Feasibility Study of Container Cargo Handling Facilities of Ujung Pandang Port

Part 2

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1. INTRODUCTION

1.1 OBJECTIVES

1. The Part 2 of Vol. 3 intended to present a Short-term Development Plan of the container handling facilities of Uj. Pandang Port in line with the Long-term Development Plan proposed in Master Plan of Ujung Pandang Port in Part 1. The feasibility of the Short-term Development Plan is also analyzed and evaluated economic and financial viewpoints.

2. The Short-term Development plan aims at the plan to be completed by the target year 2003. The major elements of container cargo handling facilities discussed in the Short-term development plan are:

i) Layout Plan of the wharf and Inland Terminal,
ii) Container handling equipment,
iii) Operation and management system, and
iv) Examination of new approach navigation channel.

1.2 Methodology

3. The formulation of the Short-term Development Plan and its feasibility analysis consist of the following work items:

i) Engineering survey on natural conditions,
ii) Container freight demand forecast,
iii) Formulation of Short-term development plan,
iv) Preliminary design,
v) Implementation program
vi) Formulation of operation and management plan,
vii) Environmental impact assessment (EIA),
viii) Cost Estimates,
ix) Economic and financial analysis,
x) Project evaluation and recommendation.

4. The flow of the work is shown in **Fig. 1.1**

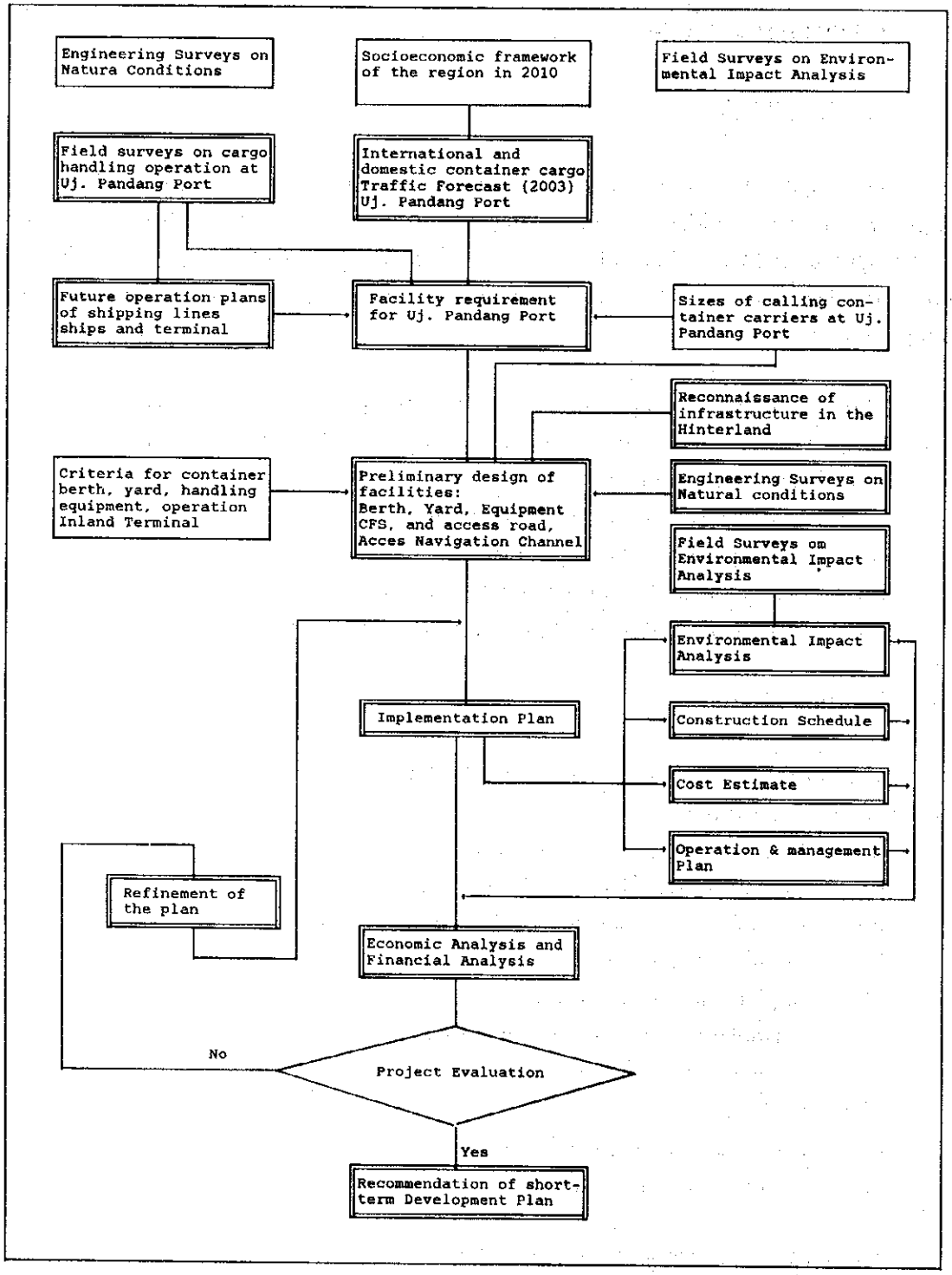


Fig. 1.1 Work Flow of Short-term Development Plan

2. MICRO FORECAST OF THE PORT DEMAND IN 2003

2.1 METHODOLOGY AND PURPOSE OF MICRO DEMAND FORECAST

1. There are generally two methods used to forecast the cargo volume. One is a macro forecast and the other is micro forecast. Micro forecast is adopted in this chapter.

2. Micro forecast estimates each commodity individually based on related indices and the forecast demand and supply situation. Purpose of micro forecast is estimating container volume of the target year and supplying basic date for planning Short-term Development Plan.

2.2 SOCIOECONOMIC FRAMEWORK OF THE HINTERLAND

2.2.1 Hinterland analysis

3. The hinterland of Ujung Pandang port is South Sulawesi province whose population is approximate 7.3 million in 1993 and annual growth rate of population for past 5 years is 1.5%.

4. The GRDP of the hinterland was Rp.3,062 billion and per capita GRDP was Rp.434,000 in 1991. Major industries of the hinterland are agriculture, fishing and industry. Major commodities of agriculture are cocoa, rice, molasses and cassava. Major commodity of fishing is shrimp.

5. Further eastern Indonesia area is regarded as a kind of hinterland of Ujung Pandang port, because the port is one of the major hub ports of above area.

2.2.2 Population projection

6. The hinterland of Ujung Pandang port is South Sulawesi province whose population is estimated to reach 8.2 million in 2003 and 8.7 million in 2010.

2.2.3 Economic framework

7. According to the 25 year long term development plan (PJPII) and REPELITA VI, the GRDP growth rate of the hinterland is estimated by applying the correlation between the GDP growth rate of Indonesia and the GRDP growth rate of the hinterland from 1984 to 1992.

Table 2.1 The estimated GRDP growth rate in the hinterland

	1994-1998	1999-2003	2004-2008	2009-2013	2014-2018
GRDP	* 6.8 %	7.1 %	7.1 %	7.1 %	7.0 %
Agriculture	* 4.0 %	4.0 %	4.0 %	4.0 %	4.0 %
Industry	* 10.8 %	11.1 %	11.1 %	11.1 %	11.0 %

Source : * REPELITA VI, Estimated by The Study Team

2.3 CONTAINER CARGO FORECAST

2.3.1 Export container cargo volume

(1) Present situation of export

8. In 1993, export cargo volume recorded 441,430 tons at Ujung Pandang port and major export commodities are cocoa (128,604t), pellet (89,991t), plywood (53,448t), molasses (48,112t), tapioca (36,294t), dry cassava (33,990t) and shrimp (6,464t). These commodities occupied more than 90% of the export volume. Other export commodities are rice, grain, marine products and general cargo.

9. Among these commodities, cocoa, plywood, tapioca, shrimp, rice, marine products and general cargo are already containerized or assumed to be containerized in the near future. Pellet is handled as dry bulk cargo and dry cassava is now handled as bagged cargo but in future it is assumed to be handled as dry bulk cargo. Molasses is handled as liquid bulk cargo.

(2) Forecast of potential container volume by each commodity

1) Cocoa

10. Production volume of cocoa has increased rapidly in Indonesia; in 1988 the production volume was 100,000 tons but by 1993 it had reached 250,000 tons. This rapid increase is due to the larger cultivated area and the fact that trees planted in the past are now yielding.

11. Export volume of cocoa also has increased in line with the production volume, from 60,000 tons in 1988 to 180,000 tons. This rapid increase is due not only to increased production but also to decreased production in other countries due to a disease that struck many trees.

12. Cocoa export volume at Ujung Pandang port was 13,000 tons of 20% of total cocoa exports in 1988, by 1993, the export volume reached 129,000 tons of 70% of total. The increase in cocoa exports in Indonesia during this five years period was almost exclusively handled at Ujung Pandang port.

13. Present increase rate of cocoa export is not expected to be maintained in future, because it will be difficult to further increase production and cocoa production volume of other countries will recover.

14. Therefore, the increase rate of cocoa export volume is assumed to be the same rate as GRDP growth rate of agriculture sector.

15. At present, cocoa is handled as bagged cargo at the port, but in future it will be handled as container cargo. Potential container cargo volume of cocoa is estimated by 12.5 tons/TEU.

Table 2.2 Potential container volume of Cocoa

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	0	12,500	15,000	20,000

2) Plywood

16. Export volume of plywood has been stable since 1986, recording over 50,000 tons every year. In Indonesia, log export is very limited; only wooden products such as plywood and timber are permitted. The increase rate of plywood export volume is not expected to increase, because it is hard to get the necessary raw materials such as logs due to protection of the forest zone.

17. Therefore, the increase rate of plywood export volume is assumed to be the same rate as GRDP growth rate of agriculture sector.

18. At present, some plywood is handled as container cargo while some is handled as general cargo at the port, but in future it will all be handled as container cargo. Potential container cargo volume of plywood is estimated by 10.0 tons/TEU.

Table 2.3 Potential container volume of Plywood

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	?	6,500	8,000	10,000

3) Tapioca

19. Tapioca is a starchy granular substance prepared from the root of the cassava plant, used to make puddings, thicken soups, etc. At Ujung Pandang port, tapioca and dry cassava are exported by mainly bagged cargo. Major export destination of cassava is Europe, but its volume is limited by quota. In future, cassava will be handled as dry bulk cargo the same as Thailand.

20. Export volume of tapioca is expected to increase, because consumption in Asia is growing. Increase rate of export is expected to be at least the same as growth rate of GRDP of agricultural sector. Tapioca is currently handled as bagged cargo, but in future it will be handled as container cargo. Potential container volume is estimated at 12.5 tons/TEU.

Table 2.4 Potential container volume of Tapioca

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	?	3,500	4,200	5,500

4) Shrimp

21. Export volume of shrimp was estimated as 97,000 tons in 1992 and 90,000s ton in 1993 in Indonesia. Export volume of shrimp at Ujung Pandang port is increasing gradually recording 6,464 tons in 1993.

22. According to interviews at a shrimp company, area of cultivated pond is estimated as 80,00 ha and productivity of it is as follows; productivity of extensive farming is 0.5 tons/ha, semi-intensive farming is 5 tons/ha and intensive is maximum 10 tons/ha. Present production volume of shrimp at hinterland is estimated at approximately 40,000 tons, because almost the entire cultivated pond is extensive.

23. Shrimp is exported as frozen shrimp without hulls and heads therefore present potential export volume is estimated at 20,000 tons. Since July 1993, shrimp has been exported by refrigerated container, and mainly 40 footers. Usually, 16.2 tons of shrimp, 1.5 tons of carton and 10.8 tons of ice are stuffed into the 40 foot container, translating into 8.1 tons/TEU.

24. Future production volume of shrimp is estimated by adopting increase rate which is the same as agricultural GRDP increase rate, however productivity will be improved because intensive is to be adopted. Estimated potential container volume is listed below;

Table 2.5 Potential container volume of Shrimp

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	?	1,000	1,200	1,600

5) Others

25. Others cargo consists of timber, coffee, robber, marine products except shrimp, resin and general cargo. General cargo occupied almost share of this, therefore others are estimated by its increase rate is same as GRDP growth rate of hinterland. Potential container volume is estimated by 12.5 tons/TEU and result is shown below.

Table 2.6 Potential container volume of Others

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	572	3,000	4,300	7,000

(3) Potential total export container volume

26. Potential total loaded export container volume of each commodity is listed below and empty container ratio is assumed same level as present ratio (10%). Estimated export volume of empty container and potential total export container volume are also listed below;

Table 2.7 Potential loaded export container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	572	26,500	32,700	44,100

Table 2.8 Potential empty export container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	255	2,500	3,300	4,900

Table 2.9 Potential total export container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	827	29,000	36,000	49,000

2.3.2 Import container volume

(1) Present situation of imports

27. In 1993, import cargo volume recorded 350,866 ton at Ujung Pandang port and major import commodities are wheat (317,390t), fertilizer (16,468t), asphalt (7,422t), steal (4,256t), spare parts (1,862t), general cargo and others.

28. Among these commodities, fertilizer, asphalt, spare parts and general cargo are already containerized or assumed to be containerized in the near future. Wheat is handled as dry bulk car.

(2) Forecast of potential container volume by each commodity

1) Fertilizer

29. At Ujung Pandang port, fertilizer is imported to fill the gap between domestic production and increasing domestic consumption, though the import volume has been slowly decreasing.

30. According to interviews with a fertilizer company, import volume of fertilizer is planned as five to ten percent of the consumption volume and annual increase rate of consumption is estimated as 7%. Volume of fertilizer handled at Ujung Pandang port

is 186,683 tons (import volume is 16,468 tons, unloading volume is 153,798 tons and loading volume is 16,417 tons)

31. Fertilizer used to be imported or unloaded as dry bulk cargo at the port and after bagged and distributed to consumers. But now, fertilizer is handled as bagged cargo at the port, and in future it will be handled as container cargo. Potential container cargo volume of fertilizer is estimated as 12.5 tons/TEU.

Table 2.10 Potential container volume of Fertilizer

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	0	1,800	2,500	4,200

2) Others

32. Others consists of general cargo, asphalt, steel, spare parts and others. General cargo accounts for a almost all of this cargo, therefore others are estimated by its increase rate is same as GRDP growth rate of hinterland. Potential container volume is estimated as 12.5 tons/TEU.

Table 2.11 Potential container volume of Others

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume		1,500	2,000	3,200

(3) Potential total import container volume

33. Potential total loaded import container volume of each commodity is listed below. Empty container volume is estimated by deducting total loaded import container volume from total export container volume assuming that total export and import container volume will be the same. Estimated import volume of empty container and potential total import container volume are also listed below;

Table 2.12 Potential loaded import container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	450	3,300	4,500	7,400

Table 2.13 Potential empty import container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	377	25,700	31,500	41,600

Table 2.14 Potential total import container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	827	29,000	36,000	49,000

2.3.3 Loading container volume

(1) Present situation of loading

34. In 1993, loading cargo volume recorded 1,036,399 ton at Ujung Pandang port and major loading commodities are petroleum (324,651t), general cargo (238,737t), rice (232,901t), flour (104,752t), fertilizer (16,417t), corn (11,219t) and others.

35. Among these commodities, some pat of general cargo, rice, flour are already containerized or assumed to be containerized in the near future.

36. There are two destinations of loading cargo, one is to transport to west area such as Surabaya and Jakarta and another is to transport to eastern area of Indonesia and neighboring islands of Ujung Pandang port.

(2) Forecast of potential container volume by each commodity

1) General cargo

37. General cargo is estimated by adopting GRDP growth rate. There are two destinations to transport general cargo, therefore fifty percent of general cargo will be containerized which will be mainly transport to western Indonesia and potential container volume is estimated as 12.5 tons/TEU.

Table 2.15 Potential container volume of General cargo

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume		14,000	19,000	30,000

2) Rice

38. Loading volume of rice had increased gradually but since 1991 increase of loading volume has been stagnant. Major destination of rice transportation are Jakarta, Surabaya and Pontianak, this volume occupied more than 70% of the loading volume of rice.

39. Loading volume of rice is estimated by adopting GRDP growth rate of agricultural sector. Seventy percent of it will be containerized and potential of container volume is estimated as 12.t tons/TEU.

Table 2.16 Potential container volume of Rice

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume		11,000	14,000	18,000

3) Flour

40. Flour is produced from wheat at flour mill factory in Ujung Pandang and wheat

is imported as dry bulk cargo which is transported by bulk carrier.

41. Based on interviews with flour mill company, present production capacity is 1,000 tons/day by wheat weight, but they have a plan to increase to 1,400 tons/day in 1995 and further to 3,000 tons/day in future.

42. 75% of weight of imported wheat processed to flour and 25% is pellet. 50% of produced flour is consumed in Ujung Pandang city and the rest is transported and distributed to the eastern Indonesia.

43. Flour loading volume is estimated by adopting GRDP growth rate and 50% of loading volume is assumed to be containerized and potential of container volume is estimated as 12.5 tons/TEU.

Table 2.17 Potential container volume of Flour

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume		8,000	12,000	13,500

4) Fertilizer

44. Before 1989, there was only one distribution center of fertilizer in south Sulawesi at Ujung Pandang but in 1989 another distribute center was constructed at Parepare, then loading fertilizer volume had decreased, but according to interviews of the fertilizer company, loading fertilizer volume will be expected to increase and annual increase rate is estimated as 7%. 50% of loading fertilizer volume will be containerized and container volume is estimated as 12.5 tons/TEU.

Table 2.18 Potential container volume of Fertilizer

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume		1,000	1,200	2,000

(3) Potential total loading container volume

45. Potential total loaded loading container volume of each commodity is listed below. Empty container volume is estimated by deducting total loaded loading container volume from total unloading container volume assuming that total export and loading container volume will be the same. Estimated loading volume of empty container and potential total loading container volume are also listed below;

Table 2.19 Potential loaded loading container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	450	3,400	46,200	63,500

Table 2.20 Potential empty loading container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	377	25,000	36,800	70,500

Table 2.21 Potential total loading container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	827	59,000	83,000	134,000

2.3.4 Unloading container volume

(1) Present situation of unloading

46. In 1993, unloading cargo volume recorded 2,249,714 ton at Ujung Pandang port and major unloading commodities are petroleum (901,396t), general cargo (823,818t), fertilizer (153,798t), vehicle (92,362t), log (58,430t), timber (54,139t), steel (24,147t), heavy

equipment (18,985t), sugar (12,283t) and others.

47. Among these commodities, general cargo and fertilizer are already containerized or assumed to be containerized in the near future.

48. There are two origins of unloading cargo, one is west area of Indonesia such as Surabaya and Jakarta, and another is eastern area of Indonesia and islands around the port.

49. The followings are under planning; cement will be transported by dry bulk cargo from Tonasa to Ujung Pandang port and after bagged and exported to foreign country by exclusive ship. The volume is planned 600,000 tons/year.

(2) Forecast of potential container volume by each commodity

1) General cargo

50. General cargo is estimated by adopting GRDP growth rate of the hinterland. There are two origins of general cargo already mentioned above and almost general cargo which is transported from Jakarta and Surabaya is considered to be containerized or will be containerized, other hand, containerized ratio of unloading cargo come from other area will be stayed low level, therefore forty percent of general cargo will be containerized and potential container volume is estimated as 12.5 tons/TEU.

Table 2.22 Potential container volume of General cargo

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	22,718	37,000	52,000	83,000

2) Fertilizer

51. Before 1989, there was only one distributer center of fertilizer in south sulawesi at Ujung Pandang but in 1989 another distribution center was constructed at Parepare, then unloading fertilizer volume had decreased but it has been recovering gradually.

Fertilizer is transported from the factory of Bontang and Surabaya.

52. Based on interviews with the fertilizer company, consumption volume of fertilizer in the hinterland will be expected to increase, and annual increase rate is estimated as 7%.

53. Fertilizer used to be unloaded as dry bulk cargo at the port and after bagged and distributed to consumers. But now, fertilizer is handled as bagged cargo at the port, and in future it will be handled as container cargo. Potential container cargo volume of fertilizer is estimated as 12.5 tons/TEU.

Table 2.23 Potential container volume of Fertilizer

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume		17,000	24,000	39,000

(3) Potential total unloading container volume

54. Potential total loaded unloading container volume of each commodity is listed below and empty container ratio is assumed same level as present ratio (10%). Estimated unloading volume of empty container and potential total unloading container volume are also listed below;

Table 2.24 Potential loaded unloading container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	22,718	54,000	76,000	122,000

Table 2.25 Potential empty unloading container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	382	5,000	7,000	12,000

Table 2.26 Potential total unloading container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	23,100	59,000	83,000	134,000

2.3.5 Container volume

(1) Total container volume

55. Potential total container volume of each trade type has estimated and listed below. Assuming the containerized ratio in 2003 will be 100% of the potential, the total container volume is estimated by applying the logistic curve. Estimated total volume of container, total loaded container volume and total empty container volume are also listed below;

Table 2.27 Potential total container volume

(Unit: TEU)

	1993	1998	2003	2010
Potential Container Volume	47,352	176,000	238,000	366,000

Table 2.28 Estimated Total container volume

(Unit: TEU)

	1993	1998	2003	2010
Loaded container	33,465	109,000	159,400	237,000
Empty Container	13,888	56,000	78,600	129,000
Total Container Volume	47,352	165,000	238,000	366,000

56. Number of container is estimated by assuming that 30% of container volume will be 40 foot container. Results of which are shown below.

Table 2.29 Number of total container

(Unit: BOX)

	1993	1998	2003	2010
20 foot	32,199	89,000	129,000	197,000
40 foot	5,683	38,000	55,000	85,000
Number of Container	37,882	127,000	184,000	282,000

3. Short-term development plan

3.1 Container terminal and related facilities

3.1.1 Cargo Flows at the Port and Inland Container Depot

1. **Fig. 3.1** shows the flow of containerized cargo at Ujung Pandang port.

2. The total container throughput of Ujung Pandang port in 2003 is estimated to be 239,000 TEUs, with domestic and international cargoes accounting for 70% (167,000 TEUs) and 30% (72,000 TEUs).

3. Because of site limitations, it is difficult to secure a large enough storage yard at Ujung Pandang port. As a result, the container terminal at Hatta Quay must handle both domestic and international containerized cargoes simultaneously.

4. The container terminal at the port is a bonded area that is intended to store international cargoes awaiting customs clearance. Therefore, it is irregular to store home-produced goods for domestic consumption at the container terminal. The container yard at Hatta Quay must be split into two sections, one for domestic cargoes and the other for international cargoes, separated, if necessary, by fence. Furthermore, domestic and international cargoes must be stored in such a way as to be clearly distinguishable from one another, without causing confusion.

5. When there remains some reserve capacity in the container yard, unloaded containers, whether stuffed or empty, are stored in the container yard at Hatta Quay. When its storage capacity is exceeded, empty containers can be stored at Saekarno Quay 500 meters away.

6. The container yard in the Makassar port area will have some reserve space when the new terminal at Hatta Quay comes on stream in 1997. However, steadily increasing containers will eat up the reserve space by 2000. Then, an additional inland container depot will become necessary.

7. A container freight station having an area of 2000 m^3 will come on stream in the port area simultaneously with the start of the operation of the Hatta Quay container

terminal in 1977.

8. Assuming that less than full container cargoes(LCL) account for 50% of general cargo, both domestic and international, they will account for 25% (approximately 42,000 TFUs per year) of all laden containers in 2003. While 14,000 TFUs per year may be handled at the container freight station in the port area, the balance (28,000 TFUs per year) will require an additional area where non-full container cargoes can be collected, stuffed, unstuffed and sorted as in the container freight station.

9. This report proposes to provide a new container freight station in the inland container depot in the Talo area.

10. The total quantity of LCL cargoes is estimated to reach 25,000 TFUs per year in 1997. The handling capacity of the container freight station, estimated at 14,000 TFUs per year, will be exceeded then. Thus, there must be some other place to handle the surplus cargo of 11,000 to 12,000 TFUs per year. Because the construction of the inland container depot will not be completed by 1997, some other appropriate handling area must be prepared. Otherwise, container throughput must be lowered by declining the acceptance of LCL cargo. Some solution must be found urgently.

11. In 2003, a total of 60,000 TFUs per year of containerized cargo, comprising 28,000 TFUs per year of LCL cargo and 32,000 TFUs per year of overflow from the container yard in the port area, is estimated to flow to the inland container depot.

3.1.2 Cargo Handling Capacities of Main Facilities.

(a) Berth Capacity

12. **Table 3.1** shows the container handling capacity of Hatta Quay at Makassar port, together with the preconditions considered in the estimation.

13. The number of container cranes installed at a container berth most significantly affects its handling capacity. The handling capacities of berths having one and two container cranes were estimated.

14. The handling capacity of a berth with one container crane was estimated to be

115,000 TFUs per year in 2003 and 123,000 TFUs per year in 2010. The handling capacity of a berth with two container cranes was estimated to be 168,000 TFUs per year in 2003 and 188,000 TFUs per year in 2010. At Makassar port, as is obvious from the above, doubling the number of container cranes per berth will not lead to the doubling of the container handling capacity of the berth.

15. This is due to the fact that the increased handling efficiency in loading and unloading brought about by adding one container crane is offset by the resulting drop in the effective time ratio.

16. Having a length of 490 m, Hatta Quay can provide two or three berths. The overall container handling capacity of Hatta Quay depends upon whether one or two cranes are provided at each berth. **Table** 3.2 shows the estimated numbers of berths and container cranes on each berth.

17. **Fig.** 3.2 shows the number of container cranes to be installed to meet the forecast demand for container handling capacity between 1998 and 2010. As shown, the container terminal at Hatta Quay will start its operation with two berths each having one container crane. Around 2002, the combination will change to one berth with one crane and the other berth with two cranes. Around 2007, furthermore, the combination must be changed to three berths each having one crane or two berths each having two cranes.

18. **Fig.** 3.3 shows the estimated lengths of container ships that will call at Makassar port. The average and maximum lengths of ships will be 165 m and 195 m in 2003, and 175 m and 205 m in 2010. Considering the overall length of 490 m and the tendency of ship size to increase, it will be difficult to use three berths at Hatta Quay. Thus, the choice must be made by comparing the length of berthing time, which is an indication of the level of services offered to calling ships, and the necessary increase in construction cost.

19. **Fig.** 3.4 shows the estimated numbers of containers to be loaded and unloaded at each call of ships at Makassar port. The estimated numbers are 250 and 320 containers per ship call in 2003 and 2010. The estimate of the container handling capacities of the berths is based on these figures.

20. **Fig. 3.5** shows the estimated GRT and DWT at each call of ships at Makassar port. The evaluation of investment such as financial analysis is based on these figures.

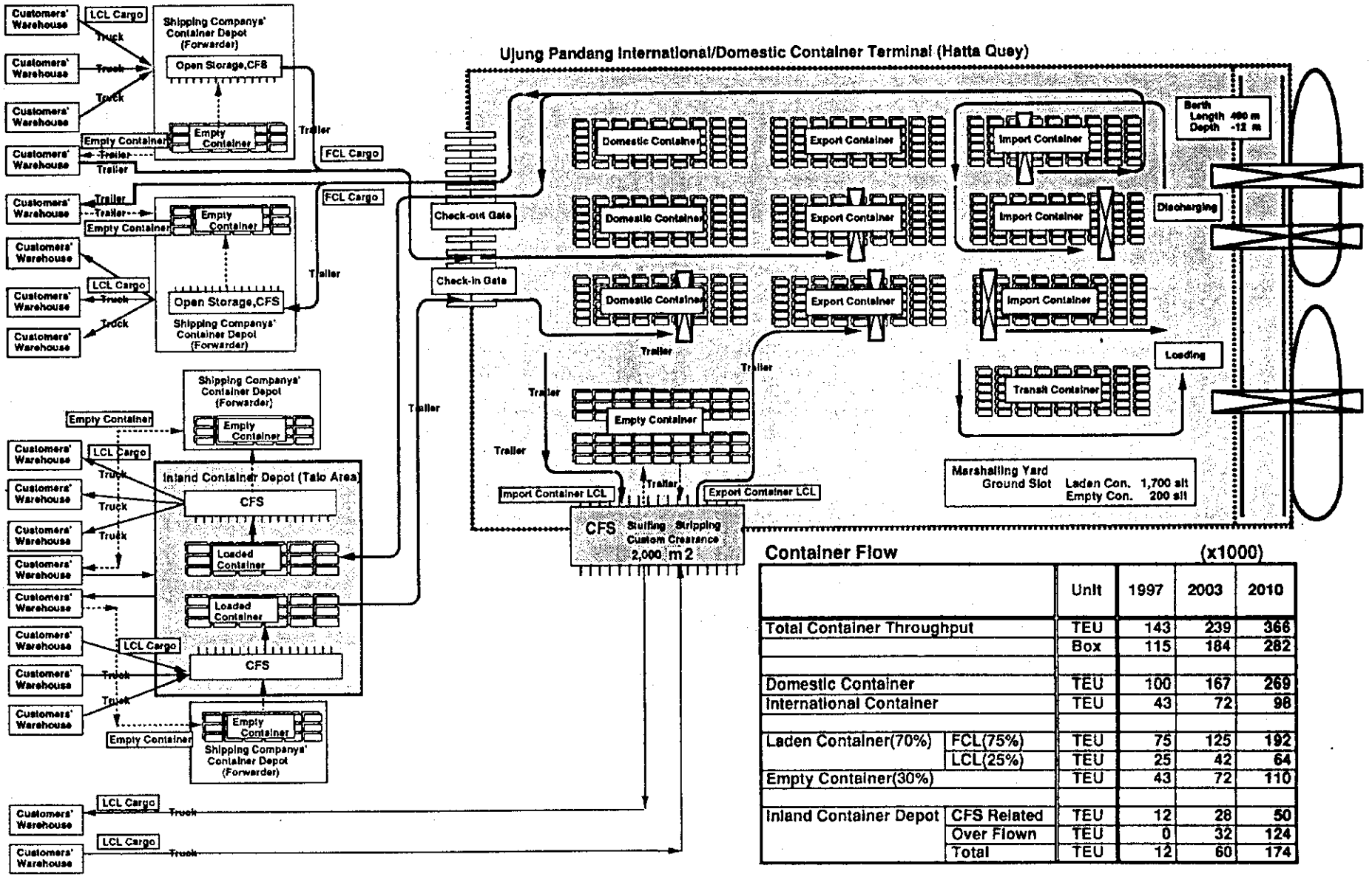
(b) Container Yard Capacity

21. **Table 3.3** shows the number of ground slots estimated to be required in the container yard at Makassar port between 1997 and 2003 based on the container demand forecast.

22. In 2003, obviously, the container yard will have a storage capacity of approximately 207,000 TFUs per year if 1700 and 200 (for empty containers) ground slots are secured in the neighborhood of Hatta and Saekarno quays, respectively. Against the demand forecast of 239,000 TFUs per year for 2003, this means a shortage of 295 ground slots and a cargo overflow of 32,000 TFUs per year.

(c) Other Facilities

23. **Table 3.4** shows the necessary quantities of other facilities at the container terminal at Makassar port between 1997 and 2003 estimated on the basis of the demand forecast, with the data used in the estimation as preconditions. The estimated facilities include the container freight station, inland container depot and container handling equipments.



Container Flow (x1000)

		Unit	1997	2003	2010
Total Container Throughput		TEU	143	239	366
		Box	115	184	282
Domestic Container		TEU	100	167	269
International Container		TEU	43	72	98
Laden Container(70%)	FCL(75%)	TEU	75	125	192
	LCL(25%)	TEU	25	42	64
Empty Container(30%)		TEU	43	72	110
Inland Container Depot	CFS Related	TEU	12	28	50
	Over Flown	TEU	0	32	124
	Total	TEU	12	60	174

Fig. 3.1 Container Cargo Flow at Ujung Pandang Port (International / Domestic Container Terminal)

Table 3.1 Container Handling Capacity (Berth Capacity) (1)

			1997	1998	1999	2000	2001	2002	2003	2010
Average Number of Loading/Unloading Containers (Box/Ship call)			220	220	225	230	235	240	250	320
Box (%)			70	70	70	70	70	70	70	70
40' Container Ratio			25	30	30	30	30	30	30	30
Container Crane handling Efficiency (Box/Hr,Cr)			-	19	21	23	25	25	25	25
1 Berth		Number of Crane Effective Working	-	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	1	ERT	-	0.71	0.69	0.68	0.66	0.67	0.68	0.73
	Container	BT	-	19.2	18.2	17.4	16.7	16.9	17.4	20.7
	Crane	Number of Shipcall	-	319	337	353	368	363	353	297
	(A)	Handling Capacity (Box/Y.B)	-	70	76	81	87	87	88	95
		(TEU/Y.B)	-	91	99	106	112	113	115	123
		Number of Crane Effective Working	-	1.6	1.6	1.6	1.6	1.6	1.6	1.6
	2	ERT	-	0.56	0.54	0.53	0.51	0.52	0.53	0.59
	Container	BT	-	12.3	12.3	11.9	11.5	11.6	11.9	13.6
	Crane	Numberof Shipcall	-	478	499	517	534	529	517	451
	(B)	Handling Cargo (Box/Y.B)	-	105	112	119	126	127	129	144
		(TEU/Y.B)	-	137	146	155	103	165	168	188

Table 3.2 Container Handling Capacity (Berth) - (2)

Number of Container Crane per Berth				1cc		1cc/2cc		2cc	
Year				2003	2010	2003	2010	2003	2010
Number of Loading and Unloading Containers			Box /ship call	250	320	250	320	250	320
Nmber of Berths	1 Berth	Berthing Time	Hr	17.4	20.7	-	-	11.9	13.6
		Number of Calling Ship	ships	353	297	-	-	517	451
		Handling Capacity	1,000 TEU /Y.B	115	123	-	-	168	188
		Total Number of Container Crane	Set	1	1	-	-	2	2
	2 Berth	Berthing Time	Hr	17.4	20.7	14.1	16.4	11.9	13.6
		Number of Calling Ship	ships	706	594	870	748	1,034	902
		Handling Capacity	1,000 TEU/Y.B	230	246	283	311	336	376
		Total Number of Container Crane	Set	2	2	3	3	4	4
	3 Berth	Berthing Time	Hr	17.4	20.7	-	-	(11.9)	(13.6)
		Number of Calling Ship	ships	1,059	891		-	(1,551)	
		Handling Capacity	1,000 TEU /Y.B	345	369	-	-	(504)	(564)
		Total Number of Container Crane	Set	3	3	-	-	6	6

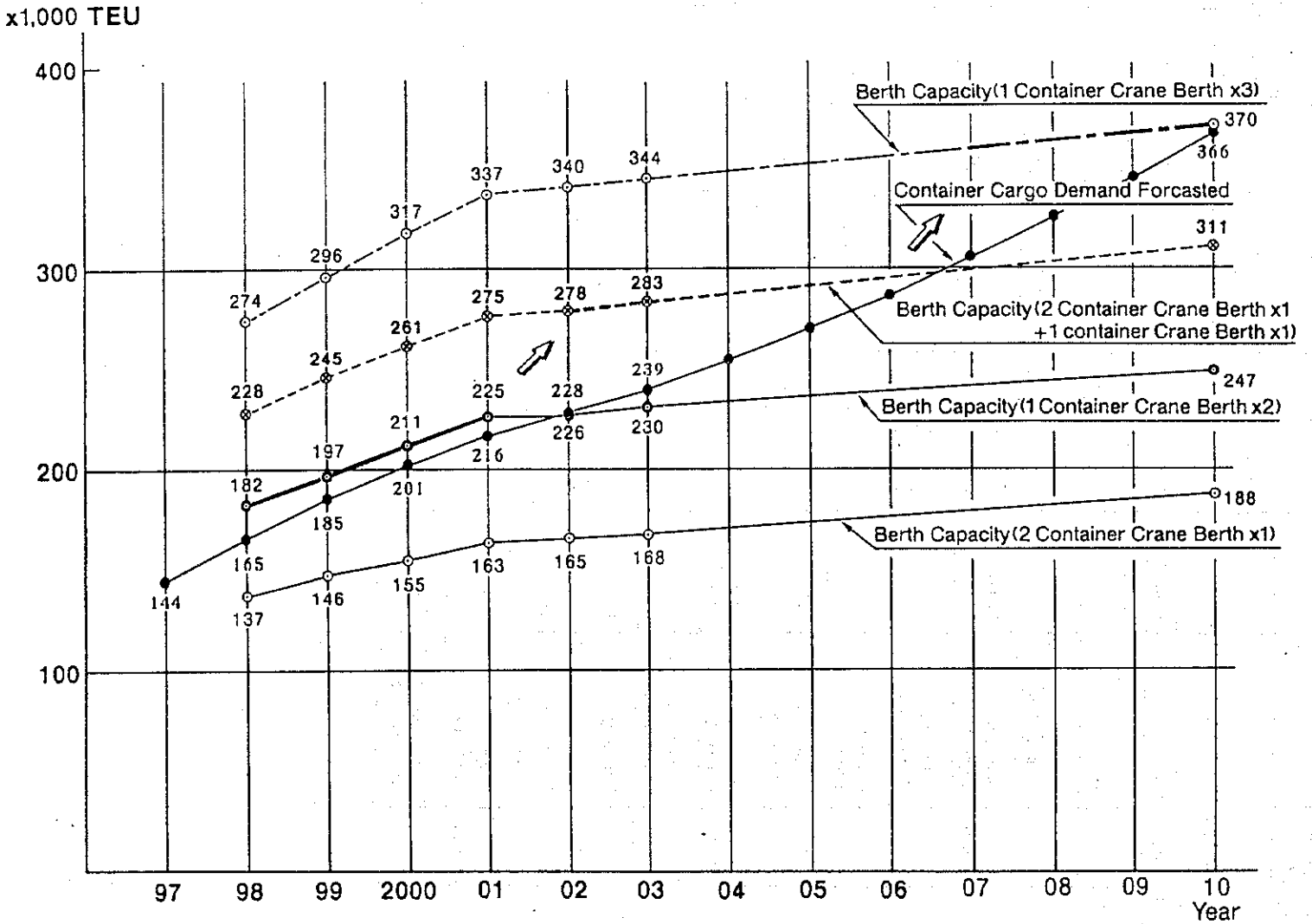


Fig. 3.2 Container Handling Capacity (Berth)

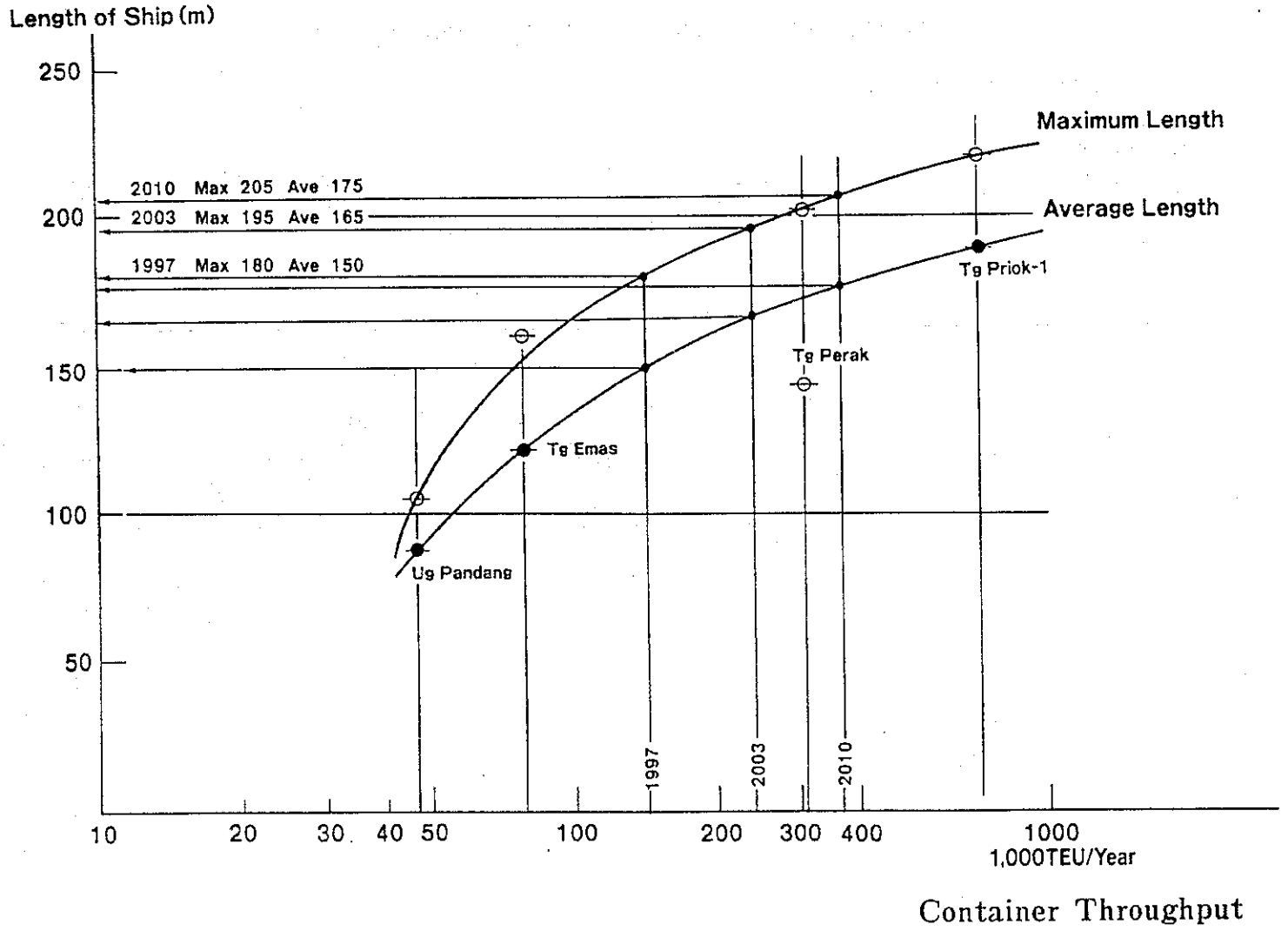


Fig. 3.3 Length of Ships Calling

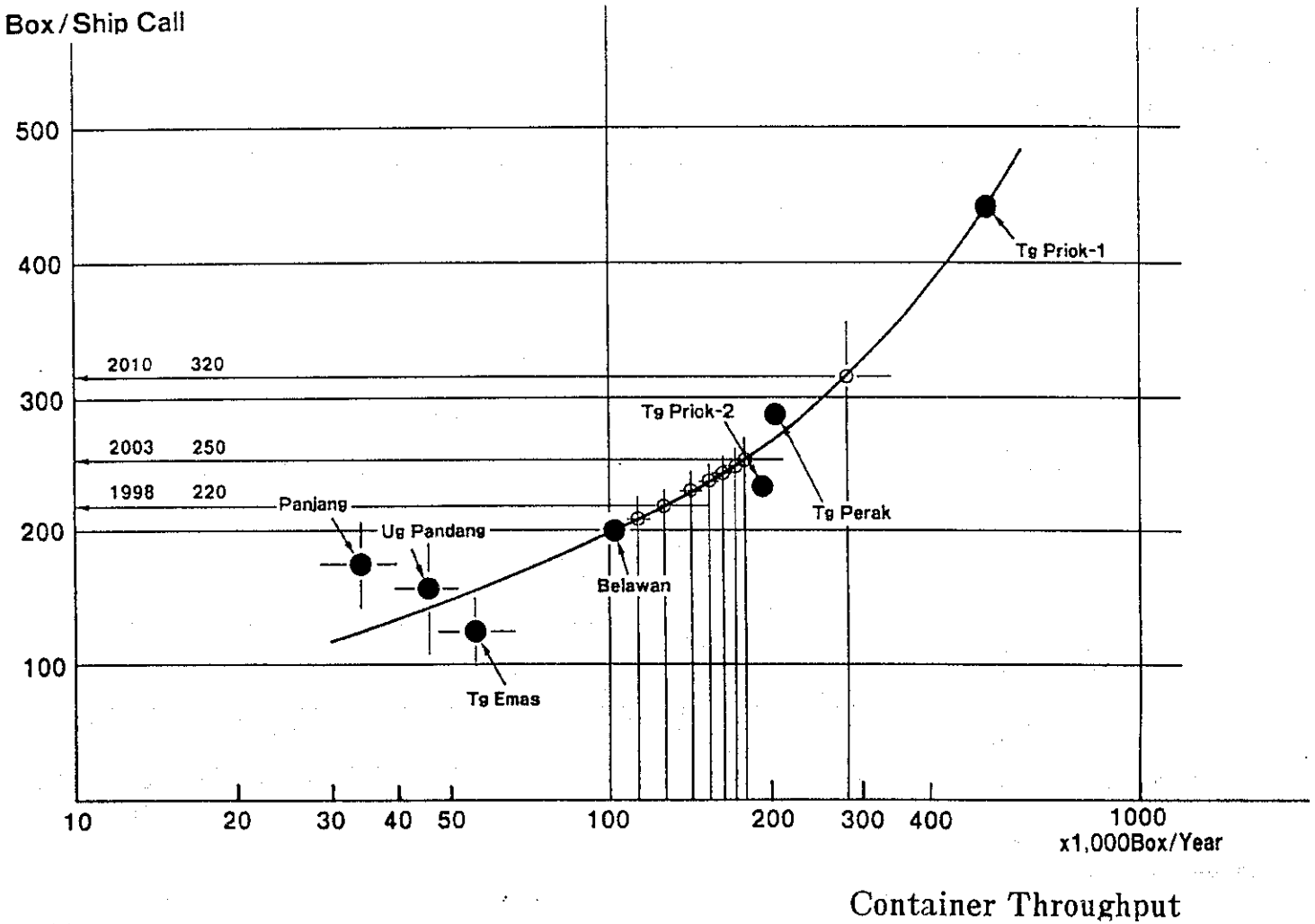


Fig. 3.4 Number of Loading and Unloading Container

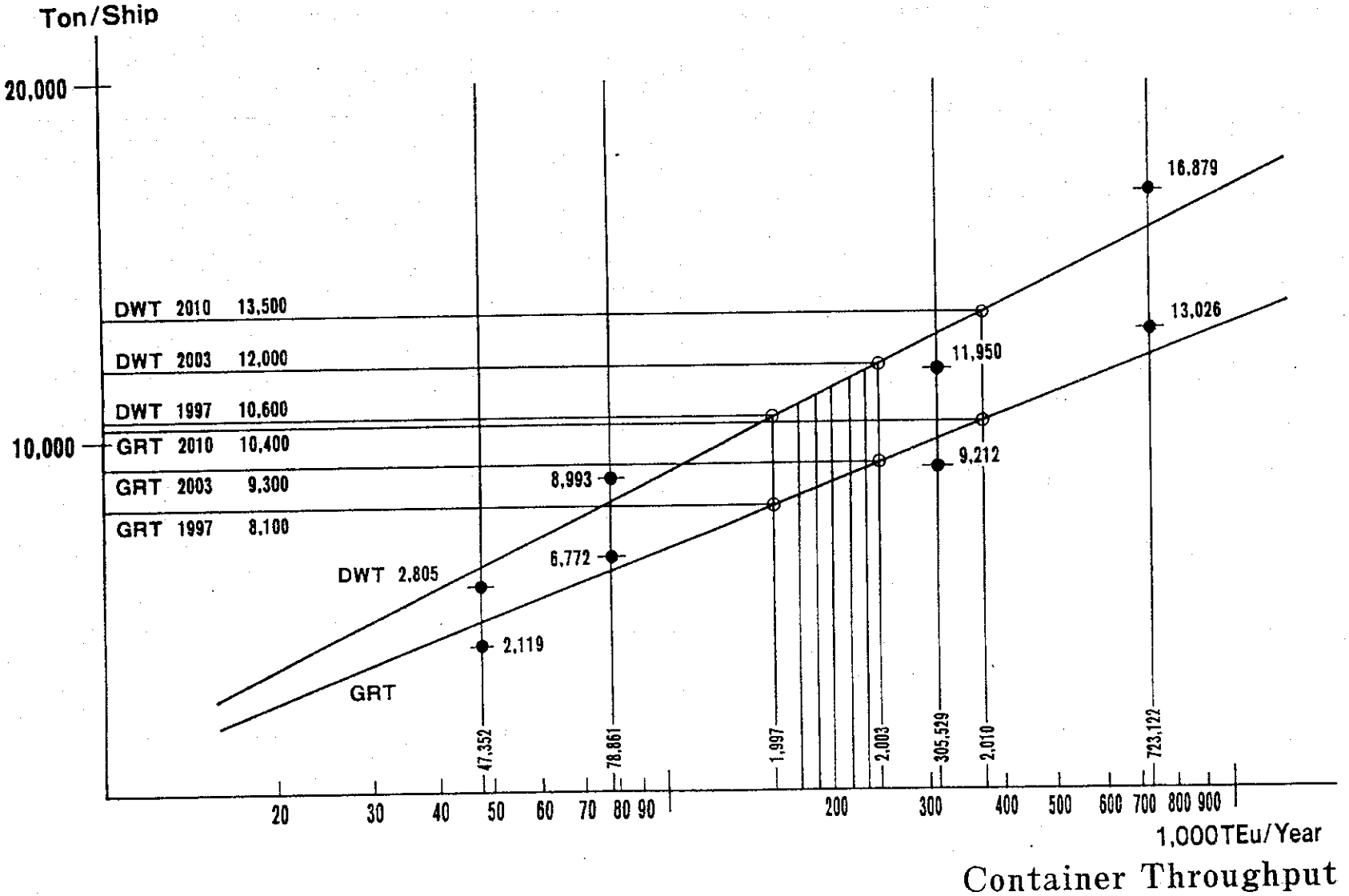


Fig. 3.5 DWT and GRT of Ships Calling

Table 3.3 Number of Ground Slots required and Container Storage Capacity (Makassar Port)

YEAR	Container yard ground slots required: Design (Transfer Crane System)														Container Storage Capacity	Demand Forcasted	Overflow Containers	
			Prop.	Throughput	Dwelling Time	Storage	Stacking Height	Required Ground Slot (Thrtcl)	YOR	Required Ground Slots (Practical)			Ground Slots Alocation		Shortage of Ground Slot			
										Total	Laden	Empty	Laden	Empty				
			(%)	(1,000 TEU/Yr	(Day)	(1,000 TEU)	(1over4)	(TEU)		(TEU)	(TEU)	(TEU)	(TEU)	(TEU)	(TEU)	(1,000 TEU/Yr)	(1,000 TEU/Yr)	(1000 Box/Y)	(1000 TEU/Y)
1997	Import	Full	0.35	50.4	10.0	1.38	3.0	461	0.6	768	768		(1700)	(200)				
		Empty	0.15	21.6	8.0	0.47	4.0	118	0.6	197		197						
	Export	Full	0.35	50.4	10.0	1.38	3.5	395	0.6	658	658		-274		-274				
		Empty	0.15	21.6	8.0	0.47	4.0	118	0.6	197		197		195	195				
	Total			144.13	9.4	3.71	3.4	1,092	0.6	1,821	1,426	395	1,700	200	-79	150.4	143.4	(-5.6)	(-7.0)
1998	Import	Full	0.35	57.8	9.0	1.43	3.0	475	0.6	792	792							
		Empty	0.15	24.8	7.0	0.48	4.0	119	0.6	198		198						
	Export	Full	0.35	57.8	9.0	1.43	3.5	407	0.6	679	679		-229		-229				
		Empty	0.15	24.8	7.0	0.48	4.0	119	0.6	198		198		196	196				
	Total			165.22	8.4	3.80	3.4	1,120	0.6	1,867	1,471	396	1,700	200	-33	168.1	165.2	(-2.3)	(-2.9)
1999	Import	Full	0.35	64.6	8.0	1.42	3.0	472	0.6	786	786							
		Empty	0.15	27.7	6.0	0.46	4.0	114	0.6	190		190						
	Export	Full	0.35	64.6	8.0	1.42	3.5	404	0.6	674	674		-239		-239				
		Empty	0.15	27.7	6.0	0.46	4.0	114	0.6	190		190		179	179				
	Total			184.53	7.4	3.74	3.4	1,104	0.6	1,840	1,461	379	1,700	200	-60	190.6	184.5	(-4.7)	(-6.1)
2000	Import	Full	0.35	70.5	8.0	1.54	3.0	515	0.6	858	858							
		Empty	0.15	30.2	5.0	0.41	4.0	103	0.6	172		172						
	Export	Full	0.35	70.5	8.0	1.54	3.5	441	0.6	735	735		-106		-106				
		Empty	0.15	30.2	5.0	0.41	4.0	103	0.6	172		172		145	145				
	Total			201.34	7.1	3.92	3.4	1,163	0.6	1,938	1,594	345	1,700	200	38	197.4	201.3	3.8	3.9
2001	Import	Full	0.35	75.5	8.0	1.66	3.0	552	0.6	920	920							
		Empty	0.15	32.4	5.0	0.44	4.0	111	0.6	185		185						
	Export	Full	0.35	75.5	8.0	1.66	3.5	473	0.6	789	789		8		8				
		Empty	0.15	32.4	5.0	0.44	4.0	111	0.6	185		185		170	170				
	Total			215.86	7.1	4.20	3.4	1,247	0.6	2,078	1,708	370	1,700	200	178	197.3	215.9	14.2	18.6
2002	Import	Full	0.35	79.9	8.0	1.75	3.0	584	0.6	973	973							
		Empty	0.15	34.3	5.0	0.47	4.0	117	0.6	196		196						
	Export	Full	0.35	79.9	7.0	1.53	3.5	438	0.6	730	730		4		4				
		Empty	0.15	34.3	5.0	0.47	4.0	117	0.6	196		196		191	191				
	Total			228.42	6.8	4.22	3.4	1,257	0.6	2,095	1,704	391	1,700	200	195	207.2	228.4	16.3	21.2
2003	Import	Full	0.35	83.8	8.0	1.84	3.0	612	0.6	1,020	1,020							
		Empty	0.15	35.9	5.0	0.49	4.0	123	0.6	205		205						
	Export	Full	0.35	83.8	7.0	1.61	3.5	459	0.6	765	-765		86		86				
		Empty	0.15	35.9	5.0	0.49	4.0	123	0.6	205		205		210	210				
	Total			239.41	6.8	4.43	3.4	1,317	0.6	2,195	1,786	410	1,700	200	295	207.1	239.4	24.8	32.3
2010	Import	Full	0.35	128.2	7.0	2.46	3.0	819	0.6	1,366	1,366							
		Empty	0.15	54.9	4.0	0.60	4.0	151	0.6	251		251						
	Export	Full	0.35	128.2	6.0	2.11	3.5	602	0.6	1,003	1,003		669		669				
		Empty	0.15	54.9	4.0	0.60	4.0	151	0.6	251		251		302	302				
	Total			366.25	5.7	5.77	3.3	1,723	0.6	2,871	2,369	502	1,700	200	971	242.4	366.3	95.2	123.9

Table 3.4 Table Requirement of the Facilities in The Container

		Unit	1997	1998	1999	2000	2001	2002	2003	2010
Forcast of Container volume (1000)		TEU	144	165	185	201	216	228	239	366
		Box	115	127	142	155	166	176	184	282
Average Number of L/UL Boxes		Box	210	220	225	230	235	240	250	320
40' Container Ratio		%	25	30	"	"	"	"	"	"
Empty Container Ratio		%	30	"	"	"	"	"	"	"
Average Yard Dwelling Time		Day	9.4	8.4	7.4	7.1	7.1	6.8	6.8	5.7
LCL Cargo Ratio		%	25	"	"	"	"	"	"	"
Berth	Berth Length(Hatta)	m	490	"	"	"	"	"	"	"
	Number of Berth		3	2	"	"	"	"	"	"
Container Yard	Ground Slot	TEU	1700	"	"	"	"	"	"	"
Empty Container Yard	Ground Slot	TEU	200	"	"	"	"	"	"	"
Inland Container Depot	Groud Slot	TEU	180	200	230	280	370	400	520	1250
	Yard Storage Area	Ha	0.9	1.0	1.2	1.5	1.9	2.1	2.7	6.6
CFS	Total CFS Area	sqm	7500	8600	9600	10500	11300	11900	12500	19100
	CFS in Port Area	sqm	4000	"	"	"	"	"	"	"
	CFS in Inland Depot	sqm	3500	4600	5600	6500	7300	7900	8500	15100
Container Crane	Number of CC	set	0	2	"	"	"	3	"	"
Yard Transfer Crane		set	5	6	7	8	"	9	"	14
Fork Lift(SideLioader)	Container Yard	set	3	3	3	4	4	4	4	7
	Inland Container Depot	set								
Fork Lift(Top Lifter)	Container Yard	set	1	"	"	"	"	"	"	2
	Inland Container Depot	set	2	2	2	2	3	4	4	11
Fork Lift	CFS	set	5	6	"	7	"	8	"	12
Yard Trailer	Truktor Head	set	8	9	10	11	12	13	13	22
	Trailer Chassis	set	16	18	20	22	24	26	26	44
Highway Trailer Head	Truktor Head	set	3	3	4	6	10	11	14	32
	Trailer Chassis	set	6	6	8	12	20	22	28	64

3.2 Inland terminal

24. This item is described in Chapter 3.3.3.

3.3 Preliminary Design

3.3.1 Navigation Channel

(1) Frequency of ship calls

25. Based on the number of ship calls in the year 2003 estimated in previous Section "4.2.3 Rough Design", further determination was made on the frequency of ship calls. As shown in **Table 3.5**, two cases of navigation channel arrangement were compared i.e:

Case 1 : with additional navigation channel

Case 2 : without additional navigation channel

Table 3.5 Comparison of navigation channel arrangement

Case 1 : With additional channel

Type of ship	Forecasted number of ship calls in 2003 (call/year)	Number of trip/year		
		Center entrance channel (one way)	South channel (one way)	North channel (one way)
Ocean-going ships	740	740	740	0
Domestic ships	1490	1490	745	745
Passenger ships	500	500	500	0
Dry bulk carriers	48	48	0	48
Liquid bulk carr.	537	537	0	537
Total	3315	3515	1985	1330
Maximum average number of trips per day 1)	(trips/day)	23	13	9
Allocated time per ship 2)	(min./trip)	31	55	80
Required time per trip	1 N.Mile/4knots	15min./trip		

(Table 3.6: continued)
Case 2: Without additional channel

Type of ship	Forecasted number of ship calls in 2003 (call/year)	Number of trip/year		
		Center entrance channel (one way)	South channel (one way)	North channel (one way)
Ocean-going ships	740	1480	-	-
Domestic ships	1490	2980	-	-
Passenger ships	500	1000	-	-
Dry bulk carriers	48	96	-	-
Liquid bulk carr.	537	1074	-	-
Total	3595	6630	-	-
Maximum average number of trips per day 1)	(trips/day)	44	-	-
Allocated time per ship 2)	(min./trip)	16	-	-
Required time per trip	1 N.Mile/ 4knots	30min./trip		

Notes 1) Maximum average number of trips per day = [(Total) /300 days x c], where concentration ratio:c = 2
2) Allocated time per ship = [12 hours/day (day time) /trips/day]

26. The required time per trip in the above Table is considered as an average ship maneuvering time taken by arrival ship from the entrance of the navigation channel to the berth and vice-versa for departure ship.
Average ship speed in port basin and channel was considered to be 4 knots which was deemed as minimum required speed for rudder effects.

27. As can be seen in above Table, "Case 2: Without additional channel", the average allocated time per trip is 16 minutes/trip/ship which is less than required time of 30 minutes. In addition to the reasons which were discussed in previous section 4.2.3 of Part 1. "Master Plan" on the necessity of additional navigation channel in the view points of safety and efficiency, it is reiterated hereby that the additional channel is

necessary.

(2) Design of navigation channel

28. The general plan of proposed navigation channel is shown in **Fig. 3.6**. The dimensions of navigation channel are summarized below:

Width : 200 m
Depth : -11 m
Dredging slope : 1:5

29. The major considerations on the Study are enumerated hereunder:

a. Width of channel: see Part 1, 4.2.3 "Rough design of port facilities".

b. Depth of channel: see Part 1, 4.2.3 "Rough design of port facilities".

c. Dredging slope: Considering the sea-bed material consisting of soft silty/clayey fine sand, slope of 1:5 was recommended as maximum inclination.

d. In order to allow a self navigation of ships, the alignment of navigation channel was made to accommodate a radius of 3.5 L (where L = LOA: 200 m). (see **Fig.3.6**) In practice, Ujung Pandang Port adopted compulsory pilotage and tug boat services, the safety allowance of the navigation channel will be higher.

e. As shown in **Fig.3.6**, the south bound transition channel, between the center and south channels, has enough width to avoid collision with the ships alongside the New Hatta Quay and those moored at anchorage.

f. The clock-wise one way navigation system at New Hatta Quay is advantageous for those ships with right turning screw propeller, which is a majority of ordinary motor ships, for easier port-side berthing at the Quay by momentum of propeller effects.

g. As to the outer navigation channels which spread outside of the coral reefs of Ujung Pandang Port, all three navigation channels have ample space for

navigation in spite of the existence of many scattered small islands and shoals such as Samolona Island Taka Bako Shoals Kudingarenglompo Island and etc.

h. The dredging works are recommended to be carried out by a combination of a grab dredger and hopper barges with bottom doors instead of cutter suction dredger so as to mitigate the environmental impacts which might be caused by turbid water.

i. As shown in Part 1, Section 2.2.6, "Natural Conditions" of Master Plan, the sub soil consists of silty fine sand up to -15 to -20 m below LWS with N-value of 0 to 13, which is suitable to be dredged by a grab dredger.

(3) Sedimentation of navigation channel

a. Movement of sand by wave action

Critical water depth for sand movement of net transport of surface sediments was obtained through the following equation:

$$Yi = \alpha(Ho/Lo)(Lo/d)n,\ Yi = (H/Ho)^{-1} \sinh(2\pi hi/Lo)$$

where $n = 1/3, \alpha = 0.741$ are given by Sato and Tanaka
Offshore wave height : Ho= 1.1 m
Offshore wave length : Lo= 56 m
Particle size of seabed material : d= 0.0275 mm
Critical water depth for sand movement of net transport of surface sediment: hi

$hi/Lo = 0.17$ $hi = 9.52\ m < 11.0\ m$

The movement of seabed material by wave action will be minimal.

b. Movement of sand by current

30. As shown in Part 1, Section 2.2.6, "Natural conditions", the lower current at the entrance of proposed navigation channel was less than 0.2 m/sec (approx. 0.4 knot) in

majority and some maximum flow reached to 0.3 m/sec (approx. 0.6 knot), while the land side observation showed maximum current of 0.3 m/sec (approx. 0.6 knot) which flowed in the north-south direction parallel to the shore line. Considering that the current survey was conducted during spring tide, the influence of the current on the movement of seabed material is small.

31. The present conditions of Jene Berang River as a supply source of sediment was also determined, and concluded that the river sediment volume has a tendency to decrease, i.e:

i) The mouth of the river was recently transferred from 4 km to 8 km south-ward of Ujung Pandang Port by river diversion works.
ii) The river flow will be controlled by Bili Bili Dam which is under construction upstream, of approximately 30 km, from the mouth of the river.
iii) River bed was over excavated for the purpose of construction material collection which caused lowering of the river bed.

32. Although above determination shows minimal effects of sedimentation at the proposed navigation channel, further precise survey by using sand accretion catchment instrument is recommended. Some of marginal portions of the channel will not be avoidable of sediment of soil by pocket effects of dredged trench.

(4) Dredged soil dumping

33. In order to mitigate the possible impact on flora and fauna such as coral and other benthos and also on the fishery activities by turbid water of dredged soil, the soil dumping site was proposed at 15 km south-east of the Port at latitude 5°16'S and longitude 119°16'E where water depth is deeper than -30 m.

34. The source of the heavy metals content in seabed materials of dredging site was not detected during this reporting period. Further investigation and the pollution control on discharging heavy metal and other toxic materials, which are at quite high rates, are recommended.

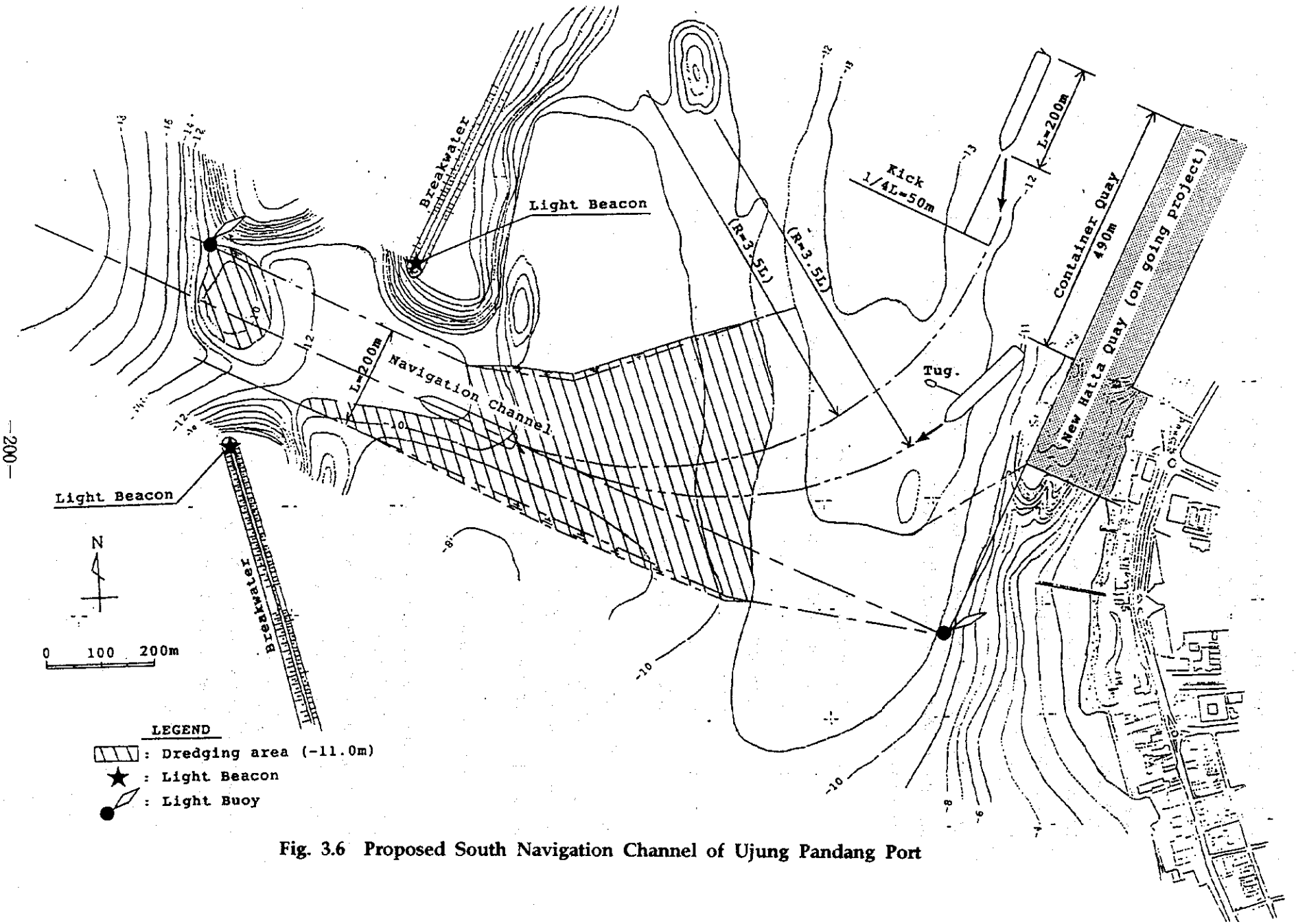


Fig. 3.6 Proposed South Navigation Channel of Ujung Pandang Port

(5) Navigation Aids

35. Two light beacons at the end of Breakwater, one light buoy at offshore end of navigation channel and another light buoy at the center of land-side end of Navigation channel are proposed.

(6) North channel

36. The north channel will be utilized mainly by bulk carriers, naval ships and some general cargo ships, hence it is out of scope of the Study on the Container Port. A confirmatory hydrographical survey on the channel area is, however, recommended, since the north channel area is naturally deep and it will allow the passage of larger size ships with minor improvement such as installation of aids to navigation. A review on the future development of Pertamina Oil Pier at Gosong Panyoa Reef with submarine pipe lines is also suggested, since the planned submarine pipe might prohibit the port development to the north.

3.3.2 Modification for Hatta Quay Construction Plan

37. As explained in Part 1 "4.2.1" Examination of facility layout, additional power supply, terminal control building at Hatta quay, rails for gantry cranes, and additional fence are provided for the new layout.

(1) Additional Electric Supply

38. In addition to the original power supply capacity for on-going Hatta Quay Project, an additional electric power supply for reefer container outlets, rail mounted gantry cranes and lighting for a part of the container yard are considered in this study.

39. It is assumed that the required electricity for the Hatta quay is received by the 20 kv line from the PLN (National electric company). A substation is provided for gantry cranes and reefer containers. The power lines for reefer container is derived through cable trench from the transformer connected line with the substation. The power line for the gantry cranes is derived through conduit or trench from the substation directly, and additional emergency generator for the gantry cranes and reefer containers is provided on the site. A cable trench for the rail mounted gantry cranes should be

provided under the on-going New Hatta Quay project.

40. Additional power demands for Hatta Quay are estimated as follows.

Rail Mounted Gantry Crane (35t)	: 3 unit x 750kw = 2,250 kw
Reefer Container Outlet	: 20 set for 40' x 11kw = 220 kw
	: 20 set for 20' x 8kw = 160 kw
Additional Lighting	: 2 tower x 10 light x 1kw = 20kw

Total Demands of the additional power supply = 2,650 kw
Additional substation capacity = 3,350 KVA
Additional emergency generator : 50% of the Rail mounted gantry cranes + 40% of Reefer containers demand= 1600 KVA =800KVA x 2 units.

(2) Terminal Control Building

41. The terminal control building is provided for the control of the marshaling containers directly from the control room in the building. The building is three (3) story reinforced concrete structure having a floor space of 600 m^2. This building comprises container terminal operators' office room (116 m^2), customs office room (50 m^2), workers' refreshment room (50 m^2), canteen and toilets, etc. The conceptual floor plans and elevation of this building are shown in **Fig.3.7**.

(3) Rails for the Gantry Cranes and Additional Yard Fencing

42. The rails for the gantry cranes is installed at the designated trench to be constructed under on-going New Hatta Quay project, and additional yard fencing is also installed along the boundary of empty container yard.

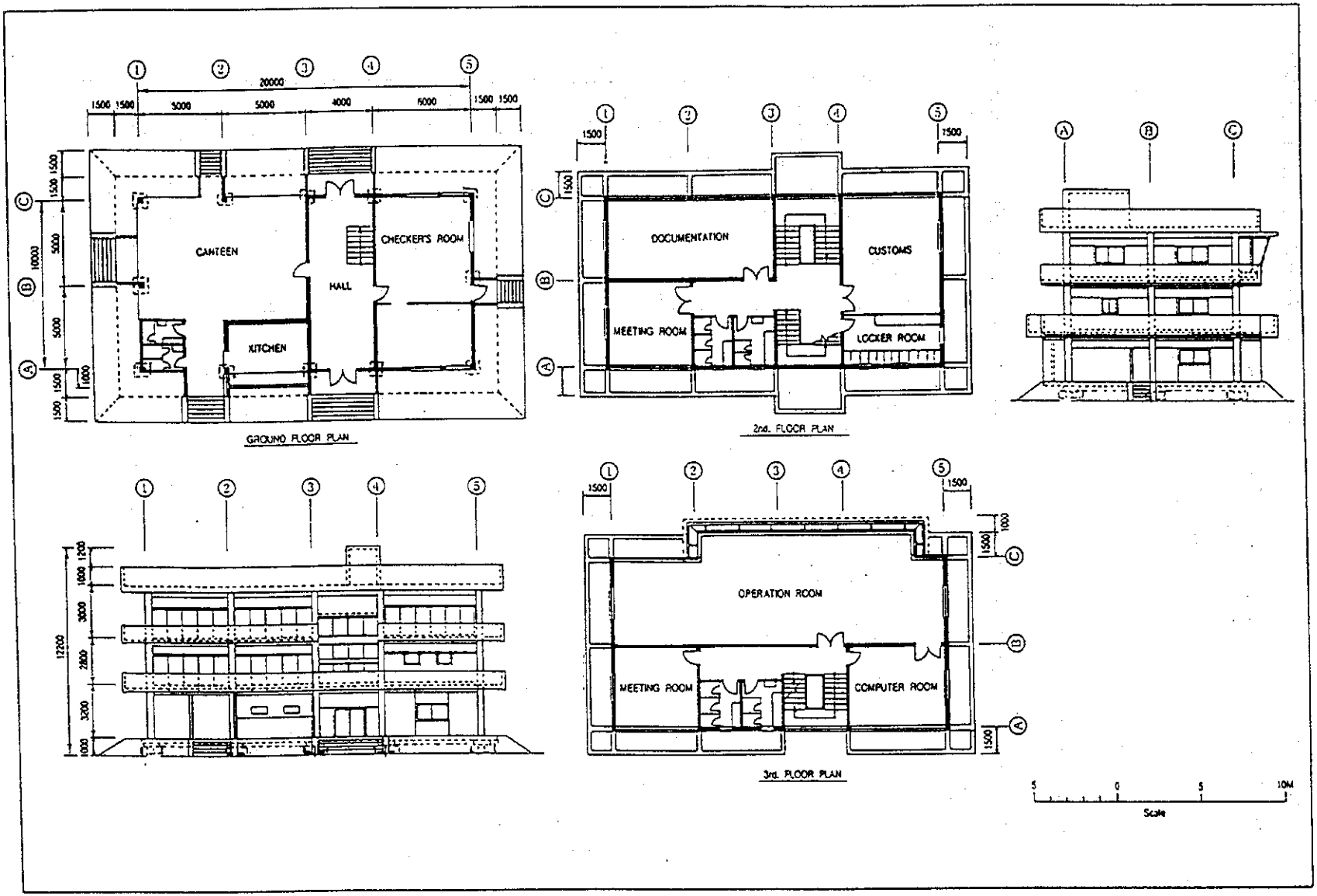


Fig. 3.7 Terminal Control Building

3.3.3 Inland Container Terminal (INCT)

(1) Yard layout

a. Required facilities

43. The scale of required facilities in the proposed INCT at Kel. Tallo are summarized in **Table 3.6**:

Table 3.6 Scale of proposed INCT (2003)

Descriptions	Quantities
Number of container ground slots	544 slots (TEU)
Container yard	27,000 m^2
CFS building	9,000 m^2
CFS trailer slots (sea-side)	8,250 m^2
CFS vehicle slots (land-side)	4,000 m^2
Handling equipment parking	3,100 m^2
Office and work shop area	3,900 m^2
Car parking	3,750 m^2
Circulation roads	19,400 m^2
Green area	8,500 m^2
Utilities	1 lot
Drainage	1 lot
Gate &fencing	1 lot
Revetment	635 m
Reclamation	199,000 m^3
Slope protection	565 m
Access road	150 m
Inter change to IRG(Inner Ring Road)	650 m
Cargo handling equipment	1 lot
Others	1 lot

b. Yard layout (see **Fig.3.8**)

44. Two container yards were arranged at sea-side in parallel with two CFS placed at land-side so as to allow future expansion of the Terminal eastward. For the location of CFS it was also considered to keep a distance from revetment so that the harmful saline effects on the cargo and building itself will be minimized. Each container yard has container ground slots consisted of (17 TEU x 2 rows x 8 wards =272 slots). General cargo trucks can enter CFS through land side slope of CFS for loading and unloading cargoes in the CFS. This will help to segregate those general cargo trucks from the container yard. The vanning/devanning of LCL cargoes will be made on the sea-side face of CFS through the platform. Although the container handling at container yard will be performed by top loader and/or reach stacker during short term stage, a surcharge load of 3 ton/m^2 was considered to allow for future expansion in which transtainer might be adopted. Considering the traffic flow volume within the Terminal, two lane circulation roads were arranged. At the marginal space of the Terminal, green area and tree planting were considered not only for the human amenity and environmental mitigation but also for the moderation of the saline effects and as a sea-wind-breaker.

c. Pavement

45. A concrete block pavement was recommended for the container yard and CFS trailer slots considering the future settlement of the reclamation yard and the container surcharge loads and live load of cargo handling equipment. The concrete tracks for the transtainer were not included in this stage. As for the CFS vehicle slots a concrete pavement was considered while circulation roads including access and interchanges would be paved by asphalt.

(2) Reclamation works

46. The existing ground configuration of proposed site of INCT located at east side of IKI (Indonesian Ship Industry) is gentle fine sand field with a ground elevation of +0.5 m to +1.9 m above LWS which is easy to reclaim by the end-dumping method.

a. Land reclamation

47. Considering the tide level (HWS +1.78 m), wave height (H1/3 = 0.8 m) and drainage thereof, the top elevation of the reclamation area is proposed to be +3.50 m. The sub-soil condition was assumed using the available data as shown in Section 2.2.6, "Natural conditions" of Master Plan. The sub-soil consists of stiff clayey silt with N-value of 9 to 15. A hard stratum consisting of sand stone is existing at -11 m to - 18 m. Judging from the soil characteristics, the consolidation settlement of the sub-soil is deemed to be minimal.

48. Dry fill materials were considered to mitigate the environmental impacts, instead of wet fill using sea-bed soil which will cause serious influence on not only local habitants but also on the flora and fauna such as mangrove trees and other benthos in the vicinity of project site with turbid water from filling soil. The dry fill materials will be transported by dump trucks from Cerekang located at 20 km east side of the reclamation site.

b. Slope protection

i) Revetment on north and east slopes:

49. In order to protect the reclamation area from scouring by wave and current, a trapezoidal rock mound type revetment will be constructed at the north and east end of reclamation area prior to the reclamation works. This will also help to avoid the leak of the turbid water and reclamation materials during the construction period. The seaside face of the revetment will be protected with armor rocks of approx. 0.5 ton/pc with an inclination of 1:2. The top elevation will be +3.5 m. The bottom elevation of the trapezoidal stone layer will be 0.0 m below LWS with sea bed excavation to avoid the scouring of the toe of slopes. The land side face and the bottom of the stone layer will be covered with filter fabric sheet to minimize the leak of reclamation materials. Stone materials are available at Kab. Pangkep 50 Km from the reclamation site. Since sedimentation is anticipated along the revetment, plantation of mangrove trees is recommended.

ii) Slope protection on south slope:

50. South boundary of INCT was kept a distance of approximately 50 m from existing shore line where mangroves are growing, to allow sea water circulation with

tide level changes. To help this function, concrete culverts were proposed underneath the access road. The south slope of reclamation area was proposed to be 1:5 inclination so that sudden steps toward land side will be avoided and easy to harmonize with existing land area. Tree planting was proposed on this slope.

(3) Access road

51. A traffic volume of 1,024 vehicle trips/day was forecasted to be generated by INCT as described in Section 4.2.3 "Rough design" of Master plan. The hourly volume "n" is estimated hereunder:

n = 1,024 vehicle trip/day / 24 hours x 3 (concentration ratio)
= 128 vehicles/hr

a. Access from existing IKI road to INCT

52. A four lane asphalt paved access road 150 m long was considered. The number of lanes was decided to moderate the congestion of container trailers in front of main gate located at the middle of the access road. Walkways are arranged on both sides of the access road. Concrete culverts were provided at the sea side end of the access road to allow sea water circulation.

b. Interchange between IKI road and Inner Ring Road

53. The proposed arrangement of interchanges is shown in **Fig.** 3.9 Since an overpass with total span of 73 m is existing as a part of the IKI road, four ground level interchanges connecting to Inner Ring Road were proposed. The existing overpass with two lanes 7.2 m wide road and 1.15 m side walk on both sides has a maximum loading capacity of 15 tons/axis. The proposed interchange is 4 m wide one lane asphalt paved road. Banking with shoulder and slope protection, guard rails, lighting, and drainage were considered. The minimum radius of 50 m is applied.

54. As for the interchange from IKI road to west bound Inner Ring Road, a new proposed merging ramp will be overlapping with Jasa Marga's planned transition lane which connects to the existing tollway (see **Fig.3.10**). A modification on Jasa Marga's transition lane to be shifted eastward is proposed.

55. The existing IKI road connecting between INCT and Inner Ring Road was deemed not necessary to widen in short term stage until the year 2003. A widening of IKI road, however, will be needed after 2003 for the long term stage.

(4) Building Construction

a. Import and Export CFS Sheds

56. As explained in the Short Term Plan, the total space for the import CFS and export CFS including a CFS in the Hatta Quay area is required to be 12,500 m^2. A CFS in the Hatta Quay has only an area of 4,000 m^2, so that the area of import CFS and export CFS in the inland terminal are required of 4,250 m^2 each.

57. One (1) import CFS shed and one (1) export CFS shed in the inland terminal are recommended to be built. Both CFS sheds have dimensions of 100 m in length and 45 m in width, with 6 m deep canopy on both sides. Each shed has an area of 600 m^2 for damaged and valuable cargo storage and 300 m^2 of operators' and customs office room. The floor level of the each shed are 1.3 m above ground elevation. One side of the CFS shed has a platform which is 4 m in width, 1.3 m height from the ground level in order to facilitate cargo handling from/to container on chassis and the other side of the CFS shed has a slope way for in-coming and out-going directly.

58. The sheds consists of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter doors, aluminum box-rib sheet roof with transparent PVC skylights and reinforced concrete floor slab. The columns of the sheds are supported by the reinforced concrete spread footing foundations directly, since sub-soil condition is sandy materials and stable for the building foundation. The floor plan and elevation plan of these sheds are shown in **Fig.3.11**

b. Work Shop and Garage

59. This work shop is planned mainly for repairing the forklifts, tractor heads, chassis and top loaders but also as the garage of the above mentioned equipment can be available. The work shop has a dimension of 30 m in length and 20 m in width. Spare parts storage, battery room and locker room for mechanics are provided in this shop. Minimum clear height inside the work shop is 6 m, and a 5 ton capacity hoist crane

is installed in the shop.

60. The shop consists of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter door, aluminum box-rib sheet with transparent PVC skylights and reinforced concrete slab. The columns of the shop is supported by the reinforced concrete foundations.

c. Terminal Office Building

61. Receiving and delivery control room and customs room is provided in the terminal office building. The building is a two (2) story reinforced concrete structure having a floor space of 400 m^2. This building comprises terminal control office room (100 m^2) and customs office room (50 m^2) in second floor, and comprises canteen and checker's room in ground floor.

62. Number of workers and space for rooms of this office were assumed as follows:

Number of workers for this building

Terminal Officer	:	12 persons
Custom Officer	:	6 persons
Worker (Checker)	:	10 persons

Space of rooms

Control office room	:	100 m^2 (0.12 person/m^2)
Customs office room	:	50 m^2 (0.12 person/m^2)
Workers room	:	50 m^2 (0.2 person/m^2)

63. The building is supported by reinforced concrete spread footing foundation, since sub-soil condition is good. The conceptual floor plans are shown in **Fig.3.12**

d. Utilities

i) Drainage System (Storm Water Drainage)

64. The drainage system is provided in inland container terminal. Storm water drainage is considered based on rainfall intensity and catchment area. The catchment area of the storm water is the only new reclamation area for the inland container terminal, since reclamation area is an independent area in the sea connected to the land

by an access road.

65. Main drainage lines are designed to divide into several areas with an under ground RC pipes line. Storm water is collected into main drainage lines by the concrete trenches installed in each area. Discharging volume of the storm water is calculated as follows.

$Qp = c \times Ip \times A$

Where c : Runoff coefficient = 0.9 (concrete block pavement)
Ip : Design rainfall intensity = 60 mm/hour
A : Catchment area = 8.5ha

Total Runoff is calculated as 1.28 m^3/sec

ii) Electricity

66. It is assumed that the required electricity for the consumption of inland container terminal will be received from the PLN (National electric company), since PLN has supplied electricity around the area, and has a substation nearby planned area of the inland container terminal.

67. The lighting system for the container yard, terminal roads, gate and parking areas, and the power supply system for CFS sheds, terminal office building, gate checking room, work shop and reefer container outlet are provided. Yard lighting is designed to be 2,000 w rainproof out door luminaries installed on steel structural towers 15 m high. The electricity is supplied by transformer and switch-gear in cubicles installed.

68. The electrical demands of each facilities are estimated as following **Table 3.7 and 3.8**

iii) Water Supply

69. Water supply for the inland container terminal is received from the PDAM (city water) pipe line (4") installed under the road in front of the planned area for inland container terminal.

Table 3.7 Unit Load of Power demands

Facility	Unit Load (VA/m2)				
	Lighting	Receptacles	Air-Con	Others	Total
Terminal Office Bldg	38	11	62.5	20	131.5
Gate Checking Room	38	11	86.5	20	131.5
Office Room in Work shop	38	11	62.5	20	131.5
Work Shop	21	11	-	20	52
Office Room in CFS	38	11	62.5	20	131.5
CFS Shed	6	11	-	20	46
Canteen	38	11	-	20	69
Parking Lot	2.5	-	-	-	2.5

Table 3.8 Power Load Estimates

Facility	Floor Area	Unit Load	Demand	Power Load		Particular	Total
	m2	VA/m2	Factor	(KVA)	(KW)	Factor	(KW)
Terminal Office Bldg	200	131.5	0.7	18.41	14.73		29.46
Gate Checking Room	7.5	131.5	0.7	0.69	0.55		0.55
Work Shop Office	100	131.5	0.7	9.21	7.36		7.36
Work Shop	500	52	0.6	15.60	12.48	100kw	112.48
CFS Office Room	160	131.5	0.7	14.73	11.78		11.78
CFS Shed	1340	46	0.6	36.98	29.59	8kw	37.59
Canteen	200	69	0.7	9.66	7.73		5.8
Parking and Road	25000	2.5	0.6	37.50	30.00		16.8
Container Yard	-	-	-	-	-	150kw	150
Inland Terminal Total							371.82

70. The water supply system is arranged for the CFS sheds, work shop, terminal office building equipment washing area and green belt. the fire hydrant system is also arranged for the CFS sheds, terminal office building and work shop. Demand for fire fighting and each facilities are estimated as follows.

Demand of Fire fighting :

Standard rate of discharge : 1 m^3/min/hydrant
Minimum supply pressure : 70 atm
Minimum diameter : 100mm
Hydrant Numbers conflagration : 3 numbers

71. Demand total for fire fighting : 3 x 1.0 m^3/min = 180ton/h

The maximum hourly demands of water supply for each facilities are shown in **Table 3.9.**

Table 3.9 Demands of water supply for each facilities

Facility	Assuumed Population	Unit Demand (m3/day)	Water (m3/day)	Particular Factor	Total (m3/day)
Terminal Office Bldg	28	0.1	2.8	1 m3/day	3.8
Work Shop	16	0.4	6.4	1 m3/day	7.4
CFS Sheds	50	0.1	5	1 m3/day	6.4
Canteen Employee	6	0.15	0.9		0.9
Visitor	50	0.04	2		6
Cleaning Equipment				3 m3/day	3
Total					27.5

Note : The total demand is not included in the water supply for fire fighting

72. Considering the present city water supply situation, the underground reservoir water tanks with pumps are installed for the water demands of the fire fighting and washing water for equipment. Reserved water for the fire fighting of 180 m^3 plus washing water of 5 m^3 =185 m^3 is reserved. Two (2) pumps for the fire fighting with the following capacity is provided.

Pump capacity for Fire fighting
Total Head : 90 m
capacity : 180 m^3/ hr

iv) Sewerage System

73. Waste water from buildings, office, canteen, and those toilets are to be discharged to the septic-tank and treated naturally. Therefore, the septic-tanks are installed for individual facilities, and their capacities calculated as in the following table 3-3-3(5).

Waste water volume :
Daily Sewage Flow (Qs)= 0.9 x Qw(m^3/day) --(Qw= water demand)
Infiltration (Qi)= 0.15 x Qs --(15% of daily sewage flow)
Maximum daily sewage flow (Qmax)= Qs+Qi
Average daily sewage flow (Qave)= 0.8 x Qmax
Peak sewage flow (Qpea)= 1.5 x Qmax /24 (m^3/hr)

Table 3.10 Sewage volume of each facility

Facility	Water Demand m3/day	Sewage Flow m3/day	Infilt-ration m3/day	Max Sewage m3/day	Average Sewage m3/day	Peak Sewage m3/hr
Terminal Office Bldg	3.8	3.42	0.51	3.93	3.15	0.25
Work shop	7.4	6.66	1.00	7.66	6.13	0.48
CFS Sheds	6.4	5.76	0.86	6.62	5.30	0.41
(Canteen)	0.9	0.81	0.12	0.93	0.75	0.06
Total	18.50	16.65	2.50	19.15	15.32	1.20

v) Communication System

74. Telecommunication network in the inland container terminal is provided and is connected to the Administration and control offices of Hatta Quay.

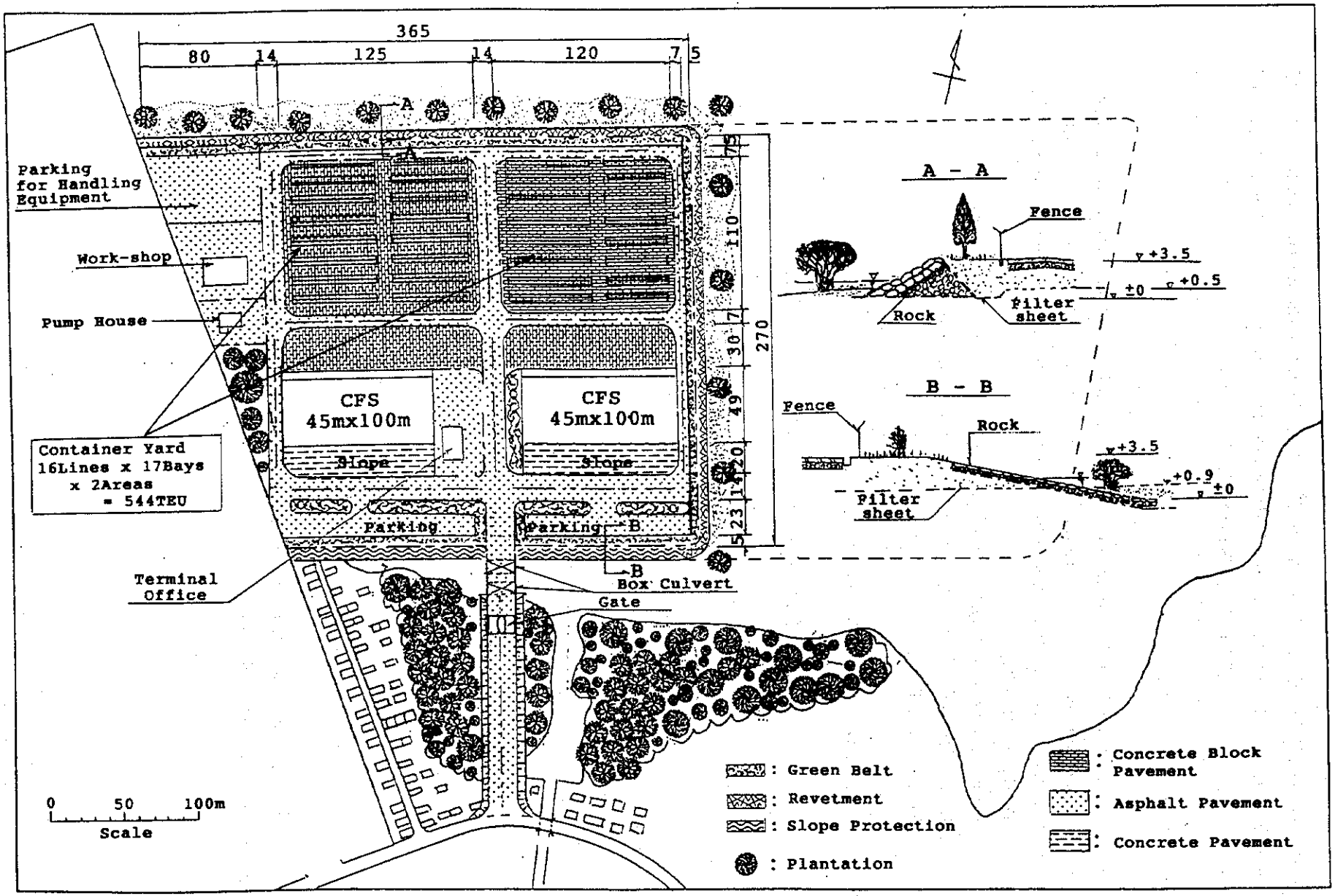


Fig. 3.8 Layout Plan of Inland Container Terminal (2003)

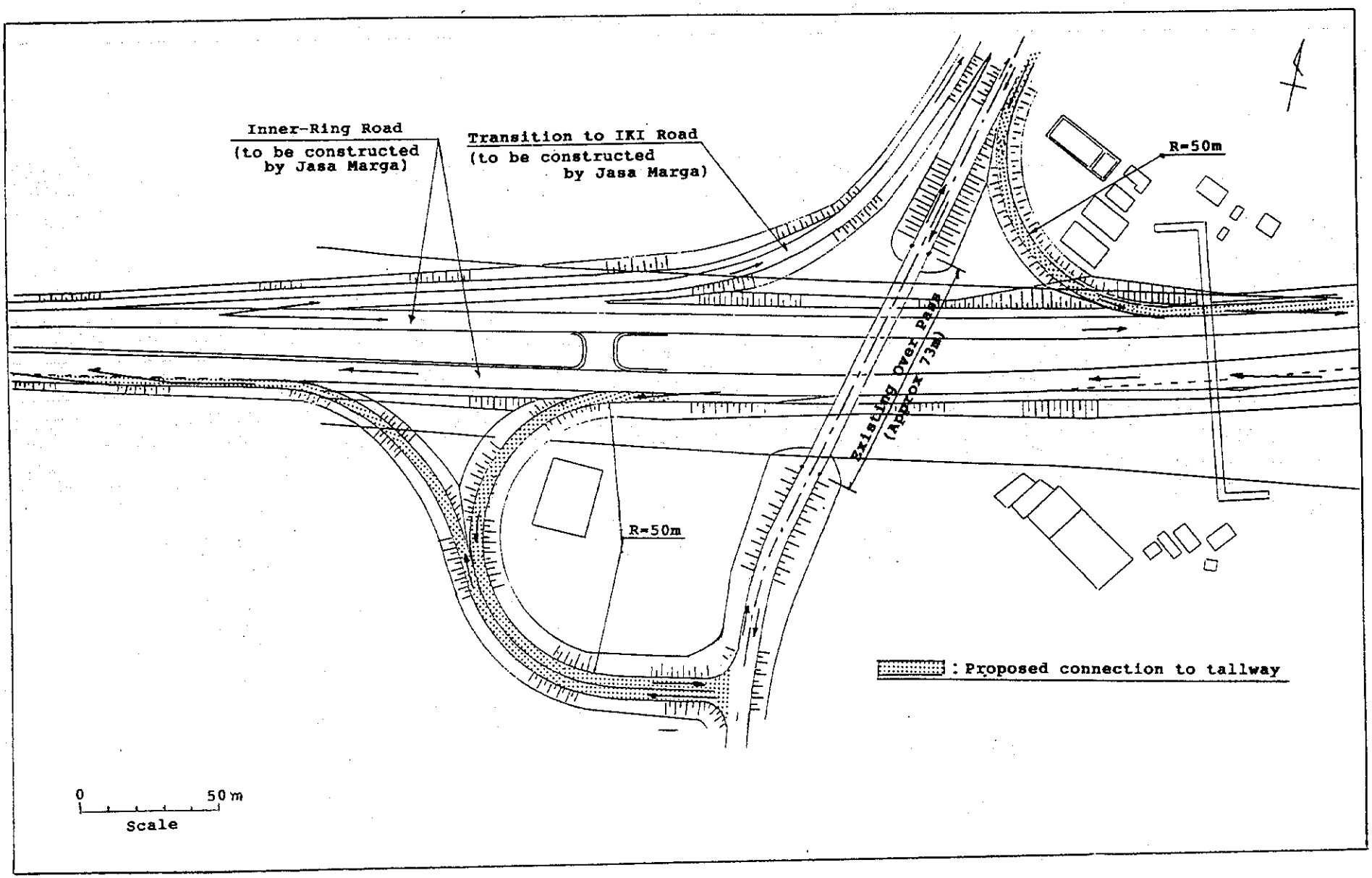


Fig. 3.9 Arrangement of Interchange at Inner-Ring Road (1)

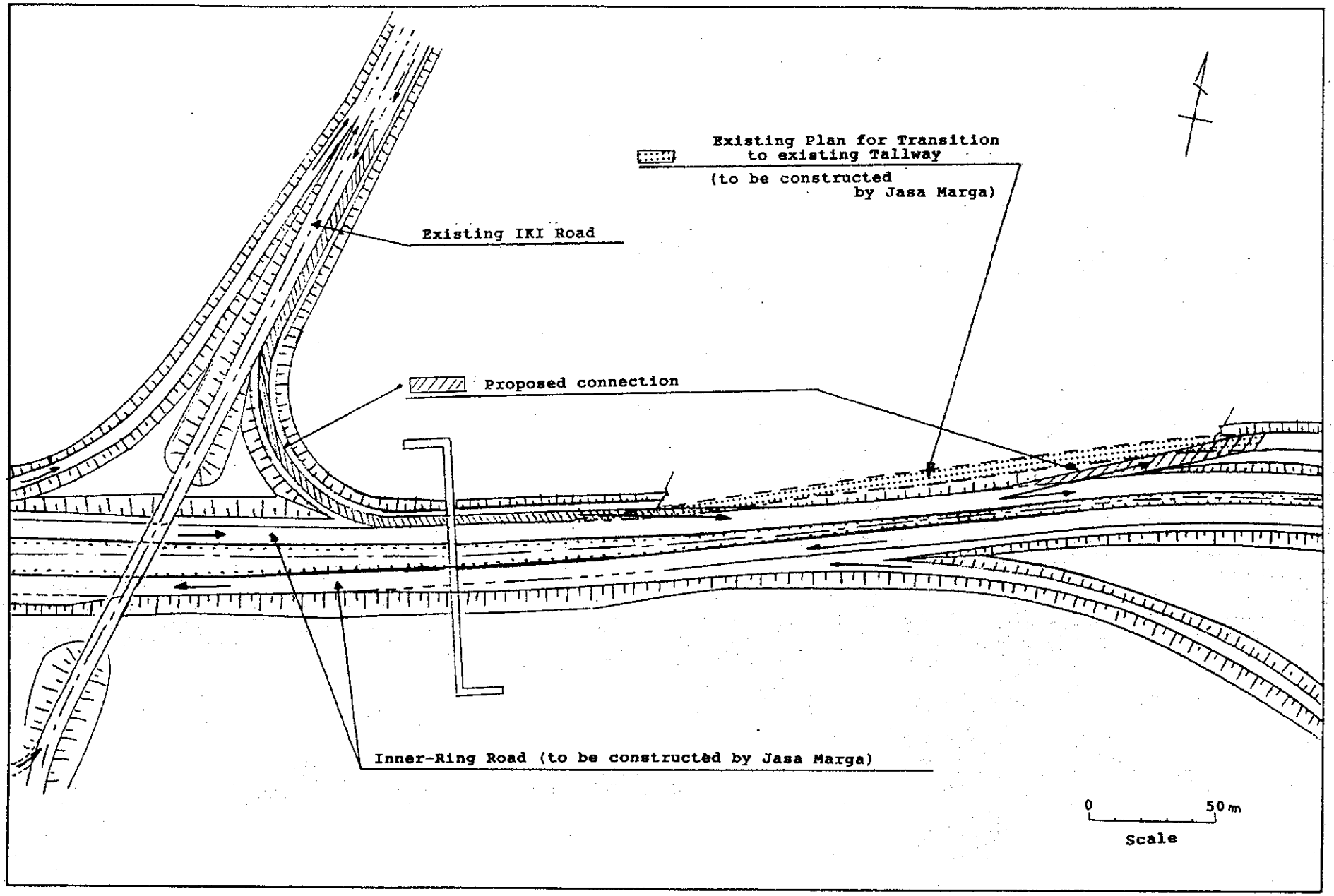


Fig. 3.10 Arrangement of Interchange at Inner-Ring Road (2)

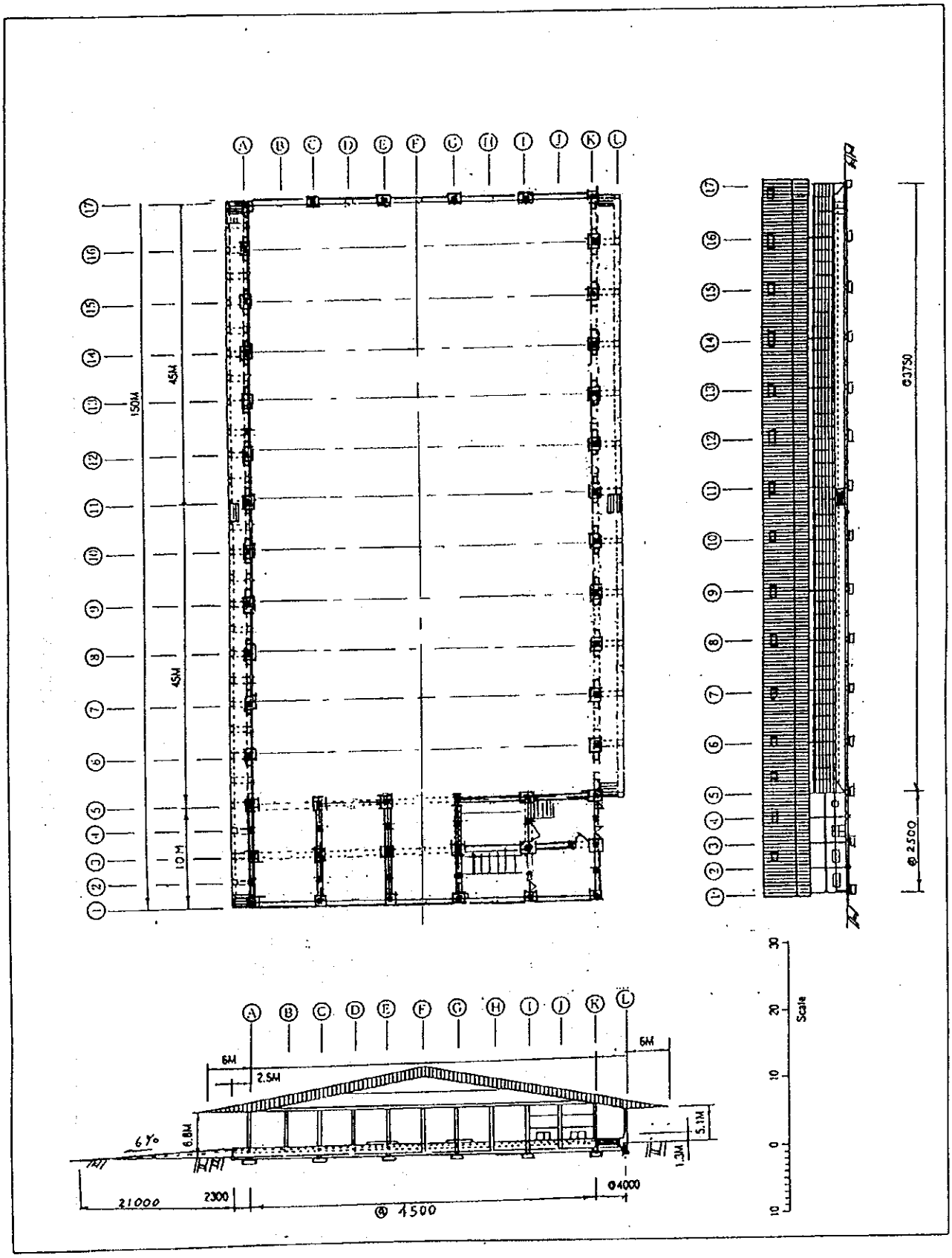


Fig. 3.11 Import / Export CFS Shed

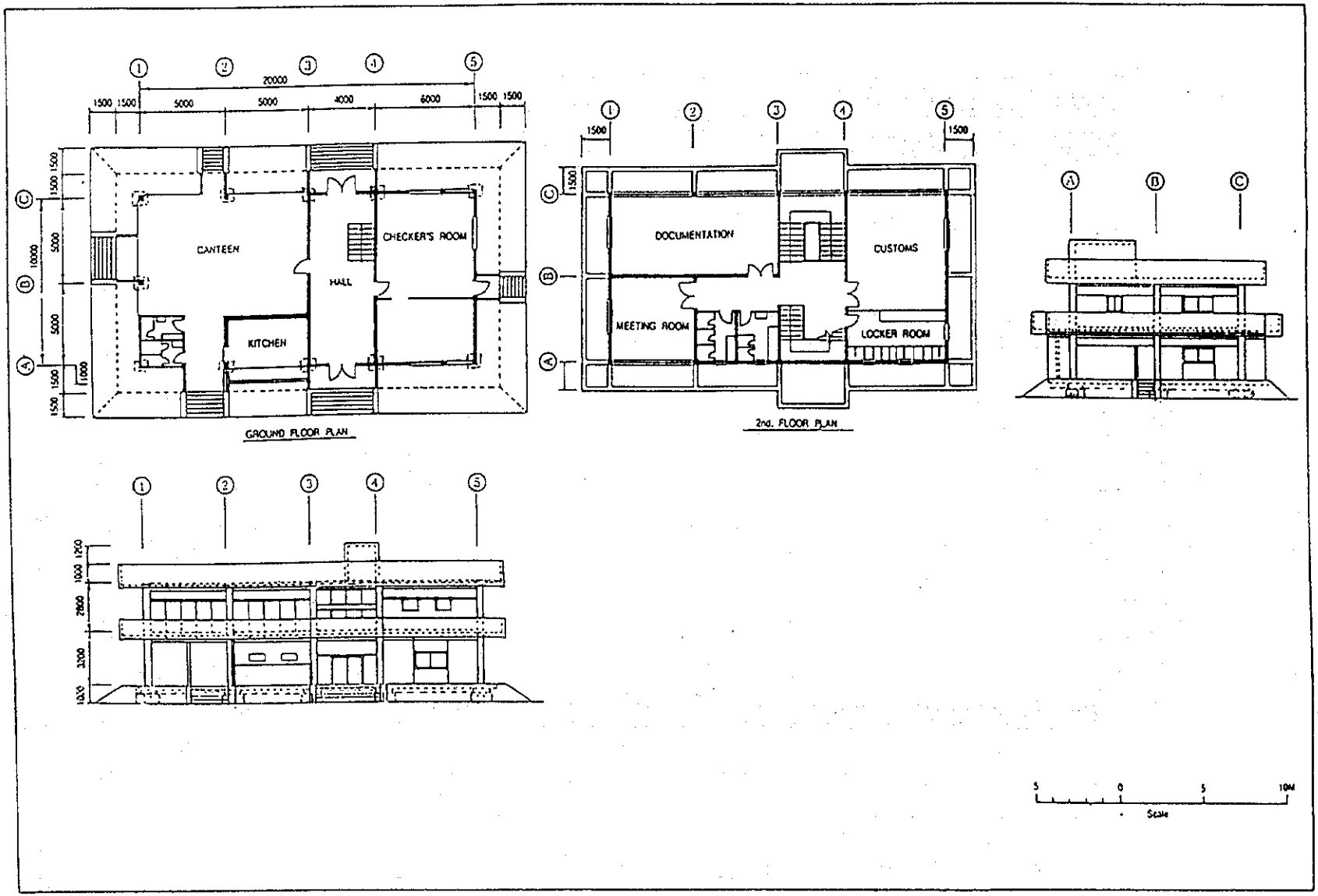


Fig. 3.12 Terminal Office Building

(5) Container Handling Equipment

75. Technical specifications of the container handling equipment for the Short Term Plan is determined based on the design report of the New Hatta Quay Project (Urgent Rehabilitation Project) as summarized in **Table 3.11** However, according to the report, the electric supply for the operation of rail mounted gantry crane was planned to be provided by diesel engine generator installed on the individual cranes. As the situation of the electric supply by the PLN (national electric company), the electricity for the gantry cranes should be supplied by PLN back up by emergency generators. Preliminary general arrangement of the rail mounted gantry crane and the rubber tired gantry crane is shown in **Fig.3.13** and **3.14**

Table 3.11 Specifications of Container Handling Equipment

Equipment	Specifications	
	Description	Capacity
1. Rail Mounted Gantry Crane	Rail Gauge Rated Capacity Hoisting capacity Out Reach Back Reach	: 15.24 m (50 ft) : 30.5 ton : 47 ton (heavy lift) : 35 m : 11 m
2. Rubber Tired Gantry Crane	Span of Tires Capacity	: 23.47 m : 20′~40′ 1 over 4
3. Top loader	Capacity	: 20′~40′ 1 over 3
4. Chassis	Capacity	: 20′~40′
5. Truck	Capacity	: 20 ton
6. Trailer	Capacity	: 42 ton max

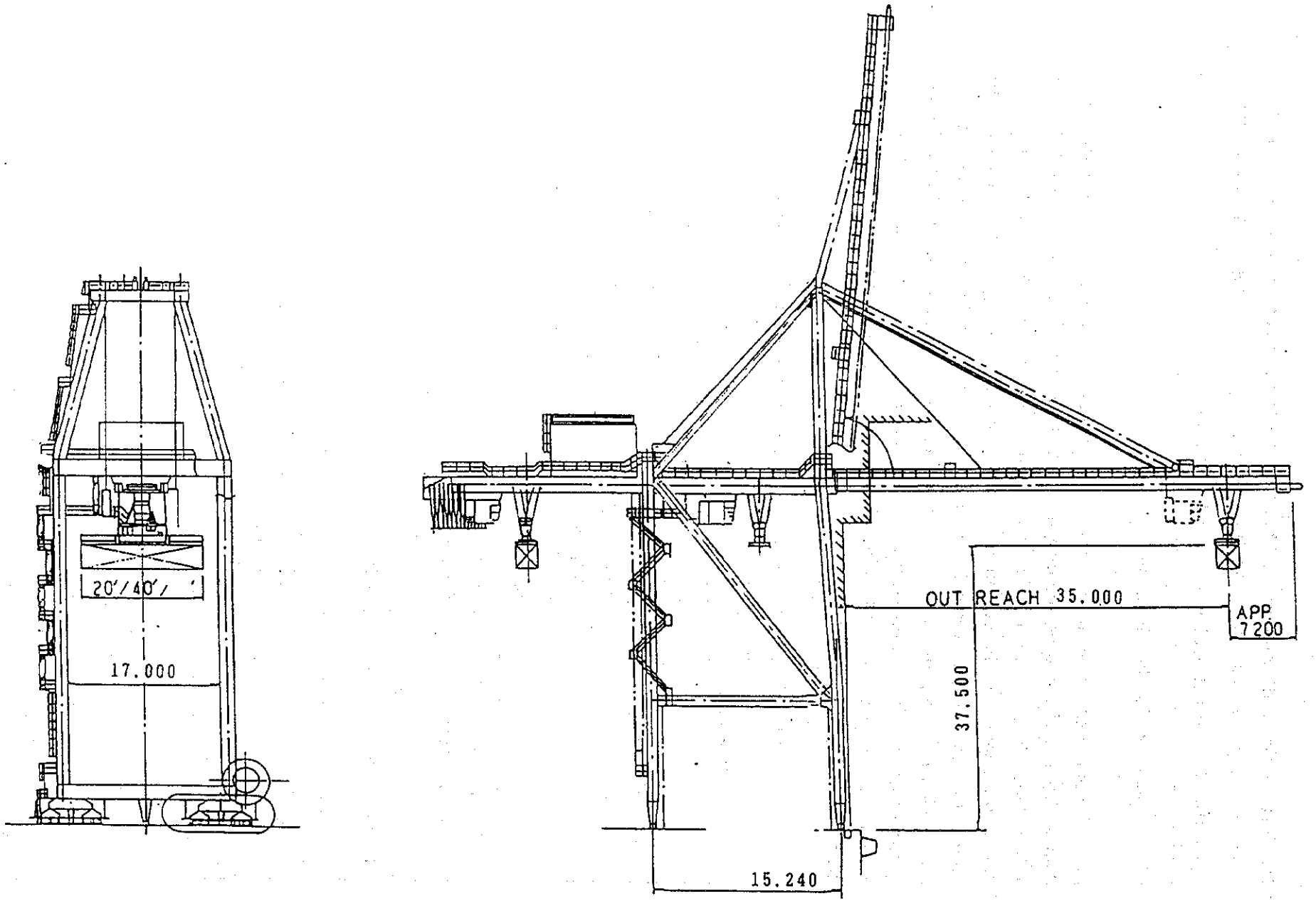


Fig. 3.13 Rail Mounted Gantry Crane

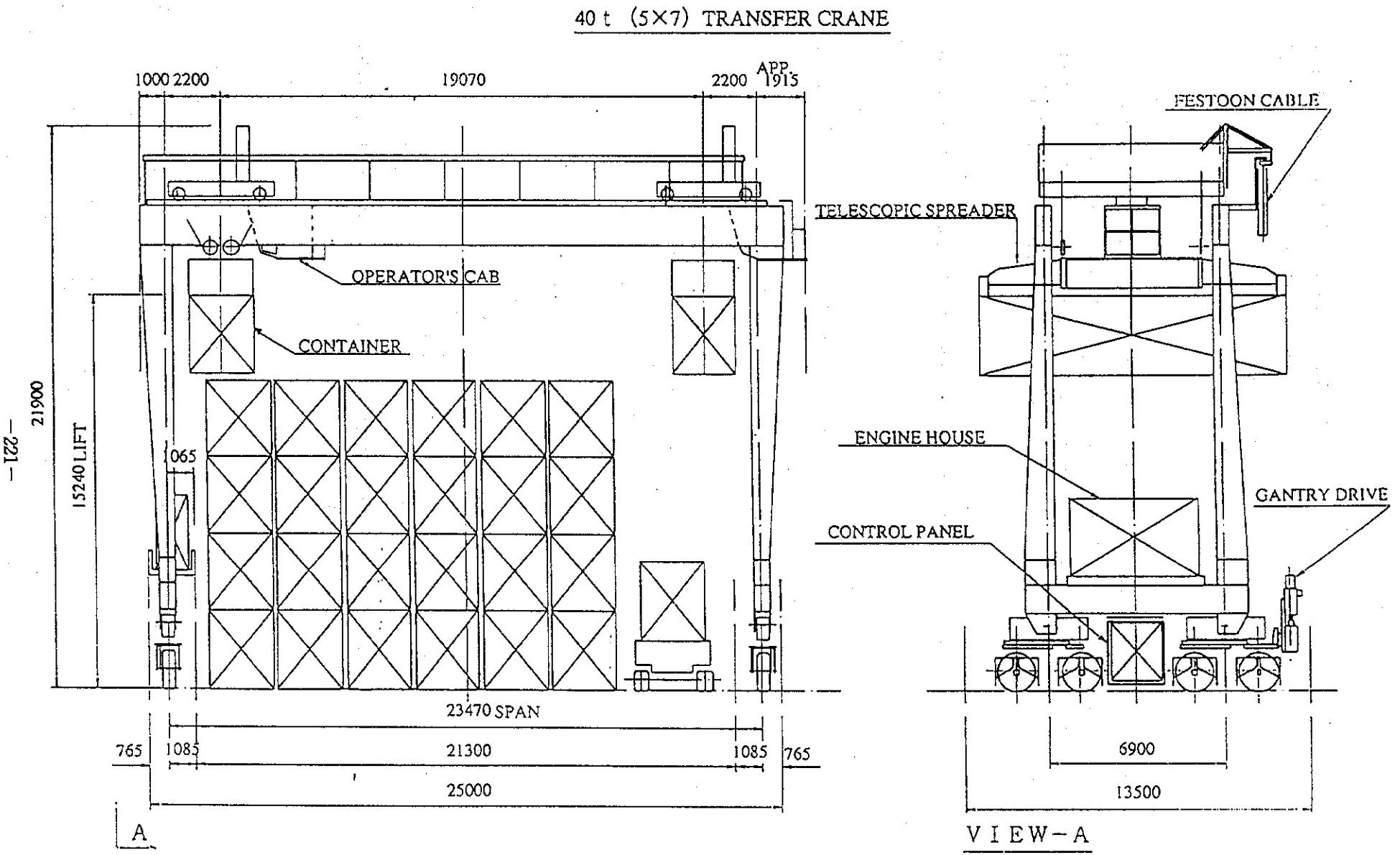


Fig. 3.14 Rubber Tired Gantry Crane

3.4 Implementation Plan

76. The project implementation schedule is considered for the preparing period until the end of 1997, such as the site investigation and the basic/ detail design for the project, etc. After the preparing period, the commencement of the construction works and installation of the container handling equipment are considered based on the requirement in the year 2003.

77. In preparing the construction schedule the following technical assumptions are applied.

(1) Working days considered in schedule
The number of working days considered in the schedule are every day except Sunday, National Holidays and rainy days.

(2) The productivity of the reclamation by mountain soil.
Reclamation : 900 m^3 / day
Compaction : 900 m^3 / day

(3) The productivity of the Dredging and disposal by grave dredger
Dredging and disposal : 1800 m^3 /day

(4) The productivity of the concrete work
RC Beam and Column : 20 m^3 / day
RC Slab : 80 m^3/ day

(5) The productivity of pavement
Concrete Block Pavement : 30 m^3 / day /party
Concrete Pavement : 100 m^3 / day /party
Asphalt pavement : 250 m^3 / day /party

78. Based on the above assumptions and considerations, the prospective construction schedule is prepared as shown in **Fig.3.15.**

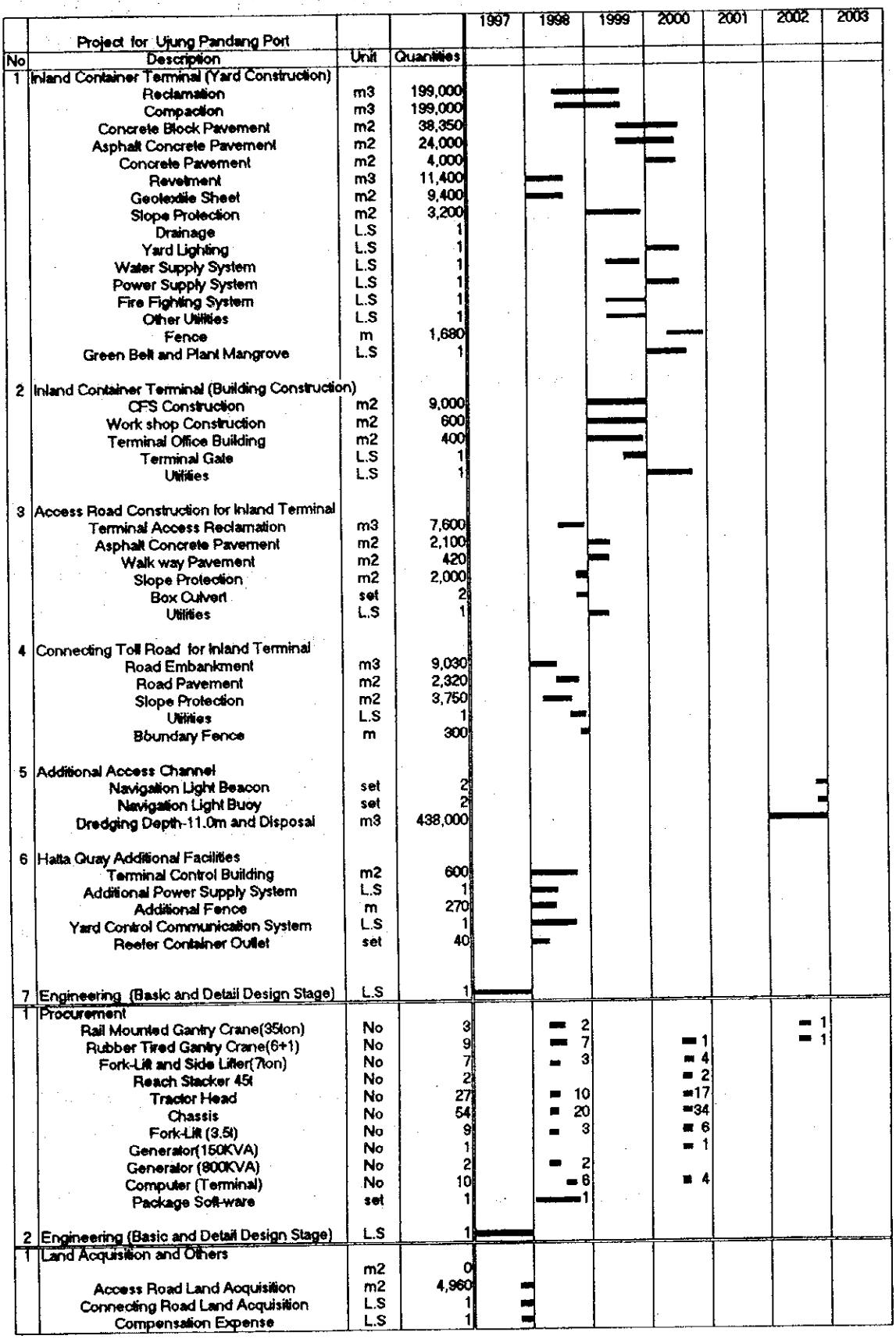


Fig. 3.15 Project Implementation Schedule

3.5 Cost Estimation

79. The project cost for the Ujung Pandang Port is estimated based on the Short-Term Plan, the basic assumption for the cost estimation is shown as follows.

1) Unit Price and Exchange Rate

80. The project costs are estimated based on the unit price as of May, 1994 and the foreign currency exchange rate of US$ = 2,134 Rupiah = 105.85 Yen as of May, 1994.

2) Construction Cost

81. The construction cost is estimated based on the results of the quantities and the unit price for the construction works. The unit price was obtained by accumulating labour cost with income-tax, material cost, equipment cost, relating temporary works including mobilization /demobilization, indirect cost, overheads and profit.

3) Procurement Cost

82. The procurement unit prices are determined based on the imported CIF Jakarta prices excluding Indonesian taxes and duties. The installation costs are including in the individual unit price of items and costs of spare parts for two years. The procurement of the computer facilities including package soft-ware are determined for additional terminals of New Hatta Quay and package soft-ware for container yard planning and control in Hatta Quay only. It is assumed that the main control system and facilities will be procured and function by 1997.

4) Project Cost

83. In addition to the construction cost and procurement cost, the engineering fee, the physical contingency and VAT (value added tax) are estimated in this study. However, the contingency for price escalation is not included in this project cost. The **Table 3.12** shows the summary of project costs for the Short Term Plan of the Ujung Pandang Port.

5) Foreign and Local Currency Components

84. The project cost was split into foreign and local currency portions, both indicated in Rupiah, estimated in the following classifications.

(1) Foreign Currency Components
- Imported construction materials.
- Foreign components of depreciation and operating/ material cost of construction equipment and plant.
- Foreign components of domestic materials.
- Salaries and costs of foreign personnel.

(2) Local Currency Components
- Local construction materials.
- Local components of depreciation and operating/ material cost of construction and plant.
- Salaries and costs of local personnel.
- Import duties on imported materials.
- Indonesian taxes.

85. The foreign and local currency costs of the project are presented in **Table 3.13**

6) Annual disbursement schedule for the project

86. The annual disbursement schedule is estimated based on the project implementation schedule, and presented in **Table 3.14.**

Table 3.12 Summary of Project Cost for The Short Term Plan

	Project Cost for Ujung Pandang Port				
No	Description	Unit	Quantities	Unit Price	Cost
1	Inland Container Terminal (Yard Construction)				Million Rp
	Reclamation	m3	199,000	23,000	4,577
	Compaction	m3	199,000	3,000	597
	Concrete Block Pavement	m2	38,350	60,000	2,301
	Asphalt Concrete Pavement	m2	24,000	50,000	1,200
	Concrete Pavement	m2	4,000	60,000	240
	Revetment	m3	11,400	45,000	513
	Geotextile Sheet	m2	9,400	6,000	56
	Slope Protection	m2	3,200	53,000	170
	Drainage	L.S	1		430
	Yard Lighting	L.S	1		850
	Water Supply System	L.S	1		50
	Power Supply System	L.S	1		300
	Fire Fighting System	L.S	1		200
	Other Utilities	L.S	1		140
	Fence	m	1,680	170,000	286
	Green Belt and Plant Mangrove	L.S	1		150
	Sub-Total				12,080
2	Inland Container Terminal (Building Construction)				
	CFS Construction	m2	9,000	550,000	4,950
	Work shop Construction	m2	600	600,000	360
	Terminal Office Building	m2	400	600,000	240
	Terminal Gate	L.S	1	80,000,000	80
	Utilities	L.S	1		250
	Sub-Total				5,880
3	Access Road Construction for Inland Terminal				
	Terminal Access Reclamation	m3	7,600	26,000	198
	Asphalt Concrete Pavement	m2	2,100	50,000	105
	Walk way Pavement	m2	420	20,000	8
	Slope Protection	m2	2,000	8,000	16
	Box Culvert	set	2	50,000,000	100
	Utilities	L.S	1		40
	Sub-Total				467
4	Connecting Toll Road for Inland Terminal				
	Road Embankment	m3	9,030	26,000	235
	Road Pavement	m2	2,320	50,000	116
	Slope Protection	m2	3,750	8,000	30
	Utilities	L.S	1		150
	Boundary Fence	m	300	170,000	51
	Sub-Total				582
5	Additional Access Channel				
	Navigation Light Beacon	set	2	140,000,000	280
	Navigation Light Buoy	set	2	85,000,000	170
	Dredging Depth-11.0m and Disposal	m3	438,000	11,000	4,818
	Sub-Total				5,268
6	Hatta Quay Additional Facilities				
	Terminal Control Building	m2	600	600,000	360
	Additional Power Supply System	L.S	1		1,000
	Additional Fence	m	270	170,000	46
	Yard Control Communication System	L.S	1		200
	Reefer Container Outlet	set	40	750,000	30
	Sub-Total				1,636
	Total Cost .				25,892
	Physical Contingency	%	10		2,589
	Engineering Fee	%	10		2,589
	VAT	%	10		3,107
	Total Construction Cost				34,177

No	Description	Unit	Quantities	Unit Price	Cost
1	Procurement				Million Rp
	Rail Mounted Gantry Crane(35ton)	No	3	11,500,000,000	34,500
	Rubber Tired Gantry Crane(6+1)	No	9	3,800,000,000	34,200
	Fork-Lift and Side Lifter(7ton)	No	7	141,000,000	987
	Reach Stacker 45t	No	2	1,250,000,000	2,500
	Tractor Head	No	27	200,000,000	5,400
	Chassis	No	54	50,000,000	2,700
	Fork-Lift (3.5t)	No	9	90,000,000	810
	Generator(150KVA)	No	1	110,000,000	110
	Generator (400KVA)	No	2	400,000,000	800
	Computer (Terminal)	No	10	20,000,000	200
	Package Soft-ware	set	1	1,450,000,000	1,450
	Sub-Total				83,657
	Physical Contingency	%	0		0
	Engineering Fee	%	3		2,510
	VAT	%	10		8,617
	Procurement Cost Total				94,783
1	Land Acquisition and Others				
		m2	0	0	0
	Access Road Land Acquisition	m2	4,980	20,000	99
	Connecting Road Land Acquisition	m2	0	50,000	0
	Compensation Expense	L.S	1		50
	Other Expense		0	0	0
	Sub-Total				149
	VAT	%	10		15
	Land Acquisition Total				164
	Total Project Cost				129,125

Table 3.13 Foreign and Local Currency Portion of the Project Cost

No	Project Cost for Ujung Pandang Port Description	Unit	Quantities	Market Price Cost	Foreign Portion Million Rp	Local Portion Million Rp
1	Yard Construction			Million Rp		
	Reclamation	m3	199,000	4,577	2,288	2,289
	Compaction	m3	199,000	597	358	239
	Concrete Block Pavement	m2	38,350	2,301	1,151	1,150
	Asphalt Concrete Pavement	m2	24,000	1,200	840	360
	Concrete Pavement	m2	4,000	240	144	96
	Revetment	m3	11,400	513	251	262
	Geotextile Sheet	m2	9,400	56	53	3
	Slope Protection	m2	3,200	170	94	76
	Drainage	LS	1	430	280	150
	Yard Lighting	LS	1	850	723	127
	Water Supply System	LS	1	50	28	22
	Power Supply System	LS	1	300	285	15
	Fire Fighting System	LS	1	200	140	60
	Other Utilities	LS	1	140	112	28
	Fence	m	1,680	286	215	71
	Green Belt and Plant Mangrove	LS	1	150	30	120
	Sub-Total			12,060	6,992	5,068
2	Building Construction					
	CFS Construction	m2	9,000	4,950	2,970	1,980
	Work shop Construction	m2	600	360	216	144
	Terminal Office Building	m2	400	240	132	108
	Terminal Gate	LS	1	80	44	36
	Utilities	LS	1	250	188	62
	Sub-Total			5,880	3,550	2,330
3	Access Road Construction					
	Terminal Access Reclamation	m3	7,600	198	109	89
	Asphalt Concrete Pavement	m2	2,100	105	74	31
	Walk way Pavement	m2	420	8	6	2
	Slope Protection	m2	2,000	16	3	13
	Box Culvert	set	2	100	55	45
	Utilities	LS	1	40	28	12
	Sub-Total			467	275	192
4	Connecting Toll Road					
	Road Embankment	m3	9,030	235	122	113
	Road Pavement	m2	2,320	116	81	35
	Slope Protection	m2	3,750	30	6	24
	Utilities	LS	1	150	120	30
	Boundary Fence	m	300	51	38	13
	Sub-Total			582	368	214
5	Additional Access Channel Dredging					
	Navigation Light Buoy	set	2	170	167	3
	Navigation Light Beacon	set	2	280	266	14
	Dredging Depth-11.0m and Disposal	m3	438,000	4,818	3,854	964
	Sub-Total			5,268	4,287	981
6	Hatta Quay Additional Facilities					
	Terminal Control Building	m2	600	360	198	162
	Additional Power Supply System	LS	1	1,000	900	100
	Additional Fence	m	270	46	35	12
	Yard Control Communication System	LS	1	200	190	10
	Reefer Container Outlet	set	40	30	21	9
	Sub-Total			1,636	1,344	293
	Total Cost .			25,892	16,815	9,077
	Physical Contingency	%	10	2,589	1,681	908
	Engineering Fee	%	10	2,589	2,000	589
	VAT	%	10	3,107	0	3,107
	Total Construction Cost			34,177	20,496	13,681

	Project Cost for Ujung Pandang Port			Market Price	Foreign Portion	Local Portion
	Description	Unit	Quantities	Cost	Million Rp	Million Rp
1	Procurement					
	Rail Mounted Gantry Crane(35ton)	No	3	34,500	34,500	0
	Rubber Tired Gantry Crane(6+1)	No	9	34,200	34,200	0
	Fork-Lift and Side Lifter(7ton)	No	7	987	987	0
	Reach Stacker 45t	No	2	2,500	2,500	0
	Tractor Head	No	27	5,400	5,400	0
	Chassis	No	54	2,700	2,700	0
	Fork-Lift (3.5t)	No	9	810	810	0
	Generator(150KVA)	No	1	110	110	0
	Generator (800KVA)	No	2	800	800	0
	Computer (Terminal)	No	10	200	200	0
	Package Soft-ware	set	1	1,450	1,450	0
	Sub-Total			83,657	83,657	0
	Physical Contingency	%	0	0	0	0
	Engineering Fee	%	3	2,510	2,259	251
	VAT	%	10	8,617	0	8,617
	Procurement Cost Total			94,784	85,916	8,868
1	Land Acquisition and Others					
		m2	0	0		
	Access Road Land Acquisition	m2	4,960	99	0	99
	Connecting Road Land Acquisition	m2	0	0	0	0
	Compensation Expense	LS	1	50	0	50
	Other Expense		0	0		
	Sub-Total			149		149
	VAT	%	10	15	0	15
	Land Aquisition Total			164		164
	Total Project Cost			129,125	106,412	22,713

Table 3.14 Annual Disbursement Schedule of the Project Cost

No	Year / Project Cost for Ujung Pandang Port / Description	1997 Million Rp F	1997 L	1997 T	1998 Million Rp F	1998 L	1998 T	1999 Million Rp F	1999 L	1999 T	2000 Million Rp F	2000 L	2000 T	2001 F	2001 L	2001 T	2002 F	2002 L	2002 T	Total Million Rp
1	Yard Construction																			4,577
	Reclamation				1,525	1,526	3,051	763	763	1,526										597
	Compaction				239	159	398	119	80	199	384	383	767			0			0	2,301
	Concrete Block Pavement						0	767	767	1,534	280	120	400			0			0	1,200
	Asphalt Concrete Pavement						0	560	240	800	144	96	240			0			0	240
	Concrete Pavement						0			0			0			0			0	513
	Revetment				251	262	513			0			0			0			0	56
	Geotextile Sheet				53	3	56			0			0			0			0	170
	Slope Protection						0	94	76	170			0			0			0	430
	Drainage				280	150	430			0			0			0			0	850
	Yard Lighting						0			0	723	127	850			0			0	50
	Water Supply System						0	28	22	50			0			0			0	300
	Power Supply System						0			0	285	15	300			0			0	200
	Fire Fighting System						0	140	60	200			0			0			0	140
	Other Utilities						0	56	14	70	56	14	70			0			0	286
	Fence						0			0	215	71	286			0			0	150
	Green Belt and Plant Mangrove						0			0	30	120	150			0			0	
2	Building Construction																			4,950
	CFS Construction						0	2,970	1,980	4,950			0			0			0	360
	Work shop Construction						0	216	144	360			0			0			0	240
	Terminal Office Building						0	132	108	240			0			0			0	80
	Terminal Gate						0	44	36	80			0			0			0	250
	Utilities						0			0	188	62	250			0			0	
3	Access Road Construction																			198
	Terminal Access Reclamation				109	89	198			0			0			0			0	105
	Asphalt Concrete Pavement						0	74	31	105			0			0			0	6
	Walk way Pavement						0	6	2	8			0			0			0	16
	Slope Protection				3	13	16			0			0			0			0	100
	Box Culvert				55	45	100			0			0			0			0	40
	Utilities						0	28	12	40			0			0			0	
4	Connecting Toll Road and Widening Access																			235
	Road Embankment				122	113	235			0			0			0			0	116
	Road Pavement				81	35	116			0			0			0			0	30
	Slope Protection				6	24	30			0			0			0			0	150
	Utilities				120	30	150			0			0			0			0	51
	Boundary Fence				38	13	51			0			0			0			0	
5	Additional Access Channel Dredging																			170
	Navigation Light Buoy						0			0			0			0	167	3	170	170
	Navigation Light Beacon						0			0			0			0	266	14	280	280
	Dredging Depth-11.0m and Disposal						0			0			0			0	3,854	964	4,818	4,818
6	Hatta Quay Additional Facilities																			360
	Terminal Control Building				198	162	360			0			0			0			0	1,000
	Additional Power Supply System				900	100	1,000			0			0			0			0	46
	Additional Fence				35	11	46			0			0			0			0	200
	Yard Control Communication System				190	10	200			0			0			0			0	30
	Reefer Container Outlet				21	9	30			0			0			0			0	
	Total Cost				4,226	2,754	6,980	5,997	4,335	10,332	2,305	1,008	3,313	0	0	0	4,287	981	5,268	25,893
							0			0			0							0
	Physical Contingency				423	275	698	600	434	1,033	231	101	331	0	0	0	429	98	527	2,585
	Engineering Fee	1,000	300	1,300	300	80	380	300	80	380	200	79	279	0	0	0	200	50	250	2,589
	VAT	0	130	130	0	806	806	0	1,175	1,175	0	392	392	0	0	0	0	604	604	3,107
	Total Construction Cost	1,000	430	1,430	4,949	3,915	8,864	6,897	6,023	12,920	2,736	1,580	4,316	0	0	0	4,916	1,734	6,649	34,178
							0			0			0							0
1	Procurement						0			0			0							
	Rail Mounted Gantry Crane(35ton)	7,600	0	7,600	15,400	0	15,400	0	0	0	0	0	0	3,800	0	3,800	7,700	0	7,700	34,500
	Rubber Tired Gantry Crane(6+1)	8,800	0	8,800	17,800	0	17,800	1,260	0	1,260	2,540	0	2,540	1,260	0	1,260	2,540	0	2,540	34,200
	Fork-Lift and Side Lifter(7ton)	141	0	141	282	0	282	188	0	188	376	0	376			0			0	987
	Reach Stacker 45t			0			0	830	0	830	1,670	0	1,670			0			0	2,500
	Tractor Head	660	0	660	1,340	0	1,340	1,100	0	1,100	2,300	0	2,300			0			0	5,400
	Chassis	330	0	330	670	0	670	560	0	560	1,140	0	1,140			0			0	2,700
	Fork-Lift (3.5t)	90	0	90	180	0	180	180	0	180	360	0	360			0			0	810
	Generator(150KVA)			0			0			0	110	0	110			0			0	110
	Generator (800KVA)			0	800	0	800			0			0			0			0	800
	Computer (Terminal)			0	120	0	120			0	80	0	80			0			0	200
	Package Software	480	0	480	970		970			0			0			0			0	1,450
	Sub-Total	18,101	0	18,101	37,562	0	37,562	4,118	0	4,118	8,576	0	8,576	5,060	0	5,060	10,240	0	10,240	83,657
	Physical Contingency	0	0	0	0	0	0	0	0	0	0	0	0			0			0	0
	Engineering Fee	2,259	251	2,510			0			0			0			0			0	2,510
	VAT	0	2,061	2,061	0	3,756	3,756	0	412	412	0	858	858		506	506		1,024	1,024	8,617
	Procurement Cost Total	20,360	2,312	22,672	37,562	3,756	41,318	4,118	412	4,530	8,576	858	9,434	5,060	506	5,566	10,240	1,024	11,264	94,784
1	Land Acquisition and Others																			
	Access Road Land Acquisition	0	99	99			0			0			0			0			0	99
	Connecting Road Land Acquisition	0	0	0			0			0			0			0			0	0
	Compensation Expense	0	50	50			0			0			0			0			0	50
	Sub-Total	0	149	149			0			0			0			0			0	149
	VAT	0	15	15			0			0			0			0			0	15
	Land Aquisition Total	0	164	164			0			0			0			0			0	164
	Project Total Cost	21,360	2,906	24,266	42,511	7,671	50,182	11,015	6,435	17,450	11,312	2,438	13,749	5,060	506	5,566	15,156	2,758	17,913	129,128

F Foreign Portion L Local Portion T Total

4. MANAGEMENT AND OPERATION

4.1 CONCEPT OF MANAGEMENT AND OPERATION

(1) The direct management system and organization

1. It seems most appropriate for Port Corporation IV to continue managing and operating the new Container Terminal directly for the time being, considering the reasons mentioned in **chapter 4.3.1 of Part 1**.

2. Because Port Corporation IV which have about 1,500 workers is itself a powerful cargo-handling company, it will be sufficiently possible to organize the number of persons which employ to manage and operate to the new Container Terminal.

3. Considering the forecasted container cargo handling volume and ship calls, in 1998 which is the year of the first stage ongoing program, it will be necessary roughly about 120 stuffs and operators to manage and operate. In 2002, the year of the second stage which three gantry cranes will be arranged, it will be required approximately 250 stuffs and operators.

4. The draft of organization of the new Container Terminal show in **Table 4.1**.

Table 4.1 Organization of the new Container Terminal

Section	Function	Employee		
		1988	2000	2002~
General	General Affairs, Personnel	10	20	20
Affairs	Accounting			
Instruction	Planning of Cargo Handling	15	30	30
Coordination	Cargo supervisors			
Cargo	Loading / Unloading and	40	90	95
Handling	Transporting of cargo			
	Daily maintenance			
Cargo Storage	Container Yard	55	100	105
	Container Freight Station			
	Daily maintenance			
	Total	120	240	250

Source : Prepared by The Study Team

(2) Bring up of the private cargo-handling companies

5. Port Corporation IV should understand the policies of DGSC regarding the port privatization that made public in 1994. Port Corporation IV should support the weak private companies related port business, which will become good pardoners in future for Port Corporation IV.

6. Port Corporation IV should promote that the private companies can obtain the now how of port management and operation and build up themselves management foundation. For example, Port Corporation should loan the low-interest funds and lending of port equipments for the private companies, and should carry out the training for their stuffs and operators, which are treated the temporary member of Port Corporation IV in a fixed period.

7. At the time that the private companies will sufficiently obtain the now-how of port management and operation, Port Corporation IV should entrust them a part of port business of the new Container Terminal.

(3) Port promotion

The port promotion and port sales are important section of the port business. These business draw the users (consignors and shipping companies) to the port, and collect their cargoes stably. At present Port Corporation IV's headquarter and Ujung Pandang Port branch have no divisions and sections of this part sufficiently functioned.

It is commonly said in four Port Corporations that necessary for the port promotion and sales are not well recognized. A positive port sales is proposed to acquire new port users engaged in foreign trade and to increase handling volumes of cargoes and port revenues.
The purpose of port promotion support and help to increase the economic development of the background area of the port.

Therefore, Port Corporation IV should build up their service section that work out the fundamental strategy of the new Container Terminal promotion, specially in Ujung Pandang Port branch, and should carry out to cultivate the new market.

4.2 HANDLING SYSTEM

8. There are two kinds of phases in which the handling system is discussed. One is facility planning phase of container terminal. In this phase, main issue is to decide a optimal berth capacity and to select optimal yard handling system. The other is the phase to discuss the operational system of the terminal.

9. We have already discussed the former aspect in Pert-1 (Master Plan of Ujung Pandang Port). In this chapter we have to discuss of the second aspect of the handling system. In this chapter the discussion on the handling system consists of three items.

10. The first discussion is the basic flow of the documents for container shipping. In this discussion main documents for international shipping business and the basic procedure of customs clearance will be clarified.

11. The second discussion is regarding to the planning, scheduling and supervising of the container terminal operation. To understand these three functions for controlling the terminal is necessary for designing of the computer system of the terminal operation.

12. The third item to be discussed is the basic concept of the management and information control system of the terminal. The detailed discussion of the optimal computer control system is difficult without definition of detailed terminal facilities and operation. So, in this report, the basic concept of the container terminal operation control system will be discussed.

4.2.1 Flow of Shipping Documents for Container Shipping

13. The flow of export and import cargo and documents for container shipping is similar to that for conventional shipping. However, container shipping has its own features. For example, all cargoes are containerized and container ships can travel, load and unload faster than conventional break-bulk vessels. These features have led to the extensive use of new document handling systems including the container loading plan (CLP) and computers.

14. The flows of cargoes exported and imported by container and their shipping documents are discussed below.

(1) Flow of Export Cargoes and Their Shipping Documents

1) The consignor (shipper) or its agent books space for the cargo to be shipped with the shipping company. The shipping company enters the booking in its booking note, prepares a booking list, and sends its copies to the container terminal and freight station.

2) The consignor carries the export cargoes into the bonded area and submits to the customs a bank certified export declaration, invoice, packing list and other documents required by customs formalities to obtain an export permit. Customs examines the submitted documents, checks the cargoes as required, and returns the export declaration after stamping a permit seal when the details of the declaration are correct and appropriate.

3) In the case of full-container loading, the consignor obtains an equipment dispatch order (EDO) from the shipping company and an empty container from the container terminal or inland depot. The operator at the container terminal or inland depot, serving as an agent of the shipping company, checks the details

of the EDO and/or other information supplied from the shipping company (such as the manner of delivery, container temperature specified for frozen goods, etc.), prepares an equipment receipt (E/R for out-going), and delivers an empty container to the consignor.

The consignor loads the export cargo in the received container and prepares a container loading plan (CLP), shipping advice and a dock receipt (D/R) to be signed by the shipping company on receipt of the cargo.

Next, the consignor carries the loaded container, together with the CLP, D/R and export permit, to the container terminal. On receiving the loaded container, the terminal operator signs and returns the original copy of the D/R submitted by the consignor, prepares an equipment receipt (E/R for in-coming), and exchanges the E/Rs for out-going and in-coming signed by the consignor and terminal operator.

When any irregularity is found about the container, the terminal operator describes the details and level of the irregularity in the original copy of the D/R and E/Rs and determines where the responsibility lies.

4) In the case of incompletely filled container loading, the consignor prepares a D/R and carries the cargo to the container freight station, as in the case of full-container loading.

The container freight station operator checks if booking has been made on the booking list submitted from the shipping company, cross-checks the cargo with the description on the D/R, and returns the signed D/R to the consignor. When any irregularity is found, the operator describes the discovered irregularity in the Remarks column of the D/R.

When a given quantity of cargoes has been carried into the container freight station, the station operator loads the cargoes into empty containers supplied from the container terminal by destinations, after checking the properties, shape and other features of individual cargoes based on the booking list furnished from the shipping company. On completion of loading, the operator prepares container loading plans and delivers the loaded containers with their loading plans to the

container terminal. Whether off dock (separated from the container terminal) or on dock (adjacent to or in the container terminal), the container freight prepares E/Rs.

The container terminal operator places the received loaded containers in predetermined areas of the terminal and loads them onto a container ship.

5) On completion of loading, the terminal operator signs or seals the D/R (for the customs) on behalf of the ship's master, and submits the signed or sealed D/R with the export permit to the customs in charge.

After checking the submitted documents, the customs stamps a seal of confirmation on the export permit and returns it to the consignor. The master of the vessel confirms the loading of cargo by signing or sealing a final bay plan.

6) After receiving a confirmation of loading, the consignor requests the issue of a bill of lading from the shipping company in exchange for the D/R. After checking that the cargo has been loaded in good order and condition, the shipping company fills in the date of loading in a prepared bill of lading that is signed by a person in charge and issued to the consignor.

If the D/R has a clause stating that the condition of the cargo received for loading was unsatisfactory, the same clause is described in the bill of lading as well.

7) The consignor negotiates a draft for the shipped cargo with a bank in exchange for the basic shipping documents including the bill of lading, invoice, packing list and insurance policy, confirmed export declaration, letter of credit, documentary bill of exchange, and written request for negotiation.

8) The shipping company prepares the manifest, container loading plan, stowage plan, exception list, special cargo list, copies of bills of lading and other documents, and mails them to the unloading ports and/or other points of delivery.

(2) Flow of Import Cargoes and Their Shipping Documents.

1) A consignee who has concluded an import contract immediately requests a bank to issue a letter of credit in conformity with the regulations of the Foreign Exchange and Foreign Trade Control Law and other relevant laws. When the contract is made on an FOB basis, the consignee books a shipping space for the cargo to be imported with a shipping company, secures insurance on the cargo to be shipped, and obtains an import permit and other necessary approval from relevant government agencies.

2) On completion of loading at the shipping port, the consignor sends the shipping documents to the consignee or its negotiating bank. When the contract is concluded on a letter-of-credit basis, the consignor receives the shipping documents from the bank in exchange for the payment of the invoiced amount (usually at usance).

The shipping company prepares an arrival notice, delivery order, delivery record and other necessary documents, and sends the arrival notice to the consignee when the expected time of arrival of the vessel becomes almost definite.

3) When the carrying ship arrives at the unloading port, the shipping company submits a botanical and/or zoological cargo list to the plant and/or animal quarantine station, and a dangerous cargo list to the port authority. When unloading, the shipping company submits a manifest of cargoes to be unloaded to the customs.

4) When the cargoes have been carried into the container terminal or container freight station at the destination ready for delivery, the shipping company sends a delivery notice to the consignee. The consignee or its agent receives the delivery order in exchange for the submission of the bill of lading or, when the freight has not been paid, for the payment of the freight due.

5) The consignee goes to the container terminal or container freight station to receive the cargo in exchange for the delivery order.

When the consignee submits the delivery order, a terminal operator checks the

appearance of the container. The consignee and terminal operator sign two copies of the delivery record and an equipment receipt (for outgoing) and each keeps one copy of the signed documents.

When any irregularity is found, the operator describes the details and level of the discovered irregularity in the Remarks column of the equipment receipt and delivery record.

The container freight station operator also checks the number and condition of the cargoes and describes the details and level of irregularity, if any, in the Remarks column of the delivery record. The container freight station operator and the consignee or its agent sign two copies of the delivery record and each keeps one copy of the signed documents.

6) When the unloaded cargo is a bonded cargo, the consignee carries the cargo back into a bonded area after receiving a transport permit, cargo list and warehousing or transfer permit from the customs.

Then, the consignee prepares an import declaration and submits it to the customs in charge together with an invoice, packing list and other documents necessary for customs clearance. The customs examines the submitted import declaration, inspects the cargo declared, as required, decides the amount of import duty and issues a notice of payment to the consignee or its agent. When the payment of the import duty has been confirmed, the customs stamps a permit seal on one copy of the import declaration and returns the sealed copy to the consignee or its agent.

7) In the case of full-container loading, the consignee unpacks the container and returns the empty container to the container terminal. When receiving the returned container, the container terminal operator prepares an equipment receipt (for incoming). The consignee and the terminal operator sign two copies of the equipment receipt and each keeps one of the signed copies.

Fig 4.1 shows the flow of information and documents for container shipping based on the explanation above.

(3) Shipping Documents

15. Following are brief explanation on the shipping documents used in the discussion of the flow of export/import cargoes and their shipping documents.

1) Booking List

16. The booking list is a list of cargoes a shipping company undertakes to carry between ports. The list describes the cargoes by loading ports, destinations or unloading ports, and points of delivery based on the descriptions in the shipping company's booking note. The booking list stating the details of container cargoes and requirements for their transport serves as a cargo receiving and container packing instruction. The container manager calculates the necessary number of containers and makes their allocation plans on the basis of the booking list.

2) Equipment Dispatch Order

17. The equipment dispatch order is an instruction issued by a shipping company to request the container terminal operator to deliver an empty container or containers or other equipment to the bearer of the equipment dispatch order.

3) Equipment Receipt

18. A shipping company that owns or controls containers concludes a basic agreement on the exchange of equipment with land transport (road and railway) companies that transport containerized cargoes.

19. The equipment receipt is a document that certifies the delivery of containers and other equipment from and to the container terminal or other stockyard in accordance with the provisions of the basic agreement.

20. There are two types of equipment receipt; one is for outgoing equipment and the other is for incoming equipment. Japanese shipping companies use equipment receipts of substantially uniform format.

21. The equipment receipt for outgoing (and incoming) equipment states the name

of the person who takes out (brings in) the container, the number and size of containers, whether the container is empty or packed, the name of the consignor, the place and time of taking out (bringing in), the place to (from) which the container is sent, the expected time of arrival (departure), the expected time of returning (the name of expected shipping company or course), the condition of returning (the name of ship and voyage number), the expected date of returning (unloading port), the contents of inspection on outgoing (incoming), etc. To begin with, the conveyor terminal operator at the gate enters necessary details in the equipment receipt for the container to be taken out of or brought into the container terminal. If any irregularity is found, the operator describes it in the Remarks column. The container terminal operator and trucker sign two copies of the equipment receipt and each keeps one copy of the signed documents.

22. The equipment receipt is made for each container when it is taken out of or brought into the container terminal. While the equipment receipts are used for the inventory control and the tracing of the flow of containers, their contents are input in the control computers.

4) Container Loading Plan

23. The container loading plan is a document stating all particulars and other information about the cargoes packed in each container (such as the condition of delivery, container temperature specified for frozen goods).

24. Because the container loading plan covers the particulars and other information about the cargoes contained in each container that cannot be found elsewhere, it is used in the preparation of a notice to be submitted to the customs when the cargo is taken into the loading port, when delivery is made between the container freight station and container terminal, making container allocation plans at the container terminal and stowage plans for the carrying container ship, preparation of detailed cargo lists to be submitted to the carrying container ship, customs clearance formalities (including bonded transport) at the destination, container unstuffing, etc.

5) Dock Receipt

25. The dock receipt is a document that certifies the receipt of the cargo by the

shipping company from the consignor and the condition of the cargo received. The dock receipt is similar to the mate's receipt used with conventional ships.

26. As in the case of the container loading plan, Japanese shipping companies are using dock receipts of uniform format. The dock receipt describes the items to be described in the bill of lading, plus the conditions under which the cargo is received and delivered, type and properties of the cargo, the name of the shipping company, forwarding agent and consignor, form of package, commodity code, etc.

6) Export Permit

27. The export permit is a document the customs issues to the exporter of a cargo that has proved appropriate and satisfactory when cross-checked with the export declaration on it. The export permit is made by stamping a seal of permit on one copy of the export declaration submitted to the customs by the consignor or its agent and returned to the exporter (consignor). The cargo is not shippable until the export permit is obtained.

7) Bill of Lading

28. The bill of lading is a negotiable document acknowledging the receipt or loading of a cargo and promising to deliver it to the legitimate bearer of the bill of lading at the destination specified thereon. The bill of lading is also an agreement of transport specifying the conditions of transport agreed between the shipping company and consignor.

29. The bill of lading proves the title to the cargo described thereon, becomes negotiable by endorsement and serves as the core of the shipping documents attached to a documentary bill of exchange.

8) Arrival Notice/Delivery Notice

30. The arrival notice is a notice the shipping company sends to the notify party or consignee described in the bill of lading to notify the expected time of arrival of the vessel and particulars of the cargo to be delivered.

31. The shipping company sends a delivery notice to the consignee when the cargo has been unloaded and carried to the container freight station (in the case of incompletely filled container loading) or container terminal (in the case of full-container loading) at the destination and preparation for the delivery to the consignee is complete.

32. As the date described in the delivery notice is the one on which the cargo becomes ready for delivery, storage is charged on the cargo from that date.

9) Delivery Order

33. The delivery order is a non-negotiable document by which the shipping company instructs the operator of the container freight station or container terminal to deliver the cargo to its bearer. The delivery of cargo must essentially be made in exchange for the bill of lading. Actually, however, the shipping company issues a delivery order to the consignee who submits a bill of lading, and the consignee receives the cargo by submitting the delivery order to the container freight station or container terminal.

10) Manifest

34. The manifest is a list of cargoes loaded on a vessel, stating the consignees and other particulars of individual cargoes by loading and unloading ports, and in the order of bill of lading numbers.

35. The manifest is necessary for customs clearance. The customs of the unloading port usually demands the submission of a manifest signed by the master of the vessel. Actually, however, there is not enough time to complete the manifest before the ship leaves the loading port. In most cases, therefore, the manifest is airmailed to the terminal operator of the unloading port who submits it to the customs after signing on behalf of the ship's master. The customs determines details of the cargoes to be unloaded, checks their conformation to legal requirements, and imposes import duties on them.

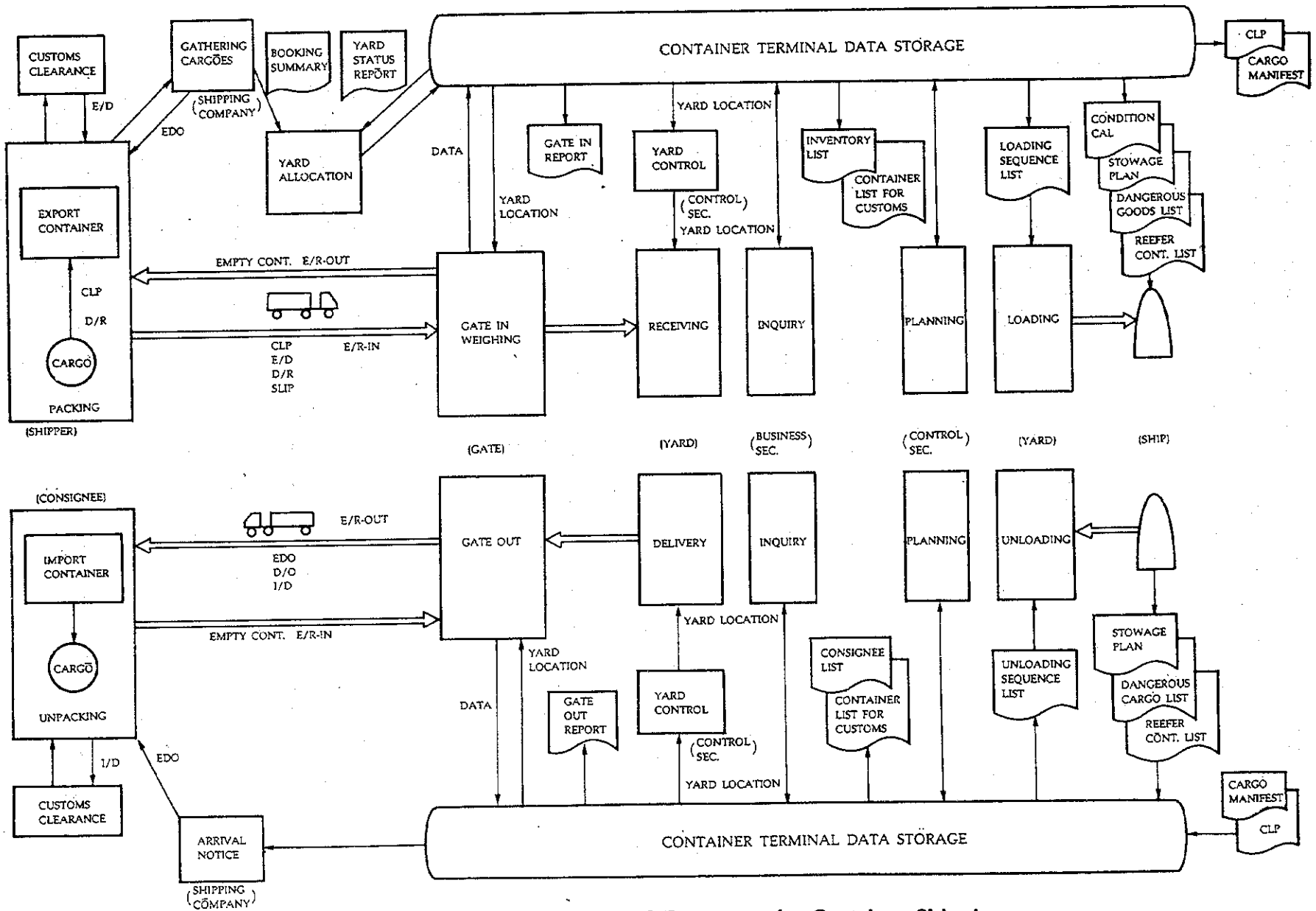


Fig. 4.1 Flow of Information and Documens for Container Shipping

4.2.2 Planning and scheduling procedure

36. In this section container handling system will be discussed from the viewpoint of terminal operator. The yard plan, vessel plan, conducting of loading and discharging of the container, supervising gate-in/gate-out operation and inventory control of the container consist of the basic function of the container terminal operation.

(1) Yard stacking plan

37. Yard stacking plan is to assign some yard area space to each group of containers which have common attributes before receiving of the export container.

38. The Booking Summary list of export containers to be loaded on a vessel is given to the terminal operator prior to commencement of receiving (Container Yard Open).

39. Booking summary includes such information as name of vessel, voyage number, number of containers by each container size, number of special containers (reefer, dangerous and over size container, etc.).

40. The yard stacking plan includes assignment of the yard area for import containers which are planned to be discharged from a vessel and empty containers which are received at the gate or divined at CFS or discharged from a vessel and stacked in the yard for storage.

(2) Vessel Calling schedule

41. The calling schedule of a vessel which includes vessel scheduling data such as estimated time of arrival and departure, number of loading and discharging container etc is provided by the shipping company before the vessel calls.

42. Loading and discharging of containers is primarily managed by referring to this schedule.

(3) Receiving of Gate-in Container

43. The driver of a truck, who trails containers into the terminal, hands over E/R

(Equipment Receipt) to the gate-house clerk. This is the opening of an import container handling operation in the terminal and the data input in the gate house is the initial data for the computer operation. An empty container to be entered through gate for storage has the same status at this time.

44. The gate clerk informs the yard planner of the container information on the E/R usually through the VDT installed at the gate house.

45. The operator in the yard control center assigns the yard location for stacking by referring to the stacking plan already input into the computer and displays it on the screen of the VDT in the gate house from which the gate-in data have been input.

46. After the clerk of the gate-house confirms the yard location of the receiving container displayed on screen, he gives clearance for the truck driver to proceed to that position.

47. The yard operator in the yard control center dispatches the instruction for the receiving operation to the driver of the transfer crane by the operation instruction message on the VDT screen there, which is also displayed by computer.

48. The driver of the transfer crane should pick up the specified container directly from the load truck and place it at the designated yard location.

(4) Vessel Loading Planning

49. Before planning the loading operation, the number of containers of each attribute group to be loaded and the yard location where they are stacked are confirmed. As the computer outputs various kinds of check lists for the above confirmation, terminal personnel should carry out a cross check between the original or source documents and these computer outputs and, if necessary, correct the data in computer.

a. Loading operation schedule

50. In order to achieve effective operation in loading and discharging work by container cranes, vessel planner makes the loading operation schedule plan considering various factors about not only the terminal but also the vessel, such as availability of

container crane and container handling equipment in the yard, interference of container crane's handling work obstruction on the way from the stacking yard to the berth, vessel stability etc.

51. As both loading and discharging work are controlled simultaneously using the same container cranes and container handling equipments in the yard, the operation schedule of each should agree with one another.

52. Vessel stability in the period of loading and discharging should be considered in scheduling. For example, the vessel is put in heavy trim by the head when containers are loaded only on the vessel fore bay (hold) by one crane while another crane discharged only from the vessel aft bat.

b. Vessel stowage plan

53. The vessel stowage planning is to assign containers stacked in yard to vessel cell positions to be loaded one by one. Special containers, such as reefers, dangerous and over dimension containers, should be assigned carefully to cell positions.

54. Standard or ordinary containers can usually be automatically assigned by computer to cell positions by inputting a few parameters concerning the loading container and the vessel to be loaded. Usually, computer makes the loading sequence physically operative.

55. After provisionally assigning loading containers to vessel cells in the computer file, the computer calculates the vessel trim and stability on sail. If the calculation figure is not in a permissible range, the data should be canceled and a new file should be prepared. This procedure is to be repeated until the figure enters the permissible range.

(5) Loading Operation

56. After the final loading plan is completed, the computer prints out the "Container Loading Sequence List" and/or "Container Loading Bay Plan", which are also used as the loading work instruction sheets.

57. Theses papers are distributed to the sections or personnel concerned, such as a yard operator, drivers of container cranes and transfer crane, tally men on hatch and wharf etc.. The loading operation is carried out according to the instruction on the paper.

58. The loading completion message is input by the yard operator after every load operation has been completed. At that time, communication between the working spot or wharf and the yard operation center is carried out by radio or VHF.

(6) Discharging Planning

59. Information on import containers to be discharged in the terminal is sent from the shipping company to the terminal. Bay Plan or Stowage Plan of the container ship on sailing from the last loading port is sent by air mail. And the additional information on containers loaded in the previous ports where the Bay Plan was made are sent by telephone or telex to the terminal directly.

60. This is the opening of an import container handling operation in the terminal and the origin of its data are generated for the computer operation.

61. The vessel planner usually inputs all this information for a specific vessel into the computer, cross-checks the data of the computer and the source papers and finalizes it before the discharging planning.

62. The vessel planner inputs the discharging sequence of the containers in the vessel cell by designating several parameters on the screen of the VDT. The same as in the case of loading, special containers (reefer, dangerous and over dimension) are assigned to a yard location to be stacked manually one by one. On the other hand, standard or ordinary containers can be automatically assigned to any location in the yard.

63. After planning, usually the computer prints out "Container Discharging Sequence List" or "Container Discharging Bay Plan" which are also used as instructions for the discharging operation.

64. The discharging operation is the reverse of the loading and carried out in the same manner. In practice, the discharging operation is carried out simultaneously with

loading operation as described in section (4) Vessel Loading Planning.

(7) Delivery of Gate-out Container

65. A consignee who wants to have a delivery of a discharged import container should make a reservation. On receiving the delivery request from the consignee, the business clerk of the terminal should confirm that the customs permission has been issued and the necessary payment has been made. The delivery becomes acceptable after he inputs the information into the computer.

66. Upon delivery, the truck driver hands over "Equipment Despatch Order (EDO)" to the gate-house clerk. The sections or places where the container No. to be delivered is input into the computer in the same manners in the case of receiving. After inputting the container No., the computer gives the yard location.

67. Before the truck proceeds into the yard, a placard is handed over to the driver. The placard No. is input into the computer with the container No.

68. The yard operator dispatches the delivery instruction which includes only the container No. to be delivered, its yard location and the placard No. of the truck to yard machinery driver. The truck driver puts the placard on the roof of truck cabin which is easily observed by the yard machinery driver.

(8) In-yard Movement and CFS Container Control

69. There are many requirements for in-yard container movement besides gate-in/out and loading/discharging operators. These are the so called "Container Shift". They occur mainly when shifting containers for restoring in the yard and veining/divining at CFS.

70. The shifting plan is input into the computer and can be accessed by the sections concerned at the terminal. After the shifting operation is carried out, the completion message should be input and the data in the files are corrected or modified.

71. For CFS containers, a function of this system converts their status from full-import to storage-empty men divined and storage-empty to full-export when veined.

4.2.3 Outline of the Computer System for Container Terminal Operation Control

Following are the basic concept of the computer system which covers the container terminal operation and CFS operation including the inland container depot.

1) In this discussion the computer is an UNIX based system and the Data Base Management Software is INFORMIX.

2) The application systems are usually composed of the following systems:
   a. Yard Plan Computer System (YPCS)
   b. Yard Operation Computer System (YOCS)
      using Radio Data Transmission System (DTS)
   c. Vessel Plan Work Station (VP)
   d. Yard Plan Work Station (YP)

3) The YPCS is the core of the Container Terminal Management System. All the application programs are menu-driven through interactive terminal devices which are placed in various offices in the container terminal.

The terminal devices are Personal Computers emulating ASCII terminal or ASCII terminals.

The terminal devices placed in the gate, the CFS and the inland container depot are connected to the YPCS through local telephone lines or public telephone lines.

Lists and reports produced by the YPCS are printed on terminal printers which are also placed in various offices in the container terminal.

4) The YPCS covers the following container terminal business:
   a. Road receiving/delivery operation
   b. Ship loading/discharging operation
   c. In-yard container movement operation including container transportation between the container terminal and the inland container depot.
   d. Inventory control of containers
   e. Import/export documentation procedure
   f. Billing

g. CFS operation and documentation including receiving/delivery of bulk cargo, stuffing/stripping of containers and inventory control of bulk cargo.

5) The VP conducts the computer aided ship loading/discharging plan using GUI (Graphical User Interface).

6) The YP controls the container stacking plan entry using GUI and graphically displays the container stacking state in the yard.

7) The YOCS automatically arranges the transfer cranes in an adequate block in the yard, transmits the work instructions created by the YPCS through the radio data transmission system and displays them on a Mobile Data Terminal equipped on the transfer cranes and the top-lifts.

The Mobile Data Terminal is not equipped on the container cranes. The drivers of container cranes operate ;based on the paper information such as bay plan sheets and loading/discharging sequence lists.

The YOCS provides the functions to manually interrupt the arrangement of transfer cranes and to monitor the work instructions being displayed on the Mobile Data Terminals, etc. The yard status is graphically displayed on the large screen of an X-terminal.

Figs.4.2 and **4.3** show the outline of the basic functions of the container terminal operation control system and computer hardware configuration for the Ujung Pandang International/Domestic Container terminal.

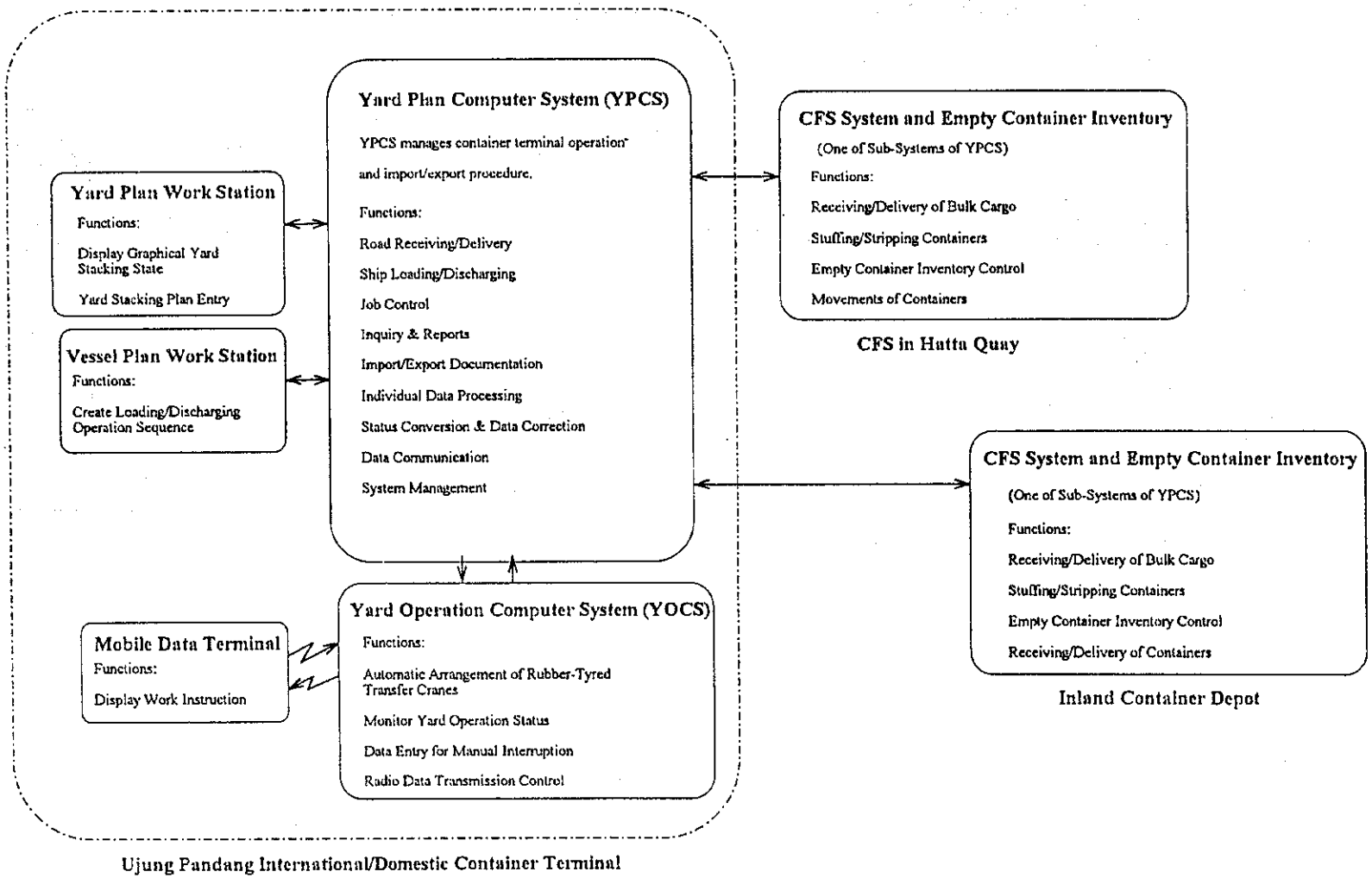


Fig. 4.2 Outline of the Container Terminal Operation System for the Ujg Pandang Container Terminal

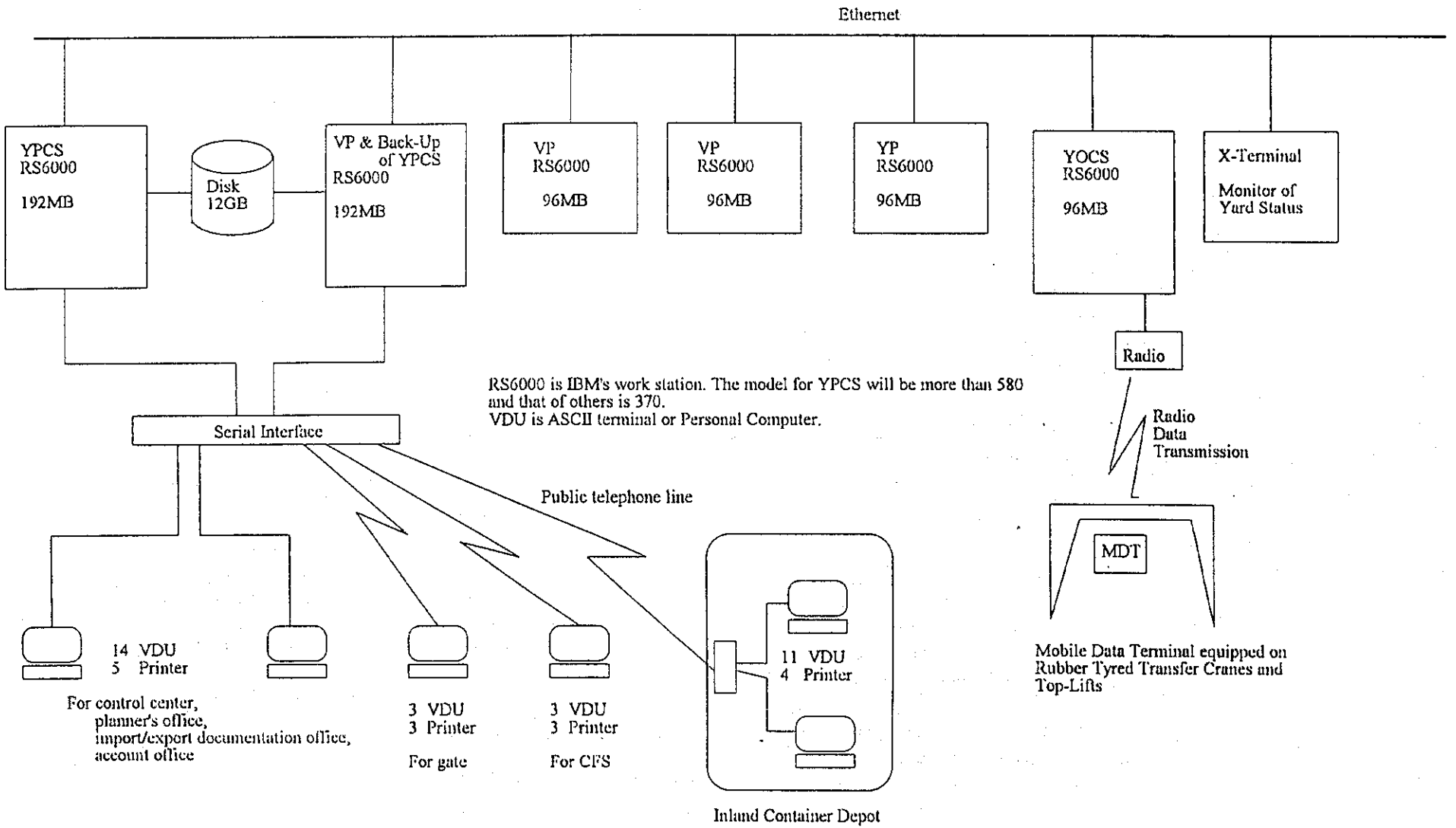


Fig. 4.3 Outline of the Computer System Hardware Configulation for the Uj. Pandang Container Terminal

4.3 COMPUTERIZATION OF TERMINAL OPERATION

(1) The necessity and advantages of computerization

a. The necessity of computerization

72. Manual labor is sufficient to handle terminal duties at such harbors where the volume of container cargo that requires handling is relatively small. Harbors that manually handle container terminal duties fairly efficiently by employing new inventions and modifications in such fields as document processing can be found in various parts of the world. However, the volume of work increases rapidly as the container-handling volume and the number of incoming ships increase at a given terminal. As a result, processing delays and operational errors become conspicuous.

73. A container handling volume of 60,000 TAU per year is generally considered the upper limit for manual labor. The introduction of computers is indispensable at container terminals where the handling volume has surpassed this limit. Computers are necessary for improving efficiency in operational planning, management, and document processing even when the actual loading is manually performed.

b. The advantages of computerization

74. The introduction of computers to container terminals has the following benefits.

i) The terminals can easily meet the rising volume of containers that require handling.
ii) It enables effective personnel deployment as exemplified by a smaller number of workers required for the control center.
iii) It frees individual laborers from mastering the skills demanded by manual labor.
iv) It becomes possible to perform related duties in quickly and accurately.
v) It enables collection of a large volume of container-related information and improvement of services for users including shipping companies and consignors.
vi) It becomes possible to make effective use of the marshalling yards.
vii) It affords easy access to various statistical data and enables their effective

use and analysis.

(2) Preceding cases and model plans

75. Below are explanations of model plans for introducing computers to handle container terminal duties. The three model plans concern three different duties: management, planning, and document processing.

a. Terminal management system

76. This system has two programs: one for managing marshalling yards and the other for managing gates. Container storage positions at the marshalling yards are decided, position changes are directed, and containers in storage are monitored based on the data provided by shipping companies at terminals that handle containers from two or more shipping companies such as those subject to this research.

77. The gates and the control center are connected on an on-line basis. This system enables input of container loading and unloading information and output of container storage positions within the marshalling yard at the gates.

b. Terminal planning system

78. This system has three programs: one for planning loading, another for planning unloading, and the other for deciding the procedure for operating equipment at the marshalling yards.

79. Loading and unloading plans are decided on the basis of the storage positions of export and import containers determined through the marshalling yard management program, and on the stowage plans of incoming and outgoing vessels obtained from shipping companies.

80. After loading and unloading plans are decided, loading and unloading procedures are fixed for each piece of equipment used, and the information is conveyed to equipment operators. The control center completes the loading and unloading of each and every container and gives directions on emergency measures.

c. Terminal document processing system

81. This is a system that puts together data processed by the management and planning systems. The system prints out data to be supplied to shipping companies, incoming and outgoing vessels, and the customs and transport agents that serve the port. These parties all exist outside the container terminals. The system also keeps the data in files for statistical and analytical purposes. Ideas for model plans for the three systems are indicated in the appendix.

d. Criteria for Introducing Computers

82. The following criteria should be satisfied when introducing computers.

i) The system must be able to not only perform ordinary duties but also meet the schedule and other changes concerning incoming and outgoing vessels in a flexible manner.
ii) The system should be a duplex one based on a load distribution method. Such a system enables mutually exclusive management of different duties.
iii) The system must have a backup system to safeguard itself against disorders and accidents.
iv) Operation of equipment must be straight forward and simple.
v) The system must afford easy equipment replacement in view of future technological advancement.
vii) There is a need to consider facilities in CFS and maintenance departments and interface with other computer systems.
vii) The system must have file duplication and other systems for functional recovery.

e. Model plan

83. The container-handling volume and other statistical data for container terminals at the Ujung Pandang Port (including Inland Container Terminal) are as follows:

i) Number of containers in storage: 7,500 tau
ii) Number of containers handled per month: 30,000 tau
iii) Number of incoming ships per month: 50 ships

iv) Maximum number of cargos per ship: 400 tau
v) Number of gates: 5
vii) Number of berths: 3

84. In terms of processing capacity, personal computers can cope with the aforementioned container-handling volume. However, in view of the duplex system to be adopted and the terminals to be used, adoption of a mini computer that satisfies the following minimal standards will also be necessary.

i) Number of main computers: 1

Binary digit (bit): 32 bits
Data memory capacity: 200-350 MB

ii) Number of terminals: 10

f. Investment and maintenance costs

85. When equipment is procured according to the model plan provided in section e) and application is limited to container terminal duties, the estimated costs of necessary investment and annual maintenance will be as follows:

i) Investment outlay: about 1.7 billion Rp
ii) Annual maintenance cost: about 10 million Rp

86. It is preferable to introduce computerization just when the gantry cranes are installed on the terminal to raise efficiency in terminal operation and service. Further, the computer system should be expanded to the Inland Terminal to operate the new Container Terminal including the Inland Terminal as one body when it is used as a container yard other than CFS are.

4.4 ORGANIZATION

87. Of the four state-run port authorities, Port Corporation II and Port Corporation III have full-scale container terminals. Tg. Priok Port and Tg. Perak Port, which are managed by Port Corporation II and Port Corporation III, respectively, clearly distinguish

their management and operation sections from the ordinary quays. These sections are managing and operating container terminals as independent branches.

88. These two branches concentrate on the loading and unloading of container cargos. They operate the terminals with clear objectives, critical thinking, and secure management principles. Their objectives include cultivation of demands and improvement of work efficiency. Container terminals at Belawan Port, the third largest port, are currently managed and operated by the Belawan Port branch, which also manages ordinary quays. Container terminal duties are expected to be transferred to a new branch that will be established to raise work efficiency to meet the rising volume of containers.

89. Container Terminals at Ujung Pandang Port are scheduled to reach the first stage of an ongoing program to transform them into full-scale container terminals in 1998. In view of the anticipated handling volume and required work force at this point, it will be desirable to establish a container terminal division within the Ujung Pandang Port branch, and to let this section manage and operate the terminals. However, in 2003, the target year for this feasibility study, the new branch which manage and operate to Container Terminals exclusively will be established

4.5 TARIFFS

90. A standard tariff for the four state-run port authorities should be established in consideration of regional characteristics, cargo-handling volumes, and management conditions of the four corporations. Tariffs should be made flexible through such steps as the adoption of fixed coefficients for the four companies that reflect market realities.

91. There is also a need to promote the use of inland container terminals, particularly at Ujung Pandang Port. Inland container terminals differ from yards within harbors in that the transport costs and the highway tolls are added to the expenses. Therefore, cost absorption and other ideas should be put into practice when setting the tariff so that neither inland nor harbor container terminals place the user in a disadvantageous position.

5 ECONOMIC ANALYSIS

5.1 PURPOSE OF THE ECONOMIC ANALYSIS

1. The purpose of this chapter is to appraise the economic feasibility of the Short-term Plan for the port development from the viewpoint of the national economy. Thus, this chapter focuses on whether the net benefits of this development project exceed those which could be derived from other investment opportunities in the Republic of Indonesia.

5.2 METHODOLOGY OF THE ECONOMIC ANALYSIS

2. Economic analysis will be carried out according to the following method. Short-term development plan will be defined and it will be compared to "Without" case. All benefits and costs in market prices will be calculated and then converted to the economic price. All benefits and costs are evaluated using economic prices in the economic analysis based on the border price concept. There are various methods to evaluate the feasibility of this type of development project. Here, the economic internal rate of return (EIRR) based on cost-benefit analysis is used to appraise the feasibility of this project. The EIRR is a discount rate which makes the costs and the benefits of the project during the project life equal, and it is calculated using the following formula:

$$\sum_{i=0}^{n} \frac{Bi - Ci}{(1+r)^i} = 0$$

Where, Bi : Benefits in the i-th year
Ci : Cost in the i-th year
r : Discount rate
n : Period of project life

3. The procedure used for this economic analysis is shown in **Fig. 5.1**

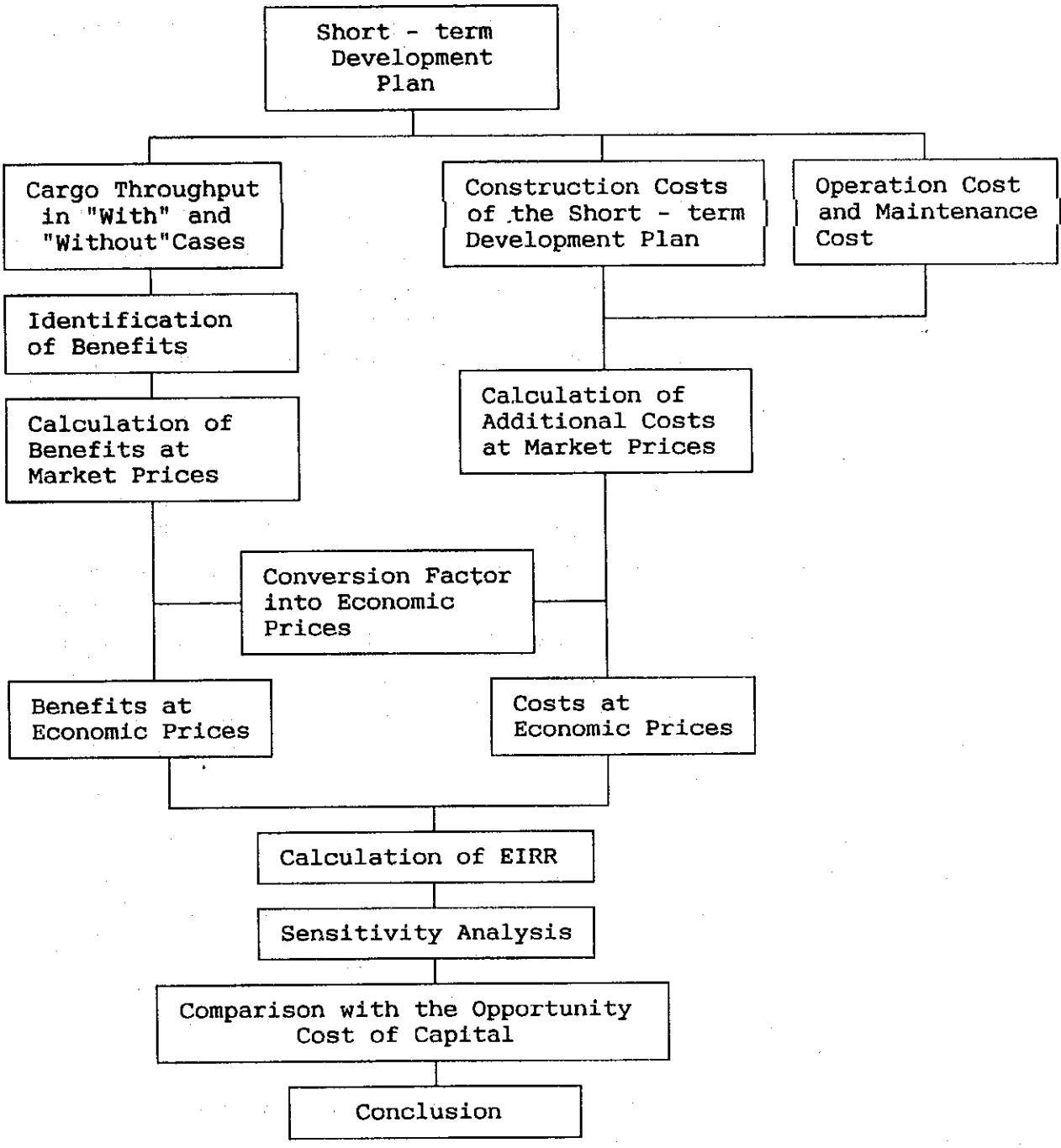


Fig. 5.1 The procedure of the economic analysis

5.3 "WITHOUT" CASE AND "WITH" CASE

4. In the cost-benefit analysis, the benefits and the project costs are defined as the difference between the "Without" the project and the "With" the project cases. Therefore, it is very important to define the difference between "Without" case and "With" case in the economic analysis in order to evaluate the feasibility of the development project. In this study, the following conditions are adopted as the "Without case" considering the existing situation.

5.3.1 "Without" Case

5. In the "Without" case, it is assumed that no additional investment will be made to enlarge the existing port facilities but the required funds will be provided to maintain the existing facilities at their current level of services. Thus the level of capacities of the port which are efficiency of loading and unloading and available yard and CFS and so on are not improved but minimum container handling equipment such as top lifter, tractor head and chassis will be purchased, because there are no container handling equipment to transport the container from the berth to the container yard at the existing port. The conditions of "Without" case are assumed as follows.

Table 5.1 Berth conditions for "Without" case

Wharf name	Number of Berth	Purpose of Use	Handling facilities
Hatta Quay	2 - 3 Berth 490 m	Multipurpose and Container	By ship gear

6. The maximum berth capacity for the calling vessels for container cargo will be calculated as follows:

365day/year x 24 hours x 3 Berths = 26,280 hours / year

Table 5.2 Container handling conditions at the Berth in 1997

	Container Cargo
Ave. Cargo / Vessel	215 Box (250 TEU)
Handling Efficiency	7.93 (Box/hour)
Ave. Berthing Time	27.1 (hours)

Table 5.3 Container Yard and CFS Conditions in 1997

	Area	Location	Capacity
Container Yard (1)	5.8 ha	Port area	64,000 TEU / year
Existing C. Yard	?	Port area	60,000 TEU / year
CFS	4,000 m^2	Port area	20,000 TEU / year

Table 5.4 Container handling equipments in 1997

	Unit	Location	Capacity
Top Lifter	4	Container Yard	45t
Fork Lift	5	CFS	
Tractor head	10	Container Yard	
Chassis	20	Container Yard	

5.3.2 "With" case

7. In the "With" case, it is assumed that the short term plan for the port development is completed and the level of capacities of the port which are efficiency of loading and unloading, available container yard and so on are improved. The conditions of "With" case are assumed as follows.

Table 5.5 Berth Conditions in 2003

Wharf name	Number of Berth	Purpose of Use	Handling facilities
Hatta Quay	2 - 3 Berth 490 m	Container	3 Gantry Cranes

8. The maximum berth capacity for the calling vessels for container cargo will be calculated as follows:

365day/year x 24 hours x 3 Berths = 26,280 hours / year

Table 5.6 Cargo Handling Conditions in 2003

	Container Cargo
Ave. Cargo / Vessel	250 Box (325 TEU)
Handling Efficiency	14.4 (Box/hour)
Ave. Berthing Time	17.4 (hours)

Table 5.7 Container Yard and CFS Conditions in 2003

	Area	Location	Capacity
Container Yard (1)	5.8 ha	Port area	190,000 TEU / year
CFS	4,000 m^2	Port area	20,000 TEU / year
Inland Container Yard	2.7 ha	Inland	56,000 TEU / year
CFS	8,500 m^2	Inland	40,000 TEU / year

Table 5.8 Container handling equipments in 2003

	Unit	Location	Capacity
Gantry Crane	3	Container Berth	45t
Transfer Crane	9	Container Yard	
Top Lifter	5	Inland Terminal	
Side Lifter	4	Container Yard	
Fork Lift	9	CFS	
Tractor head	27	Container Yard	
Chassis	54	Container Yard	

5.3.3 Cargo Handling Volume and Calling Vessels

9. According to the demand forecast at Ujung Pandang Port, future container cargo volume is as follows:

Table 5.9 Estimated Container Cargo Volume

(Unit: TEU)

Cargo	1993	1998	2003	2010
Container Cargo	47,352	165,000	238,000	366,000

10. The number of estimated calling vessels and the total berthing time is calculated based on the above. The results of calculation are shown in **Table 5.10** and summarized bellows:

Table 5.10 Summary for No. of Calling Vessels and Required Berthing Time

	1993	1998	2003	2010
Number of Container Ship	190	580	740	880
Required Berthing Time (Without)	4,750	16,008	22,644	33,088
Berth Occupied Ratio		61%	86%	126%
Required Berthing Time (With)	4,750	9,253	12,850	18,180
Berth Occupied Ratio		35%	49%	69%

5.3.4 Container Cargo Flow under the "Without" Case

11. Under the "Without" case, the estimated cargo volume will be handled without the installation of the new gantry cranes, purchasing of new container transportation equipments, construction of new inland container terminal and the dredging works for the required channel. The berth capacity will be limited by the container handling capacity at the port utilizing the existing facilities and minimum additional equipments and the current level of services.

12. Under the "Without" case, in 1998 the total required area of container yard will exceed the available area of container yard. Therefore additional container yard will be constructed for the excess container cargo volume in 1997. Required area of additional container yard is estimated at 12.0 ha, capacity of which is 128,000 TEU. Further under the "Without" case, in 2006 the total required berthing (unloading/loading) time for the calling vessels will exceed the available total berthing time of the berths. Therefore excess cargo volume after the year 2006 has to be handled at additional berth at the port and transported additional equipment.

13. Taking into account the characteristics of the cargoes and the port facilities, the required additional facilities will be as follows:

Table 5.11 Required Additional Container Yard in 1998

	Area	Location	Capacity
Container Yard (2)	12.0 ha	Inland area	128,000 TEU / year

Table 5.12 Required Additional facilities in 2006

	Unit	Location	Capacity
Container Berth	1	Extension	L = 160 m
Top Lifter	1	Container Yard	45t
Tractor head	3	Container Yard	
Chassis	6	Container Yard	

5.4 PREREQUISITES OF THE ECONOMIC ANALYSIS

14. In order to estimate the costs and benefits under the "With" and "Without" cases, the following prerequisites are assumed for the analysis.

5.4.1 Base Year

15. The "Base Year" here means the starting year of the economic analysis. Taking into consideration the construction and installation schedule, 1997 is set as the "Base Year" for this Study.

5.4.2 Project Life

16. Taking into consideration the depreciation period of the main facilities mentioned in the chapter of Financial Analysis and construction period of four years, the period of calculation ("project life") in the economic analysis is assumed to be thirty years from the beginning of construction. It is from 1997 to 2026.

5.4.3 Foreign Exchange Rate

17. The exchange rate adopted for this analysis is as below, that is, the same rate as used in the cost estimation.

US$ 1.00 = Rp. 2,258
US$ 1.00 = JP¥ 105.85
JP¥ 1.00 = RP. 21.34

5.4.4 Others

18. Under the "With" case, the short-term plan for the port development will be carried out from the year 1997 and the new container terminal will start operation in 1998.

5.5 ECONOMIC PRICES

5.5.1 Method for Converting to Economic Prices from Market Prices

19. For the economic analysis, prices are expressed in economic prices rather then prices based on the border price concept. There are various methods to convert the market prices into border prices. Here, the border prices (economic prices) are calculated by multiplying the conversion factor after eliminating transfer items, such as taxes, subsidies and etc.

20. In general, all the costs and benefits are divided into three categories: labor, tradable goods and non-tradable goods. And labor is further classified into skilled labor and unskilled labor. As for skilled labor, the economic price is determined by multiplying the market wage by the conversion factor for consumption. On the other hand, the economic price of unskilled labor is determined by multiplying the nominal wage by the shadow wage rate and the conversion factor for consumption.

21. The prices of tradable goods are expressed in CIF and FOB value for import goods and export goods respectively.

22. These values show the actual border prices. However, as the border price of non-tradable goods cannot be converted directly, the border price of the inputs needed to

produce the non-tradable goods is considered. After some classification of the non-tradable goods, the economic price of a small amount of the non-tradable goods is calculated by multiplying the market prices by the standard conversion factor directly.

5.5.2 Conversion Factors

23. Conversion factors for goods and labor are determined as follows:

(1) Standard Conversion Factor (SCF)

24. The standard conversion factor is used to determine the economic prices of certain goods which cannot be directly revalued at border prices. These goods include most non-tradable goods and services. The standard conversion factor is expressed by the following equation:

$$SCF = \frac{X + M}{(X-Tx) + (M+Tm)}$$

Where, X : Value of exports
M : Value of imports
Tx : Value of taxes on exports
Tm : Value of taxes on imports

25. The standard conversion factors for the last four years for which data are available (1989-1992) are shown in table 5-5-1. In this study, for the average standard conversion factor over the four years, 0.951 is adopted.

(2) Conversion Factor for Consumer Goods (CFC)

26. This conversion factor is used to convert the market prices of consumer goods into the border prices. The conversion factor for consumer goods is usually calculated in the same manner as the SCF, replacing total imports and exports by those of consumption goods only.

27. However in this case, it is difficult to directly calculate the CFC due to the shortage of necessary data such as export and import value and taxes on the consumer goods. Therefore, in this study, 80% of export and 50% of import goods are assumed

to be consumer goods and conversion factor for consumer goods is estimated as 0.925.

(3) Conversion Factor for Labor (CFL)

28. For the economic analysis, labor costs are usually measured in terms of their opportunity costs, that is the value of the foregone marginal product from other alternate employment due to the employment of laborers for the project.

29. The cost of skilled labor is calculated based on actual market wages, assuming that the market mechanism is functioning properly. However, as these are domestic costs or market cots, they are converted into border prices by multiplying the market wages by the conversion factor for consumption goods.

Thus, the conversion factor for skilled labor
= (Market wage rate) x (CFC)
= 1 x 0.925
= 0.925

30. As the wages paid to unskilled labors by a project are usually far above the opportunity cost, these market wages should not be used for calculation of the economic value of the unskilled labors. Considering the labor market, the labor is usually provided from the agricultural sector and the marginal wage rate is calculated based on the labor market in the agricultural sector. Therefore, in this study, the economic cost of unskilled labor is estimated based on a simplified measure of the opportunity cost considering the productivity of the agriculture sector. The conversion factor for unskilled labor is calculated as follows;

$$\text{CFL(Unskilled)} = \frac{\text{Opportunity Cost}}{\text{Nominal Wages}} \times \text{CFC}$$

$$= 2{,}500 \;/\; 4{,}000 \times 0.925 = 0.578$$