railway terminal	80 ha 45' dredging intermodal railway terminal	91/235 ha 50' drediging intermodal railway terminal	3 berth/14-15m (4-50,000 DWT) 1,050m length	56 ha/4 berth-15m/ c. terminal 134 ha - site related to port facility	32 ha/4 berth - 13-14m	390 ha - 15 m/5 cont berth 12 m/6 tramp berth 7.5 m/2 feeder berth
Completion (Year)	2000	2000	1997/ 2000	1998	2000	2000	1998
Function	Gate Port	Gate Port	Gate Port	Gate Port	Gate Port	Gate Port	Gate Port

Table VII-1-3-5

Nation	Brazil		Chile			Uruguay	Argentina
Name of Port	Rio de Janeiro	Santos	Valparaiso	San Antonio	Talcahuano	Montevideo	Buenos Aires
Size (ha) C. Terminal Area	5	35	4.5	6.1	4	10	95
Depth (ha) Alongside Berth	12.5	14.0	9.6	12.0	10.0	10.0	8.3 - 9.1
Number of Berth (Length/m)	2 480	2 510	2 450	4	3	10 4,253	29 5,376
Number of Quay Crane	2	5	1	none	none	1	7 (40t)
Traffic Volume TTL TEUS '93 TTL TEUS '94	 150,000	540,029 604,166	250,157 240,456	95,533 136,922	12,463 16,250	79,000	450,335 532,687
Future Plan (Berth/Capacity) Completion (Year)	15 ha 300m new berth 2000	extending berth 2000					under planning
Function	Gate Port	Gate Port	Gate Port	Gate Port	Gate Port	Gate Port	Gate Port

(3) The trend of container ship size changes

The size of container ships engaged on main international shipping routes of Japan/North America and Japan/Europe have got bigger, such as post panamax 40 to 50,000 DWT to carry 4,500 to 5,000 TEUs and also the average size and major type of container ships in this routes. Subsequently the previously engaged smaller ships, 20 to 30,000 DWT class, are transferred to serve for feeder and secondary routes. The ship companies plan to procure bigger ships to carry large volume of container with minimum number of trips to provide reasonable sea transport cost to their customers.

Table VII-1-3-6

Nation	Netherlands	Germany	England	Belgium	France	Spain
Name of Port	Rotterdam	Hamburg	Felixstowe	Antwerp	Le Harvre	Algeciras
Size (ha) C. Terminal Area	413.3	321.5	125	453.9	210	46
Depath (ha) Alongside Berth	6.5 - 13.5	9.5 - 15	7.3 -13.4	10 - 18	9.0 - 13.5	12.0 - 14.0
Number of Berth (Length/m)	15,455	7,053	7 main/2 feeder 2,343	14,852	28 berths 6,820	5 main 1,300
Number of Quay Crane	65	45	1450.3t), 2(350), 2(52.8t)	49	24 include 10P P. Crane	9
Number and Type of Yard Crane	36 AGV50, ATC25	RTG 20 F. Handler 34	44(36t), 13(36t)	F. Handler 89	F. Handler 174	RTGs 17 F. Handler 9
Number of Straddle Carrier	95	114	none	108	66	none
Traffic Volume TTL TEUS '92 TTL TEUS '93	4,125,409 4,161,160	2,268,481 2,486,130	1,4923,733 1,603,932	1,835,595 1,876,296	746,388 894,691	780,336 806,543
Future Plan (Berth/Capacity) Completion (Year)	Delta 2000 - 8 Plan 8 berths/2,600m	30ha deeper berth/500m 2000		60ha 1,075m 650,000 mid 1996	2 berths - 775/675m - 14.5m depth 5 G. Crane 1 berth - 300m/1995	1 berth - 644m/28ha - 16m depth 6 G. Crane (3 P. Panamax) Early - 1995
Function	Hub Port of Europe Area	Gate Port of Nation	Gate Port of Nation	Gate Port of Nation	Gate Port of Nation	Gate Port of Nation

For competing severe and tough competition at low cargo freight in main routes as in the Pacific ocean between the west coast USA and Far East, etc., container carriers have been making their container vessels' size bigger to transport large amount of containers at one time.

The relation of depth of ship and container ship generation is illustrated on Figure VII-1-3-1. The draft (depth of ship beneath sea level) of container ships have been steadily growing deeper.

Since the 1960s, new vessels became steadily bigger as shippers sought to pack as much cargo from aboard if possible to increase cost efficiencies and their profit margins.

Table VII-1-3-7 shows typical container vessels' size under operation in main route in the world which were built for last 15 years.

Table VII-1-3-7 Yearly Changes of Container Vessel Size from 1980s to 1995

Year	'80	'83	'86	'90	'94	'94	'95
Ship Size LOA (M) Length	221	217	248	290	294	300	275
Width (M)	31.2	32.2	32.2	32.2	32.2	37.1	40.0
Depath (M)	19.0	21.5	21.5	21.5	21.5	21.8	24.3
Draft (M) (Plan)	9.6	10.1	10.5	11.5	12.5	11.2	12.0
Draft (M) (Max.)	11.0	11.5	11.5	13.0	12.6	13.0	14.0
Power	31,300	25,210	32,300	49,000	46,800	59,300	66,385
Speed (KT)	26.4	24.3	25.5	24.5	22.8	23.5	24.6
Gross Ton	31,000	36,375	42,145	49,800	53,100	61,000	66,000
Container Carrier (TEU)	1,280	1,728	2,568	4,000	4,229	4,743	4,826
Reefer Container REF (UNIT)	200	250	250	450	450	400	312
Remarks of Ship	2nd/3rd Generation			Panamax Type		Post Panamax	

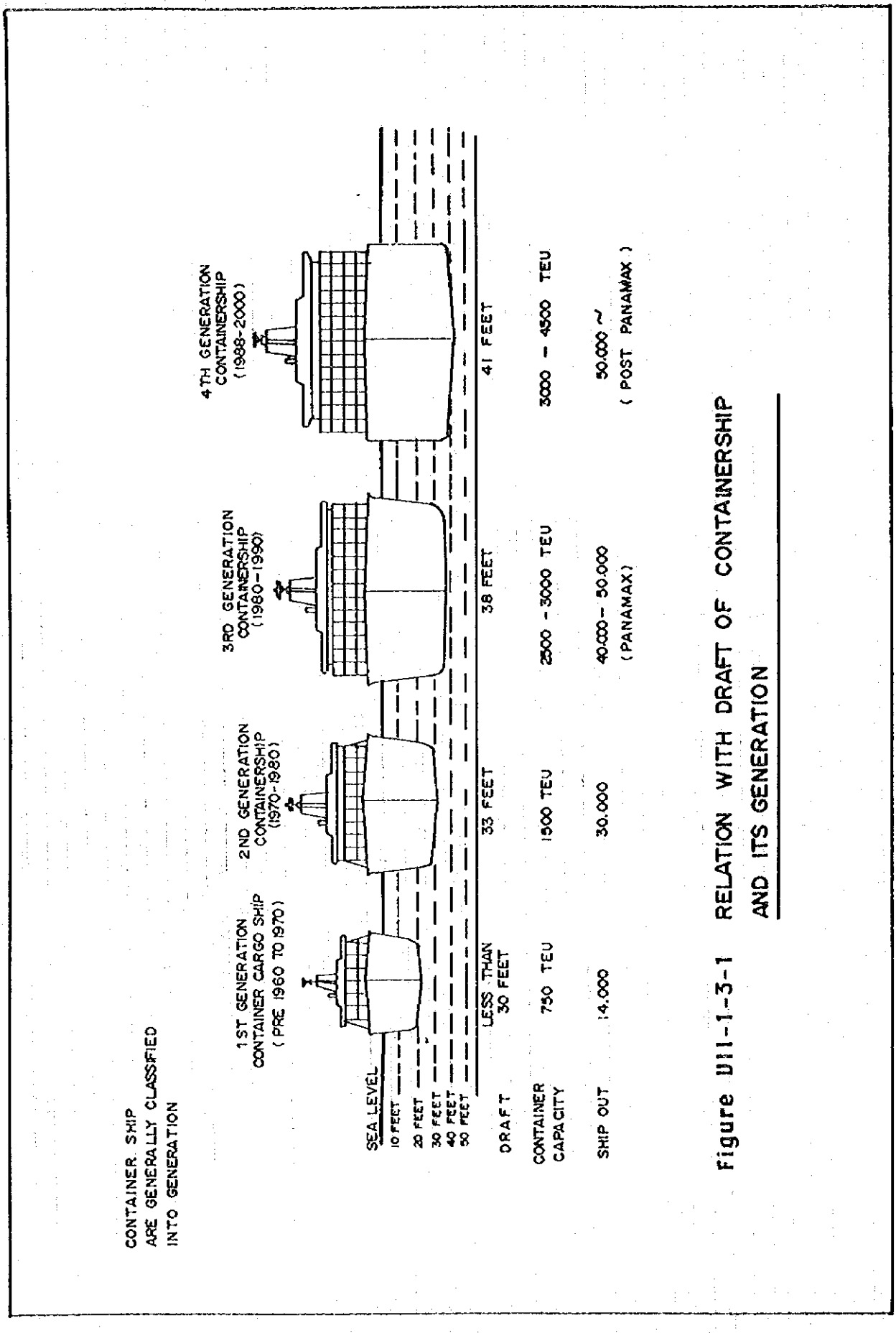


Figure VII-1-3-1 RELATION WITH DRAFT OF CONTAINERSHIP AND ITS GENERATION

As seen from the above table, their sizes became larger year by year. This trend cannot however be applied to all vessels which engaged in services of all over the world, but can be applied to vessels in main routes as Japan/US, Far East, South East Asian, and European shipping lines.

This is an usual way in which container carriers deserved to hold their strategic business supremacy in the routes.

More than 10 years has passed since 2,000/2,500 TEU vessel had started in operation in the above mentioned main route services, which type of vessels should be gradually replaced by new larger vessels. In other words these old type vessels will be shifted from main routes to secondary routes as feeder. In secondary routes as feeder service routes, accordingly their terminal facility had to be improved to accommodate such larger size of ships.

In case of the Japan/South American route, if the port facilities could accommodate for larger than 2,500 to 3,000 TEU container carrying vessel, shipping companies would like to put such vessels in service to the Port of Santos or other main ports in this region. But unfortunately in the case of Santos, the present traffic condition is congested due to port operation and low efficient services. Shipping companies are now hesitant to put their desirable-size container ship in this port.

In the Port of Buenos Aires some shipping companies engage from 1,700 to 2,000 TEU carriers vessels, they often have troubles in draft due to the limited water depth of the access channel.

In case of the port of Oakland where there is 38ft depth of channel and alongside the wharf, but without a deeper channel, shipping firms cannot send their biggest ships fully loaded into Oakland. That means that some cargo although not destined for such region is sent through deeper ports in Southern California or Seattle. The Oakland Port estimates this situation causes a loss of $5.4 million per year from their revenues.

Orient Overseas Container Lines told that of the 20 ports in their global strategy, the Oakland port is the most shallow. The need to go onto the 42-foot deepening program was constantly emphasized.

(4) Container handling equipment types

a. Typical system of container handling equipment

The container handling methods between the yard and apron emptoyed in container terminals are three typical types as follows:

1) Chassis system

Containers are discharged from container ship by quay side gantry crane or shiptainer on board and placed direct onto chassis alongside. Containers on chassis are transferred by tractors to the marshaling yard and are lined up in the shape of trailers. As tractors can be connected direct for land transport, supplementary handling equipment inside the yard can be dispensed with; hence the system is most suitable for door to door transport. On the other hand, chassis must be made available for containers one to one and further a very large space is necessary as containers cannot be stacked. This is the shortcomings of this system.

This handling system are adopted by most of terminals with ample space in Seattle, Oakland, and Los Angeles ports in USA.

2) Straddle carrier system

Stacking or transfer of containers inside the terminal are performed by straddle carriers. This system discharges containers by crane from the container ship direct onto the apron, transfers them to the marshaling yard by straddle carriers and, places them directly on the yard. Under this system, the gantry crane places containers on the apron, making crane cycle shorter. In the marshaling yard, containers can be stacked three or four-tier high. This system required less terminal space than in the chassis system. On the other hand, upon dispatch inland, container must again be placed onto chassis by straddle carriers. This additional handling of each container, coupled with the difficulty in sorting as resulted from multi-tiered storage, tends to increase the chances of damage to container.

At the initial stage of containerization this system had been adopted at many container terminals, but recently many ports have often shifted to transtainer system as parts of the development of container terminals.

3) Transtainer system

Multi-tier storage is performed by using transfer cranes in the marshaling yard, with a view to combine the advantages of the chassis and straddle carrier systems.

Under this system, containers discharged from container ships are placed onto yard chassis and carried to the marshaling yard to be stocked by transfer cranes. This system enables mobility by chassis and 5 or 6 tier stacking of containers in the marshaling yard, having the advantage over the straddle carrier system of efficient use of limited yard space. However, the containers stowed underneath multiple tiers must be taken out through repeated handling, which results in lower handling efficiency. It has appeared that in mechanized terminal operations, this system is more adaptable and advantage to automation and computerization.

Nowadays transtainer system is more popular and most of new container terminals being designed in the world are adopting this transtainer system.

Each system has its own advantages and disadvantages from the viewpoints of efficient use of the container yard, manpower and time saving in handling, investments in facilities, etc. The summary is tabulated in the Table VII-1-3-8. Frequently more than two of the three systems are adopted in combination.

Table VII-1-3-8 Comparison of Container Handling System

Handling System	Chassis	Straddle Carrier	Transtainer
Yard space required	large	medium	smamm
Capital investment required	large	small	medium
Yard efficiency	high	medium	low
Gantry crane efficiency	low	high	low
Handling time for container dispatch	short	medium	long
Container damage frequency	low	high	high
Handling equipment maintenance cost	small	large	small
Yard operation versatility	none	possible	none
Automation	less	medium	high

b. Automatic container handling system at the new container terminal of the Singapore Port

The main development likely to occur in the future is complete automation of the container handling operations. Computers are used at present to control the movement of containers, and their use is likely to increase in the future in more sophisticated operations.

Systems have been developed to store containers in multi-story cells, served by automatic lift and container transfer units, controlled either manually or by computer.

This type of store uses very much less land for a given number of containers than present methods of stacking, but the more important advantage is that each container is immediately available and its position in the system accurately defined. The service lift and transfer and transport equipment can be keyed into a computer control system giving a completely automated operation.

Another new development is the automatic horizontal transportation of containers. A number of system have been or are being designed, although these are all basically similar and consist of trolley or bogey, rail mounted, which carries the container between dockside crane and inland depot or store, and can be remotely controlled so that no driver is necessary. This can be complied in the multi-story system.

The possibility of a fully automated port operation with the handling of containers centrally controlled by push bottom and computer operated, coming into use within the next few years can not be ruled out.

It would seem that this system can only be economical where there is lack of storage area and land value are very high and where there is a very large volume of containers to be handled.

The Port of Singapore Authority (PSA) carry out the container terminal development projects at the Pasir Panjang wharves, west of the existing port area as shown on Figure VII-1-3-2. The Port Authority plan to introduce automatic container handling system operated by computerization at this new terminal.

At Pasir Panjang Terminal in Singapore 226 ha mega facility is being built. The new operating system called automated containers handling system, which will be adopted for the Terminal is now being tested at Brani Terminal. This test will continue until 1998. By the year 2000, the first phase of 129 ha at Pasir Panjang will see the completion of eight berths giving a capacity of 5.4 million TEUs - about the same as the PSA's Brani Terminal, 226ha giving a total capacity of 36 million TEUs in four phases over 30 years.

This automated handling system is composed of Overhead Bridge Crane (OHBC) and Automated Guided Vehicle (AGV). (concept is shown on Figure VII-1-3-3.)

Each OHBC, with a span of 43.6m, will traverse on beams supported by 28m-high columns. The 40-tones capacity units will hoist at 130m/min. and travel at 120m/min. along the beams. It will have an automatic crane control system (ACCS) which comprises the automatic position indication system (APIS), automatic travel control system (ATCS), stack profile scanning system (SPAS) and automatic fine alignment system (AFAS).

Each AGV will run at high speed (up to 25 km/hour) with very heavy payloads (over 40 metric tones). It will have supervisory control system (SCS) and traffic control system at intersection (TCS).

c: The trends of enlargement of quay cranes and yard cranes

Each container handling equipment along the quay in the container terminals of Asian, USA, and European ports is becoming larger to cope with larger container vessels and post-panamax type vessels. The new enlarged quay cranes for post-panamax size vessels can handle containers on the 6th tiers on deck and 16th rows on deck from the shore side. It features the following technology advantages;

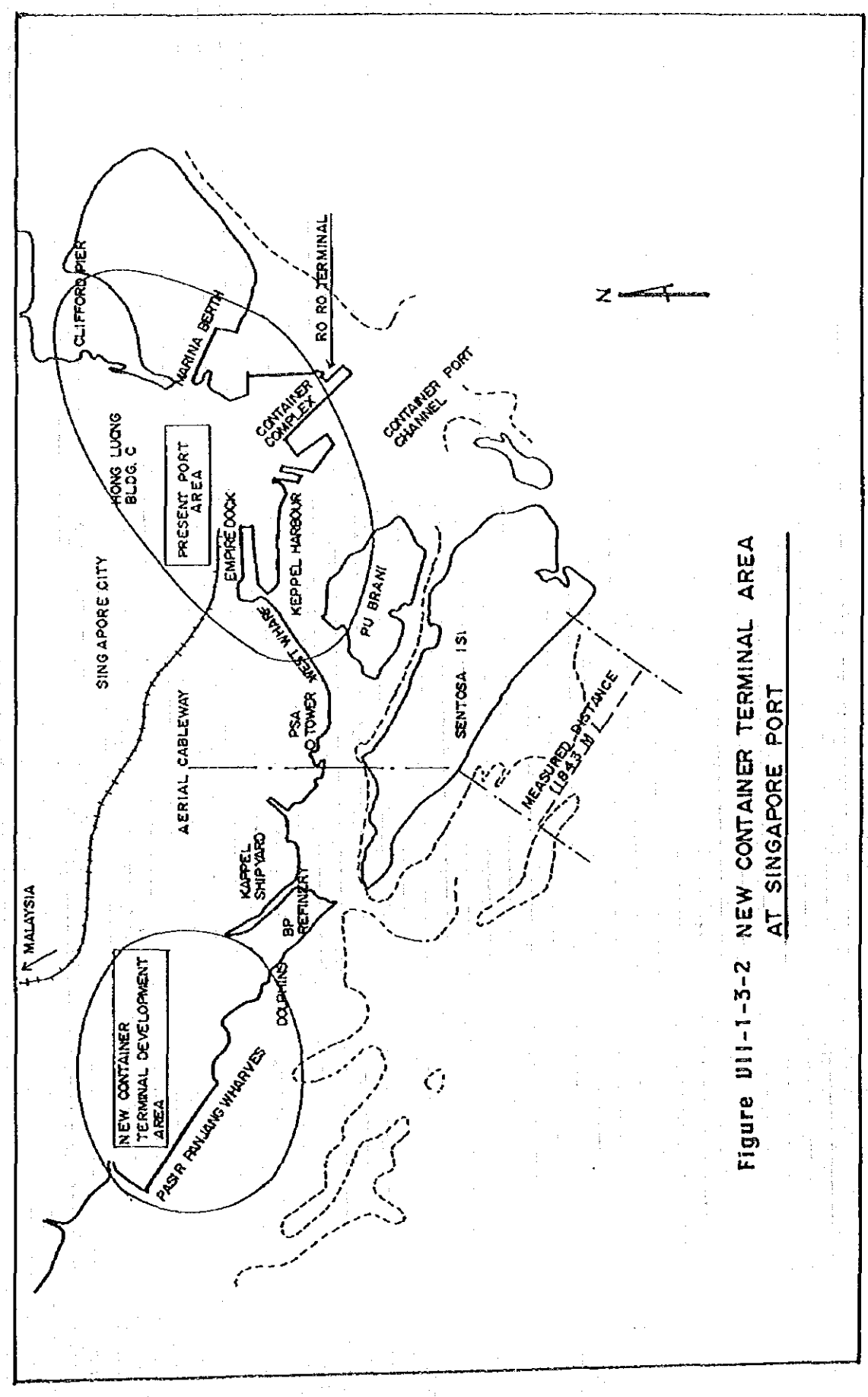


Figure VII-1-3-2 NEW CONTAINER TERMINAL AREA AT SINGAPORE PORT

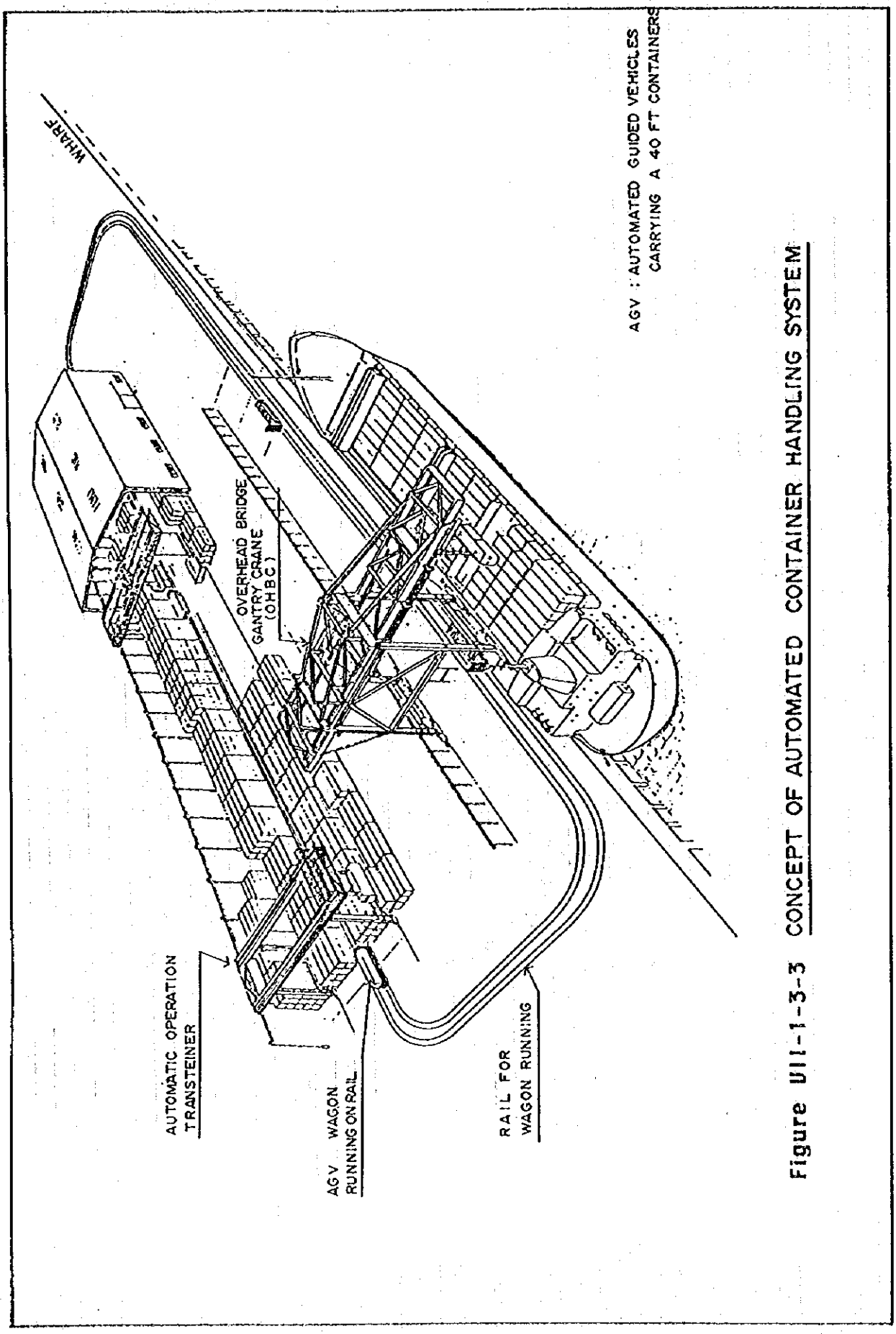


Figure VII-1-3-3 CONCEPT OF AUTOMATED CONTAINER HANDLING SYSTEM

- Stable handling with hydraulic or electric anti-sway
- Dual Hoist system to increase the number of containers handled
- Semi-automatic operation from fixed point to fixed point
- Monitoring system help identify equipment problem

Typical dimensions and performance of quay crane are shown on the following Table VII-1-3-9 and drawing (Figure VII-1-3-4).

According to the trends of enlargement of quay crane, the new straddle carrier and transtainer are also getting higher and larger.

Table VII-1-3-9 Typical Dimension of Latest Type of Quay Crane and Supporting Cranes in the Yard

1) Gantry Crane

Gantry Crane	Panamax Type	Over-Panamax Type
Rating load (ton)	30.5	40.6
Lifting load (ton)	49.0	56.4
Crane weight (ton)	660.0	867.0
Rail span (m)	16.0	30.0
Outreach (m)	38.0	45.0
Backreach (m)	16.0	14.0
Speed Hoisting (m/min.) loand/unload		
Trolley travel (m/min.)	50.0/120.0	65.0/150.0
Gantry travel (m/min.)	150.0	180.0
Boom hoist (min./cycle)	45.0 8.0	45.0 8.0
Lift (m)	36.5	47.0
Clearance between legs (m)	16.0	17.5

2) Straddle Carrier

Type	3-High Stacking Type		3-High Stacking Type	
Overall length (mm)	12,200	(40'1")	12,200	(40'1")
Overall width (mm)	4,500	(14'9")	4,500	(14.9")
Overall height (mm)	11,400	(37'5")	11,900	(39'1")
Capacity (ton)	30.5		41	
Maximum lifting height (mm)	8,900	(29'4")	8,900 (29'4")	
Tare weight (ton)	39		57	
Speed -Max. traveling empty/load (kn/h) -Max. lifting empty/load (mm/sec)	 25/22 230/200		 32/28 300/300	
Diesel eng. Total Output (ps)	200		400	

3) Rubber-tired Tansfer Crane

Type	One Over 4	One Over 4	One Over 5
Rail span (m)	23.47	23.47	23.50
Lift above ground level (m)	15.24	15.24	18.0
Rate load (LT)	40	40	40
Hoisting speed (m/min.) -with rate load -with 30 LT load -Spreader only	 17 20 40	 20 24 45	 23 28 54
Trolley traversing speed (m/min.)	70	70	70
Gantry travelling speed (m/min.)	90/135	90/135	90/135
Control system	Wheeled drive	Wheeled drive	Rack & pinion drive
No. of gantry wheels	4/8	4/8	4/8

At the Singapore port, one-over-6 high and one-over-7 high type transfer crane are in use.

(6) Concept of modern container terminal facilities

a. General plan of the terminal facilities

The port infrastructure development projects of major port and its secondary supplemental ports in Asian countries have had the general tendency that their existing general cargo terminals are reconstructed and renovated into a container terminal by procurement of additional and specialized container handling equipment and ports operation are privatized.

The modernized container terminal to handle some 1.5 to 2.0 million containers per year should be equipped with the following facilities.

- The port have the sufficient depth of the access channel and alongside of the wharf with calm wave conditions to accommodate oceangoing full container ships, (major container terminals in the world such as Singapore, Port of Los Angeles and Oakland along the west coast of USA have the depth of -13 to 15 m).
- The wharf length shall have sufficient length to berth oceangoing full container ships. (generally the length of wharf is 350 m, minimum 250 to 300 m).
- There shall have sufficient areas directly behind the wharf for storage of containers. Generally the area required is 400 m to 500 m distance behind the wharf.
- The gantry cranes shall be installed on the apron of the wharf, generally 2 to 3 cranes for one berth and supporting handling cranes transtainers (3 to 4 units per one gantry crane) and 25 to 40 ton of forklifts in the container yard and number of trailer chassis for transporting containers.
- The terminal shall be equipped with utilities supply facilities for lighting the yard operation, electric outlet for reefer containers, mechanical workshop for repairs of container boxes, equipment and computer information system through the truck gate, administration control building and container freight station (CFS).
- It is required that the land area equivalent to the same size of container yard for constructing the access roads to the main public roads and depot for stocking the containers to support the smooth and efficient terminal operation.

The typical plan of container terminal show on the drawing, Figure VII-1-3-5

b. Depth of channel and along side of wharf

At present, major container terminal in the world have a water depth of -13 to 14 m (39 ft to 42 ft) for accommodating panamax type container ships and some have a deeper water depth in anticipation of the post panamax class ships. Some major container

terminal have a berth length of more than 1 km to realize efficient operation by making use of the scale merit. Most of these terminals have a container yard width of 300 to 500 m and some have even larger container yard width.

c. Trends of development of terminal capacity, longer length of wharf, deeper depth along side of wharf

According to the shipping company carrying trade goods between Asia and Argentina, their ships (general cargo, container ship) sail from Asia through Indian Ocean, Cape Town at South Africa and Atlantic Ocean to South American countries.

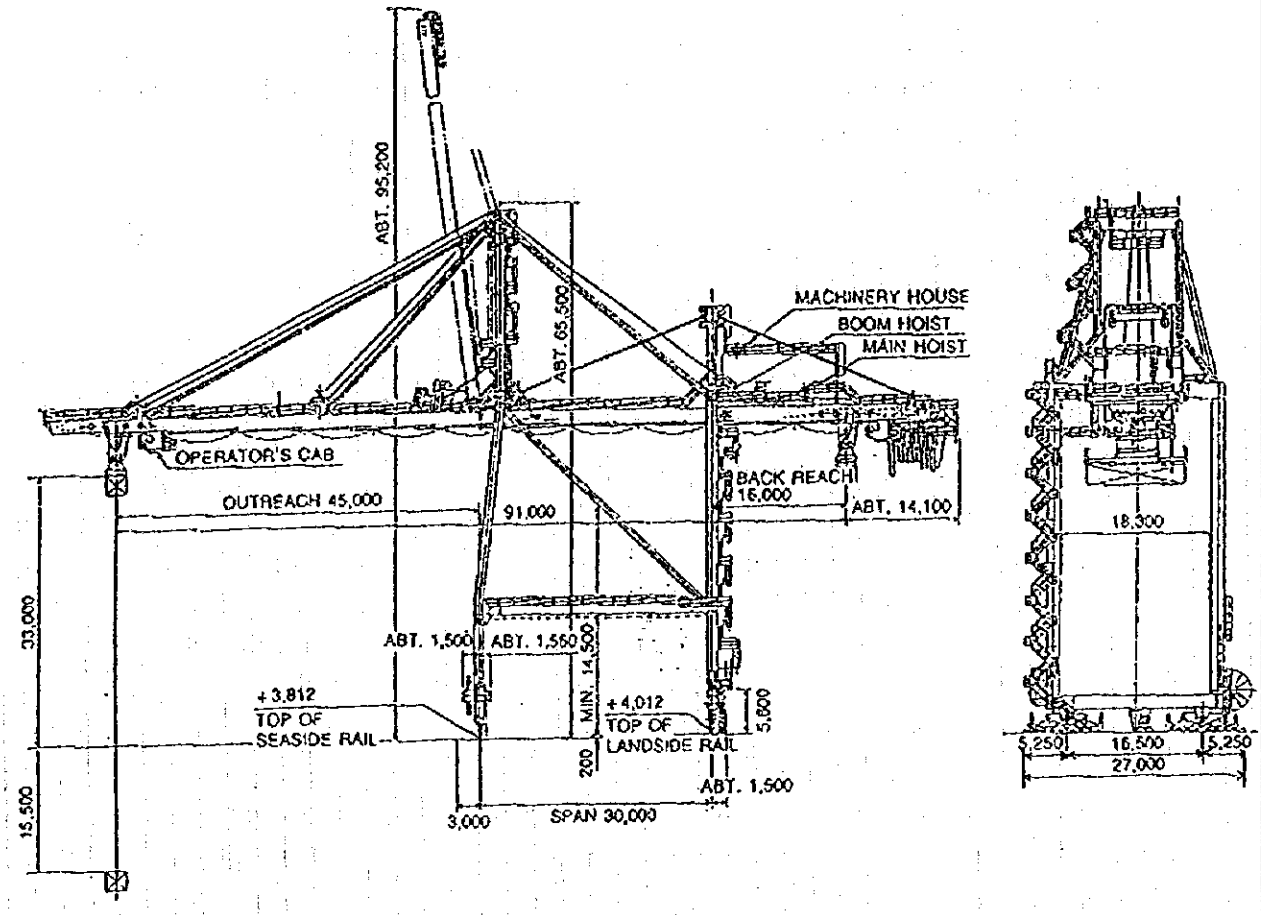
They can collect and deliver cargoes from the major ports like Pusan in Korea, Hongkong, Singapore, Malaysia, South Africa enroutes between Asian and South American countries.

In order to understand the necessity to enlarge the container terminals of Argentine port, the trends of container terminal facilities, development of the above ports located on the routes of trade between Asia and Argentina including the USA are introduced as examples of such development.

1) Case of Oakland Port of USA

In the Oakland Port, the traffic have increased in average of growth rate of 4 % per year and is beginning to launch a $500 million program to upgrade and expand its maritime facilities. Key elements include the following;

- The water depth in the channel and alongside the berth of port of Oakland are 38 ft which is not enough to accommodate current container ships. The port authority plan to deepen gradually to 42 ft and 48 ft by dredging to accommodate post Panamax type of container ship having draft of 42 ft.
- The annual handling volume through the port of Oakland were 1.4 million TEUs per year. The terminal size are small. It is planned to improve the gate system and speed up the gate pass of in-out terminal by introducing soft ware services. The ratio between loaded containers and empty one is planned to be improved by utilizing the satellite public inland depots to obtain spaces in the terminal area for stocking immediate containers and to increase the handling capacity.
- Raising three cranes to achieve lift heights of more than 100 feet to handle today's new larger container ships.
- Leasing more than 400 acres from the Oakland Naval Supply Center for warehousing and eventually constructing an intermodal terminal to transfer containers onto Oakland's three rail carriers.
- Continuing to modernize and upgrade existing terminals



SPECIFICATIONS

Rated Load	*40.6 t*
Rail Span	*30.0 m*
Out Reach	*45.0 m*
Back Reach	*16.0 m*
Lift	*above rail 33.0 m, below rail 15.5 m*
Spreader Type	*20 ft, 40 ft, 45 ft, telescopic*

Speed	
Main Hoist	*60/140 m/min*
Trolley Travel	*210 m/min*
Boom Hoist	*8 min/cycle*
Gantry Travel	*45.0 m/min*

Figure VII-1-3-4
SECTION OF QUAY CRANE

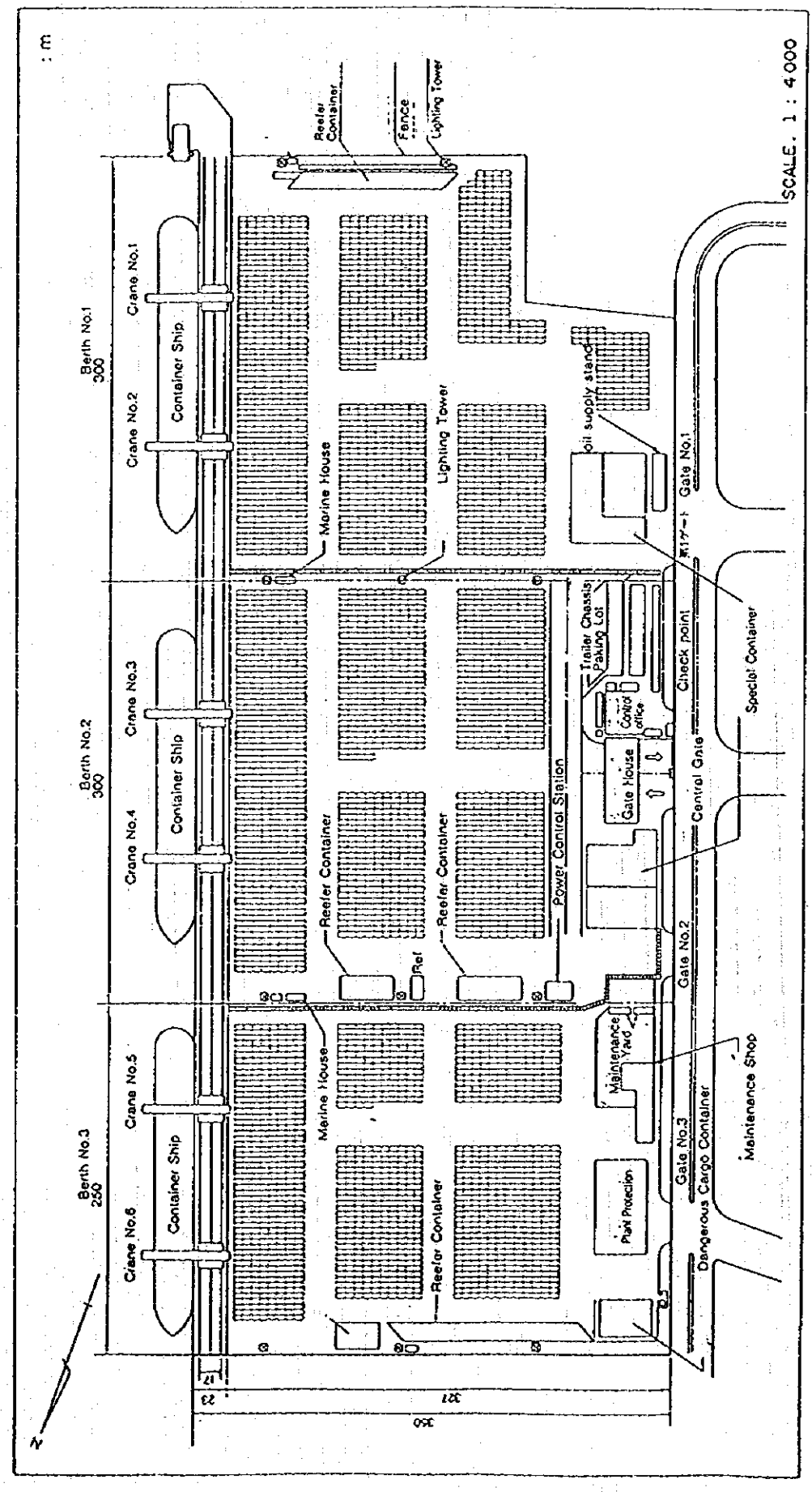


Figure VII-1-3-5
Arrangement Plan of Container Terminal (Handling 500,000 Ton per Year) at Nagoya Container Berth (NCB)

- The average ship size has been 50,000 to 60,000 DWT and number of calls in 1994 were 1,567 where 96 to 98 % of ships calling to the port have been container carriers.
- The north channel is to be deepen by dredging to 63 ft as first phase and subsequently to 81 ft in second phase. The dry bulk terminal is developed to have 72 ft draft along side the berth and subsequently to 81 ft for accommodating super tankers of 300,000 DWT. The dredging material are used for the reclamation of the new terminal development called "project 400" to construct 4 berths having 50 ft draft along side the berth to accommodate post panamax size container ships and to install 4 units of post panamax container cranes. The APL (American President Line, Ltd.) will operate this terminal as a tenant user.

2) Case of Port of Los Angeles

The Port of Los Angeles accommodated the largest container ship of Evergreen Taiwan, and APL post panamax new largest container ship carrying 7,000 TEUs . The Port received an average load of containers of 4,000 to 5,000 TEUs per carrier. The port facilities have sufficient length and draft to receive the maximum size of ships and volume of cargoes.

The Port of Los Angeles has limited land area and has to develop port area by reclamation. The development plans were prepared jointly by the city municipality and Port Authority. At present the Port Authority plans to develop the following projects as land load port system.

- One consolidated project for transporting containers composing dredging, container terminal development, railways, highway, and procurement of handling equipment.
- Coal exporting project as national interest project, developing coal from Uta, Colorado State to be used for steam coal power plant and exporting to Asia.

The most ambitious development project in its 88-year history is the Pier 300/400 Implementation Program envisioned as the solution to meet the demands of the growing Southern California population and the burgeoning global market. The Pier 300/400 Implementation Program is a comprehensive strategy that will enable the port of Los Angeles to accommodate the projected traffic volume coming through the port.

The program is a prescription for the future development of Pier 300, which will feature a new American President Lines (APL) container terminal, an on-dock intermodal container transfer facility and the Los Angeles Export Terminal (LAXT) for coal and other dry bulk products. Pier 400 the port's long-term expansion site, will be designed with an emphasis on flexibility to respond to future cargo-handling demands.

In terms of land transportation, the creation of the Alameda Corridor, a road and rail improvement program linking the Port to major transcontinental rail facilities in downtown Los Angeles with grade-separated trackage and additional truck routes, will best serve the Los Angeles region in terms of economic and environmental advantages.

Through the Pier 300/400 Implementation Program, cargo volume through the port of Los Angeles is expected to double over the next decade.

In anticipation of this booming international trade, the Port of Los Angeles applied foreign trade zone status. With this designation, WORLDPORT LA has become a restricted-access site where foreign and domestic merchandise may be brought into the Port without payment of customs duties or excise taxes.

3) Program of enlarged container terminal of major ports in Asian countries

The program of enlarged container terminal development of major port in Asia to accommodate 50,000 DWT or more before the year 2000 are shown on the following Table VII-1-3-10.

The port infrastructure development projects of major ports and their secondary supplemental ports in Asian countries have had the general tendency that their existing general cargo terminal are reconstructed and renovated into a container terminal and procurement of additional and specialized container handling equipment. The port operation at such major ports are privatized.

Some ports in Indonesia and the Philippines started to deepen the access channel around 14 to 15 m depth and install larger size of quay cranes (longer reach and higher lifting capacity) on the wharf to accommodate larger container ships of panamax size (draft -14m, length 250m to 300m).

Table VII-1-3-10 Program of Enlarged Container Terminal at Major Ports in Asia Countries

Country	Name of Ports	Target Year	Planned Berth		Existing Number of Berth in 1995	
			Depth	Number of Berth	Draft of -14m	Draft of -15m
Korea	Pusan Port	1997	-15m	4	3	-
	Inchon Port	1997	-15m	4	-	-
Taiwan	Kaohsiung Port	1998	-15m	5	10	-
Hong Kong	Hong Kong Port	1996	-15m	7	5	1
		1998	-15m	8	-	-
Singapore	Singapore Port	1998	-15m	5	-	5
		1999	-15m	3		
Japan	Kobe Port	1998	-15m	5	5	-
	Yokohama Port	1999	-15m	2	2	-
	Tokyo Port	1996	-14m	1	2	-

(7) Information flow system

The introduction of EDI (Electrical Data Interchange) as information flow system to the Buenos Aires port is imporant, the major ports in USA and Singapore have already installed and applied such system for information flow of container transport. The advanced examples applied by the port of Los Angeles and Singapore are referred hereunder;

a. Case of Los Angeles Port, USA

Recently gate control is emphasized for efficient container terminal operation. The automated gate systems at the container terminal of the Los Angeles port are as follows:

- Video cameras mounted at the precheck gate provide the clerk with container and chassis numbers via video monitoring for inputting into computer.
- Driver provides booking number and seal number to clerk. Automated system identifies company name and calculates truck weight.
- Computer automatically prints the Equipment Interchange Receipt (EIR) in the precheck booth.
- Clerk takes EIR, verifies the seal number and physically inspects equipment for damage giving the EIR to driver.
- Driver process into yard as per instructions reflected on EIR assigned location.

b. Case of Singapore Port

The Port Authority developed the electronic information flow system called PORTNET and installed necessary hardware. PORTNET is electric link with the port users.

24 hours on-line service enables port users to electrically submit their declarations, plans and manifests to PSA.

This system has additional port activities which includes submission of electronic port clearance, electronic bayplan and submission of electronic stowage instructions and bunker receipts and the declaration of dangerous goods.

CIMOS Computer-Integrated Marine Operations System) comprises the Vessels Traffic Information System(VTIS), the Port Traffic Management System, the Expert Planning Systems, the Mobile Radio Data Terminal System and Automatic Telex Management System.

By this system a ship coming into Singapore is immediately tracked by the radar-based computer systems of VTIS.

The radar information is then transmitted back to the control center instantaneously and presented graphically on the screen.

The information is then used by Port Traffic Management System and Expert Planning Systems to smooth terminal traffic control and efficiently plan and co-ordinate the development of pilots, tugs and launches.

1.3.2 Development of Container Terminal Facilities of Neighbor Countries

The findings of container terminal operation at the major ports of the neighbor countries are explained to realize how they prepare and develop the infrastructure to be competitive statue of global containerization process.

Major international shipping companies like APL (USA), Evergreen (Taiwan) and Hanjin (Korea) prepared the strategic plans with Brazilian companies to develop hub ports of container transport between Asian, European countries and Latin American countries in the Latin American region like at Panama.

Based on such hub ports they select secondary ports for shuttle and feeder services of containers. Considering such strategy of shipping companies for container transport system it is expected that the container traffic volume from USA, Asian countries to the Latin American region will increase considerably in the near future.

To comply with such demands of ship companies and trends of global containerization transport, the major ports of neighbor countries have started to develop container terminal facilities as follows;

(1) Case of Brazil

The traffic of containers between Brazil and Argentina have increased. The commodities from Brazil are industrial and manufactured goods and from Argentina are fruits, meat and agricultural products. The government had made the export procedures and permits more simple and encourage the containerized transportation.

The order of rankings of ports in container handling volume are first, Santos Port, second, Rio de Janeiro, third Paranagua port, San Paulo air port and Urugaiana pass to Argentina. The following ports are developing the container handling facilities.

- Santos port, 500m of existing berth and 300m container berth extension, there are 6 berths for handling containers and plans the terminal development with draft of 14 to 15 m depth to accommodate post panamax type ships and install container cranes.
- Rio de Janeiro port, 250 m of existing berth, plans of 280 m container berth extension to accommodate post panamax type ships with draft of 14 to 15 m depth there are three terminal, currently receiving the ships carrying 1,500 TEUs on the average, the

transshipment containers volumes for Uruguay and Argentina have increased through these three ports.

- Rio Grande port, 300 m of existing berth and plan of 250 m container berth extension. It is considered that this port will become very important transshipment port in the Mercosur cargo movement. For this prospect it is planned to develop and operate a new container terminal with the joint operation of Singapore Port Authority and Brazil company. The containers are transported to Uruguay by the trucks for 400 km distance.
- It is planned to develop the Septiba port as the hub port of container traffic at the southern coast of the countries.

The government established 8 public cooperation of the Santos, Rio de Janeiro, Rio Grande Norte, Seara, Maranion, Para under the state government control. The facilities of these ports are owned by the government and operation will be contracted to private companies.

The government prepare to develop the necessary infrastructures at the major ports for accommodating the larger size of container ships and to cope with the international containerization trends.

The railway transport volume to the neighboring countries of Brazil and to Argentina have increased and have the trends of increase. The government encourage to transport containers by the railway as well as the sea and inland transports system. The government plan to develop inland dry port along the border and the inland dry port will be operated by the custom and the custom clearance procedures will be simplified for smooth and quick pass for crossing the border.

a. The Port of Santos

The port of Santos requires improvement of port services because of the present ship congestion in the port, longer waiting time for berthing, demurrage of export and import cargoes in the yard within the port, the complicated slow services in the export and import process through custom and gate clearance.

The Port Authority (CODESP) commenced in 1992 the project of extension of the existing container terminal for 300 m long and 14 m depth with 2 additional container handling quay cranes, 3 additional transtainer cranes for yard and reclamation of 300 m x 500 m for additional container stock yard.

The port has hinterland of industry and agricultural with population of 150,000,000 and function as gate port of such industrial and agricultural region in the south Brazil. The large quantity of cargoes were handled through this port.

The port of Santos is centrally located on the coastline of the state of Sao Paulo with its installations extending along an estuary bordered by the island of Sao Vicente and Santo Amaro. Access Channel have the width of 300 to 700 meters and minimum depth of 12 meters.

1) Traffic Volume

In 1992, Santos port handled 494,680 TEU with an increase of 15,6 % from 1991 through the existing container terminal.

The export cargo from Santos are mainly agricultural products such as coffee, beans, tobacco, cotton, which are heavy weight commodities and import cargo are mainly industrial and manufacturing products such as textile, mechanical equipment, spare parts which are comparatively light weight commodities.

The export containers are mainly 40 ft size and import are 20 ft size.

Currently in 1994, Santos port handled about 30 million tons equivalent to 30,000 ton per liner meter of the wharf.

70 % of the general cargoes (excluding liquid cargo of 13 mil ton) were transported by containers. 62% of total cargo are shipped at the CODESP' facilities (Companhia Docas do Estado de Sao Paulo), and the other 38% at the private terminals. It is estimated from the observation at the port that since there is no statistic data of containers through the conventional wharf compiled at the port authority, (33-13) x 0.7 = 14 mil ton equivalent to 1.4 mil containers handling through the conventional wharf areas.

Among the projects currently being undertaking for the modernization and improvement of efficiency of the port shall be the containers and fertilizers terminals development so called "Exports Corridor Project" and is the priority project in the Santos Port.

The container traffic export and import are shown on Table VII-1-3-11 and 12.

Table VII-1-3-11 Port of Santos (Handling of Containerized Cargo) Import Cargo (Including Inbound, Domestic and Transshipment)

Year	Full Container				Empty Container			
	20 Feet		40 Feet		20 Feet		40 Feet	
	(in Units)	Tonnage	(in Units)	Tonnage	(in Units)	Tonnage	(in Units)	Tonnage
1990	59394	874,019	15,234	297,374	108,150	250,375	12,802	53,413
1991	61,354	911,843	19,706	345,587	88,075	208,053	12,296	51,021
1992	60,838	903,838	20,355	348,132	99,128	242,384	22,366	90,860
1993	87,991	1,332,852	32,653	583,242	77,257	186,942	22,119	91,804
1994	104,549	1,629,091	51,342	857,550	62,069	149,034	19,898	78,075

Table VII-1-3-12 Port of Santos (Handling of Containerized Cargo) Export Cargo (Including Inbound, Domestic and Transshipment)

Year	Full Container				Empty Container			
	20 Feet		40 Feet		20 Feet		40 Feet	
	(in Units)	Tonnage	(in Units)	Tonnage	(in Units)	Tonnage	(in Units)	Tonnage
1990	136,162	2,178,225	19,664	339,262	24,098	60,691	7,465	30,500
1991	125,573	2,056,232	18,961	317,610	25,496	62,541	12,694	51,523
1992	143,322	2,393,815	31,495	543,014	23,207	60,351	9,868	41,299
1993	137,681	2,361,763	38,734	674,291	26,010	66,000	12,039	48,956
1994	142,994	2,524,893	42,279	862,278	27,504	66,064	20,006	80,946

2) Facility

The port have the access channel of 8,810 m long, 150 m width and 12 m depth. The number of berths are 65, and their average berth length is 150 m and total length of berth of 12,000 ml and 20 m width of apron and with 10m on the average depth of water.

There is one exclusive container handling terminal called TECO inaugurated in 1981 in which length of wharf is 510 m, and depth alongside the wharf is -13.0 m.

There are five inland depots for containers stock yard owned by five private companies and the government do not permit other private investors to construct additional inland depots. So all the containers coming to the port have to pass through such depots for custom clearance and they wait till the spaces in the port area and inland depots are available by relocations of containers.

The general plan of the port is shown on Figure VII-1-3-6.

3) Container handling cost and port charges

It is reported that the container handling cost is US$320 per one container on the average, the cost along the wharf is US$120 to 130 per one container and add the high handling cost within the yard. The handling inside the ship by independent cargo handling labors union, and handling on the wharf by the port public cooperation. The berth waiting time is longer than the other ports of neighboring countries, in general 3 to 7 days.

The port charge the container handling rate at per ton basis, 20 ft full container is about US$200 and 40 ft is US$400. The handling cost of empty containers are cheaper. The cargo handling cost at Buenos Aires port have reduced to 25 % in 1994 because the port allows shipping company to select stevedoring company for cargo handling at the reasonable cost through the tenders. The container handling cost is about three times higher than the Buenos Aires.

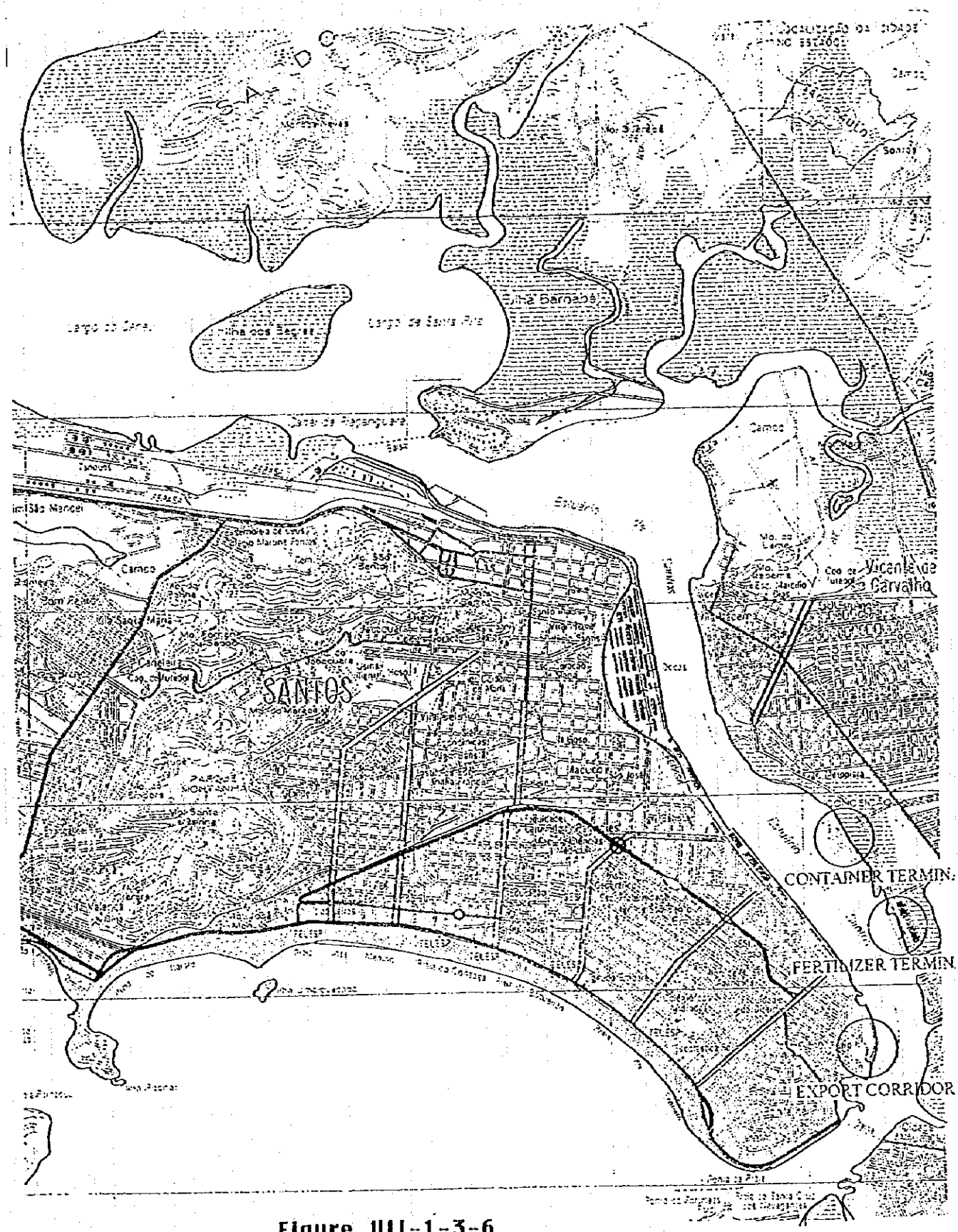


Figure VII-1-3-6
CITY OF SANTOS AND LOCATION OF THE TERMINAL

The ship cost at the port is accumulated by multiplying the number of the days with around US$30,000/per day which is also added to the costs to the regional economic activities.

4) Tariff for cargo handling

The ship line agent pay the following fees based on the box rate for container handling at the container terminal and separately pay the services of tug boats and pilotage to their respective business offices. (1SR = 0.85 US Dollar in 1995).

i)	Charges of channel utilization and buoy and dredging service cost	47.29	SR/box
ii)	Ship stay fee, warfare for 12 hrs in per meter of ship	59.96	SR/m
iii)	Charge for export handling container 20 ft	127. 02	SR/ container
iv)	Equipment usage fee, if equipment need	26.43	SR/container
v)	State government tax 20 % of iii) and iv) of above		
vi)	City government tax 5 % of i), ii) and iii) of above		

Comparing trends of Buenos Aires port, the port charges, cargo handling inside hatches of ship and on shore and tug boats services of Santos and Rio de Janeiro and other ports of Brazil are higher, since the ports service are managed under the state owned company.

The tug boat service charges are US$6,000 for 25,000 DWT class ship per one trip with two tug boats for going and coming.

5) Development plan

The Port Authority prepared the container terminal development program. Several existing warehouses shall be demolished and develop the area to an open stock yard for containers.

Extension of the wharf of container terminal to make 810 m in total and maintaining the depth of -13 m to have 3 berths in total and increase handling capacity of 250,000 TEUs to the existing capacity. The development plan is summarized in Table VII-1-3-13.

6) Institutional strengthening

The port authority established a new commercial department for the following assignment to eliminate an intermitted agents or persons.

Table VII-1-3-13 Terminal Development Program of Santos Port

Terminal	Existing Situation	Development Plan
Container Terminal (TECON)	-berth length 510m, water depth 13.5m -yard area 350,000sqm -6 units of 30.5t cap. gantry crane -3 uniots of CFS -200,000 TEU handled in 1992	-expansion of berth length 310m -1 additional gantry crane installed -4 additional transfer cranes
Fertilizer Terminal (TEFER)	-handling volume 1.3 mil. ton -10 units of grab unloaders 10 ton with 800 ton per hr capacity -6 units of warehouse, 180,000 ton capacity of fertilizer storage -2 berths with 567m length 13.5m depth	-to increase the handling volume to 3 mil ton -install 4 units of new unloaders 1,200 ton per hr capacity -existing old unloaders are removed
Grain Terminal	-handling volume 2 mil.ton -1 berth 2 units of ship loaders of 1,500 ton per hr capacity -3 units of warehouses with 100,000 to storage capacity	-to increase the handling volume to 5 mi. ton -2 additional ship loaders with 1,500 ton per hr capacity install -1 unit of warehouse 15,000sqm - new belt conveyors between berth and warehouse

- Coordinations of privatization for port operation among the public and private sectors.
- Assessment of reasonable and competitive container handling tariff.
- Development of marketing of port users.
- Development of new partnership with exporters and shipping line agents to encourage for increase traffic and decrease tariff through operation contract and traffic agreement in order to raise bigger overall revenues.

b. The Port of Rio De Janeiro

The port authority of Rio de Janeiro is operated and managed by Companhia Docas Do Rio De Janeiro under the State of Rio de Janeiro. The state is responsible for the administration of the infrastructure as it is a public port and pursuant to the Port Modernization Law of 1993.

The port authority of Rio de Janeiro intends to develop the port to be modern international network of highly efficient port to meet the growing demand for services in international trade.

CDRJ is not only responsible for improving port services - in the Ports of Rio de Janeiro, Septiba, Forno, and Niteroi - but also for providing support to other Brazilian ports through the Port Education Center (CEPORT), the Dredging Management (GEDRAG), and the Institute for Waterway Research (INPH), which are incorporated to the activities of Cia. Docas do Rio de Janeiro.

1) Development plan at Rio de Janeiro and Septiba Port

The Port of Rio de Janeiro is the second largest in cargo handling in Brazil and the main port of CDRJ located in the Guanabara bay. The port of Rio de Janeiro have 30

berths scattered along the 8.5 km distance and 100,000 sq.m of stock yard area with water depth alongside of the berth -12.0 m.

The port of Rio have handled containers around 300,000 TEU's per year with an annual increase of 33% between 1993 and 1994, and expected to further increase by 40% from 1994 to 1995.

There are almost 1.4 million square meter of storage area - including yards and warehouses -, as well as specialized terminals for containers, roll on-roll off, bulk and new bulk products, in addition to the passenger station.

It is planned to develop that by the year 2000, the port's capacity will handle approximately 15.5 million metric tons per year (an increase of over 60% from the 1990 capacity).

The Port Authority of Rio de Janeiro plans to develop the container terminal within the existing port areas by renovating the existing conventional wharf.

The existing container berth will be extended for 250 m long of 2 berths with 12 m depth and expansion of the stock yard by 2,000 sq.m. and to procure additional cargo handling equipment consisting of 3 units of stacker, 2 units of gantry cranes and 2 units of transtainer.

The handling efficiency will be improved to 30 containers/hr., on the average and takes about 6 - 7 hours for loading/unloading containers per ship.

By this project it is projected that more than 1.0 mil TEU's per year will be handled through the Rio de Janeiro port and Septiba port.

The development works have already been in progress in Port of Rio Container Terminal and the multi-purpose pier at Septiba port for handling about 400,000 TEU per year in the first stage development.

The Port Authority of Rio de Janeiro planned to privatize the port operation, particularly container handling, and invited bidders from the private companies. There are three (3) bidders from Argentina participating this tender.

The Port Authority of Rio de Janeiro have requested the port of Buenos Aires, (currently AGP) to provide the transfer of know-how on privatization process from the Argentina's experience. The Brazil port authority desires to expedite the process of their privatization of port operation and to encourage the private investors to be involved on

infrastructures developments like the case of Argentine ports, specially the port of Buenos Aires.

c. The Port of Septiba

The port is located about 94 km south of Rio de Janeiro which was constructed in 1980s for industrial cargo handling terminal. The port handled export coal which are delivered to the port by railway and loaded by belt conveyor of 16 km long. The port have 10 mil sq.m. There is natural approach channel of 22 km long and 200 m width with 20 m draft from the Atlantic Ocean to the port through the Septiba bay.

At the north of the Septiba bay and partly on the Madeira island, in the town of Itaguai, the Port of Septiba currently receives metallurgical coal, alumina, scrap iron, and other bulks, with an influence area that reaches the States of Rio de Janeiro and Minas Gerais. The Companhia Docas do Rio de Janeiro intends to enlarge it by building two additional berths for general cargo.

The port authority plan to develop Septiba port as hub port of container, grain and coal/ore. Then the port of Rio de Janeiro will be retained as feeder port for handling containers, general cargo, liquid cargo in small scale.

The cargo handling at this port are carried out by stevedoring company belonging to the Union. The operation efficiency is high and flexible for development, but at the Rio de Janeiro, the cargo handling are carried by the authority employees and thus the efficiency is lower and rather rigid for changes in operation.

The Port of Septiba has 4 berths in 540 m x 50 m ft long and 40 ft deep pier. The quay area can simultaneously accommodate two 90,000 DWT coal carriers and two 45,000 DWT ships.

The port authority of Rio de Janeiro plan to develop the Septiba port with the access channel of 18 to 20 m depth from the Ocean to the port and to have the following facilities.

- Container terminal
  to construct berth of 270 m x 2 as phase-1, then additional 3 berths of 810 m long in phase-2 to be a hub port of containers in this region.
  to cope with the modern trend of containerization and handle around 400,000 TEU per year, and to service feeder ships to the regional ports for containers delivery and collection with a view of paying special attention to Mercosur requirement.
- Ore and solid bulk terminals to handled 9 to 12 million tons and to accommodate 150,000 DWT, post panamax bulk carriers.

- Grain terminal with multipurpose facilities to handle 4 to 6 million ton and improving the rail and roads access with private or public investment for mixed use to promote access to the international export market.

The port will accommodate container ships carrying 6,000 TEUs containers, (post panamax type), and serve as a transhipment port (similar function of Rotterdam and Antwerp) to strengthen its role in promoting regional and local economic activity such as export process zones, industrial center in the regions.

The infrastructure development will be financed by the federal government and private investment. Procurement of cargo handling equipment and port operation will be carried out by the private investor.

(2) Case of Chile

Chile has a total of 32 major ports consisting of 10 public ports under the control of the Empresa Porturia de Chile (EMPORCHI), an independent public cooperation body and 22 private ports owned by the private companies located along the coast of 1,800 km facing the Pacific Ocean. The cargo handled by the 10 public ports in 1993 were 16,445,528 ton which was 2.4% less compared from 1992 (16,852,556 ton). The export and import volume were 8,278,240 and 5,225,694 tons respectively. The domestic cargoes were 1,483,000 ton and transit were 1,038,000 tons, the containers were 499,974 TEUs in total. The ranking of large volume of cargo handling ports is in the order from Valparaiso, San Vincente port, Antofagasta port which handled more than 53 % of the total volume.

The government studied potential and capacities of all the ports to increase trades from Brazil, Paraguay, Argentina and other countries in the continent who are interested to reach their products to Chilean ports through the export corridors crossing the Andes and to export to Asian countries.

The government plan to restructure the present organization set-up of public ports to be a self-autonomous management, and allow the participation of private sector invest in the port development. The location of such public ports is shown on Figure VII-1-3-7.

The government plans to change the institutional arrangement of the existing public port organization (EMPORCHI) in order to;

- Increase and encourage the private sector invests in the Chilean ports development and operations by giving concession for 30 years.
- The ports to provide the level of third generation port services and improve the level of efficiency.

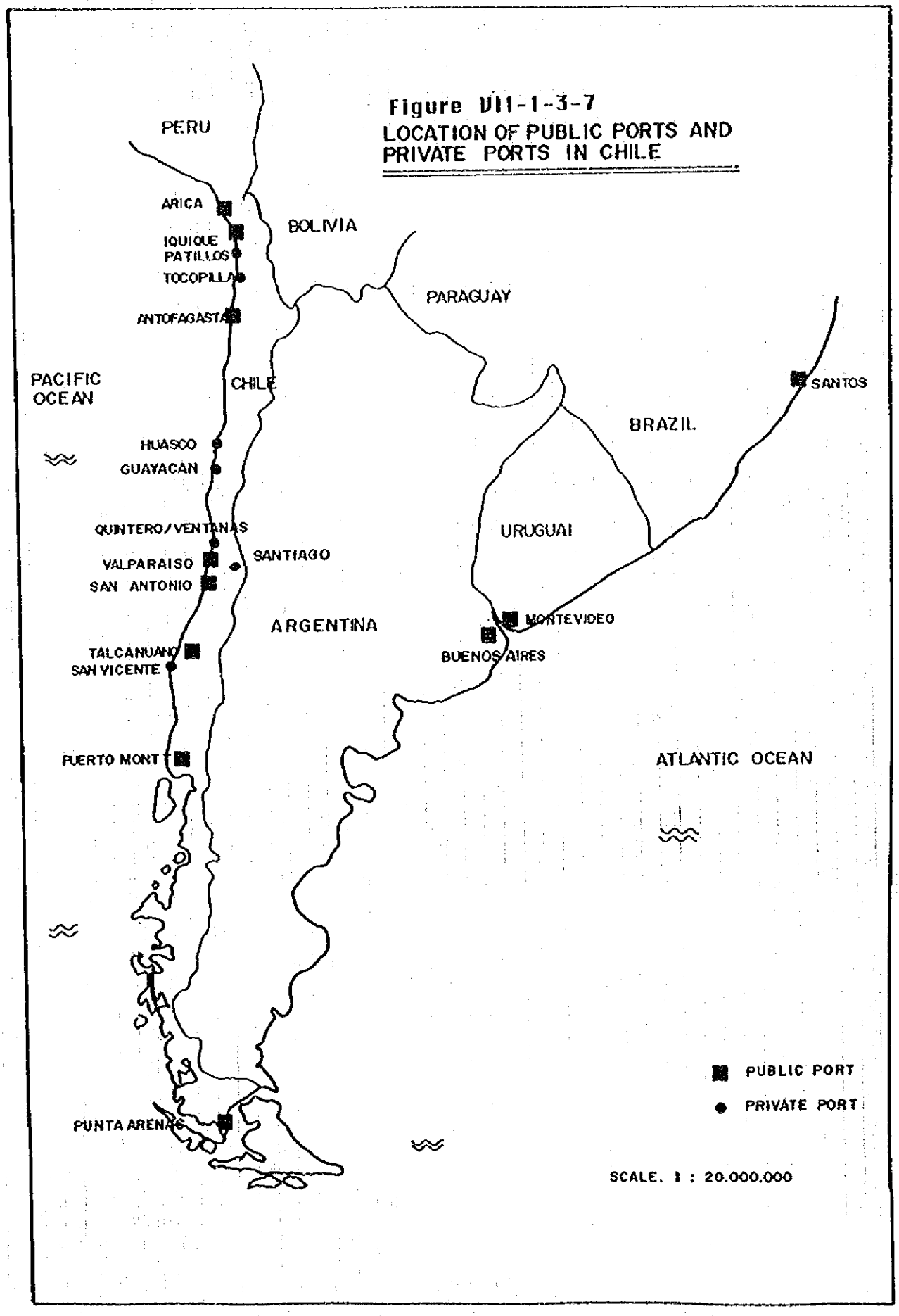


Figure VII-1-3-7
LOCATION OF PUBLIC PORTS AND PRIVATE PORTS IN CHILE

- To create competitiveness with effective services among the neighboring ports as well as the foreign ports.

The government consider to develop the ports with the following concept.

- Develop an adequate infrastructures in and around the ports to meet the demands of own economic opportunities through the market.
- Bring cargo from third countries by private investors.
- Improve loading and unloading efficiency by construction of additional berth and cargo handling equipment with new technology.
- Improve the cargo handling standard within international level.

a. Traffic Volume through public ports

The classified cargoes distribution through the four (4) major ports in 1993 are as follows:

Table VII-1-3-14 Cargo Movement through Major Ports of Chilean Ports

Description	Cargoes	Name of Port				Total Cargo National Volume
		Valparaiso	San Antonio	Talcahuano	San Vicente	
International	Export	1,971,101	1,217,821	284,545	2,651,697	8,278,240
	Import	2,067,156	2,062,880	65,168	84,404	5,225,694
Domestic	Loading	111,990	25,431	4,431	1,092	566,517
	Unloading	37,372	113,239	39,172	95,743	917,317
Transit	Loading	30,836	14,266	156	2,036	480,440
	Unloading	35,925	11,469	2,265	2,494	458,492
Others		228,897	55,698	11,562	19,825	518,828
Total		4,483,277	3,500,804	407,299	2,857,291	16,445,528

The main ports that handled containers are Valparaiso, Iquique, Antofagasta, San Antonio and the volume handled in 1993 through these ports were 426,157 TEUs (85.2%) out of 499,974 TEUs in total national volume as detailed below;

Table VII-1-3-15 Container Handling Volumes in Chilean Ports

Name of Port	in 1993	1993	in 1994	1994
	Container in TEU	Share in (%)	Container in TEU	Share in (%)
Arica	40,397	8.1	41,558	7.5
Iquique	61,433	12.3	74,398	13.4
Coquimbo	3,599	0.7	3,385	0.6
Antofagasta	19,014	3.8	21,918	3.9
Valparaiso	250,157	50.0	240,456	43.3
San Antonio	95,553	19.1	136,922	24.6
San Vicente	8,206	1.6	7,942	1.4
Talcahuano	4,257	0.9	8,308	1.5
Puerto Montt	89	0.0	130	0.0
Punta Arenas	17,258	3.5	19,534	3.5
Others	11	0.0	1,097	0.2
Total	499,974	100.0	555,648	100.0

Source: EMPORCHI

The total traffic volume of container through national public ports have increased 11.14 % between 1993 and 1994, which has been contributed mainly by the ports of San Antonio, Antofagasta, Talcahuano and Iquique.

Out of the above total containers volume in 1994, the export containers were 172,270 TEUs (34.5 %) and import containers were 200,796 TEUs (40.2 %), domestic containers 40,279 TEU, (8.0 %) transit containers 23,546 TEU (4.7 %) and others 63,083 TEU (12.6%).

The present working rate of container handling are on the average of 17 unit per hour. It is planned to improve to be 37 units per hour.

The present condition of container handling at major ports of Chile is described as follows.

b. The Port of Valparaiso

The reconstruction of port facilities damaged by the earthquake in 1983 were completed by the federal government budget and the further development of existing facilities will be carried out by private investors.

The Valparaiso port is planning to modernize the container terminal facilities expanding the terminal facilities and instaling of additional cranes including the expansion of stock yard areas by the private investments.

In Valparaiso port there is the headquarter of EMPORCHI. The general layout of port is shown on Figure VII-1-3-8.

1) Facility

There are ten (10) berthing facilities in the port and the total length of the wharf is 1,685m. The draft of berths vary from 6.5 m to 9.5 m, out of which the berths No.4 and 5 are used for handling containers with container stock yard of 52,300 sq. m.

For the storage facility in the port area, there are fourteen (14) units of shed and warehouse of 115,000 sq. m and open storage areas of 70,000 sq. m.

There is the fishery wharf in front of the city gate and the railway line is connected into the port for carrying mainly copper and related products. Behind the berth No.3 there are six (6) old warehouses which the port authority plans to demolish and convert into the container open stock yard.

The existing container yard will be reorganized with yard cranes of transtainers system from presently operating stacker cranes. The port operation will be contracted to private cargo handling companies.

2) Traffic

As seen from the Table VII-1-3-14 the port handled containers of 250,157 TEUs in 1993, but decreased to 240,456 TEUs in 1994, about 3.87% less than 1993. The traffic volume of containers at this port have been in similar order of 240,000 to 255,000 TEUs for last two years.

It is observed that the draft along the container handling wharf is only 9.5m, which is not capable to accommodate medium size container ships. Thus, the traffic volume cannot be increased to enhance the economic grow.

The port had handled transit cargoes of 66,761 ton for Argentina besides other international cargoes. The max. size of ship with a length of 210 m entered the port in 1994. The port function as multipurpose terminal handling both unitized break bulk and bulk cargo such as exporting fruits cans in container and importing steel products in break-bulk/bulk. The export volume of fruits to USA, Europe, Asia, Japan were reaching to 93 million tons by October 1995. The demands forecast of the Valparaiso port is estimated at the middle case to be 19 million ton in 2015, equivalent to 1.6 million containers units. The details is shown on the Table VII-1-3-16.

Table VII-1-3-16 Projection of Container Movement at Valparaiso Port

(Unit: Number of Box)

Area	1995	2000	2005	2010	2015
Africa	1,476	3,382	6,080	9,756	14,741
Europe Norte	37,965	86,977	156,364	250,910	379.102
Europe Mediterr.	6,114	14,006	25,180	40,404	61,047
Lejano Oriente	18,806	43,084	77,455	124,488	187,788
USA Golfo	9,884	22,645	40,710	65,326	98,701
USA Pacifico	7,895	18,0-86	32,515	52,176	78,833
USA Atlantico	33,648	77,088	138,587	222,383	336,000
Caribe	3,514	8,051	14,473	23,225	35,090
America Central	1,236	2,831	5,089	8,166	12,338
Latinoam, Atlant.	21,703	49,738	89,417	143,483	216,790
Latinoam. Pacifico	13,463	30,842	55,448	88,979	134,432
Oceania	2,969	6,801	1,226	19,619	29,642
Medio Oriente	1,749	4,007	7,204	11,559	17,465
Total	160,460	367,610	66,880	1,060,480	1,602,290

Source: EMPORCHI

3) Development plan

The port plan to develop infrastructures (berth renovations, reclamation, procurement of container cranes) based on the demands forecast of the middle case of the above Table VII-1-3-16, which will be implemented by giving a concession to private investors.

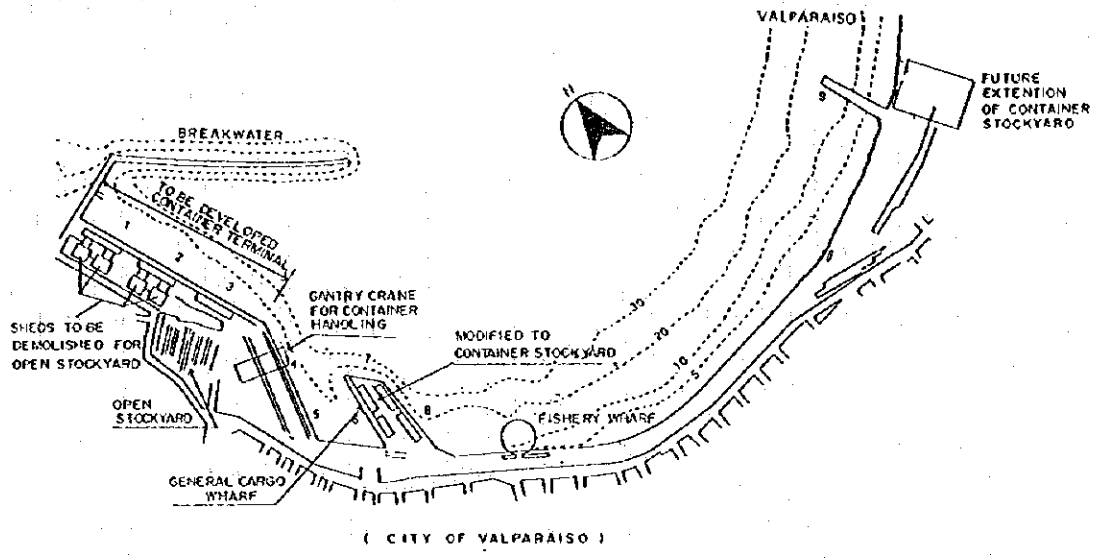


Figure VII-1-3-8 PLAN OF THE PORT OF VALPARAISO

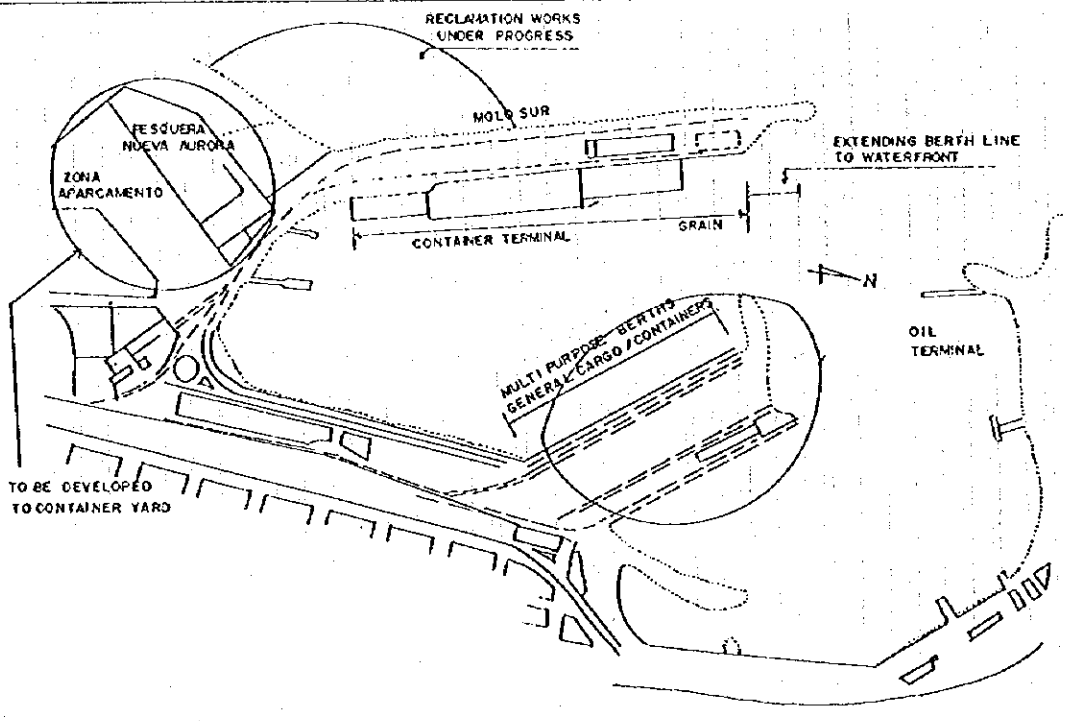


Figure VII-1-3-9 PLAN OF THE PORT OF SAN ANTONIO

The expansion of the container terminal are at present under construction in the port to be completed by 1996. It is planned to renovate the present 10 berths into seven (7) larger berths such as; renovating berth No. 3 & 4 into one berth to accommodate 3rd generation container ships and deepening the water depth in front of berth and extending about 6.5 m in front of the existing berth No.1 to 3 to have -12 m depth of the berth.

The wharf structures were designed and reinforced with anti seismic design. This project include 80,000 sq.m. pavement, maintenance work shops, main offices building, electric substation and reclamation for a new container stock yards. By this development the handling capacity will be about 500,000 TEUs containers, which will be able to handle 60 to 70% of total national container traffic with the San Antonio port.

The port have the enough water depth at the basin and access channel, but the only road access to/from the inland at present passing through the city are heavily congested (1,400 trucks coming to the port in 24 hrs) and land areas are limited due to the mountains located closer to the shore. The Government plan with its own budget to develop a new access road by the tunnel to the port from the south.

The existing crane can handle 2nd generation container ship carrying 2,000 TEUs, but it is planned to procure two gantry cranes in 1996/97 to service 3rd generation container ships carrying 2,500 to 3,500 TEUs. Depending on the demands additional two cranes will also be installed. The existing warehouses located behind the berth No 1&2 will be demolished for multipurpose open storage areas. It is expected to improve the handling efficiency about 20% from the present operation system.

Berths No.6, 7 and 8 will be rehabilitated for general cargo berths and one transit shed on the finger pier will be demolished to be used as open storage yard.

The above rehabilitation works is planned to start during 1996.

The land side area for development is not available since the city develop to the coastal area and Port of Valparaiso is closed by the city road and railway lines.

4) Coordination of city activities

The port and city authority have plan jointly to develop the coastal areas to provide adequate access to the port and coastal areas for port activities and for tourist attraction as well as meeting places of city residents.

c. The port of San Antonio

1) Facilities

This port is located about 100 km south of Valparaiso port and about 200 km from Santiago, capital city of Chile and have functioned as gate port as well as providing supplemental port service to Valparaiso Port. General plan of the port is shown on Figure VII-1-3-9.

The port facilities at San Antonio were also damaged by the earthquake in 1985, but were reconstructed in 1992/93 and resumed normal port operation. San Antonio port have berths of -12m depth with wider stock yard and could accommodate larger type of ships than the Valparaiso port. The traffic volume was estimated around 4.5 million tons in 1994.

At this port the container traffic have increased substantially in last two years compared with Valparaiso have been steady at around 250,000 TEUs in last two years, since larger container ships cannot enter at Valparaiso port.

The port will develop container terminal and grain terminal and plan to construct one berth for general cargo under private investors. They also plan to improve the existing 2 berths to handle containers where cargo handling is contracted to the private multi operators companies.

2) Traffic

In view of the deep draft alongside the berth and larger stock yard areas behind the berth after reconstruction in 1993 many container carriers of larger size were calling at this port instead at the Valparaiso port due to its water depth limitation.

As seen from the Table VII-1-3-14, the container traffic volume at San Antonia Port has increased 30.2 % between 1993 and 1994, while at Valparaiso has decreased about 3.9 % between 1993 and 1994.

d. The Port of San Vicente

The Port Authority (EMPORCHI) has proposed to develop the San Vicente port as container terminal in the Concession bay, where large space are available for storage area and with deep water.

There are two (2) public ports and five (5) private ports located around this region handling different commodities.

1) Export corridor to Chilean ports from Argentina

It is planned to export Argentine products through the Chilean ports by crossing Andes mountains, as the connection to southern part will be more convenient to cross than the northern parts.

The major routes to reach the port along the coast of Pacific Ocean by road and railway is planned as the "Bioceanic Corridor Route Development Project". It will start from Argentina, Bahia Blanca through Zapala, to the ports of Talcahuano-Concepcion by the use of railway, covering a total distance of 1,300 km. Out of which about 130 km on Argentine side and 70 km on Chile side were not yet connected. Its objective is to promote the export of agricultural products and natural resources of the southern region of Argentina and to develop the potential of exporting markets in the Pacific Basin. The port facilities of Tolcahuano and San Vicente and other private ports along this region has such potential for handling the export goods from Argentina.

2) Traffic

The two ports of San Vicente and Talcahuano handled nearly 48 % of cargoes coming to this region. Out of which cargo 72 % are handled through the San Vicente port which also handled 7,942 TEUs in 1994.

The depth alongside the berth (3 multipurpose berths) is 37 to 39 ft and the port is equipped to handle different type of commodities.

e. The Port of Talcahuano

The port of Talcahuano have 2 berths with 28 ft draft and have planned to develop a container terminal. At present in-coming ship carriers empty containers to load fish meals in bags, wooden finished products and furniture for export to Asian countries.

1) Traffic of containers and operation system

The container handling operation are carried out by two private stevedoring companies using rented mobile crane from the port state company. The handling rate is 12 to 13 boxes per hour by using ship gear.

The port handled containers in 8,308 TEUs in 1994.

2) Development plan

It is planned to develop a inland depot for stuffing and unstuffing with capacity of 32,000 TEUs at 3.5 km distance away from the port.

The ports of Talcahuano and San Vicente will function as feeder port in the container transport. Since there are large areas and deep draft in the port of San Antonio where many freight ships go to, it will function as a hub port as well as Valparaiso. The basin of the port of Talcahuano is calm. A private company expressed interest to develop a container terminal and the government will agree by giving concession basis to conduct engineering study and arrangement of financing for implementation of this project

including procurement of all equipment required for container handling and operation of the terminal.

f. The Port of Antofagasta

1) Facilities and traffic

The Antofagasta port is located about 1,370 km north of Valparaico port. Antofagasta is the capital city of the north district of Chile. This port function as the gate port to trading of products from neighboring countries including Argentina with Asian countries.

The port management of Antofagasta is under the control of the EMPORCHI. There are 9 berthing facilities in the port and the total length of the wharf is 1,480 m with draft varying from 7.3 m to 11.25 m. It has an open storage area of 53,993 sq.m, warehouse of 2,100 sq.m, and a container stock yard of 8,300 sq. m. The port handled containers 19,014 TEUs in 1993 and 21,918 TEUs in 1994. It also handled the transit cargoes for Bolivia and Argentina beside the international cargoes for Chile. In 1992 transit cargo of 319,995 ton was handled for Bolivia.

2) Development plan

The port has a long term development plan to expand new berth from No 7 west side of the port within the breakwater and additional land reclamation for bulk cargo stock yard outside of the north breakwater and demolishing the old warehouse to be converted to container stock yard.

It is envisaged that the port will be able to handle some 3.2 million ton of cargo with the presently available berthing facilities, since the port had wide basin with enough depth of water for larger ships up to around 50,000 DWT. The port has potential area for development to accommodate additional cargoes from Argentina, Chile and Bolivia. The major commodities handled at present through the port are raw material of copper and its products.

(3) Case of Uruguay

a. The Port of Montevideo

1) Location and function of the port

The port of Montevideo is located on the Rio de la Plata. From such geographical point of view, the port will function as a gateway port of Uruguay as well as a transshipment point for the Brazil and Paraguay and coexisting with Buenos Aires port

which will function respectively as a gate port of its national economy and industry hinterland.

The port was constructed in 1883 and organized into National Port Administration in 1916. The Port Law in 1992 "Free Port Concept" was introduced and being implemented in the port operation. This makes port area customs exclusion for packing transshipment cargoes, which is the first and only terminal available in South America Atlantic coast ports.

The port operation and service at the cold storage, passengers ferry terminal warehouses, container yard, equipment operation, storage and distribution of cargoes are provided by private companies and currently still on the transformation stage from the public control to privatization process. The Port of Montevideo provide the port services for 24 hrs and 365 days of the year.

2) Main facilities and terminals in the port

There is one container terminal of -10 m draft and it is planned to develop a second container terminal with -11 m draft and to install two (2) additional quay cranes in 1995. (Refer to the Figure VII-1-3-10 for the general plan of the port). This port has the following existing main facilities.

- Total length of 4,253 m of berths,
- Container terminal, length of wharf 300m, depth of water 10.5 m, the yard area of 10 ha, one gantry crane of 40 ton lifting capacity.
- Specialized berths to passenger vessels connecting between Uruguay -Argentina, fishing boats, bulk cargo for grain from Argentina, ship repair yard operated by private company and wooden handling terminal are available.
- Wooden terminal (Wharf B) handling 100 % of all wooden export and also loading living animals, fruits and additionally accommodate most of the river fleet navigating through the Hidrovia Paraguay - Parana to river ports in Paraguay.
- 8 berths about 2,276 m long for container terminal and general cargo and bulk cargo
- Open storage area of 220,000 sq. m
- The access channel has 30 km length and depth of -10.5 m (34 ft).

  The maintenance dredging are being carried out by the private company of Argentina on contract basis alongside of the specialized wharf of wooden terminal and grain terminal up to -10 m depth.

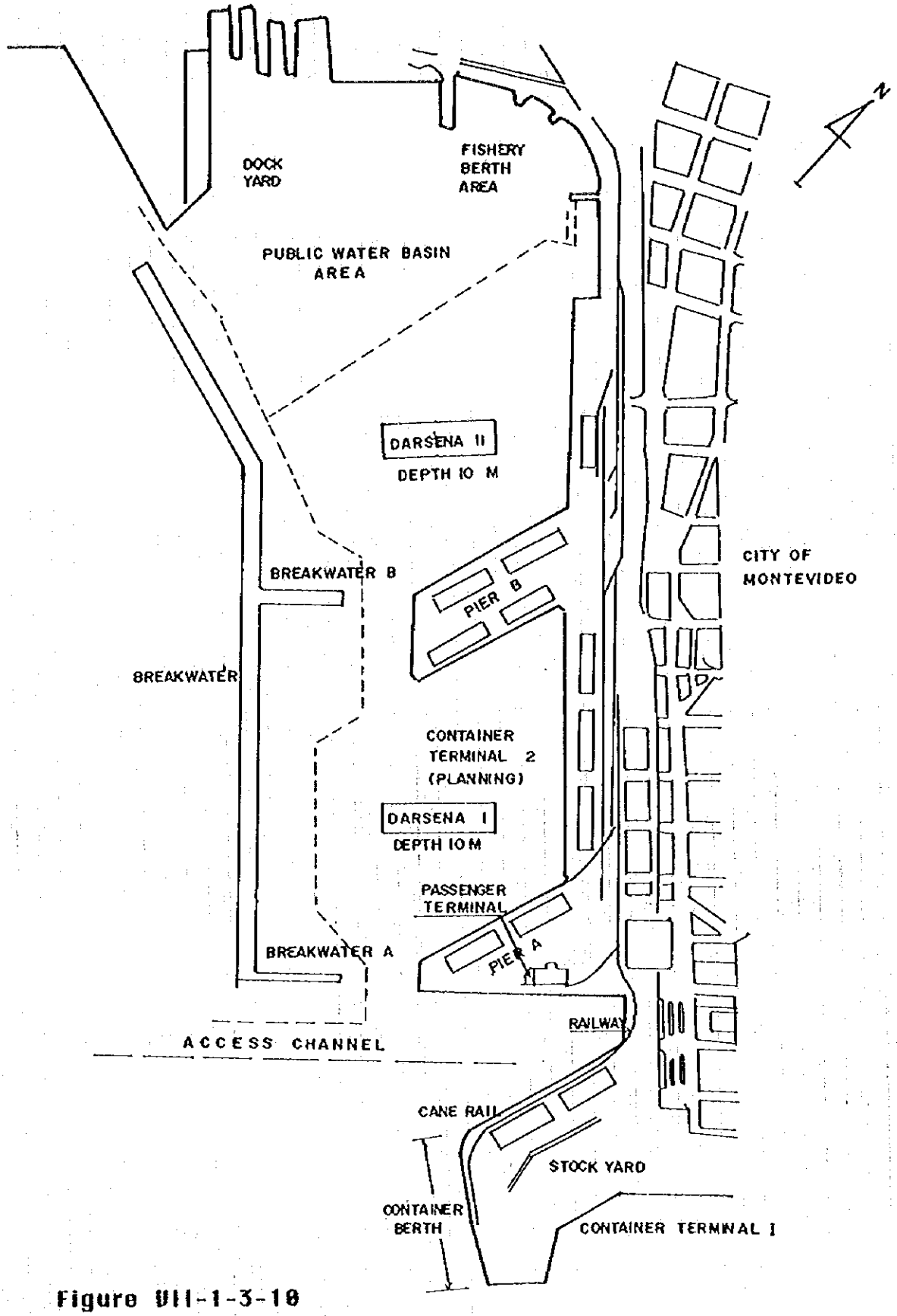


Figure VII-1-3-18

PORT OF MONTEVIDEO

SCALE. 1 : 6 000

3) Traffic of ships

The port had received 1,397 international oceangoing vessels and 2,465 domestic ships in 1992. The biggest number of domestic ships were fishery boats of 2,289. The general cargo ships were 557, container ships were 212, semi container ships were 12 and passenger ships were 245.

4) Cargo movement

The port had handled export cargo of 573,561 tons in 1992 and import cargo of 1,062,188 tons, out of which there were 182,849 ton of transit cargo. The cargo volume of 1994 have increased about 25 % from 1993, due to additional number of ships calls. Taiwan shipping co., EVERGREEN, which used to call at the southern ports of Brazil have changed to call at Montevideo port for distribution of cargoes going to Paraguay and to south of Brazil by using trucks and railway from this port.

The port handled containers from 1991 to 1994 as shown below with handling productivity of 25 units per hour by one gantry crane; The total volume in 1994 was about 22.5 % of Buenos Aires port in private terminal.

Table VII-1-3-17 Movement of Containers

(unit: TEUs)

Year	1991	1992	1993	1994
Unloading	31,254	39,975	49,000	46,864
Loading	30,233	35,107	30,000	46,864
Transshipment	-	-	-	12,000
Total	61,487	75,082	79,000	105,758

Source: ANP

5) Development plan

The existing container terminal No.1 is privatized and will be calling for re-tender. Terminal No 2 currently handling general and bulk cargo with warehouses will be converted into a container terminal operated by private company.

The ANP has already invited private investors for a new container terminal development project and operation of container crane of the existing container terminal No.1 of the Montevideo Port in November 1994. The ANP intends to privatize the container terminal operation and considers to call a re-tender with modifications in the conditions of the concession.

The port have limited land areas, shortage of number of equipment and lack of know-hows in container terminal operation. Port facilities for accommodating conventional type of cargo ships are already old and have not yet modernized to accommodate new model designed ships, particularly container ships.

The port capacity is comprehensively small compared with the Buenos Aires and Santo ports and therefore it will be difficult to function as hub port in this region.

(4) Case of private container terminal at Lirquen Port in Chile

a. Background of the private port

In the case of private port for container handling in Chile it is considered significant to mention that the private port handle containers aggressively on the commercial basis, in order to encourage Argentine private sectors. This has been proven particularly in the port of Lirquen located about 60 km north from the city of Concepcion and public twin ports of San Vicente and Talcahuano. The port had been completely developed with private own financial resources since 1954.

The terminal operator established by the Puerto Lirquen S.A. in 1960 as full private port started to handle containers along with logs, timbers, fertilizers and other break bulk cargoes from 1980. This private port has 2 berths and stock yards with own financial consortium of banks, port users and ship companies.

b. Traffic

The port have a container stock yard of 210,000 sq.m with a capacity of 2,000 TEU and handled on the average of 4,500 boxes per month in 1994 (54,000 boxes/year) and 6,000 boxes in 1995 (72,000 boxes / year) and expected to handle 14,000 boxes in 1996 (168,000 boxes / year). The cargo handling operation are carried out by 13 trade unions working for the port company.

c. Marketing and tariff

They offer a simplified tariff on cargo handling to port users and charging the following items;

- transfering cost from warehouse to jetty
- storage fee on jetty
- handling cost between jetty and ship

The company conduct marketing and commercial development with one unit system of administration and operation of port services by visiting cargo owners, shipping lines to collect cargoes and continuous promotion of their port services.

Since the port is located among seven (7) neighbor ports (2 public ports and 5 private ports) with keen competitions, the company provided necessary training to labors of equipment operation and information system by computers network to provide better service quality through efficient and punctual cargo delivery services.

d. Development plan

Based on the demands from the port users, the port operator had estimated the increase of containers by about 10 to 12% per year. Thus, the port will require additional jetty (berth No. 2) with an additional gantry crane in order to handle 14,000 boxes per month.

The construction of the second jetty of 230 m long with 42 ft depth for 50,000 DWT container carriers and one gantry crane (50 ton lifting capacity) for handling containers were planned to start soonest to cope with such demands by 1997.

The port operator estimate to handle 600,000 TEUs containers in the additional terminal and inland depots to be constructed between the port and city of Concepcion. The private ports all over the country handled the equivalent volume of containers as handled by the public ports (555,000 TEUs in 1994) and will continue to play an important roles for regional economic and industrial development specially by increasing the nationwide import and export trades between neighbor countries and Chile.

(5) Comments of containerization development of the ports in the neighbor countries

a. Facilities development

The neighbors countries like Brazil, Uruguay and Chile have already prepared the development plan of container terminals at the respective strategic ports of their countries to cope with the growing trends of containerization of world cargo movement.

The government of Brazil planned to develop the Septiba port as hub port of containers in this region, and to accommodate by feeder services from/to the neighbor ports including Santos and Rio de Janeiro ports.

The concerned ministry of each government of neighbor countries realized the necessity to have all terminals equipped with large gantry cranes, and deeper draft quaywall and have all planned for such development by inviting the private sectors.

b. Characteristic competition among the neighbor ports

From the observation and site reconnaissance survey of ports in neighbor countries it is considered that the port of Montevideo have more potential to be competitive partner for the Buenos Aires than the other ports. Because not only of their geographically closer location to Buenos Aires, but the port has deep draft access channel and basin to accommodate Panamax size of container ships, and the port is located much closer to the Atlantic ocean.

Although there will be large traffic demands to the Buenos Aires from European, USA and Asian countries, larger ships will go to Montevideo first due to the draft

limitation of La Plata channel. That means that people in Argentine will receive the trade services and import products after Uruguay.

The port of Buenos Aires is providing a two way street, serving as the gateway for imports that give people of Argentina a wide choice of goods and also for the exports that provide additional jobs generated directly or indirectly by the port of Buenos Aires to people of Argentina.

The port of Buenos Aires should seriously considered such situation of receiving cargoes services after Uruguay that cause a loss of million of US dollar per year in the national or city revenue and therefore a comprehensive study for possible counter measures must be done soonest.

In case of the Oakland port, without a deeper channel, shipping firm can not send their largest ships fully loaded into the Oakland. That means that some cargo not destined for the immediate region is sent through deeper port. The Oakland port estimated this situation cause a loss of 75.4 million US dollar per year in revenue.

c. User's opinion

The user's opinion for the use of major ports in the neighbor countries are summarized as follow;

That the Argentina should have the deep draft sea port to accommodate larger ships, since the port charges got cheaper and reasonable level.

Bigger ship with large volume of cargo cannot directly call at the port of Buenos Aires due to water depth limitation. Thus, have to unload first some cargo at the Montevideo port or Santor port.

Alternatively the ship unload cargo at Parana port and transport cargo by trucks to Santos which is cheaper than the case of unloading through Santos port because the port charges of Santos are higher and waiting and handling time at the Santos are longer than the Parana.

1.4 Required Scheme for Development of Containerized Transportation through Argentine Ports

Considering the present trend of containerized mode of sea transportation the traffic volume of container will increase substantially in near future. Buenos Aires port handled more than 97 % of national container cargo in 1989 and such trend has been maintenanced up to 1994. Since 1980 the containers handled at the port has been carried by combo ships with loading/unloading by the ship gears.

The terminal operation thereof was privatized to 5 companies. With the present arrangement of terminal operation they will be able to handle the demands of around 1.2 mil. containers. Each private company have forecast a growth of containers at 3-5 % per year to determine necessary number of equipment and future cash flow. The present facilities under concession with AGP will be saturated shortly and is necessary to develop a new container terminal in Argentina so as to give incentives to private industries, manufactures and to promote exports of industrial products.

In this section the traffic demands of containers in Argentina around year 2010 is estimated using the available world container volume forecast made in 1991. Based on such demands forecast, the necessary development measures to expand the handling capacity of the container at the Buenos Aires port and supplement port development for long term is suggested by reference similar examples and experiences of container terminal development and operation in the world.

1.4.1 Forecast of Traffic Demands of Containers Through Argentina

In the analysis for the required development of the Buenos Aires port for the containerized transportation system, the demands forecast of containers handling through Argentina is estimated up to the year 2010 using applicable forecast calculation relative with the world GDP and the world container volume, then converting to the regional (Latin American countries) demands. In the estimation of the demands forecast, the basic data from the study report of world containerization to 1995 "Demand Forecast Container and Container Ship" issued in 1991 by Japan Container Association were used.

(1) Relation with GDP and volume of containers of major countries

The Gross Domestic Product (GDP) and Container Volumes of 1991 and 1992 of the major countries in Asia, North and South America, Europe and Oceania continents are shown in the Table VII-1-4-1 and Figure VII-1-4-1 (relation with GDP and Container Handling Volume of 1992 by country).

From the Figure VII-1-4-1 it is observed that there are three distinguished groups by country as follows;

a. First group;
Industrially developed countries with large amount of GDP like USA, Japan, Germany, France, UK handle large volume of containers,

b. Second group;
Industrially developed/ developing countries with medium amount of GDP like Hong Kong, Singapore, Spain, Taiwan, South Africa, Netherlands, Thailand, Indonesia South Korea and Australia, handle large volume of containers,

c. Third group;
Developed/developing countries of similar amount of GDP with second group like Brazil, Mexico, Argentina, Chile, handle small volume of containers.

The countries under the third group should handle more volume of containers in comparison to the scale of their GDP with the similar capacity of economy of other countries belonging to second group, like Australia, Canada whose national GDP had been supported mainly by exporting grain products and meats. The containerized traffic volume of these countries have been larger than Argentina as seen from the Table VII-1-4-2.

Table VII-1-4-1 Comparison of GDP and Container Traffic of Major Countries in the World

Country	1991		1992	
	GDP Billion US$	Container TEU (x1000)	GDP Billion US$	Container TEUs (x1000)
Asia				
Japan	3,337.2	8,782	3,507.8	8,935
Hong Kong	77.3	6,162	89.3	7,972
Singapore	39.3	6,354	44.3	7,560
Taiwan	183.8	6,130	216.2	6,179
Indonesia	111.4	1,152	122.8	1,329
Thailand	89.5	1,172	106.6	1,312
Malaysia	45.8	1,074	51.9	1,218
Philippines	46.1	1,441	49.5	1,158
Sri Lanka	8.7	669	9.5	676
North America				
USA	5,686.1	15,546	5,904.8	16,742
Mexico	252.4	346	294.8	398
Canada	568.8	1,270	565.8	1,434
Puerto Rico	22.5	1,614	23.6	1,613
Panama	5.3	239	6.1	289
Europe				
England (UK)	963.7	4,088	1,024.8	4,379
Italy	1,0722	1,870	1,186.6	1,891
France	1,167.7	1,302	1,278.7	1,595
Netherlands	278.8	3,859	312.3	4,201
Germany	1,516.8	3,513	1,846.1	3,602
Spain	486.6	2,270	547.9	2,247
Denmark	121.7	395	133.9	432
Belgium	192.4	2,091	209.6	2,400
South America				
Argentina	91.2	255	200.3	350
Brazil	447.3	679	425.4	739
Chile	28.9	205	37.1	289
Peru	38.3	99	21.3	147
Colombia	41.9	129	44.6	119
Oceania				
Australia	287.8	1,673	299.3	1,834
New Zealand	41.6	611	41.2	555
South Africa	91.0	881	106.1	889

Source: Kokusai Nenkan, Container Terminal

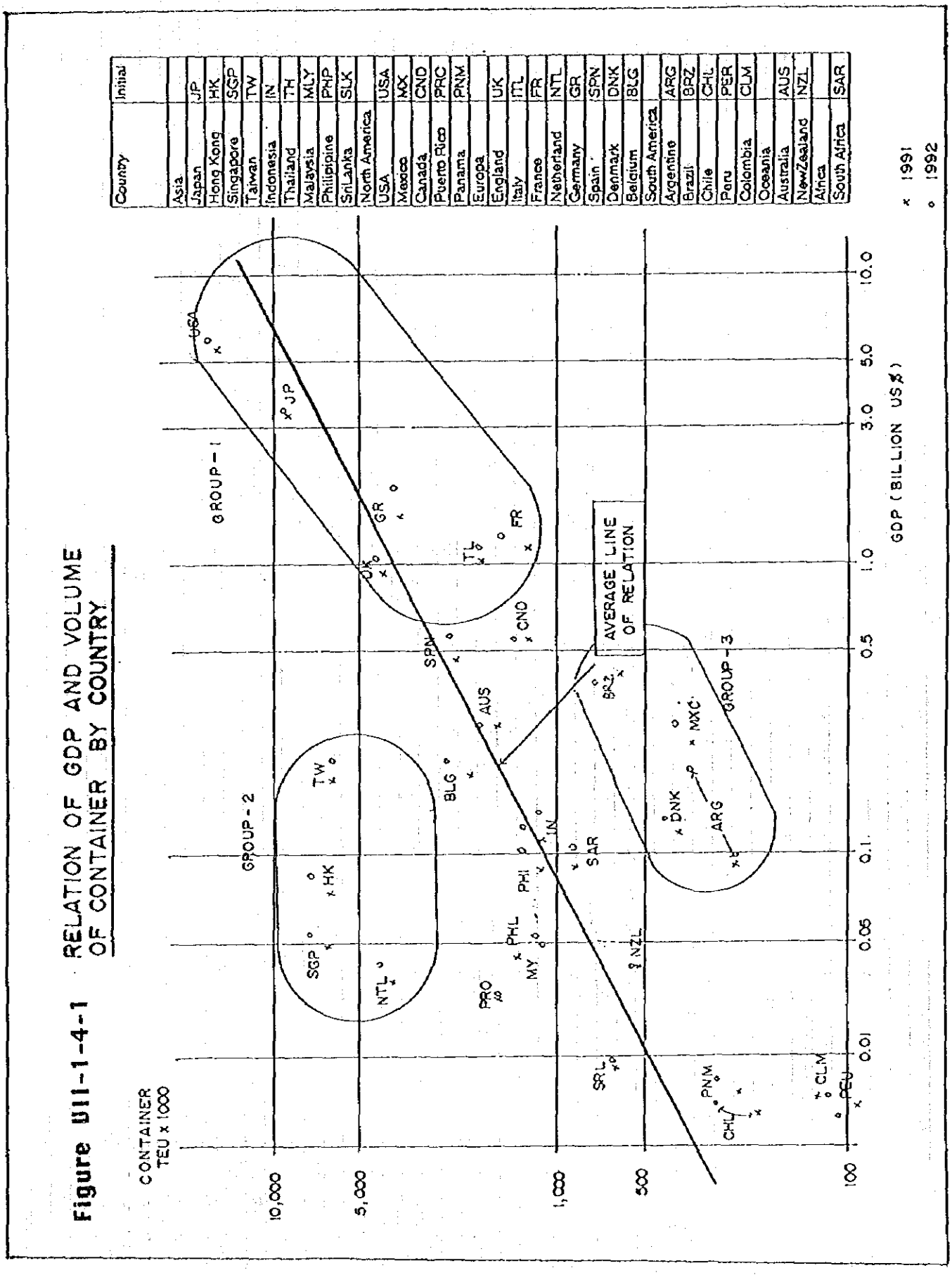
It is foreseen that the countries in Latin America will handle same volume of containers after the development of industrialization and modernization of transportation system are realized.

Table VII-1-4-2 Comparison of contrainer traffic from 1989 to 1993, between Canada, Australia South Korea, and Argentina (TEU)

YEAR	CANADA	AUSTRALIA	S. KOREA	ARGENTINA
1989	1,432,062	1,727,611	2,158,828	213,135
1990	1,524,771	1,636,359	2,348,475	218,452
1991	1,433,812	1,672,963	2,694,115	254,745
1992	1,389,058	1,850,513	2,751,006	341,992
1993	1,450,793	1,964,433	3,070,681	474,512

Source: CIY

Figure VII-1-4-1 RELATION OF GDP AND VOLUME OF CONTAINER BY COUNTRY



(2) Containerized cargo ratio from/to Japan by routes

Well prepared statistics on containerized cargo ratio (container cargo against total cargo loadings on liner vessels) are not available yet, but the containerized cargoes ratio based on Japan by the routes are worked out with limited supporting data in order to compare the regional wide containerized ratio of ship transport in the world.

The Table VII-1-4-3 shows the changes of ratio of containerizated cargoes by the shipment routes from/ to Japan between 1980, 1988 and 1992. Most of the cargoes from /to advanced and industrialized countries have already been containerized with little room left for transporting break bulk loaded cargoes which are also shifted to be containerized in near future.

As seen from the Table VII-1-4-3 the Japan/North American or Japan/Europe shipments have been containerized by 98 %, which is almost near the maximum limit. The cargo flow in North - South trade has been successively shifted into container and no more areas by containerization remains.

According to the survey by Japanese Shipping Association (JSA) the Africa and Latin American routes, which are generally considered as less containerized, have already had full container ships in service between South America /Africa. Container ships are now serving almost all over the world. The containerized cargoes will continue to increase but the shift to containers have almost reached its limit without much non-containerized cargo remaining.

Table VII-1-4-3 Containerized Cargo Ratio by Routes From/To Japan (1982-1988-1992)

Shipment Route	Containerized Ratio		(%)
	1982	1988	1992
North America	94	98	98
Europe	98	98	98
Mediterranean	56	66	70
Central, South America Caribbean	17	21	25
South Asia	31	37	50
Oceania	75	86	88-90
Africa	37	40	45-50
Indonesia, Malaysia, Singapore	41	59	65-70
Far East	60	63	70

Source: CIY

(3) Demand forecast of world and Argentine container handing volume

The demands forecast of container handling volume have been made using the trends of world GDP, world container handling, world product export volume index, international marine dry cargo (Except grain) between 1970 to 1990. It can be understood the trends of how the lines are corresponding with each other. It has been found that the

yearly changes in the world container handling volume have actually been very closely parallel those of world GDP.

The correlation between the world GDP, world product export volume index, international marine dry cargoes with the container handling volume between 1973 to 1988 are shown as follows;

- World GDP : 0.9878
- World product export volume index : 0.9848
- International marine dry cargoes : 0.9123

The correlation of the world container handling and world GDP will be the best data available for estimation of demand forecast of world container handling.

Based on the above the world growth ratio of GDP calculated by the GDP index based on 1970 as 100 is used as the base to estimate container handling volume including both international and intra-regional trades. Figure VII-1-4-2 shows the relation between the actual results and revolving line. Correlation among them can be expressed in the following formula:

$$Y = 834 X - 87{,}000$$

Y : World container handling (1,000 TEUs)

X : World GDP (Index based on 100 of 1970 GDP)

a. Forecast of world container handling volume for 1995 - 2005

1) World economic growth ratio

As mentioned above the world economic growth ratio as the base data for the container demands forecast is selected for calculating the future index of world GDP based on 1970 as 100.

Under the recent big political and economic changes world wide, a forecast is somewhat unpredictable and difficult to make, but based on the actual economic growth ratio of 2.6 % in 1990, 1.7 % in 1991, 3.3 % in 1992, 2.9 % in 1993, 3.1 % in 1994, the world GDP forecast after 1995 is made for the base data by considering the guideline of OECD and other ports like Seattle, Oakland and Los Angeles when these port prepared the demands forecast for implementing the container terminal development project. The growth rate was taken around 4% to 4.1% annually. The World GDP growth ratio and index (based on 1970 = 100) forecast up to the year 2000 is shown in Table VII-1-4-3.

Table VII-1-4-4 World GDP Growth Ratio (%) and Index, Actual and Forecast

(Index: 1970=100)

Year	Better Case		Base Case	
	Growth Ratio	Index	Growth Ratio	Index
1989	4.09	200.0	4.0	200.0
1990	4.0	208.0	4.0	208.0
1991	3.9	216.1	3.9	216.1
1992	4.0	224.8	4.0	224.8
1993	4.0	233.7	4.0	233.7
1994	4.1	243.3	4.1	243.3
1995	4.1	253.3	3.1	250.9
1996	4.1	263.7	3.1	258.7
1997	4.1	274.5	3.1	266.7
1998	4.1	285.7	3.1	274.9
1999	4.1	297.4	3.1	283.5
2000	4.1	309.6	3.1	292.3

Source: The Study Team's estimate after 1996

2) Forecast of world container handling

The forecast of world container handling volume is obtained from the calculation applying the formula (Y = 834 X - 87,000), the world container handlings (Y) is worked out by world GDP (index shown in the Table VII-1-4-4) placed as X. The world container handling forecast is shown in the Table VII-1-4-5.

Table VII-1-4-5 World Container Handling Actual up to 1994 and Thereafter Forecast

(Unit: TEU x1,000 TEU)

Year	Better Case	Base Case
1991	93,646	93,646
1992	100,734	100,734
1993	107,906	107,906
1994	115,662	115,662
1995	124,252	122,251
1996	132,926	128,756
1997	141,933	135,428
1998	151,274	142,267
1999	161,032	149,439
2000	171,206	156,778

Source: The Study Team's estimate after 1995

In 1992 the Japan Container Association made the World Container Forecast for the year of 1992 by using the base data of 1988. They had estimated world container handling volume at 100,200,000 TEU on the better case and 97,000,000 on the base case. Actual world handling volume in 1992 was 100,734,472 TEUs according to the Container International which were almost equivalent to the forecast volume of the above better case. The estimated world container handling upto the year 2010 based on the better case growth rate of GDP is shown on Figure VII-1-4-3.

b. Region-wide forecast of container handling volume for the year 1995-2010

In 1991 Ocean Shipping Consultants in UK who had carried out the container handling forecast in the container market to the year 2005 had estimated the region wide

container handling volume by using the above formula. The forecast of region wide container handling volume from 1995 upto 2005 are shown in the Table VII-1-4-6.

Table VII-1-4-6 The Forecast of Regionwide Container Handling Volume up to 2005 by Japan Container Association

(Unit: x1,000 TEU)

Region	1990	1995		2000		2005	
	Actual	Base Case	Better Case	Base Case	Better Case	Base Case	Better Case
Europe	21,902	25,950	27,630	30,545	32,205	35,190	38,100
Africa	2,246	2,500	2,740	2,920	3,365	3,505	4,125
Central Asia	2,980	3,200	3,575	3,725	4,470	4,620	5,360
Southeast Asia	10,080	14,050	16,550	17,550	23,570	24,070	31,250
East Asia	21,675	30,350	34,680	36,850	43,250	41,750	49,210
Oceania	2,295	2,650	2,850	2,985	3,325	3,555	3,900
North America	18,290	21,700	23,460	24,785	27,640	28,545	30,535
Latin America	2,985	3,435	3,585	3,880	4,480	4,675	5,375
Total	92,403	103,835	115,070	123,240	142,305	145,910	167,855

Source: JCA

According to Table VII-1-4-6 it is estimated that the container handling volume in the Latin American region in 1990 was 2,985,000 TEUs. The actual container handling volume of this region including South American countries, Mexico, Puerto Rico, Panama and Costa Rica in 1992 was 4,813,567 TEUs which was more than 107 % of the above estimated regional volume of the better case in year 2000.

The share of container handling volume of the Latin American region in the world in 1990 was 3.23 %. It has increased to 4,78 % in 1992 and will continue to increase its share around 6 to 7 % between 2000 to 2010.

The actual total world container handling volume from 1990 to 1992 have grown in similar order of the estimate at 4 % per year, but the growth in the Latin American region have been much higher, around 30.6 % per year during 1990 to 1992, than the forecast volume of around 4 % per year between 1990 to 1995. For the purpose of this study tentatively the forecast volume in the year 2000 and onward of Latin American region in the Table VII-1-4-6 is amended according to the actual growth made upto 1992 and expected increase of the share of container traffic in the world as follows.

1) for 1995 :
   The estimated volume comes to 7,322,000 TEUs, and its share is 5.89% of the traffic in the world, which is worked out by applying 15% growth rate of container in the regions per year between 1992 to 1995
2) for 2000 :
   The estimated volume comes to 11,792,000 TEUs and share 6.88%, which is worked out by applying 10% growth rate per year between 1995 to 2000
3) for 2005 :

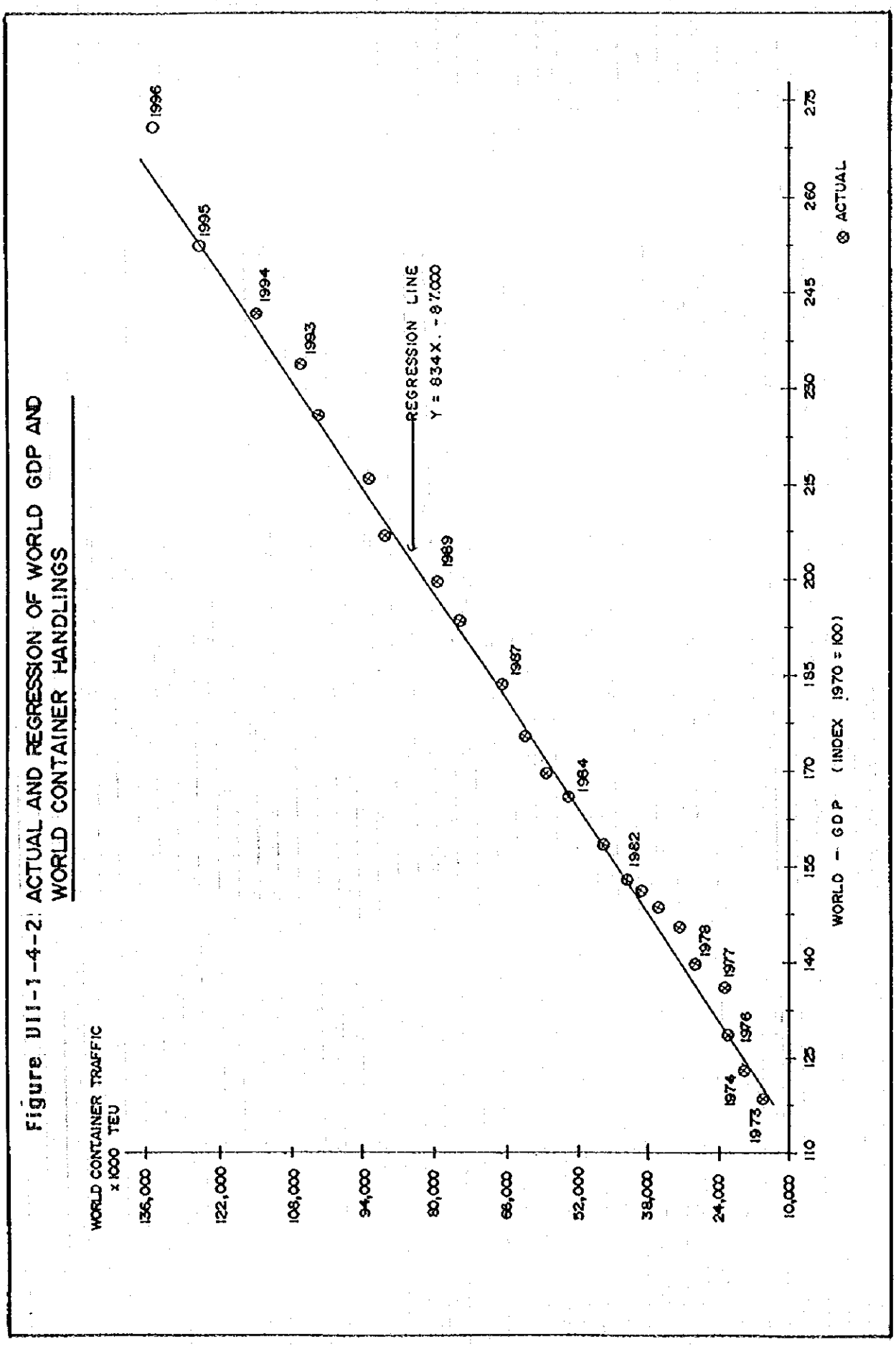


Figure VII-1-4-2: ACTUAL AND REGRESSION OF WORLD GDP AND WORLD CONTAINER HANDLINGS

The estimated volume comes to 16,540,000 TEUs and share 7.23%, which is worked out by applying 7 % growth rate per year between 2000 to 2005

4) for 2010 :

The estimated volume comes to 21,109,000 TEUs and share 7.06%, which is worked out by applying 5 % growth rate per year between 2005 to 2010

The above relation and amended forecast demands from these prepared by JCA in Table VII-1-4-6 up to 2010 is shown in Table VII-1-4-7.

c. Forecast of container handling volume through Argentina

In 1992 the total container handling volume in the Latin American region was 4,813,567 TEUs which was about 4.8 % of the total world container handling volume.

During this year the port of Buenos Aires handled 342,000 TEUs, which was about 7.10 % of the regional container handling volume, but subsequently after implementing the new Port Law in 1993 the container handling volume have substantially increased to 532,681 TEUs in 1994, which was about 55.75 % increase for two years time and equivalent to 7.10 % of the regional total volume. It was estimated to handle 600,000 TEUs in 1995. Accordingly the demands forecast of the container handling volume through Argentina is estimated based on the conservative growth rate of container handling for 1995 to 2010 as stated in the (3) above and shown in the following Table VII-1-4-7.

Table VII-1-4-7 Forecast of Container Handling Volume through Argentina

Year	Container Handling Volume				
	(1) World in Total, x1000 TEU	(2) Region, Latin America, x1000 TEU	Share Ratio (%) Against World (2)/(1)	Argentina (3)	Share Ratio (%) Against Region (3)/(2)
1990	92,403	2,985	3.23	218,452	7.32
1992	100,734	4,814	4.78	342,000	7.10
1995	124,252	7,322	5.89	600,000	8.19
2000	171,206	11,792	6.88	966,300	8.19
2005	228,669	16,540	7.23	1,355,300	8.19
2010	298,892	21,109	7.06	1,730,000	8.19

Source: The Study Team estimate

d. Required scale of Argentine container terminal by global containerization transport

Under the global containerization transport trends as described above it is expected that the cargo throughputs by containers to Argentina will increase due to the aggressive drive and promotion of industrialized development policies of the government.

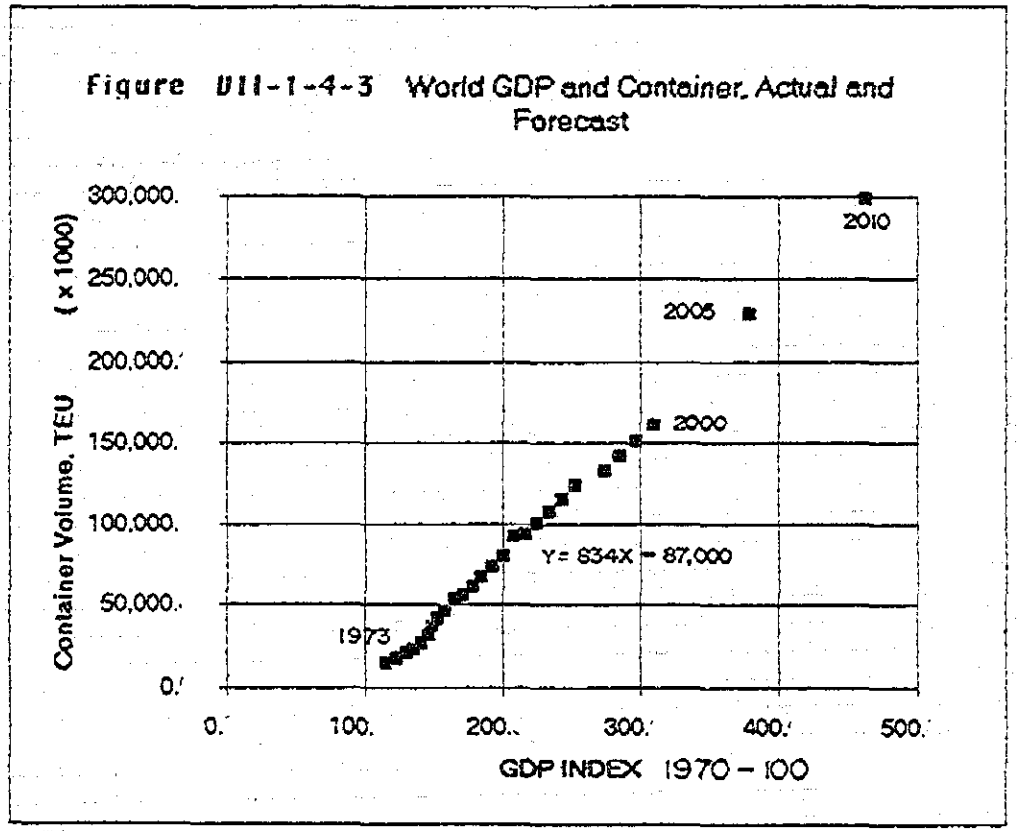
The scale of economy of Argentina of 1991 / 1992 has been in similar order of Hongkong, South Africa, Indonesia as seen from the Figure VII-1-4-2. The scale of container terminals in Argentina shall be upgraded and modernized. The number thereof shall be

Figure VII-1-4-3

World GDP and World Container Handling
Actual upto 1993 and Forecast thereafter till 2010

Year	World GDP	World Container
1973	115.90	15,144.00
1974	123.00	17,018.00
1975	123.00	17,410.00
1976	130.00	21,214.00
1977	135.60	22,992.00
1978	141.30	26,470.00
1979	146.10	31,986.00
1980	149.50	37,163.00
1981	152.40	40,851.00
1982	153.10	42,300.00
1983	158.10	45,957.00
1984	165.20	53,321.00
1985	171.50	55,903.00
1986	177.70	60,877.00
1987	184.10	67,257.00
1988	192.30	72,928.00
1989	200.00	79,800.00
1990	208.10	92,403.00
1991	216.10	93,646.00
1992	224.80	100,734.00
1993	233.70	107,906.00
1994	243.30	115,662.00
1995	253.30	124,252.00
1996	274.50	132,926.00
1997	285.70	141,933.00
1998	297.40	151,274.00
2000	309.60	161,032.00
2005	378.49	228,660.80
2010	462.71	298,899.57

World GDP is calculated in to INDEX figures based on the 1970 as 100.
World Container Handling Volume is in TEU (Figures in table X 1,000)



increased to the similar capacity and number of facilities having by those countries as seen in the Table VII-1-3-3 to 6 to provide necessary cargo delivery services required by the magnitude of economic activities.

The shipping companies connecting Asian countries and Argentina desire to engage bigger size of full container ships. At present the shipping companies provide average ship size of 20,000 to 30,000 DWT of semi container ships sailing between Latin American and Asian countries. Major ports of Latin American countries like Santos, Buenos Aires, Valparaiso ports should be equipped with deeper draft of quaywall and larger handling cranes thereon so as to engage bigger size of full container ships.

1.4.2 Improvement and Reinforcement of Intermodal Transport

According to the above estimated demands forecast, Argentina as a whole will handle containers around 1.73 mil. TEUs by 2010.

It is obviously necessary to upgrade and modernize the container terminals in the Argentine ports. Strategically the development of the current container terminals at Buenos Aires port is essential and priority project. The following development schemes are considered tentatively to meet such demands of container transportation in Argentina.

(1) The optimum utilization of existing facilities at the Buenos Aires port for further upgrading the capacity of current container terminals as first step.
(2) The development of container terminal at neighboring ports of Buenos Aires such as Bahia Blanca, Quequen, Rosario ports as second step.
(3) The development of secondary port, nearby the Buenos Aires artificial off-shore island terminal development as third step.

The immediate schemes as first step are described as follows;

2nd and 3rd steps are discussed in Section 1.5 as parts of the short and long term action plans of institutional and infrastructural development schemes.

(1) Optimum utilization of railway facilities of Buenos Aires Port

According to the above demands forecast the port will receive the containers of about 1.35 million by 2005. The maximum possible handling capacity of container under the present arrangement of terminal facilities operations by 5 private companies is estimated to handle about 1.2 million containers, provided that the upgrading of existing

facilities and operation efficiency and the following measures are carried out in the Buenos Aires port.

- Optimum Utilization of railway facilities as inter-modal transport
- Development of handling equipment and improvement of handling efficiency
- Integrated terminal area development by land reclamation, and
- Improvement of information flow system

The practical experiences by other countries and concepts of the above measures concerned which are considered to be applicable for the Buenos Aires Port are described as follows;

a. Utilization of railway facilities in inter-modal transport

The distribution system and container logistic are considered of great importance to cope with further globalization of containerization. Such a global distribution system must be well incorporated into the network both ocean and inland routes.

Argentina has large share of lands in the South America railway system had been developed all over the country from 1880s. The optimum utilization of this system for containers transportation will be one of the most economical and effective measures to improve containerized transportation in Argentina, particularly for long distances.

Generally railway transpiration as an intermodal has following advantages;

* The railway can carry containers into inland area through main routes, or even from one inland country to another.
* More efficient delivery in long-distance transportation can be enjoyed, especially for the long-distances of generally more than 300 miles or 500 km.
* The container goes along to match with various transportation modes such as the railway, truck, and ship, while trailers are not flexible as carriers. In this respect railways can be more heavily involved in the future transportation and the inland area so far less developed will progress as containerized transportation is developed into further inland.

1) In the case of the Argentina

The railway has just been utilized for the containers transportation as intermodal transport.

The NCA (Nuevo Central Argentino S.A) is one of container handling railway companies, which has been granted the concession of the former General Miter portion of Ferro carries Argentinos, and now is responsible for operating this rail freight service. With US railway consultant companies they started to provide container transportation services by flat wagon car and box wagon car.

Their transportation volume last 2 years have been as follow:-

Table VII-1-4-8 Container Transport by Railway in Argentina

Year	General Cargo (ton)	Empty (box)	Auto Parts (box)	Acid (Oil Product)	Steel Product (ton)	Cargo Total (ton)
1993	49,294	6,548				2,831,435
1994	69,709	9,466	220			3,447,056
1995 (1-8)	60,086	9,005	43,294	10,818	788	2,430,277

Source: NCA

The portion of containerized cargo in 1994 is only 2.0 % of total cargo but its volume will increase as their containerization progresses.

The company are handling about 2,000 TEU per month in 1995, 70% of which originate from Cordoba and 30% from Tucuman for Buenos Aires. The service of auto parts transportation by containers between Cordoba and Buenos Aires seems to be competitive with truck transportation in price and time.

This section discuss the impact given by railways as an intermodal to containerization as seen in USA and South Africa for seeking the applicable opportunities to the railway facilities of Argentina.

2) Case of USA

i) Role of railway as intermodal transport

US container terminals without exception have their rail yards called intermodal container transfer facility on-dock or near-dock which quickly move containers between the ships and railcars.

Piggy -Back(transportation of truck trailers on railroad flat cars) transportation dates back in 1880 but its development started in 1950s.

There are two types of container transportation, TOFC (Trailer on Flat Car) and COFC (Container on Flat Car). At circus ramp former system enables truckers to load trailers to railroad flat car or discharge it from without any handling equipments for the railway terminal in destination. Recently this circus ramps are gradually disappearing under hub-center concept.

The later system requires container handling equipments like cranes, piggy-packers etc. at railway terminals. The number of this type of terminal is increasing. Piggy-back transportation was developed on the basis of TOFC transportation.

Railways are greatly responsible for development of USA inland transport. Especially the Double Stack Train (DST) were introduced by American President Co. in 1984 which caused a great impact in changing the conditions of USA inland transportation. Demands for container transport were driven by the utilization of the DST.

The widespread acceptance of the DST as inter-modal transport in a short time span were derived from the following merits in the container transportation system.

* Lighter weight flatcar: lighter by 54 % against the old type of flatcar
* Double loading capacity: Doubling loading capacity from 100 to 200 units by applying additional locomotive(s)
* Energy saving: Energy efficiency of DST
* Safety: Less vibration at stop and go

These merits in DST naturally meet with the operators demands for economic rationalization, which have developed DST into such a popular method. This has greatly changed the status of USA domestic transportation, replacing the conventional trailers which are less popular due to different module system incompatible with DST.

Today DST has grown to 3,900 units since its inception. The operational cost efficiency in per-mile are compared by the other modes as follows:-

Mode	Cost	
Less Trucks Load Carrier	US$	1.31
Truckload, Independent	US$	1.14
Truckload, Irregular	US$	0.81
DST, Domestic	US$	0.74

ii) Feature of container transport by railway

The actual utilized conditions of DST through the major ports along the west coast of USA dealing large volume of container handling with Asian countries by crossing the Pacific Ocean are described below;

* In the case of USA the infrastructure development of railway facilities were generally initiated by shipping companies to utilize the railway networks for container transport as inter-modal and through such services to clients of cargoes the shipping companies maintain competitive in the container transport.

  The infrastructures of railway transport to be developed behind the terminal were constructed by the port authority with their financial arrangement and cargo handling operation in the yard called " On dock terminal, or Near dock terminal" where two or three shipping companies will use for containers transports were conducted by the stevedoring companies and railway companies operate wagons for transport cargoes.

  The railway companies constructed an inter-modal terminals with their own financial resource.

  The cargo handling operation in the railway yards are carried out by separate cargo handling company selected through public bid.

* Previously the railway companies like Santa Fe Co. collected cargoes directly from the manufactures, individual industries and provided local sales offices near the clients, which had resulted in high cost of operation. From 1980s they changed such business promotion system and selected clients from truck companies and shipping companies and transport cargoes from the main stations to main stations and reinforced the companies organizations by mininizing number of employees and regional sales offices.
The truck companies also deliver cargoes to the railway yards for further transport by railway to the destinations, by which services the truck companies manage delivery services with shortage of drivers.

* The sales concept of railway companies like Santa Fe Co. and Union Pacific Co. are; how to collect and keep clients who are shipping and truck companies by providing the information of exact location of their cargoes by computerized on line network system and better services of punctual delivery of cargoes on the contract basis. When the shipping companies plan to develop new consigners, they consider to utilize railway transport services, subsequently new demands of container by railway are created and saturate for infrastructures development.

iii) The case of railway transport through the Ports of Seattle, Oakland and Los Angeles

* In the case of the Port of Seattle, 75 % of containers coming to port are transported by railway DST to their destination and 25 % were carried by trucks. 1.4 million TEUs in 1994 were transported beyond the Rocky Mountain, of which 72% were delivered to local distribution such as Washington, Oregon states and 10 % to different destinations in California State.
The DST that carry containers have 22 cars in one train and 10 containers on each car. The container yard is by stacker operation system and not transtainer system. No need of additional marshaling yard behind the wharf as containers is directly delivered. There are three major railway companies, Santa Fe, Southern Pacific and Central Pacific with railway lines in the yard and on the apron areas.

* In the case of the Port of Oakland it takes 3 days to transport containers by railway from Oakland port to Chicago and 5 days to New York, which is faster delivery than passing through the Panama canal.

* In the case of the Port of Los Angeles 50 % of total import containers are distributed to local domestic areas by trucks and remaining 50 % go to inland such as Chicago, and further east ward up to New York by DST railway.

* At present containers through the port of Los Angeles were carried by trucks from the port to the inland depot which was planned and developed 10 years ago by the Southern Pacific railway and port authority where the containers were transferred to the railway. The land of this inland depot are owned by the port. Three railway companies, Southern Pacific, Union Pacific, Santa Fe that operate the inland railway transport.

* The transport cost by trucks from the port of Los Angeles is below the actual cost. Delivery cost of 20 ft container varies from US$120 to 200 per one container in local distribution.
  The port handling capacity and productivy can be increased and handling efficiency improved if the railway line are extended to the dock areas so that the containers can be directly loaded on the trains. The railway trains were remodeled and arranged to carry large volume in one unit.
  Another intermodal development planned at the port of Los Angeles is called the "Los Angeles Port the Alameda Corridor".
  The Alameda Corridor covers a 25-mile route that will connect the port with major rail facilities in downtown Los Angeles. The Alameda Corridor project focuses on extensive railroad and highway construction to enhance the efficiency of cargo-carrying trains and minimize truck emissions of smoke in Southern California.

3) Case of South Africa

Intermodal traffic in South Africa can be divided into three categories: domestic; crossborder; and marine. Total container traffic has remained fairly stable since 1990/91 when 378,308 TEU was handled and for 1993/94 was 385,129 TEU and for 1994/95 the estimate is 388,980 TEU.

In recent years, maritime sector has become the dominant sector with traffic focused on the corridors between the three main ports - Durban, Cape Town, and Port Elizabeth. Import container traffic by rail has increased from 77,145 TEU in 1991/92 to 126,649 TEU in 1994/95. Similarly, export traffic has increased from 100,583 TEU to 155,825 TEU.

The main ports of South Africa, Durban and Cape Town are all located on the sailing route to South Eastern Asian ports and Japan from Argentina and are linked to European ports, and North and South American ports through regular service lines and feeder networks. These ports are connected with railway networks, not only in their country but also to adjacent neighbor countries, such as Zambia, Zimbabwe, Mozambique, etc.

The railway transport operation are managed by Transnet which is 100 percent government share holding company, but it is operated like a private company.

Ports in South Africa are managed by the Portnet and railway networks are managed by Spoornet that belong to Transnet. These institutions are established under the Transnet of the Ministry of Transport.

i) Inland railway container terminal/city deep

The Ministry of Transport have developed the container transportation networks as shown on Figure VII-1-4-4.

Spoornet has an inland railway container terminal (called City Deep at Johannesburg), which is operated by one of subsidiary companies of the Spoornet, and situated 9 km from Johannesburg. This inland terminal have handled between 280,000 TEUs to 227,000 TEUs per year during 1987 to 1994.

It is well organized to handle containers from sea ports, 500 km apart from Durban and 1100 km apart from Cape Town and also handling inland containers by railway networks.

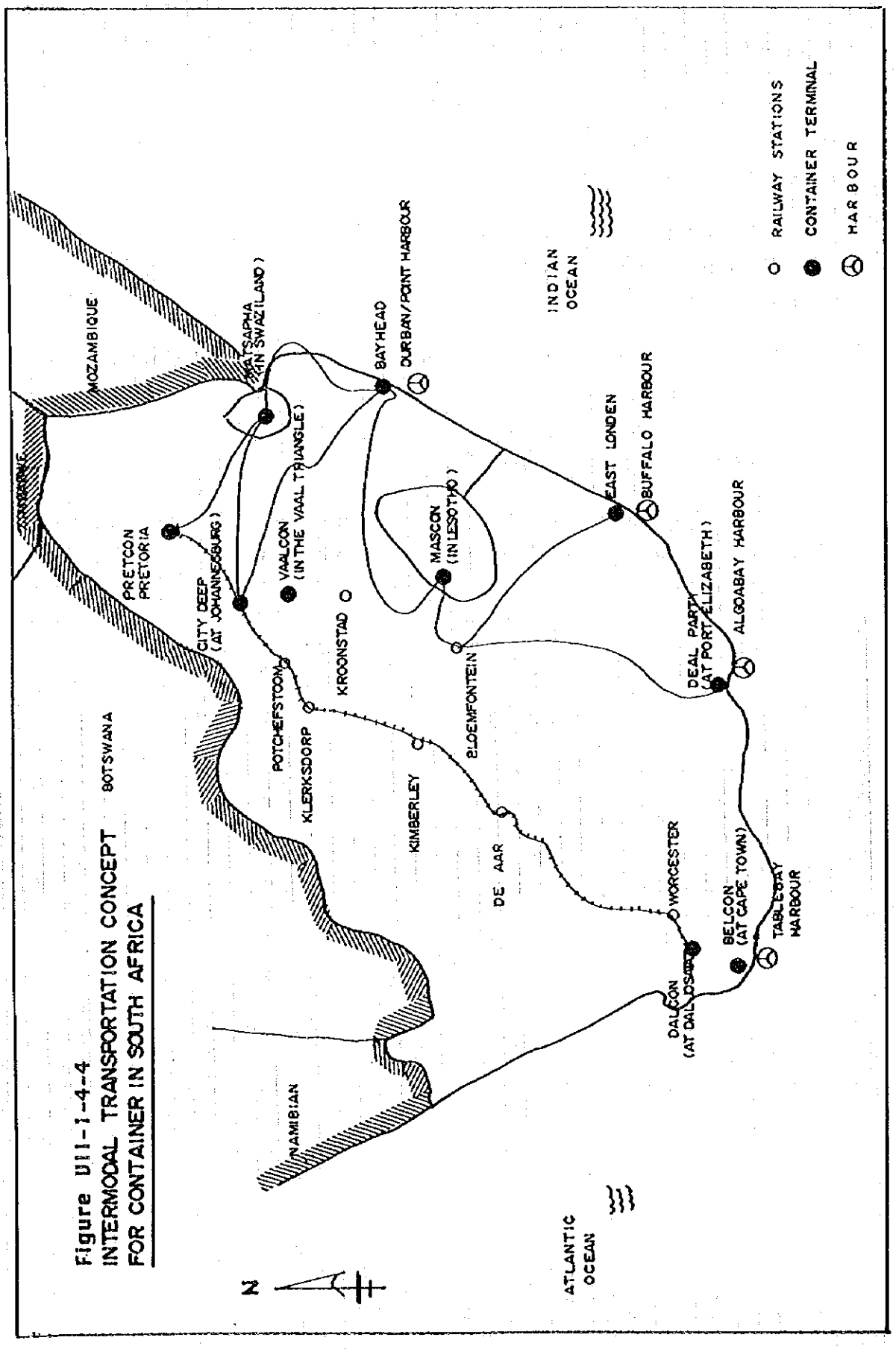


Figure VII-1-4-4
INTERMODAL TRANSPORTATION CONCEPT
FOR CONTAINER IN SOUTH AFRICA

ii) Facility at this terminal

Handling Capacity:	20 trains of 50 trucks per day
Space:	32 hectare
Personnel:	517
Gantry Crane:	5 x 35-ton Mannesmann Damage Gantry Crane
Tractors:	54 terminal tractors
Parking Capacity Area:	1,597 containers
Stacking Capacity Area:	1,088 containers

4) Summary of railway contribution of container transport

The railway contributions to improve the container transportation system is summarized below, which shall be considered as one of the alternative measures for development of container handling capacity in the port of Buenos Aires.

i) The railway provide the main routes for container transport into inland areas, whereas containerization so far was developed mainly to cover port to port. Containerization is to be further developed from ports to inland via the railways.

ii) The railway provide more advantages in long distance travel, as compared with trucks, even more so in the future when environmental problems, energy saving and manpower shortage are taken into account. Promotion of utilization of railway will not only increase economic efficiency but also solve various social problems.

iii) The container goes along to match with various transportation modes such as the railway, truck and ship. In this respect railway can be more heavily involved in the future transportation and push to bring more demands for containers equipment. The railway will also enhance the development of the areas along the railway routes.

iv) Introduce a new type of flat wagon, like double stack train (DST) to carry containers to increase transport capacity by one train.

v) The railway facilities may be developed jointly with the shipping companies.

vi) The "on dock terminal" or "near dock terminal" to handle containers between trucks and railway should be constructed outside, but near the container terminal.

b. Development of handling equipment and improvement of efficiency

The container handling equipment have improved, such as its lifting capacity have got larger, and its reach have got longer, in conjuction to the increase of size of container

carrier vessels from semi container ships in 1970s to post Panamax size of ships in 1990s.

The current containers handling system and efficiency at the Buenos Aires are compared by referring the cases of the major container terminals in USA and Japan.

1) In the case of Ports of Los Angeles

* The Port Authority and terminal operator made contract agreement with the minimum amount guarantee system based on the fare calculation from the tonnage and introduced incentives to the case of collected revenues over US$ 1 mil as follows;

In case there is an extra revenue, 25 % of the revenues beyond US$ 1 mil portion are kicked back.

* There is the labor associations covering the ports along the west coast called "Pacific Maritime Association". The terminal open for 5 days per week and stevedoring companies provide 24 hour services per day.

* The handling rate of APL at the terminal of port of Los Angeles are on average of 27 TEU per hour and 530,000 TEUs per year at 2 berths and to be increased to 900,000 TEUs by 1999 by constructing terminal 300 with berth length of 4,000 ft.

2) In the case of Nagoya port. (Nagoya Container Berth, NCB)

This terminal with 3 berths handled 650,000 TEUs in 1994 and accommodated max. size of ship 53,000 DWT containers.

The containers handling rate through this terminal is 30 boxes per hour by one crane. Generally it takes about 7 to 8 hours by using two gantry cranes for loading containers in one ship of 50,000 DWT (L=270 to 290 m) size of container ship.

The straddle carrier system had been adopted by one of the cargo handling companies for handling containers to minimize the running distance within the yard area.

This system have found that the maintenance cost of equipment and yard pavement is high, running cost of equipment is high and high insurance cost of the equipment are required. The NCB plans to replace such system to the transtainer system to increase the handling capacity, which system is not required so skilled, experienced operators and can easily adopt computerized networks for information with the gantry cranes, administration offices and gate communication and current trends of automatic handling system.

The NCB, however plan to replace existing container cranes on the apron with longer arm reach but not increasing the lifting capacity to handle cargoes from post Panamax container ships.

As seen from the Table VII-1-2-7, the terminal operation at the container terminal of Buenos Aires adopted gantry cranes at the quay and transtainer system, as the container handling equipment, which is considered reasonable due to the limited yard area and flexible to accommodate further technical innovation such as automatic handling system and computerized control system.

1.4.3 Integrated Container Terminal Area Development

(1) Integrated container terminal areas development by other countries

The expansion and the improvement of the present premises for container handling in the port of Buenos Aires may not be enough in the medium and long term port operation due to limited available space and proximity of city activities along the waterfront area. The full scale operation of container terminal is considered rather difficult due to the following reasons;

- There is no chance for fully laden ships to call due water depth constraints at the access channel and along the quay.
- Severe shortage of land behind the quay walls for the containers operation.

Considering the physical conditions of the port, it is necessary to plan the optimum utilization of existing facilities on the short term, then the development of a new container terminal at other port along the Atlantic coast where deep water are available and shorter access to the ocean supplementary to the Buenos Aires in the long term.

While it is estimated that Buenos Aires Port will be able to handle containers of about nearly 1.2 million TEUs under the present arrangement. The port authority should plan the concept of optimum utilization of existing facilities with private sectors operation.

Some cases of the major container terminal ports in the USA, Singapore, Malaysia and Japan be introduced for consideration in the planning for the development of the existing facilities in Buenos Aires to expand the container handling capacity and improve terminal operation efficiency.

The current development cases of container terminal of major ports are summarized as follows:

* The major ports in USA planned to deepen the channel depth from 36 ft to 48-50 ft, to 72 ft.
* To construct longer berth (900 ft) 300 m long and deeper draft 15 m (50 ft) alongside the berth to accommodate post panamax type ships, (60,000 DWT).

* The port authority of Oakland and Los Angles planned to expand the container terminal yard by land formation (reclamation) to increase handling capacity. The land will be leased to the private terminal operators.
* To construct a satellite public inland depots to stock containers outside the port and to obtain spaces within the terminal so as to increase handling capacity with the available infrastructures.

a. Case of container terminal development at Singapore Port

1) Terminal facilities

Container traffic through the port of Singapore has been increasing at about 20% annually since 1986. The planning for a new container terminal started way back in 1989. The steady upswing in the annual container throughput prompted Port of Singapore Authority (PSA) to consider the development of a new terminal at Pasir Panjang. It is estimated that existing capacity at Tanjung Pagar Terminal, Keppel Terminal and Brani Terminal will be saturated by 1997/98. PSA will therefore require the new container terminal to be operational by 1998 to meet the expected increase in volume of container traffic.

The new container terminal will be developed in 4-phases. The terminal will have 49 berths totaling 17 km long of the berth front (about twice the existing capacity).

Phase of Development	No. of Berths	
I	8	
II	18	
III	14*	
IV	9*	*Planned
Total	49	

The phase development of new container terminal at Pasir Panjong are as follows;

Phase I:

Area to be relclaimed	122 ha
Total terminal area	178 ha
Number of container berths	8
Handling capacity	5.4 million TEUs
Start of reclamation	Sept. '93
Completion of first 5 berths	1998
Completion of Phase I	2000

Phase II:

Area to be relclaimed	222.6 ha
Number of container berths	18
Handling capacity	12.9 million TEUs
Start of reclamation	1995
Completion of first 2 berths	1995
Completion of Phase II	2009

Estimated cost of development of Phase I and II is S$7 billion.

(S$: Singapore dollar, US$ 1 = S$1.42 in 1995)

2) Warehousing and distribution

PSA operates a number of distriparks in the Port. The total warehouse space managed by PSA is 14% of the total stock in Singapore. PSA is the largest warehouse operator in the port of Singapore.

- Alexandra Distripark - 211,600 m² of storage space
- Pasir Panjang Distripark - 195,900 m² warehousing space
- Tanjong Pagar Distripark - 65,200 m² of warehousing space
- Keppel Distripark - 112,000 m² of covered storage space

Keppel Distripark, PSA's latest distribution and consolidation center, was completed in May 1993, is within the Free Trade Zone and directly linked to the container terminals.

b. Case of container terminal development at Klang Port in Malaysia

1) Terminal facilities

Port Klang is the biggest port in Malaysia, which is handling about 60% of containers transported in Malaysia and Penang Port is 2nd biggest port, which is handling about 25% of containers. Port Klang handled 677,600 TEU in 1992 and 771,900 TEUs in 1995. Port Klang Authority has made a major investment in building a new gateway at West Port on the island of Pulau Indah, to be a hub port of containers in this region.

On-going construction of facilities in West Port are implemented in two phases. Phases I and phase II of the west port project are as follows;-

	Completion
3 general cargo/container berths	1994
2 general cargo/container	April 1995
3 dry bulk	June 1995
3 container/general cargo	November 1995
2 warehouses	December 1995
3 transit sheds	June 1995
other building	April 1995

This project will eventually have 11 kilometers of berths and back-up facilities on 510 hectares of land. All the berths are designed for ships of up to 80,000 tones displacement. Depth alongside is between 14 to 17 meter.

2) Free commercial zone

North Port, covering an area of 248 hectares, was given free commercial zone status in April, 1993. The free zone will be expected to cover South Port land and West Port. The free zone status offers Port Klang a distinct competitive advantage, especially as distribution center for containerized cargo. In this area direct transshipment, consolidation of cargo, regional distribution, trading and value-adding activities can now

be carried out with minimum documentation and procedures, and elimination of duties. Also in this area there are 26 hectare of Port Klang Distribution Park (PKDP) which offers savings of transport costs and time, and fast, efficient, just-in-time distribution. The distripark began operations in September 1993 with 2 warehouses providing 79,000 m^2 of covered storage space, 2 hectares of open storage yard and 1.2 hectares for container storage. Under the second phase of development, another warehouse of 9,000 m^2 is scheduled for completion by August 1995. When fully developed, PKDP will provide 125,000 m^2 of covered warehouse space.

c. Case of Los Angeles and Oakland Ports in USA

1) Oakland Port

The water depth in the channel and alongside of the berth at the port of Oakland are 11.5m (38 ft) which is not enough to accommodate current container ships of 50 to 60,000 DWT calling the port, 156 vessels called in 1994. The port authority plan to deepen gradually to 12.7m (42 ft) and 14.5m (48 ft) to accommodate post Panamax type of container ship having draft of 12.7m (42 ft).

The port authority of Oakland planned to construct 180m (600 ft) long of berth for a new container terminal but now it will be changed to have 273m (900 ft) long required.

The terminal size of the port of Oakland are small. It is planned to improve the gate system and speed up the gate pass of in-out terminal by introducing soft ware services. The ratio between loaded containers and empty one is planned to be improved by utilizing the satellite public inland deports to obtain spaces in the terminal area for stocking immediate containers and to increase the handling capacity.

2) Los Angeles Port

The Port Authority of Los Angeles have developed the inter container terminal for 240 acres to be used by American President Line (APL) and scheduled to be completed by February 1997.

The north channel of the port of Los Angeles is to be deepened by dredging to 19m (63 ft) in first phase and subsequently to 24.5m (81 ft) in second phase. The dry bulk terminal is developed to have 21.8m (72 ft) draft along side the berth and subsequently to 24.5m (81 ft) for accommodating super tankers of 300,000 DWT. The dredging material are used for the reclamation of the new terminal development called "project 400" to construct 4 berths having 15m (50 ft) draft along side the berth to accommodate post Panamax size container ships and to install 4 units of post Panamax container cranes.

The APL (American President Lines, Ltd.) will operate this terminal as a tenant user.

The port authority of Los Angeles started the development planning earlier stage like 10 years ahead, to solve the environmental aspects assessment and to obtain the permit from the federal government.

d. Case of Nagoya Port in Japan

1) The Nagoya Container Berth (NCB) with three berths (300m, 300m and 250 m long of berths respectively) handled 650,000 TEUs in 1994 which was equivalent to about 52 % of the total volume of containers handled at the Port of Nagoya. The average growth rate of containers through this terminal have been 7 % per year.

2) The container berths of NCB have been upgraded to accommodate larger ships. At present the draft along side of the berth is 12m (40 ft) depth and ship with the draft of 10.8m (36 ft) can come to the berths. It is planned to develop public berth with a depth of 14m (46 ft) in the Nagoya Port.

3) The NCB terminal are designed and constructed with berth and yards for use as a single consolidated container terminal for smooth and efficient operation. The gantry cranes have the enough handling capacity , but the yard areas(Berth No.1, 86,000 m2, Berth No.2, 98,000 m2 and Berth No.3, 81,750 m2 in total 265,750 m2) are not enough, thus the handling capacity is limited.

4) The allocation of containers stock in the terminal yards are arranged by the system of containers handling of the coming ship and classified to stock containers as follows
   * at the marshaling areas, containers for loading to ship are stocked.
   * at the yard areas, stock beforehand and shipment containers for loading and three layers stock for import containers.

1.4.4 Examples of Financial Arrangement by Other Ports for Container Terminal Development

In this section, alternative examples by the other ports how the port authority arrange the fund for implementing the project are described, which are considered as recommendable cases for implementing container terminal development projects in Argentine ports.

(1) Case of Seattle / Oakland / Los Angeles Ports in USA

a. The port authority of Seattle plans to dredge the channel to 11.2m (37 ft). The cost of this dredging works will be managed by the harbor maintenance tax assessed by the value of export and import cargoes to be paid to the custom collector. 25% of the project cost will be arranged to provide from the port authority and 75% from the state government.

b. The port authority of Oakland planned to construct 272m (900 ft) long of berth for a new container terminal independently. The waterfront facilities of container terminal will be constructed by financial arrangement of the port authority and leased to users. The land facilities will be developed by users with their funds.

c. The port of Oakland did not receive subsidy for terminal development. The infrastructures development have been carried out by a joint operation with private investments and not only port own resources, because the port authority of Oakland control and manage airport, sea port and operate business field of real estate and restaurant.

The port authority of Oakland however arrange the finance by the following manners for implementing projects.

1) The port issue revenue bond with the municipal tax free bond.
2) Asking private leading investors to share the cost.
3) Asking federal government.
4) Partnership with shipping companies and port users.

d. The ports of California State had established the state trust and organized as the independent trust with nonprofit basis. The Port Authority of Los Angeles is member of this trust. For implementing new development projects in the ports of California, some amount required for the project could be arranged through the fund of this trust. The income can be deposited and accumulated to receive in the Trust Fund.

The port operation are carried out under the trust document. The profit by the port operation must be reinvested for development and rehabilitation of port facilities.

e. The projects like infrastructure development in the ports of USA have been generally self financed by the bonds issued by the port authority, which can be purchased by people like Japanese companies and many share holders of the port and it is to be formed parts of the public funds. The finance of the container terminal development of the Los Angeles port is arranged from the accumulating

saving, port reserve and issue bonds and annual revenue of about US$100 mil per year.

(2) Case of Nagoya Port in Japan

a. The Nagoya Container Berth (NCB) was constructed as the public sector in 1970 with joint investment from the Nagoya Port Authority and major shipping companies for the purposes of the construction and leasing out of container terminal and its facilities.

The share of investment cost of the NCB were as follows

10 % from The Nagoya Port Authority
10 % from the shipping companies
10 % from the central government budget
40 % from the public financial fund
30 % from the banks of cities and province.

b. It is planned to develop public berth with a depth of 14 m in the Nagoya Port. The project cost of berth construction, dredging, reclamation and installation of cranes is estimated around 30 Billion Yen (US$ 300 mil), which can be returned in case the lease amount of the terminal is 3 Billion Yen (US$ 30 Mil.) per year.

c. The cost of infrastructures development at this NCB, for example, 350 m x 500 m container berth construction were arranged by the following sources;

1) Borrow without interest from the central government, 20 % of total project cost
2) Public cooperation, Nagoya Port Authority provide, 20 %
3) Borrows from the public financial fund, 30 %
4) Banks of the city and provinces provided, 30 %

d. The maintenance dredging along the front of the wharf located at the mouth of the river where is silted by the discharge flows from the river is carried out every month regularly with grab dredger and the access channel to 14 m depth annually by the budget of the central government of the public port administration office.

1.4.5 Improvement Measures in Technical Aspects of Maritime Control

Under the present arrangement of equipment by the Coast Guard for navigation safety control of ships sailing through the La Plata River to approach Buenos Aires port and other river ports along the Parana river, the following measures of technical aspects are recommended for improving the traffic control system.

(1) Introduction of radar system and information signal station

a. Examples of the traffic controls in Japan and Singapore

Usually in advanced ports in the world, technically advanced navigation control system are adopted to ensure safety of navigation in the channels and ports. The case of coastal guard services at the Nagoya port in Japan and Singapore are described as examples to be recommendable measures of the functional port service.

1) The Case of Nagoya port - local area traffic control in Japan

The Japanese counterpart of Argentine Prefecture, the Maritime Safety Agency is endeavoring to take various steps to promote the safety of maritime traffic in Tokyo bay and other bays, straits in Japanese water areas.

It has 11 regional districts throughout Japan and each district is controlled by each regional office. Their steps to promote the safety of maritime traffic include pilotage, guarding, traffic routes, restriction on overtaking, restriction on speed and restriction of using auto-pilot, etc. These are much the same as Prefecture's steps as follows;

- Sending in the Pledge for Safety Measures against oil pollution and accidents
  The owner or operator should submit "The Written Pledge for Safety measures" to Maritime Safety Agency and fulfill its requirements for following vessels.

  * a large tanker of 220,000 DWT or more carrying dangerous cargo that enters Tokyo Bay for the first time

  * a liquified (petroleum, natural) gas tanker of 25,000 GT or more that enters Japan Water way area for the first time

  This kind of step seems to be effective for environment control in Argentina. In the vicinity of Dock Sur sea water is polluted with oil leakage from vessels or oil refineries.

- Arrangement of vessels for guarding the course

A vessel of LOA 250m or more and a liquified vessel of 25,000 GT or more should arrange vessels for guarding the course until she confirms her safe navigation even after leaving the traffic routes in restricted area like Tokyo Bay, Osaka Bay, etc.

- Notification of Traffic Routes, Notification of Change, and Position Reports
  A vessel of 10,000 GT or more should inform the passing routes designated by Maritime Traffic Laws and passing time by noon of the day before the estimated date of entering the traffic routes and "Notification of Change" as follows:
  => Port and section, name of destination
  => Port and section, name of departure
  => Name, GT
  => Passing Time
  => Name of reporting line
  => Destination

Advisory Service Center also provides local mariners with navigational information on movement of vessels around, weather condition, marine notices, etc., through the function of shore-based radar.

The Safety Agency has established the Nagoya Port Traffic Advisory Service Center as local area traffic control at the entrance of the port like other busy ports in Japan which provides maritime traffic information and controls traffic for safe navigation of vessels in the port with the following general rules and regulations.

- passage priority
- prohibition of overtaking at curves
- prohibition of crossing at curves
- keeping to starboard

To ensure safety of navigation in restricted waterways in the port the center are controlling vessels of 20,000 GT or more and oil tankers of 5,000 GT or more.
The center instruct vessels by displaying traffic control signals with electric characters at several stations.

The center is controlling vessels' flow in restricted passages by following systems and measures:

i) Radar vessel-data processing system (See Figure VII-1-4-5).

The radar is installed at the tower of the Traffic Advisory Safety Center and covers the proceed radar echo area of entire port. The radar indicate the access channel with the geographic features of the port on the appearance board in the radar scanning system.

All the ships sailing through the channel is indicated by identified code given by the center when they received the details from the ship to enter the port. This code is indicated with position and size of vessel on the radar screen. Their speed and direction are updated every 6 second.

Radar echoes of vessels go through a data processor and appear on a graphic display as marks being made up of small circles with identification codes and bars which show bearing and speed of symbolized vessels.

ii) Information signal system (See Figure VII-1-4-6)

The service center installed 4 information signal station.

=> one at the tower of the service center,

=> one at the end of the port, and

=> one at the entrance of east passage channel and others at the exit of west passage.

The signal is classified by the size of vessels such as vessels more than 5,000 GT are going through from East passage to West passage indicated by E - W or vessel more than 5,000 GT are going through from Kinjo area toward north passage indicating K - N.

The service center also provide vessel traffic signal station to indicate the letter mode with means of in bound, out bound, free, warning and restricted as shown on Figure VII-1-4-7.

An electrical board is used for information signal system and displays information on vessels maneuvering at specific areas from/to destinations. Vessel Traffic Signal Station (VTSS) has traffic signal boards facing each passage. The signals are so controlled that the traffic become one way to avoid potential head-to-head situation of vessels.

Radar Service Area and Position Reporting Line

Name of Position Reporting Line	Abbreviated Name	Position
Nagoya West	NW Line	Line extending from the Ise Bay Sea Berth Light for 34°55'25"N and long. 136°46'36"E 0 degrees 8,100 meters, and line extending from this Sea Berth Light 180 degrees 3,600 meters
Nagoya South	NS Line	Line extending from the Togese North lighted buoy for 34°53'30"N and long. 136°47'33"E 270 degrees 4,500 meters

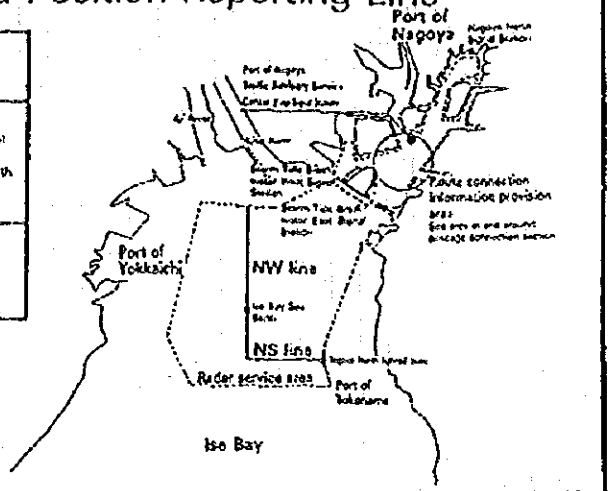


Figure VII-1-4-5

Locations of Control Signal Stations

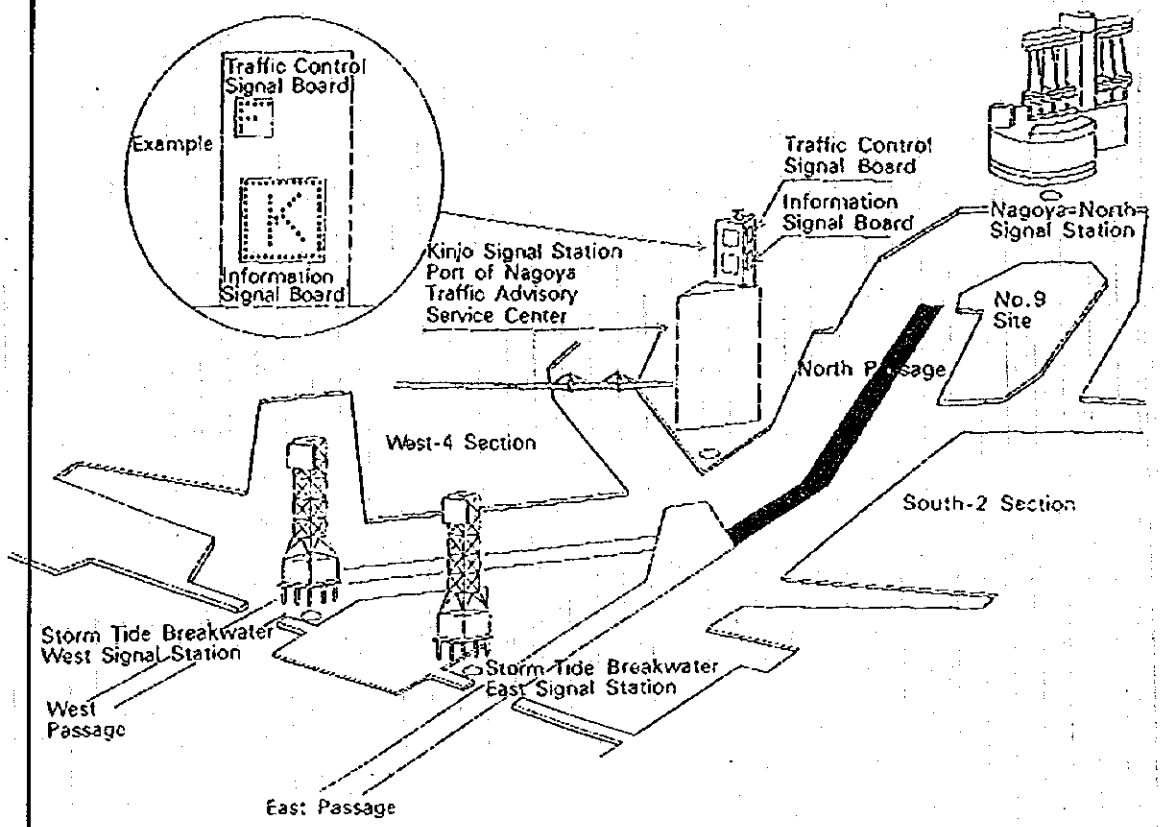


Figure VII-1-4-6

West Waterway
(Storm Tide Breakwater West Signal Station)

Waterway and Signal Station	Signal Type		Controlled vessels	Vessels subject to control	Vessels less than 500 GT	Remarks
West Waterway Storm Tide Breakwater West Signal Station	Entry signal	I Flashing	Entry OK Departure NG		Entry and Departure OK	
	Departure signal	O Flashing	Departure OK Entry NG			
	Free signal	F Flashing	Entry and Departure NG	Entry and Departure OK		
	Special signal	T Flashing	Only West Entry from Line T OK Departure NG			Line T is the line extending from the south-east end of West-4 Section to the north-east end of Port Island. (Refer to the figure below.)
	Prohibition signal	X Continuously lit	Entry and Departure NG			Only vessels specified by the Captain of the Port may enter and depart from the port.
	Advance notice signal	XI By-turn flashing	Entry and Departure NG However, vessels already in waterways may enter and depart from the port.		Entry and Departure OK	Signal will change into flashing "I" soon.
		XO By-turn flashing				Signal will change into flashing "O" soon.
		XF By-turn flashing				Signal will change into flashing "F" soon.
		XT By-turn flashing				Signal will change into flashing "T" soon.
		X Flashing	Entry and Departure NG However, vessels already in waterways may enter and depart from the port.			Signal will change into continuously lit "X" soon.

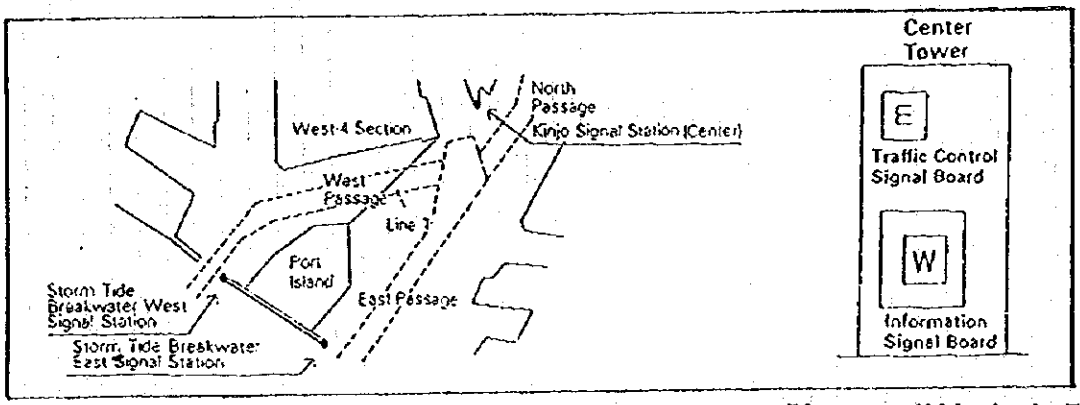


Figure VII-1-4-7

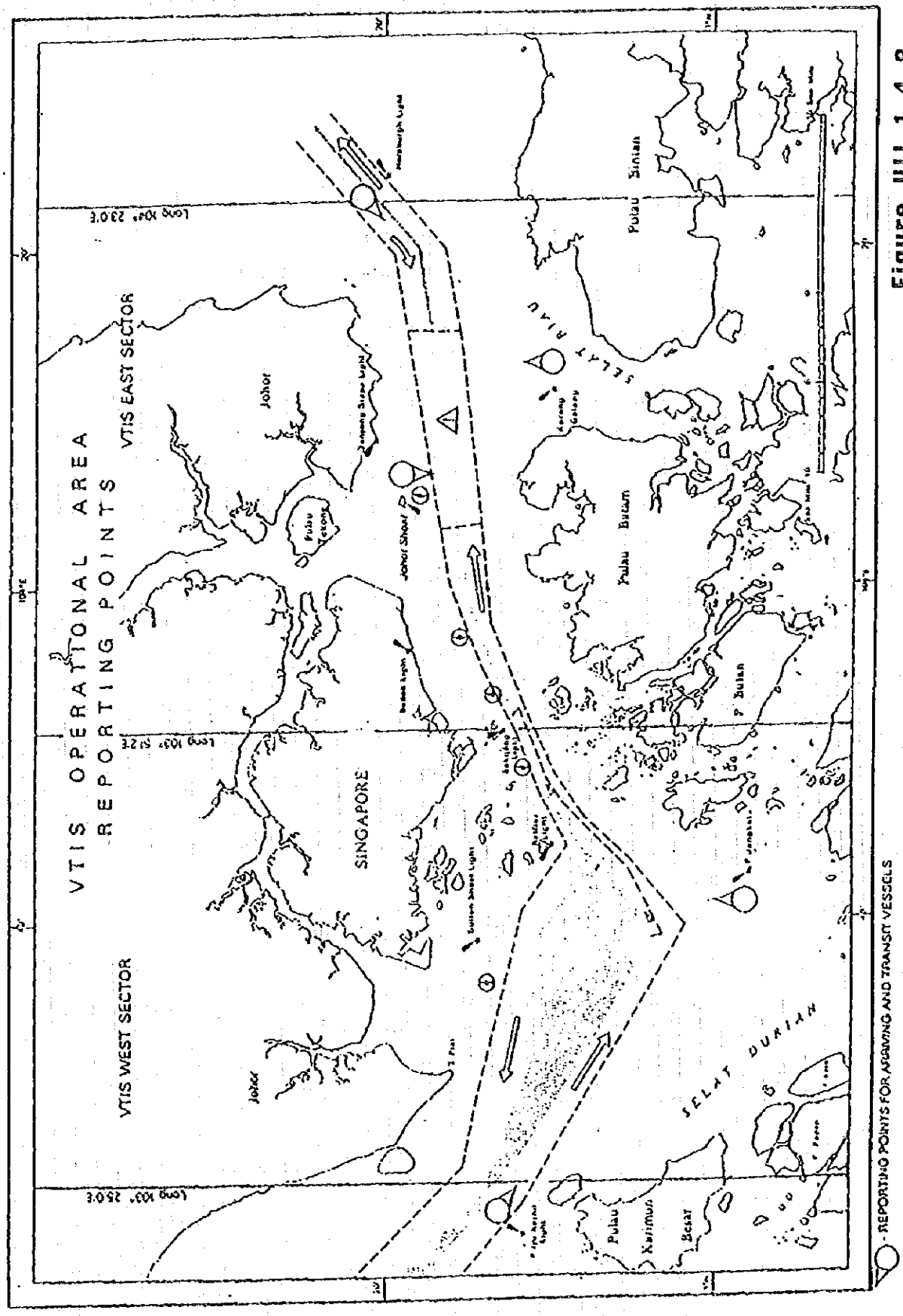


Figure VII-1-4-8