Chapter 3 Ferry Terminal Development Plan

3.1 Factors Concerned with Ferry Terminal Planning

3.1.1 Required Ferry Terminal Facilities

1. The required ferry terminal facilities at each site in the short-term development plan are determined by taking account of the following items.

(1) Required number of berths

2. Based on the demand forecast on each ferry route, required size of ferry boat and number of berth at each terminal in 2004 were determined in the long-term development plan (a summary of which is given in Table 3.1.1 below) and the detailed operation plan including berthing is mentioned in Chapter 6 of Part 3.

Table 3.1.1 Required Number of Berths at Each Terminal
in the Short-term Development Plan

Route/Terminal	Required Berth in 2004		
	Boat Size (GRT)	No. of Berths	Note
Surabaya - Banjarmasin			
Banjarmasin	5,000	1	
Surabaya	5,000	1	
Selayar - Labuhan Bajo			
Selayar	1,000	1	
Labuhan Bajo	1,000	1	The berth will be used for both the existing L.Balo-Sape route (operated by 500GRT) and this route.
Manokwari - Biak			
Manokwari	1,000	1	
Biak	1,000	1	The berth will be used for both the existing Biak-Serui route (operated by 300GRT) and this route.
Wahai – Babang			
Wahai	1,000	1	
Babang	1,000	1	

(2) Length and water depth of berth

3. The length and water depth of a ferry terminal berth depends on the dimensions and capacity of objective ferry boat (See Chapter 5 of Part 2).

(3) Passenger terminal and parking area

4. The required area of the passenger terminal and parking area is determined in the short-term development plan using the same formulas given in the long-term development plan.

5. In each site, dolphin type mooring facilities are planned, consisting of breasting dolphins and mooring dolphins. Movable bridge type of vehicle ramp is equipped for the smooth loading/unloading of vehicles.

(4) Passenger access

6. Concerning the passenger safety, access for passengers between berth and ferry boat should be separated from vehicular access by using a direct approach to the passenger deck of ferry boat or use of fenced-off lanes on the causeway or trestle.

(5) Supply of electricity, water and fuel

7. At each terminal except Surabaya and Banjarmasin, electricity is supplied owned by generators in the ferry terminal. Ground water is supplied to passenger terminal and ferry boat. Fuel is supplied by the trucks of PERTAMINA.

(6) Others

8. A truck scale has not been installed except at some of the large scale ferry terminals. Therefore, it is necessary to install a truck scale not only to charge the fare but also to secure the safe navigation of ferry boats.

3.2 Ferry Terminal Development Plan at Each Site

3.2.1 Basic Premises for Ferry Terminal Development Plan

9. Planning of the ferry terminal development at each site in the short-term development plan should consider the following matters.

- Continuity to long-term development plan:
  Terminal facilities under the short-term development plan must be able to be readily shifted for use in the long-term development plan.

- *Flexibility in land utilization:*
  It must be possible to secure and cope flexibly with unforeseen needs.
- Efficient layout of terminal:
  The topography and the layout of facilities must be amenable to ferry terminal use and conducive to efficient operation.

3.2.2 Proposed Ferry Terminal Development Plan at Each Site

10. A ferry terminal development plan at each site for the short-term development plan is proposed taking account of the required scale of ferry terminal, the above basic premises and the results of the natural and environmental condition surveys, as follows:

(1) Surabaya (Lamong Bay) - Banjarmasin

1) Surabaya (Lamong Bay)

11. The proposed site is located at Lamong Bay in the Surabaya port and situated between the existing container berth (under expansion at present) and the future container terminal and other development complex proposed in the "Location II and III" of PELINDOIII's reclamation plan, which includes the passenger vessel terminal.

12. In the layout plan of this terminal, only one berth is required, however, it is necessary to consider not only the planned two berths in the long-term development plan but also the passenger vessel berths planned by PELINDOIII because this area has a limited width.

13. Ferry berth is planned offshore about 3km from the onshore ferry terminal where the water is naturally deep. The top of mooring dolphin is planned to lie within the imaginary line connecting the corner of the existing container berth and future container berth (See Figure 3.2.1).

14. The berth (15,000m^2) consists of a reinforced concrete deck supported on steel piles including the second passenger terminal (two stories: 2,400m^2) and parking area (3,200m^2). The berth will be able to accommodate a 5,000GRT ferry boat.

15. The ferry terminal area (38,000m^2) with causeway (800m in length) is connected to the berth by an approximately 2.0km trestle with a total width of 14.5m. Other onshore facilities include the first passenger terminal (two stories: 4,000m^2), shuttle bus terminal

(3,300m²) and parking area (9,000m²).

16. Shuttle bus service is planned to transport passenger between the first and second passenger terminals.

17. In the implementation of this project, it is necessary for the Indonesian government to coordinate with PELINDO III's passenger terminal development plan including joint management of the trestle and to consider the land acquisition for the access road between the ferry terminal and regional road.

2) Banjarmasin

18. The proposed site is located next to the Banjarmasin port area (Trisakti Terminal) and situated at upstream of Barito river facing the passenger vessel terminal across from the small Teluk Dklam river.

19. This site is situated in a future port development area, 1,500m upstream from the passenger vessel terminal owned by PELINDOIII. However, this area is owned by the army and is now being leased to a private company.

20. In the layout plan of this terminal, dredging to secure a sufficient water depth for berthing of 5,000GRT ferry boat can not be carried out because this site faces the Barito river. Therefore, layout of this terminal is planned in accordance with the natural water depth and the present topography (See Figure 3.2.2).

21. The required onshore area is about 30,000m² including a passenger terminal (two stories: 4,000m²) and parking area (9,000m²).

22. As mentioned above, it is necessary for the Indonesian government to confirm the future port development plan and to consider the land acquisition for the ferry terminal.

(2) Selayar (Patumbukan) - Labuhan Bajo

1) Selayar (Patumbukan)

23 The proposed site is located at Patumbukan in the south east end of Selayar Island and situated about 40km south from the capital city of Benteng county. However,

the access road, which stretches about 4km from the main road and is 3m in width, has not been paved.

24. This site is a small scale bay and has a length of 500m and width of 200m and is rather small and shallow for the ferry terminal development plan, however, the inner bay is the calmest area around Selayar Island.

25. In the ferry terminal layout plan, as mentioned above, dredging is necessary to secure the offshore facilities including the area of a new dolphin berth for 1,000GRT ferry boat, turning basin (2 x L = 2 x ferry length = 140m) and access channel because the soft soil layers of thickness between 6 to 18m from LSL and N value 3 to 9 were found in the natural condition survey (See Figure 3.2.3).

26. The ferry terminal area (19,500m^2) including a passenger terminal (2,000m^2) and parking area (5,000m^2) is secured by land reclamation.

27. In addition, the turning basin and narrow access channel will be compensated for by installing navigation aids. And the 4km access road between the site and main road has not been paved, therefore, the road construction works are planned in this project.

2) Labuhan Bajo

28. There is an existing ferry terminal for the route connecting Sape in the Sumbawa Island. It is equipped with a dolphin berth for 500GRT, terminal building of 700m^2 and the unpaved parking area of about 1,000m^2.

29. According to the ferry operation plan for the long and short-term development plans, one ferry berth to accommodate 1,000GRT ferry boat is required for both the existing and new routes, therefore, the existing ferry terminal area has an insufficient ferry berth capacity and onshore area.

30. In the ferry terminal layout plan, the existing dolphin berth is improved for 1,000GRT ferry boat, and the ferry terminal area (20,000m^2) including two passenger terminals (2,200m^2) and parking area (5,000m^2) is secured by reclamation offshore in front of the existing terminal and adjacent land owned by the fishery association (See Figure 3.2.4).

31. In the implementation of this project, it is necessary to ensure that existing ferry

terminal operation is not obstructed during improvement of the dolphin berth and reclamation. Also, the Indonesian government must be considered the land acquisition for the expansion of ferry terminal.

(3) Manokwari (Sowi) - Biak (Mokmer)

1) Manokwari (Sowi)

32. The Sowi proposed site is situated in Sowi Bay and located about 5km south west from Manokwari city.

33. The site topography is flat and empty, and seabed is relatively deep with -5m from 75m of shoreline. The soil conditions offshore and onshore consist of mainly silt, sand and shell fragment and N values are relatively hard.

34. Layout plan for ferry terminal is planned for one dolphin berth of 1,000GRT ferry boat. The ferry terminal area (19,500m^2) with causeway (50m) including a passenger terminal (2,000m^2) and parking area (5,000m^2) is secured by land reclamation (See Figure 3.2.5).

2) Biak (Mokmer)

35. A previous study recommended construction of a dolphin berth to accommodate 300GRT ferry boats as part of the Mokmer ferry terminal plan. However, after finishing the land reclamation work, terminal construction was stopped due to lack of funds.

36. According to the ferry operation plan for the long and short-term development plans and the above mentioned circumstances and discussion with counterparts, one ferry berth to accommodate 1,000GRT ferry boat is planned for both the existing and new routes in the short-term development plan.

37. The ferry terminal area (19,500m^2) is obtained by reclamation of both east and west sides including a passenger terminal (2,000m^2) and parking area (5,000m^2) as shown in Figure 3.2.6.

(4) Wahai - Babang

1) Wahai

38. The proposed site is located about 3km east of Wahai town and situated in a hidden bay about 250m south from Wahai public port.

39. The site topography is flat and seabed is relatively deep with -5m from 100m of shoreline. The soil conditions at offshore seabed consist of mainly silt and fine sand and N values are relatively low.

40. One dolphin berth capable of accommodating 1,000GRT ferry boat is planned in the ferry terminal layout plan. The passenger terminal shall be as close to the berth as possible to minimize walking distance for passengers (See Figure 3.2.7).

41. The ferry terminal area (17,000m^2) with causeway (115m) including a passenger terminal (1,500m^2) and parking area (4,000m^2) is secured by land reclamation.

2) Babang

42. The proposed site is located in Babang Bay about 16km east from the biggest city of Labuha in Bacan Island and situated about 400m north west from Babang public port. It is owned by a timber company as a forest concession, however, the area including office and factory is not being used at present.

43. The land condition is quite rough following reclamation by a timber company, Also, water depth is -5m from LWS closes to 10m from shore line. According to the soil investigation, the hard layer of this site is estimated under -19m from LSL.

44. In the ferry terminal layout plan, one dolphin berth to accommodate 1,000GRT ferry boat is planned. The ferry terminal area (15,000m^2) including a passenger terminal (1,500m^2) and parking area (4,000m^2) will be secured by leveling the ground (See Figure 3.2.8).

45. To implement this project, it is necessary for the Indonesian government to consider the land acquisition for the ferry terminal.

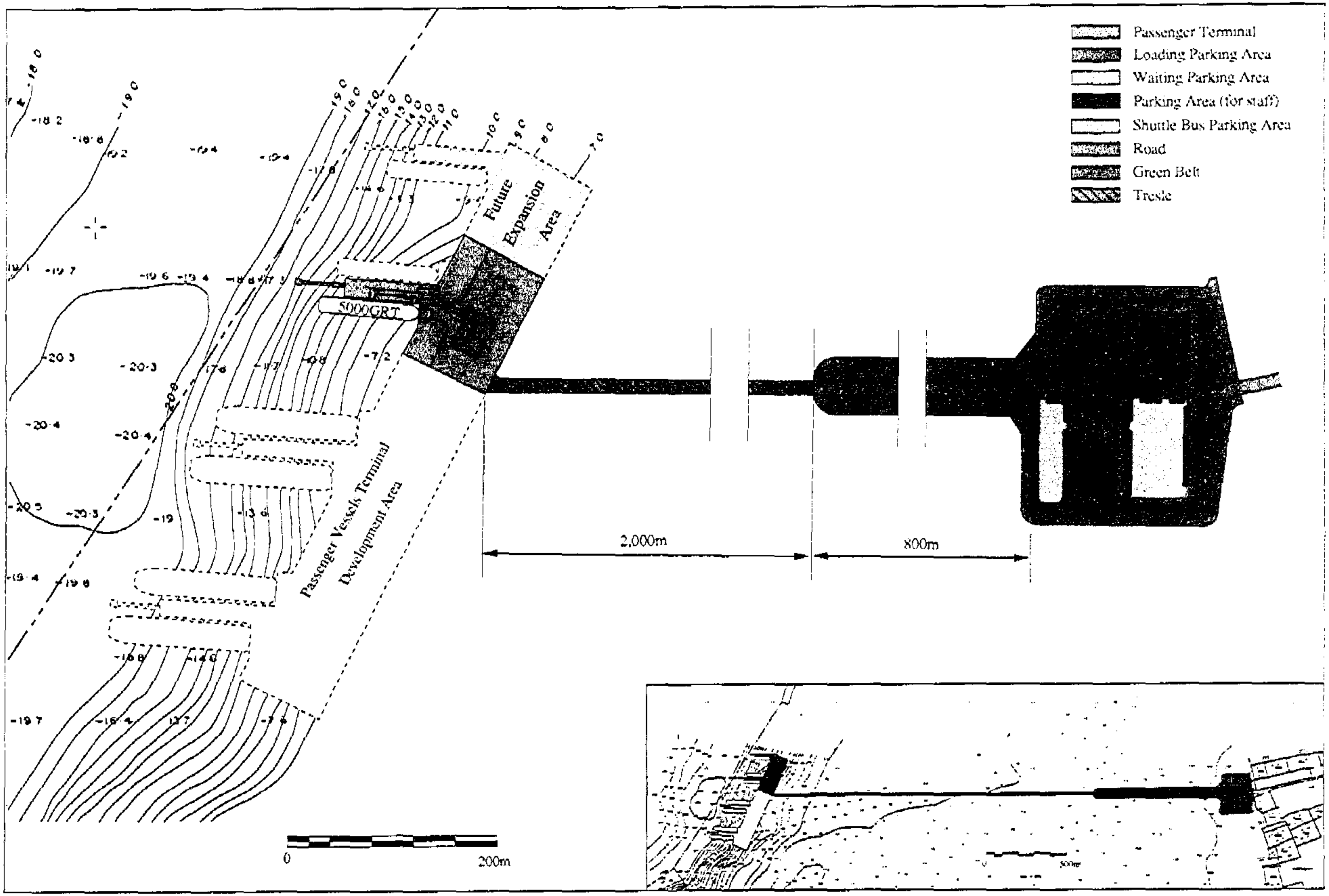


Figure 3.2.1 Layout Plan of Surabaya Ferry Terminal

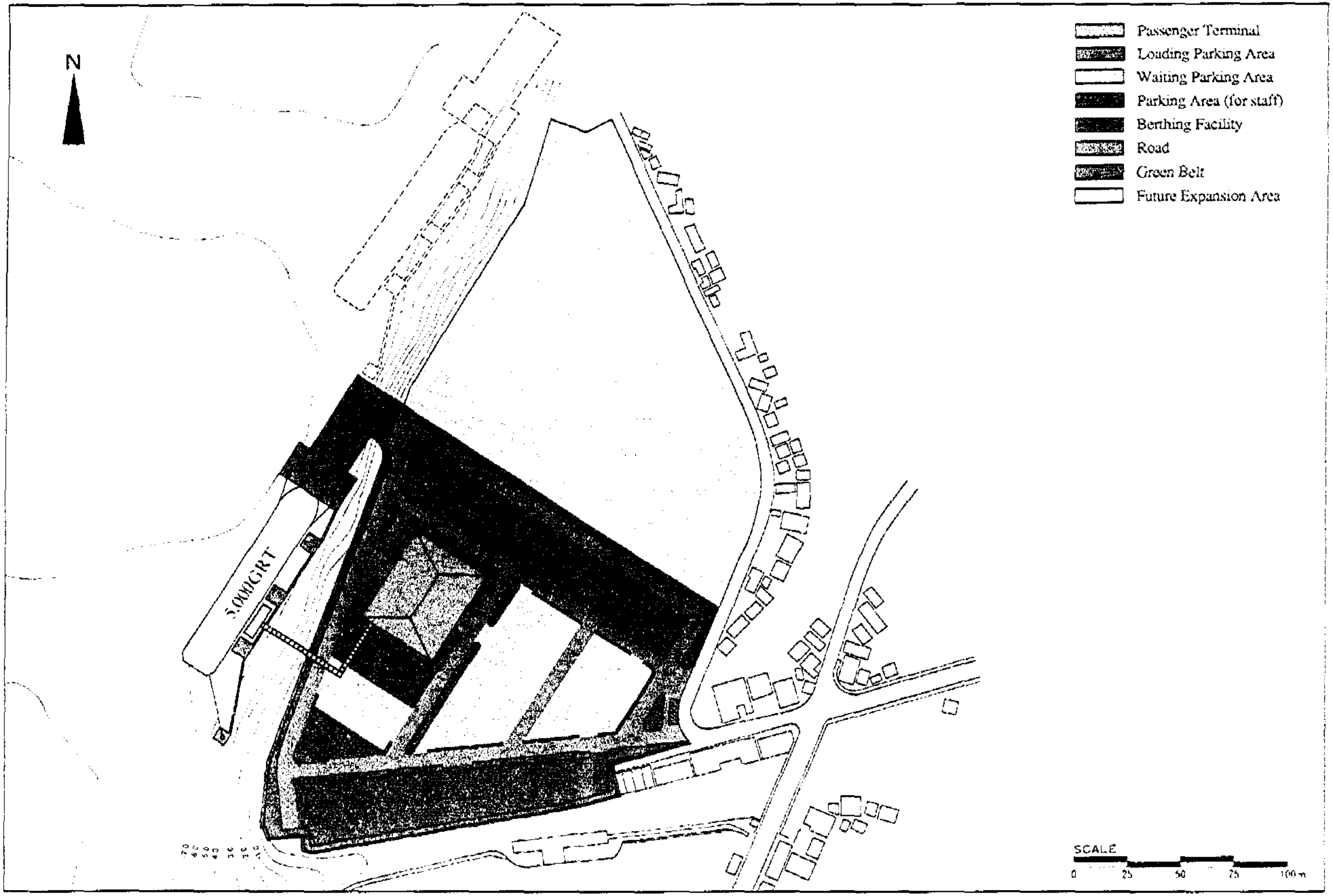


Figure 3.2.2 Layout Plan of Banjarmasin Ferry Terminal

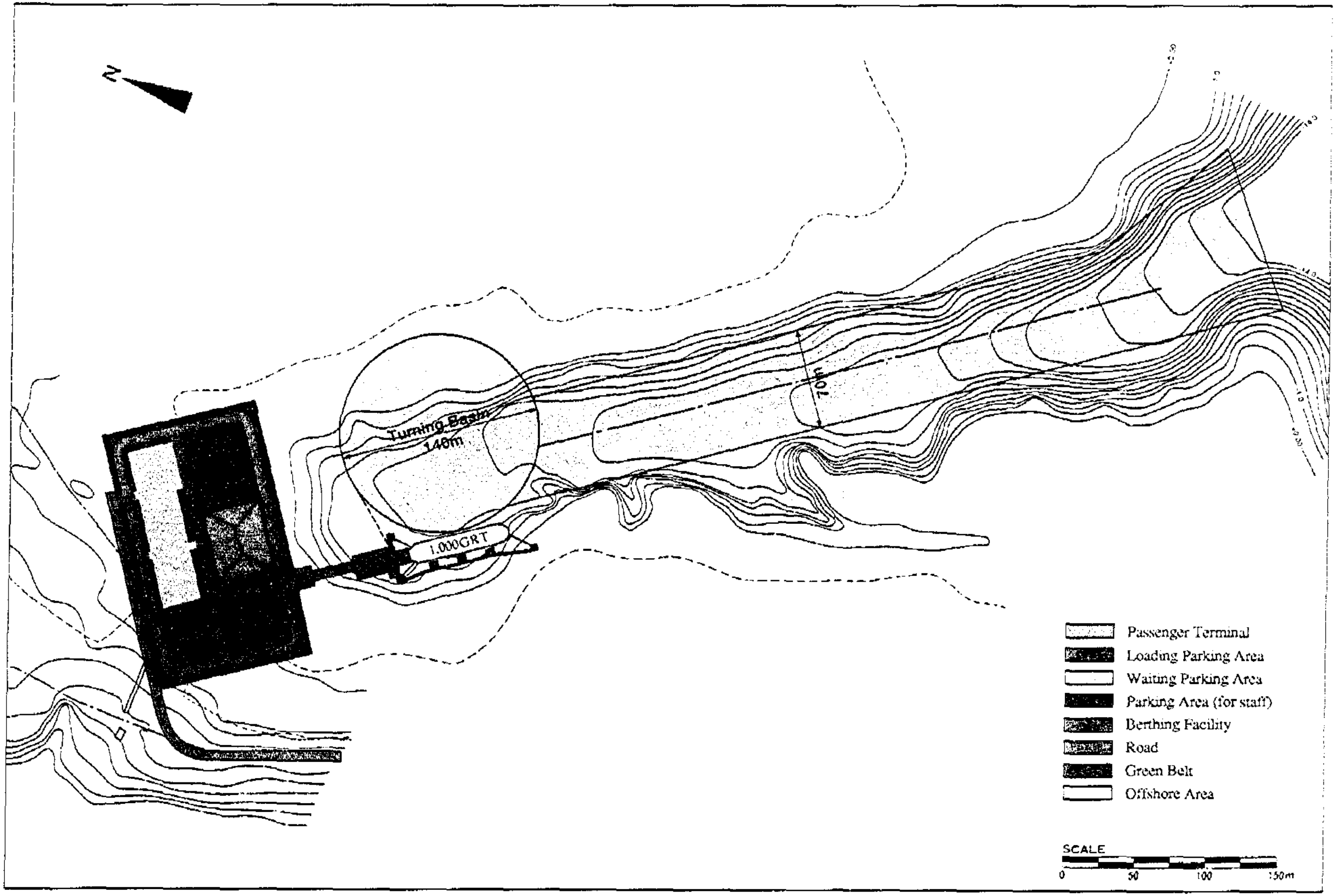


Figure 3.2.3 Layout Plan of Selayar Ferry Terminal

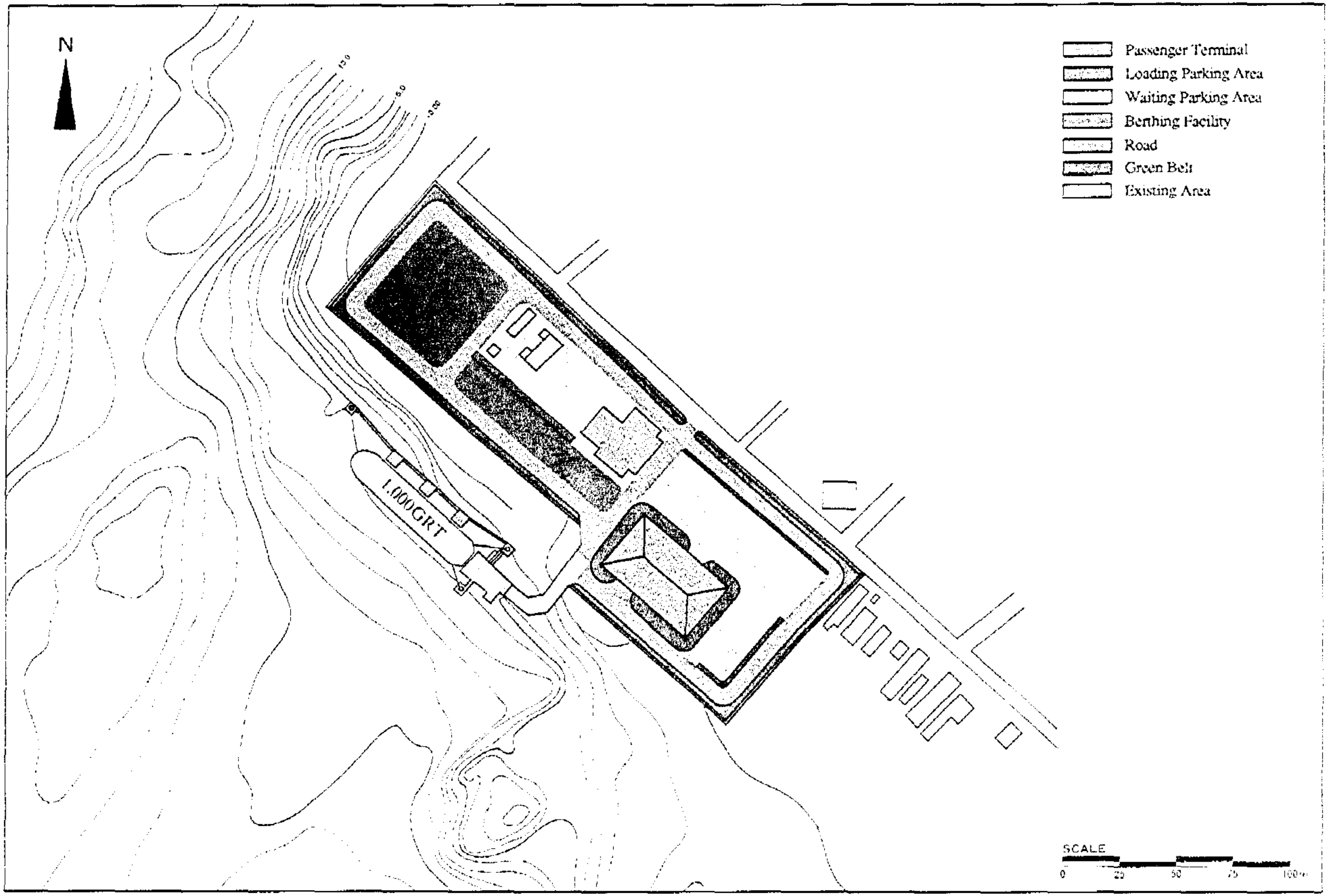


Figure 3.2.4 Layout Plan of Labuhan Bajo Ferry Terminal

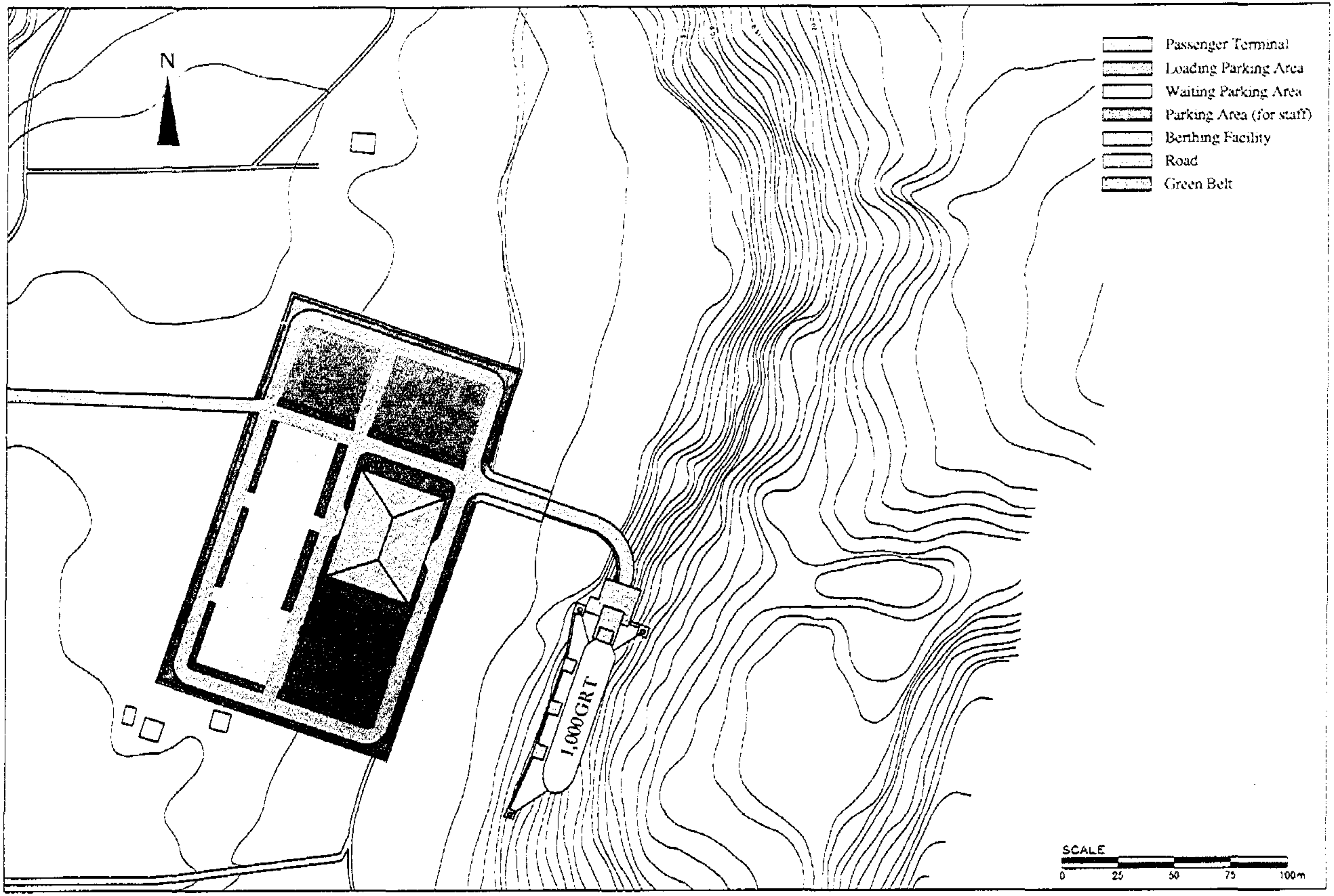


Figure 3.2.5 Layout Plan of Manokwari Ferry Terminal

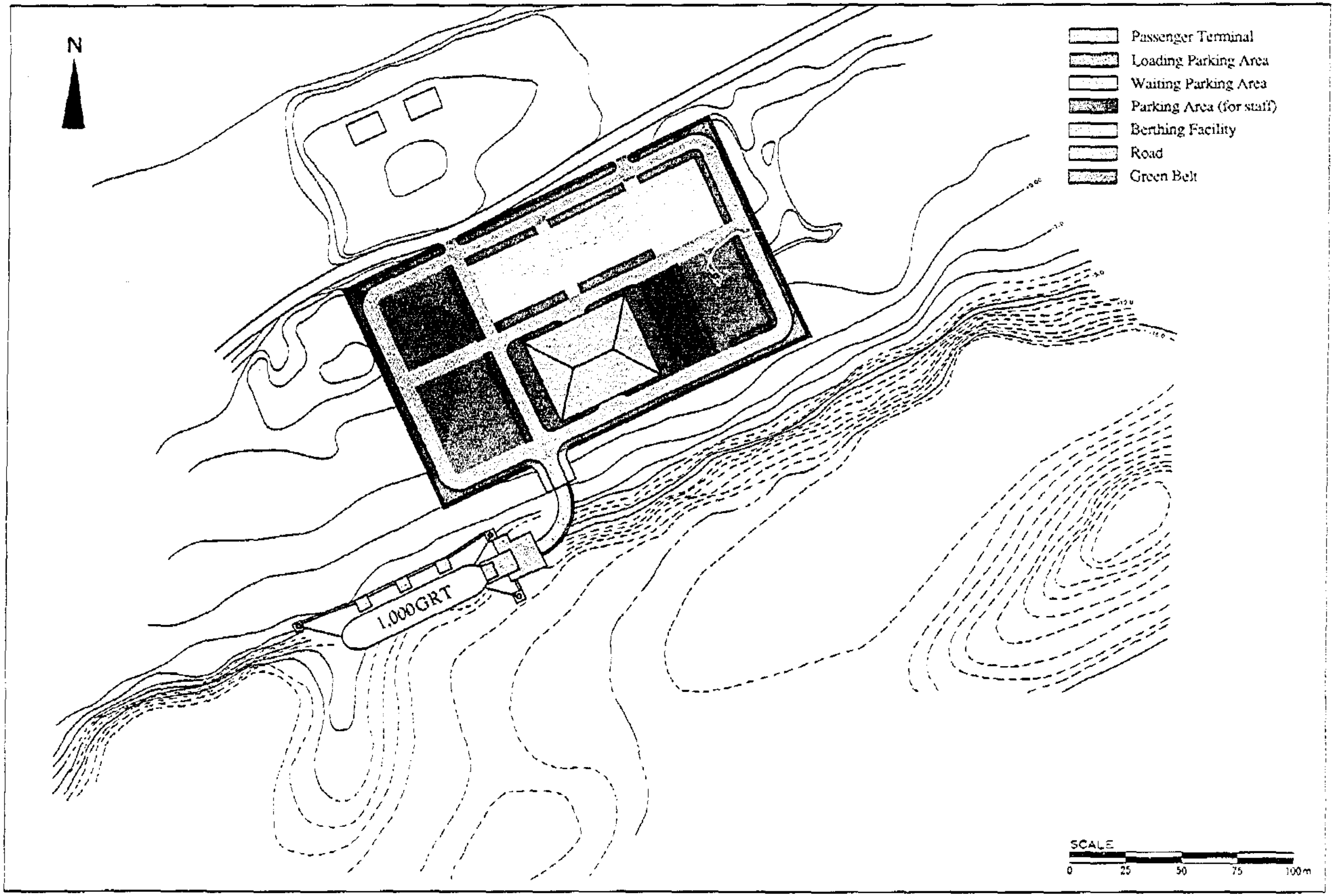


Figure 3.2.6 Layout Plan of Biak Ferry Terminal

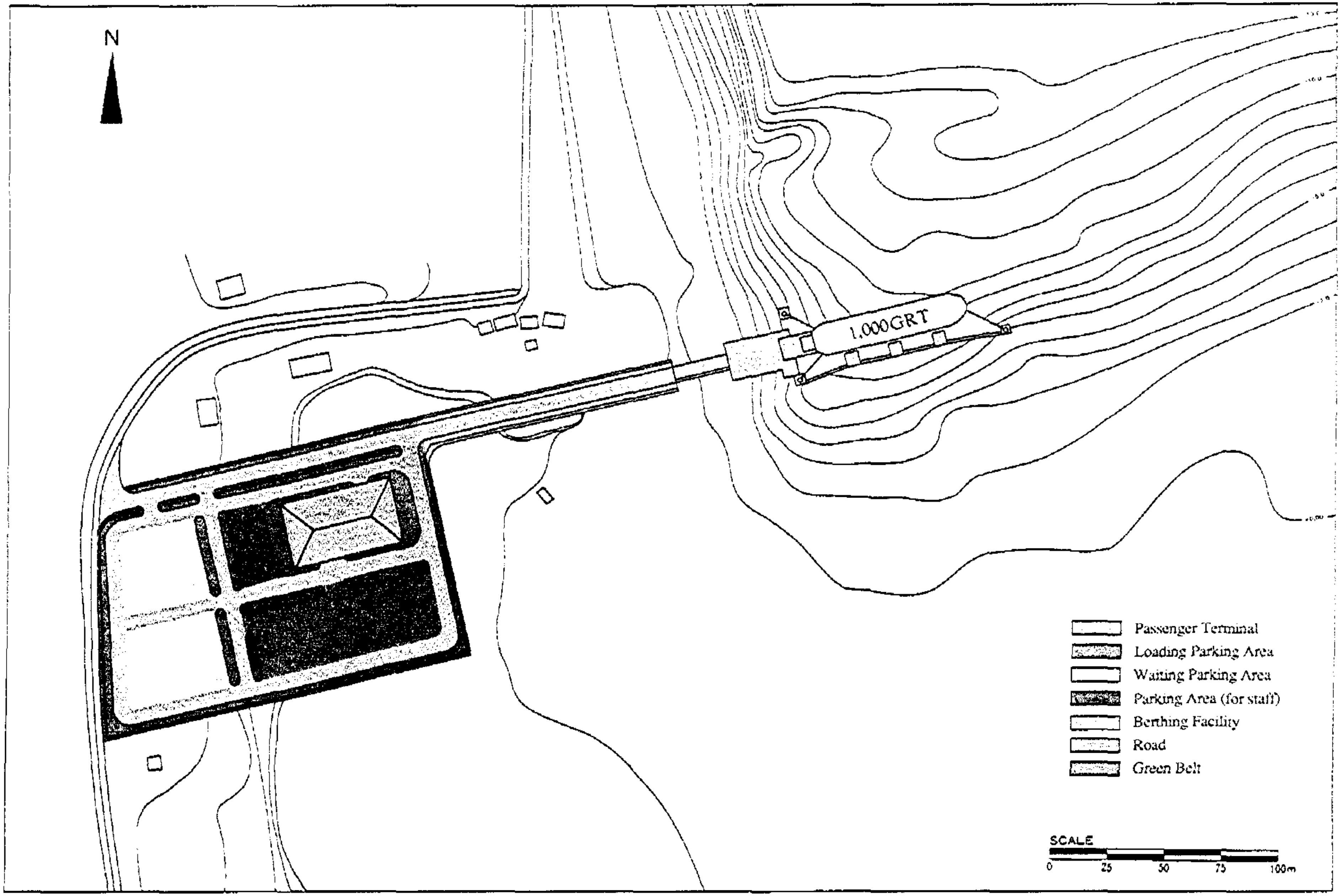


Figure 3.2.7 Layout Plan of Wahai Ferry Terminal

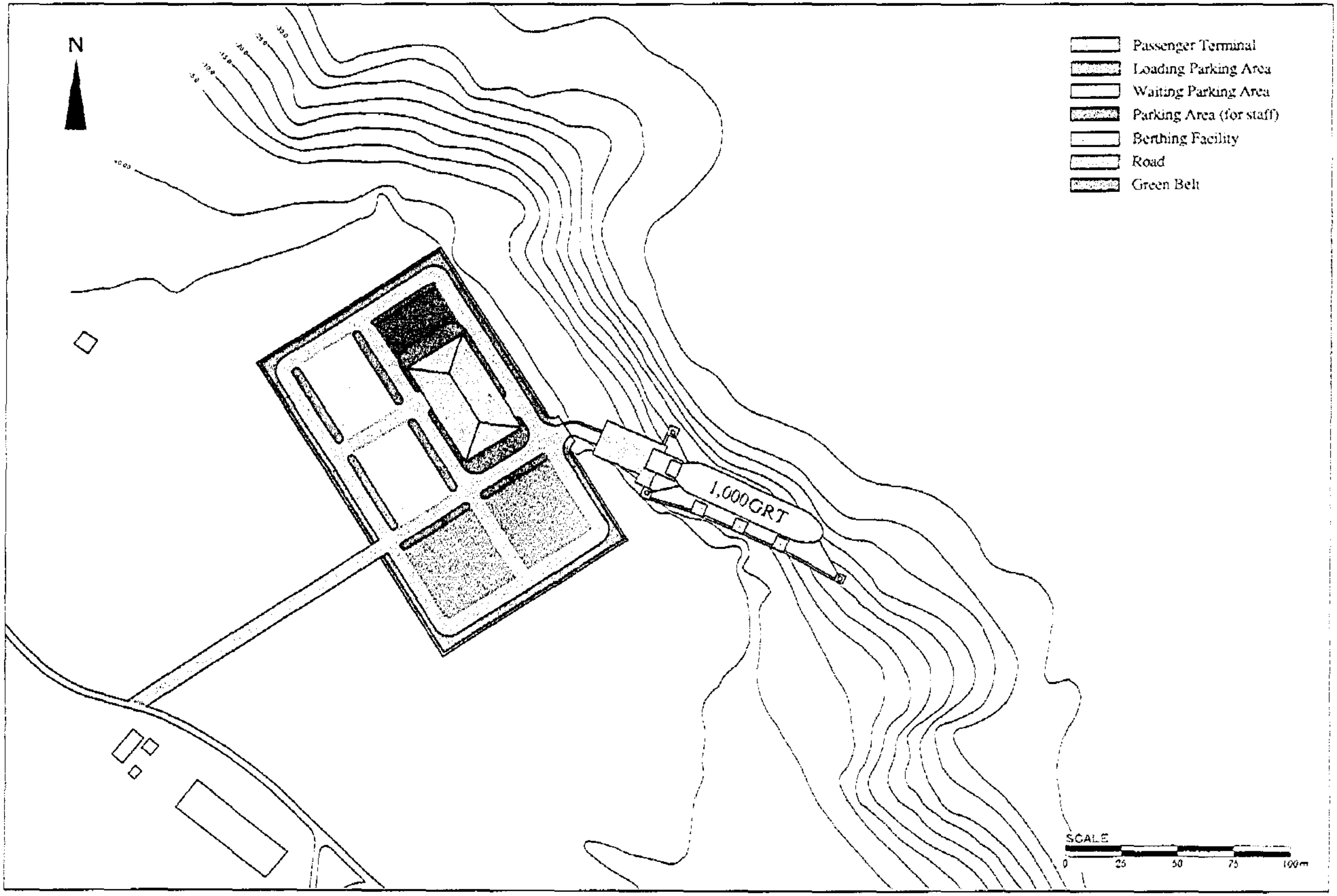


Figure 3.2.8 Layout Plan of Babang Ferry Terminal

Chapter 4 Preliminary Design, Cost Estimation and Construction Schedule

4.1 Preliminary Design

4.1.1 Design Criteria

(1) Planned ferry boat

1. The capacities and dimensions of the planned ferry boats for each terminal are shown below.

Table 4.1.1 Standard Dimensions and Capacity of Planned Ferry Boats

Ferry Route		Surabaya Banjarmasin		Selayar Labuhan Bajo		Wahai Babang		Biak Manokwari	
Gross Tonnage [GRT]		Max	Min	Max	Min	Max	Min	Max	Min
		5,000	1,000	1,000	500	1,000	500	1,000	500
Length Over All	[m]	100	70	70	50	70	50	70	50
Breadth	[m]	18	14	14	12	14	12	14	12
Full Loaded Draft	[m]	4.9	3.7	3.7	2.5	3.7	2.5	3.7	2.5
Free Board	Empty [m]	1.4	1.2	1.2	1.0	1.2	1.0	1.2	1.0
	Full Loaded [m]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ship Lamp	Length [m]	6.0	5.3	5.3	4.3	5.3	4.3	5.3	4.3
	Width [m]	7.0	7.0	7.0	6.0	7.0	6.0	7.0	6.0
Capacity	Passenger	800	500	500	400	500	400	500	400
	8 t Truck & Bus	34	19	19	12	19	12	19	12
	2 t Truck & Sedan	42	23	23	14	23	14	23	14

(2) Berthing force and tractive force of mooring post capacity

2. The berthing forces are determined based on a berthing velocity of 30cm/sec by 1,000GRT and 20cm/sec by 5,000GRT, an approaching angle of 10 degrees and fully loaded condition. The capacity of mooring posts is determined based on the Technical Standards for Ports and Harbors Facilities [Japan].

Table 4.1.2 Berthing Force and Mooring Post Capacity

Ferry Route		Surabaya Banjar-masin	Selayar Labuhan Bajo	Wahai Babang	Biak Manokwari
Berthing Velocity [m/sec]		0.20	0.30	0.30	0.30
Approach Angle [degree]		10	10	10	10
Berthing Energy [ton * m]		10.4	7.51	7.51	7.51
Reaction Force of Fender [ton]		43.0	45.6	45.6	45.6
Tractive Force on Mooring Post					
	Mooring Dolphin [ton]	50	25	25	25
	Breasting Dolphin [ton]	35	25	25	25

(3) Natural conditions and material allowable stress for preliminary design

3. Tide: The significant tide levels at each terminal are obtained by the field observation survey as follows:

Table 4.1.3 Tide Levels

(Unit: m)

	Sura-baya	Banjar-masin	Selayar	Labuhan Bajo	Wahai	Babang	Biak	Manok-wari
H.H.W.S	2.74	2.97	2.39	2.70	1.92	1.35	1.55	2.20
M.S.L	1.37	1.48	1.19	1.35	0.96	0.67	0.92	1.10
L.L.W.S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4. Current: Based on the field current observation, the resultant velocities of the current for the design are obtained as shown below.

Table 4.1.4 Current Velocity

(Unit: cm / sec)

	Sura-baya	Banjar-masin	Selayar	Labuhan Bajo	Wahai	Babang	Biak	Manok-wari
Velocity	30	85	20	45	20	40	65	25

5. Wave: At the sites of Surabaya, Banjarmasin, Labuhan Bajo, and Wahai the wave conditions are good for ferry operation and no particular measures are necessary for the design of mooring facilities. However, it is considered necessary to check the impacts of waves at the entrance of Patumbukan bay, Manokwari and Babang terminal sites due to the topographic features of these sites. The deep water wave heights and period of these sites are assessed as shown in Table 4.1.5.

Table 4.1.5 Design Waves

	Selayar	Babang	Manokwari
Wave Height $H_{1/3}$ [m]	2.27	1.76	2.27
Wave Period $T_{1/3}$ [Sec]	6.60	5.56	6.60
Direction	E	E	SE

6. Sub-soil Conditions: The sub-soil conditions of each planned terminal site according to the soil investigation are summarized in Tables 4.1.6 (1) – (8). The soil profiles of the above boring logs are presented in Figure A2.6.1 to Figure A2.6.8 of the Appendix of Part 3.

Table 4.1.6 (1) Sub-soil Condition of Surabaya Site

Land Site			Sea Site		
Elevation [m]	Sub-soil	N-value	Elevation [m]	Sub-soil	N-value
+1.1 ~ -2.9	Silty clay, very soft	0	-1.4 ~ -12.4	Silty clay, very soft	0 - 2
-2.9 ~ -9.9	Clay, hard	10 - 17	-12.4 ~ -13.4	Shell fragment	5
-9.9 ~ -15.9	Sandy shell, stiff	11 - 14	-13.4 ~ -25.4	Clay, hard	15 - 20
-15.9 ~ -20.4	Silty Clay	14 - 22	-25.4 ~-40.9	Clay, hard	24 - 35
-20.4 ~ -23.9	Silty sandy clay	23 ~ 40	-40.9 ~ -53.4	Clay, hard	40 - 47
-23.9 ~ -24.9	Clayey stone dense	48	-53.4 ~ -57.4	Clay, hard	41 - 52
-24.9 ~ -32.9	Sandy clay	19 - 24	-57.4 ~ -58.9	Clay, hard	52 - 60
-32.9 ~ -36.9	Sandy silt	24 - 41	-58.9 ~ -61.4	Clay, hard	>60
-36.9 ~ -45.9	Sandy clay	33 ~ 40			
-45.9 ~ -54.9	Clayey stone dense	52 - 60			
-54.9 ~ -58.9	Breccia, very dens	>60			

Table 4.1.6 (2) Sub-soil Condition of Banjarmasin Site

Land Site			Sea Site		
Elevation [m]	Sub-soil	N-value	Elevation [m]	Sub-soil	N-value
+3.0 ~ -3.5	Organic matter, very soft	0	-2.3 ~ -24.8	Clayey silt, soft to firm	3 - 8
-3.5 ~ -13.0	Silty clay	2 - 3	-24.8 ~ -26.8	Silty fine sand, medium	8 - 19
-13.0 ~ -15.5	Silty clay, firm	4 - 6	-26.8 ~ -34.8	Clayey fine sand	11 - 30
-15.5 ~ -17.5	Sand clay, stiff	6 - 14			

Table 4.1.6 (3) Sub-soil Condition of Selayar Site

Land Site			Sea Site		
Elevation [m]	Sub-soil	N-value	Elevation [m]	Sub-soil	N-value
+2.9 ~ +1.4	Medium sandy clay	0	-3.3 ~ -4.3	Gravel coarse sand, loose	0
+1.4 ~ -0.1	Gravely clay, very loose	<3	-4.3 ~ -5.3	Medium sandy gravel	0
-0.1 ~ -17.1	Gravely clayey sand	4 ~ 19	-5.3 ~ -9.8	Medium to fine sand	<4
-17.1 ~ -19.6	Clayey sand, very dense	>60	-9.8 ~ -22.3	Mud, very soft	0
-22.3 ~ -30.3	Fine Sandy clay, firm	4 - 6	-30.3 ~ -32.3	Clay, stiff	1
-32.3 ~ -33.8	Gravel, very dense	50			

Table 4.1.6 (4) Sub-soil Condition of Labuhan Bajo Site

Shore Site			Sea Site		
Elevation [m]	Sub-soil	N-value	Elevation [m]	Sub-soil	N-value
-0.5 ~ -1.5	Shell fragment, soft	0	-5.7 ~ -13.2	Medium sandy shell	2 - 12
-1.5 ~ -2.5	Sandy shell fragment	1	-13.2 ~ -16.7	Medium sand	17
-2.5 ~ -8.0	Fine sand, loose	2 - 7	-16.7 ~ -17.7	Gravelly clay, dense	31
-8.0 ~ -11.5	Medium sandy shell	9 - 11	-17.7 ~ -27.7	Breccia clay, dense	>60
-11.5 ~ -14.5	Gravelly clay	10 - 12	-27.7 ~ -35.7	Andesite, very dense	>60
-14.5 ~ -18.5	Silty sand, medium	10 - 14			
-18.5 ~ -22.5	Tuffaceous sand, dense	42 - 60			
-22.5 ~ -26.0	Breccia, very dense	>60			
-26.0 ~ -30.5	Andesite, very dense	>60			

Table 4.1.6 (5) Sub-soil Condition of Wahai Site

Land Site			Sea Site		
Elevation [m]	Sub-soil	N-value	Elevation [m]	Sub-soil	N-value
+1.8 ~ -0.7	Silty Sand, very loose	<4	-0.2 ~ -6.7	Fine Sand	5
-0.7 ~ -5.2	Silty shell, loose	5-7	-6.7 ~ -21.2	Sandy silt, clay silt	4 - 6
-5.2 ~ -7.2	Fine sand, shell fragment	7	-21.2 ~ -29.2	Shell fragment silt, loose	3 - 4
-7.2 ~ -10.7	Silty coral rock, loose	11 - 13	-29.2 ~ -30.7	Sandy silt, firm	6
-10.7~ -12.2	Fine Sandy Shell, loose	10			
-12.2~ -16.2	Sandy silt shell	7 - 8			
-16.2 ~ -17.2	Shell fragment	31			
-17.2 ~ -26.2	Coral rock, silt loose	4 - 6			
-26.2 ~ -28.7	Gravel coarse sand	45 - 55			

Table 4.1.6 (6) Sub-soil Condition of Babang Site

Land Site			Sea Site		
Elevation (m)	Sub-soil	N-value	Elevation (m)	Sub-soil	N-value
+1.5 ~ -1.5	Coarse sand, loose	5	-0.4 ~ -1.9	Shell fragment, loose	0
- 1.5 ~ -8.5	Silty to sandy shell	7 - 22	-1.9 ~ -7.4	Silty shell fragment, loose	7
-8.5 ~ -11.5	Shell fragment sand	24	-7.4 ~ -19.4	Shell fragment silt to sand	10 - 17
-11.5 ~ -13.5	Silty shell, hard	23 - 60	-19.4 ~ -21.4	Shell fragment coarse sand	35
-13.5 ~ -17.5	Sandy shell fragment	48 - 50	-21.4 ~ -27.4	Shell fragment, silty sand	12 - 19
-17.5 ~ -18.7	Rock shell fragment	>60	-27.4 ~ -30.9	Shell fragment clay	35 - 40

Table 4.1.6 (7) Sub-soil Condition of Manokwari Site

Land Site			Sea Site		
Elevation (m)	Sub-soil	N-value	Elevation (m)	Sub-soil	N-value
+3.8 ~ +1.8	Silty clay	0	-0.2 ~ -1.7	Shell fragment	0
+1.8 ~ -6.7	Silty sand, medium	16 - 30	-1.7 ~ -2.2	Gravel sand	60
- 6.7 ~ -7.7	Shell fragment boulder	30	-2.2 ~ -7.7	Shell fragment, very dense	>60
- 7.7 ~ -9.7	Silty sand, medium	30	-7.7 ~ -18.2	Silty Sand, medium / dense	23 - 60
-9.7 ~ -16.2	Silty sand, very dense	40 - 60	-18.2 ~ -20.2	Shell fragment, very dense	>60

Table 4.1.6 (8) Sub-soil Condition of Biak Site

Land Site			Sea Site		
Elevation (m)	Sub-soil	N-value	Elevation (m)	Sub-soil	N-value
+2.3 ~ -12.0	Sand /coral	30	-5.0 ~ -18.0	Sand /coral	24
-12.0 ~	Sand /coral	50	-18.0 ~	Sand /coral	>50

7. Load Condition: The following loads are used in the design of the marine structure and the movable bridge.

1) Dead Load

Reinforced concrete : 2.45 t/m³
Plain concrete : 2.35 t/m³
Steel : 7.80 t/m³
Sand [in air] : 1.80 t/m³ [in water] : 1.00 t/m³

2) Live Load

Uniform Live Load : 2.0 t/m² under ordinary condition
1.0 t/m² under seismic condition

Wheel Load : T-20 [Load Capacity 8.0 ton] for Surabaya and Banjarmasin terminals with Max. gradient of 12°
T-14 [Load Capacity 5.6 ton] for Other terminals with Max. gradient of 17°

3) Load Combination

Under certain combination of loads, the following increased allowable stresses of a structure are applied:

Load Combination	Percentage of Increase
Dead Load + Live Load + Impact	No increase
Dead Load + Live Load + Impact + Wind	33 %
Dead Load + ½ Live Load + Earthquake	50 %

8. Seismic Coefficient: Indonesia is classified into six areas according to the seismic conditions, as shown in Figure A4.1.1 and seismic coefficient as detailed in the Table A4.1.1 and Table A4.1.2 of Appendix 4.1.1 of Part 3. The design seismic coefficient applied to each terminal is determined in accordance with the following formula and shown in Table 4.1.7.

Design seismic coefficient [k_h] = (Regional Seismic Coefficient) x (Structural type factor) x (Coefficient of Importance):

Table 4.1.7 Design Seismic Coefficient for Each Terminal

Terminal Site	Seismic Zone	Regional Seismic Coefficient	Importance Coefficient	Structural Type Coefficient	Design Seismic Coefficient
Surabaya	4	0.05 (Soft soil)	1.5	1.0	0.10
Banjarmasin	5	0.03 (Soft soil)	1.5	1.0	0.05
Selayar	4	0.05 (Soft soil)	1.5	1.0	0.10
Labuhan Bajo	3	0.07 (Soft soil)	1.5	1.0	0.10
Wahai	2	0.09 (Soft soil)	1.5	1.0	0.15
Babang	2	0.07 (Hard soil)	1.5	1.0	0.10
Manokwari	1	0.13 (Soft soil)	1.5	1.0	0.20
Biak	1	0.09 (Hard soil)	1.5	1.0	0.15

9. Service Life: The service life of the mooring facility is 50 years.

10. Allowable Stress of Material to be used for the Works: The allowable stress of the material to be used for the construction works of the project are detailed in the Appendix 4.1.2.

11. Corrosion Rate of Steel Material: The corrosion rate of the steel material (one side) is described in the Appendix 4.1.3.

12. Safety Factors: The major important safety factors of the structures are summarized in the Appendix 4.1.4.

13. Characteristic of Soil Material: The characteristic of soil material for reclamation and back fill material are described in the Appendix 4.1.5.

14. Designed Level of Ground Level and Sea Bed Level of Each Terminal : The designed level of ground level, marine facilities and sea bed level of each terminal are indicated in the Figure 4.1.11 of Plan and Typical Cross Section of Movable Bridge.

4.1.2 Mooring Facilities

(1) Surabaya terminal

15. The layout plan of mooring facilities of Surabaya terminal is shown in Figure . 4.1.1 (1) .

1) Detached pier

16. A detached pier of 20m width and 100m long which is extended from the detached platform is provided for 5,000 GRT ferry boat to berth along with both sides of pier. This pier is made of concrete beams and slab supported by steel pipe piles of 800mm diameter to absorb the ship berthing energy of 10.4 ton•m. Cell type rubber fender of 800mm in height with two (2) pieces for one unit will be installed. Reaction force of the fender is 43.01ton which shall be withstood by 20m x 25m unit module block of piers. The typical cross section and plan of unit module detached pier is shown in Figure 4.1.1 (2).

2) Detached platform

17. A detached platform of 140m width and 90m long which is constructed between the detached pier and access way from the land is provided for off shore passenger waiting hall in the area of 2,400m^2 and parking area of 3,200m^2 for vehicles to immediately on board the ferry. This platform is constructed of concrete beam and slab supported by steel pipe piles of 800mm diameter and 63m length. Vehicles waiting to board the ferry are on the ground level of platform and passengers are waiting in the overhead hall on the 2nd floor. The typical cross section of unit module of detached platform is shown in Figure 4.1.1 (3).

3) Access bridge for passenger between passenger hall and ferry

18. Access bridge for boarding passengers which is extended from this passenger waiting hall is constructed to separate from the vehicle movement on the ground of platform and to connect between the passenger gate of ferry and passenger hall. The width of the planned access bridge is 3.0m and length thereof is 120m. A passenger boarding bridge is provided for safety of passengers to contact the ferry from the access bridge.

4) Access way

19. The access way to connect the on-land terminal facilities and the detached platform is constructed with trestle type of pre-stressed concrete beam of 2,000m length and rock mound type causeway of 800m length.

20. The surface parts of subsoil is encountered very soft clay in the distance of some 800m from the existing land for the shallower depth up to -5.0m from the sea bed, which shall be replaced with fine sand to obtain sufficient bearing capacity. The excavation and refilling volume is estimated at 230,000m^3.

21. A 2,000m long trestle is planned to be constructed with 100 spans of 20m span each of PC beam and concrete slab thereon and abutment of every 20m supported by steel pipe pile foundation. This is extended till the detached platform, taking into consideration that PC material for the beam structure will make a longer distance of one span, which results in the minimum number of abutments and pile foundation. The pile foundation will not adversely influence the littoral drift by tidal change and local fishermen's activities.

22. The width of access way is decided as 14.50m consisting of 11.50m for three (3) vehicles lanes and 2.0m width of side walks on one side.

23. The typical cross section of trestle and causeway is shown in Figure 4.1.1 (4), (5) and (6) respectively.

5) Mooring dolphin

24. Two mooring dolphins are provided on the extension from the detached pier for mooring 5,000GRT ferry boat. A mooring post of 35 tons tractive force is installed on each dolphin. The structure of mooring dolphin is supported by steel pipe piles. The typical cross section of mooring dolphins is shown in Figure 4.1.10 with the following dimensions.

Superstructure :	Reinforced concrete 5.0m x 5.0m x 1.5m, 2 units
Foundation pile :	Steel pipe pile 700mm diameter x 14.2mm thickness x 60m, 4pieces

25. The detached pier and two (2) mooring dolphins are connected by catwalk type walkway a 2.0m wide concrete slab structure. The mooring and breasting dolphins of each terminal are connected by the similar size of the above catwalk type walkway.

6) Movable bridge

26. The length and width of movable bridge at each terminal is determined by the process as shown in Table 4.1.8 based on the respective tidal range and maritime conditions of site, the size of ship ramp of planned ferry boats, and max. allowable gradient of loaded vehicles.

27. The foundation of hinge support of movable bridge and two hoisting towers for cylinder is constructed by steel pipe piles of 800mm diameter. The typical conceptual section of foundation is shown in Figure 4.1.11 .

7) Access road

28. The access road which is 8m wide and consists of two vehicle lanes connects the on-land terminal and the existing national road called Jl. Kalianak. The access road has a length of 1,000m and is paved.

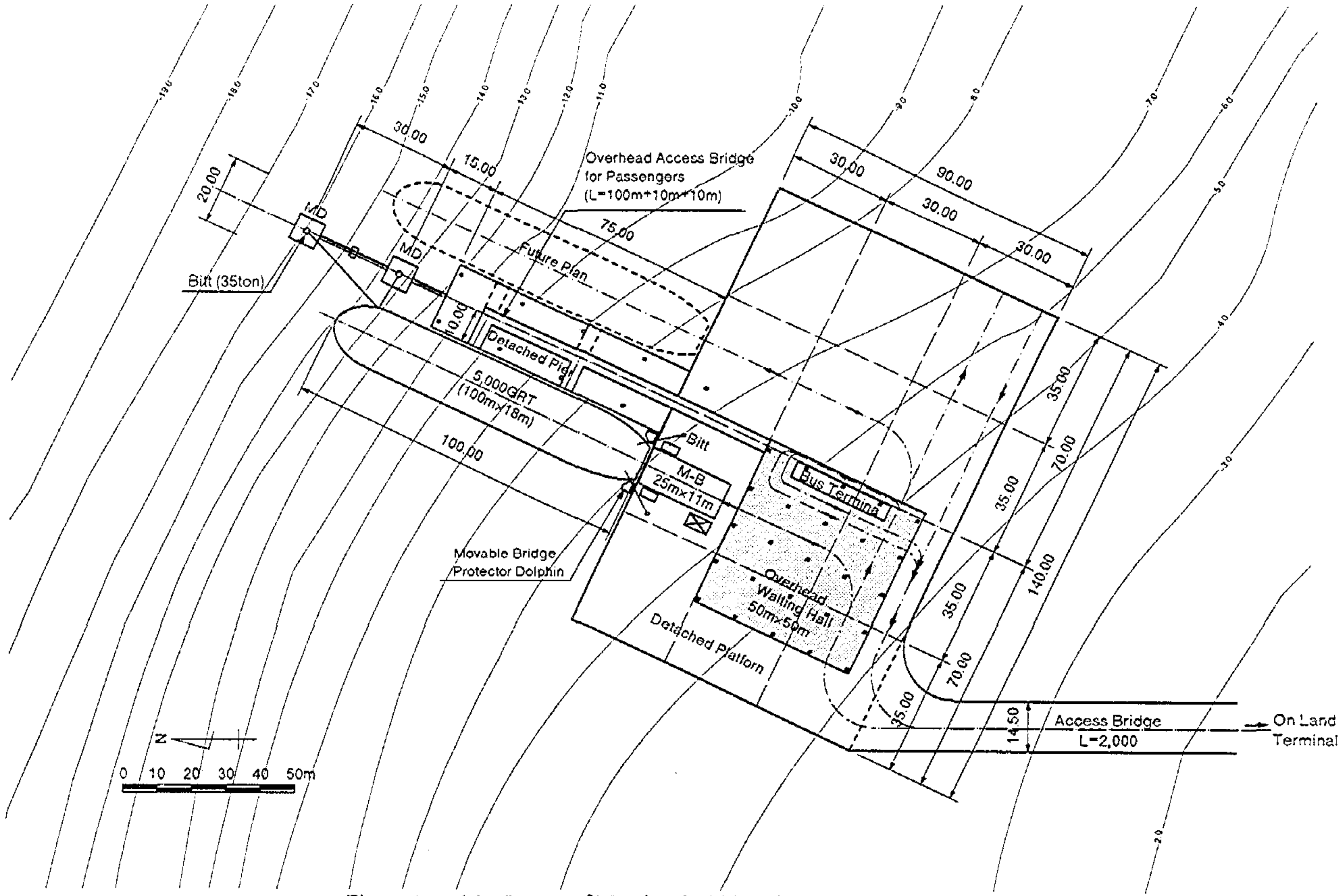


Figure 4.1.1 (1) Layout of Mooring Facilities of Surabaya Ferry Terminal

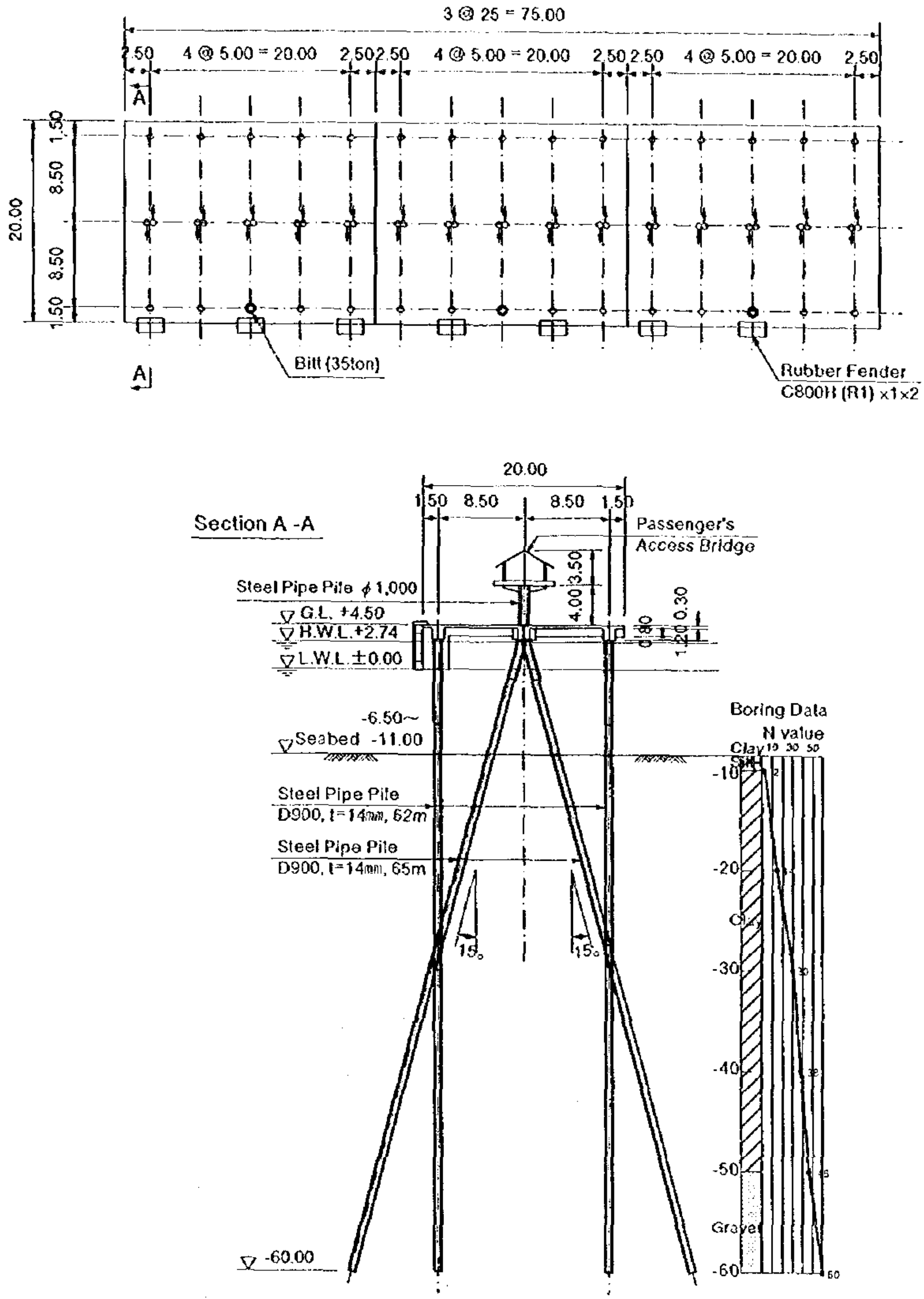
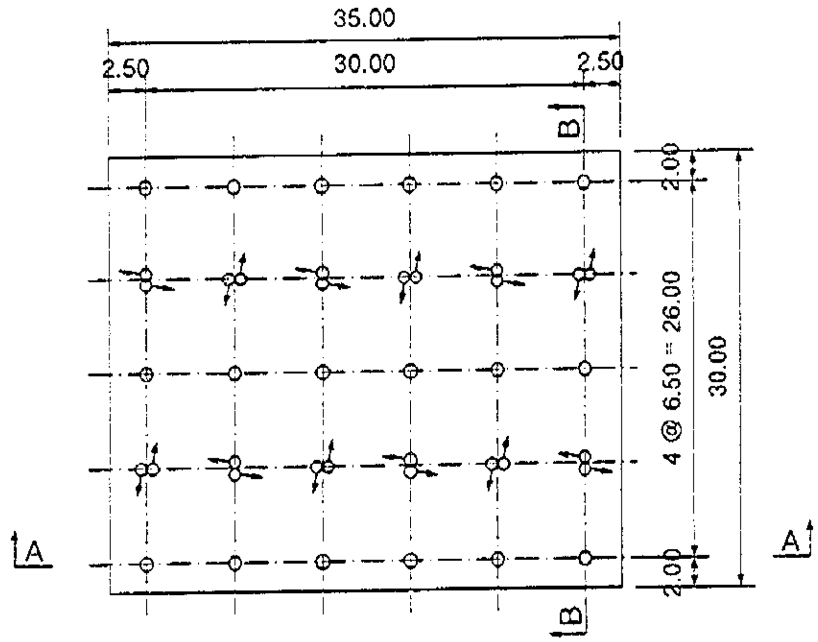
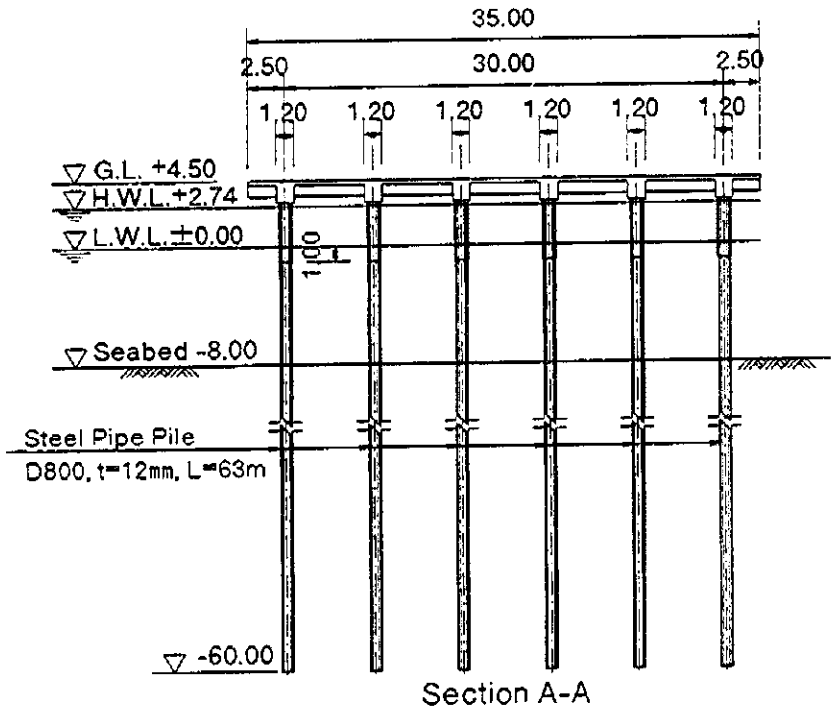


Figure 4.1.1 (2) Typical Cross Section of Detached Pier of Surabaya





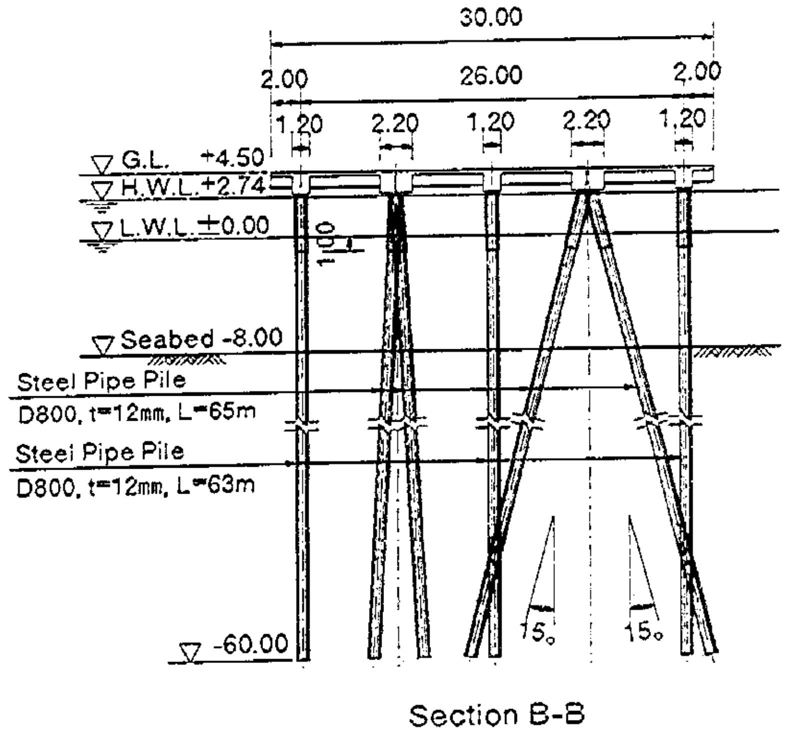
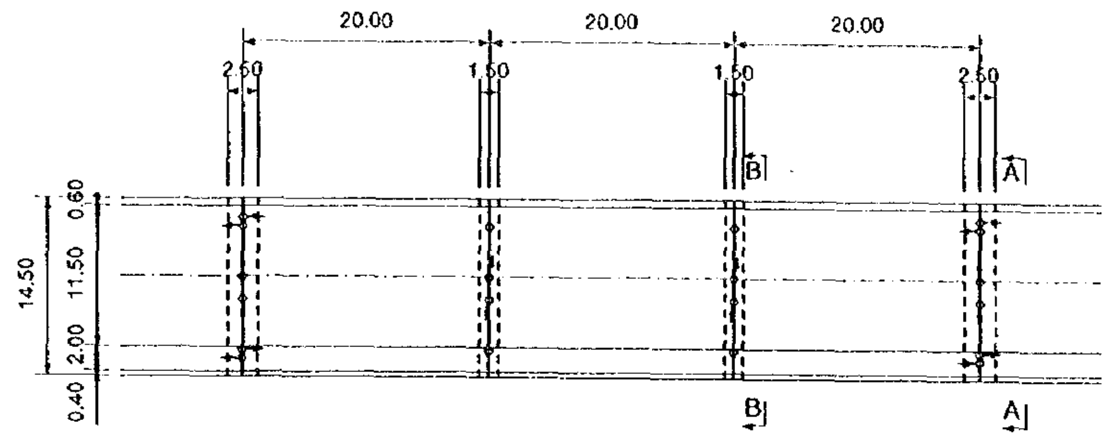
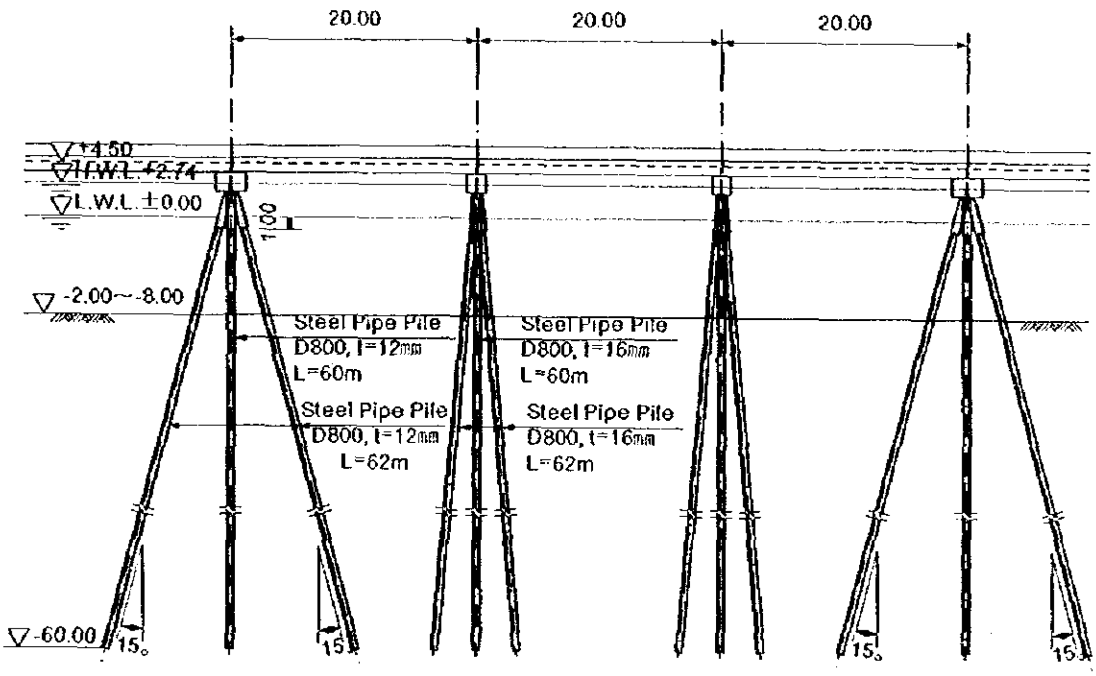


Figure 4.1.1 (3) Unit Module of Detached Platform of Surabaya

S=1/500



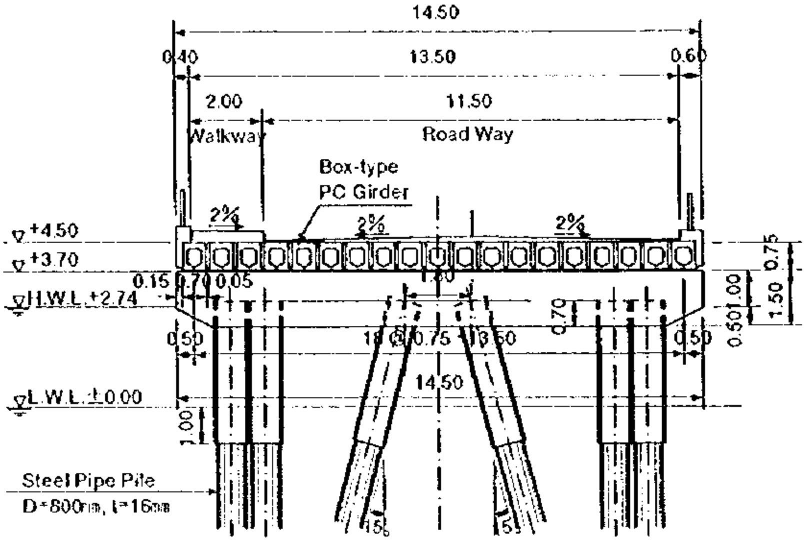
Plan



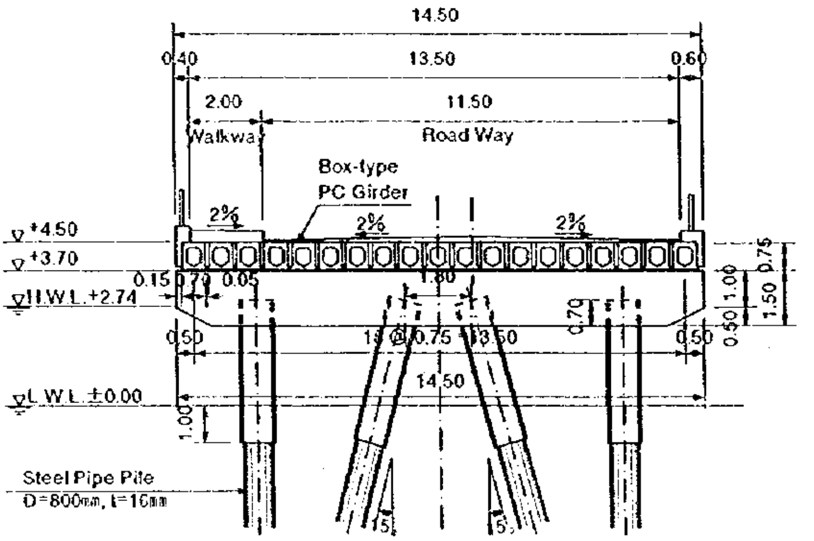
Side View

S=1/600

Figure4.1.1 (4) Plan and Cross Section of Access Bridge of Surabaya



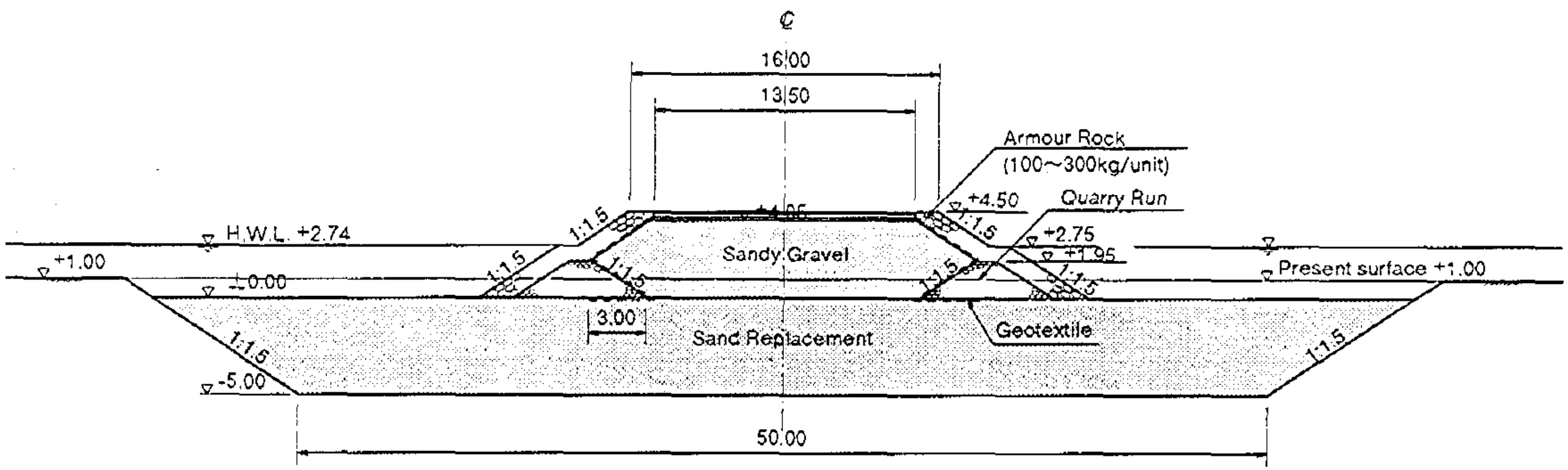
Section A-A



Section B-B

S=1/200

Figure 4.1.1 (5) Typical Cross Section of Access Bridge of Surabaya



Armour Rock	18.5m³/m
Quarry Run	16.1m³/m
Sand	67.9m³/m
Gedtextile	21.5m³/m
Pavement	13.5m³/m
Dredged volume	354.0m³/m
Sand replacement	287.5m³/m

Figure 4.1.1 (6) Typical Cross Section of Causeway of Surabaya

(L=800m)

Table 4.1.8 Calculation of Length of Movable Bridge (MB) of each Terminal

Terminal	① Location	② Wave Climate	③ HWL (DL+, m)	④ Clearance HWL+ (m)	⑤=③+④ Hinge Level (DL+, m)	⑥ Free Board Empty (m)	⑦ Free Board Full (m)	⑧ Ship Ramp L2 (m)	⑨ Slope	⑩ L5 (m)	⑪ L1 (m)	⑫ Length L4 (m)	Design Length (m)
Surabaya	Coast	Moderate High	2.74	1.30	4.04	1.4	0.5	6.0	12%	29.50	29.71	24.71	25.0
Banjarmasin	River	Moderate	2.97	0.80	3.77	1.4	0.5	6.0	12%	27.25	27.45	22.45	23.0
Patumbukan	Coast	Calm	2.39	0.80	3.19	1.2	0.5	5.3	12%	22.42	22.58	18.28	18.0
Labuhan Bajo	Coast	Calm	2.70	0.80	3.50	1.2	0.5	5.3	12%	25.00	25.18	20.88	20.0
Wahai	Coast	Calm	1.92	0.80	2.72	1.2	0.5	5.3	12%	18.50	18.63	14.33	15.0
Babang	Coast	Moderate High	1.35	1.30	2.65	1.2	0.5	5.3	12%	17.92	18.05	13.75	14.0
Manokwari (Sowi)	Coast	Moderate High	2.22	1.30	3.52	1.2	0.5	5.3	12%	25.17	25.35	21.05	21.0
Biak (Mokmer)	Coast	Moderate High	1.55	1.30	2.85	1.2	0.5	5.3	12%	19.58	19.72	15.42	18.0

* Proposed Standard of Clearance of Hinge Level from High Water Level

Location	Wave Climate	Hinge Level
River / Lake		High Water Level + (0.3~0.8) m
Coast	Calm or Low :	High Water Level + (0.8~1.3) m
	Moderate or High :	High Water Level + (1.3~1.8) m

Refer to Figure 8.1.5 in Chapter 8 of Part 2.

(2) Banjarmasin terminal

29. The layout plan of mooring facilities of Banjarmasin terminal is shown in Figure 4.1.2 (1).

1) Breasting dolphin

30. Each breasting dolphin along the ship side shall be able to absorb the ship berthing energy of 10.4 ton•m to accommodate 5,000GRT. Cell type rubber fender of 800mm in height with 2 pieces. for one unit are installed. A mooring post of 35 ton tractive force is installed on each dolphin. Reaction force of the fender is 43.0 ton which shall be withstood by one breasting dolphin. The dolphin structure is designed by steel pipe pile support considering the sub-soil conditions of soft clay in the deeper layer.

31. Three breasting dolphins with the following dimensions are provided along the ship side to accommodate 5,000GRT ferry boats.

Super structure : Reinforced concrete 6.0m x 6.0m x 4.5m to 1.5m
Foundation pile : Steel pipe pile 700mm diameter x 12 mm thickness x 40 - 41.5m long, 9 pieces.
Mooring post : 35 ton.

The typical cross section of the dolphin is shown in Figure 4.1.9.

2) Bow breasting dolphin

32. Considering the ship berthing at bow side at the Banjarmasin terminal the breasting dolphin at the bow side of ship is designed to be able to absorb a berthing energy of 66.4 ton•m and 4 pieces of cell type rubber fenders of 800mm height each are installed. Reaction force of the fender of 189.2 ton is withstood by this breasting dolphin with the following dimensions;

Super structure : Reinforced concrete 11.0m x 2.5m x 1.5m
Foundation pile : Steel pipe piles 800mm diameter x 12mm thickness x 40 - 41.5m long, 6 pieces.

The typical cross section is shown in Figure 4.1.12.

3) Mooring dolphin

33. Three mooring dolphins with the following dimensions are provided to moor 5,000 GRT ferry boat and a mooring post of 35ton tractive force is installed on each dolphin. The structural type is designed with steel pipe pile support, one mooring dolphin is installed on the extended line of breasting dolphin and two mooring dolphins are installed separately, one on both sides of the movable bridge.

Super structure :	Reinforced concrete 5.0m x 5.0m x 1.5m
Foundation pile :	Steel pipe piles 600 mm diameter x 14mm thick x 40 - 41.5m long, 4 pieces.
Mooring post :	35ton

The typical cross section of mooring dolphin is shown in Figure 4.1.10.

4) Movable bridge

34. The movable bridge is installed for berthing 5,000GRT ferry boat from the landing deck, its length and width are determined by the process as shown on the Table 4.1.7. The typical conceptual section with foundation is shown in Figure 4.1.11.

5) Landing deck

35. A landing deck of 30m width and 60m length which is provided to accommodate movements of a large truck on this deck is connected directly from the movable bridge to on-land facilities area. This deck is made of concrete beams and slab supported by steel pipe piles of 700mm diameter and 45m length. The typical plan and cross section of landing deck is shown in Figure 4.1.15.

6) Retaining wall

36. The retaining wall (approximately 180m across) for reclamation of on-land facilities is constructed along the existing land area. The retaining wall is constructed with concrete coping on top of steel sheet piles, which is driven about 10m apart from the existing land at the L.W.S. to minimize the horizontal soil pressure and surcharge by running heavy load truck behind the wall.

37. The area between the existing land area and coping will be filled by riprap stones

and covered by armour stones to protect against erosion and leakage of reclaimed sand by river flows. The coping concrete 1.0m x 2.0m is made on top of steel sheet pile type SP-II driven up to -35.0m, which is anchored by tie rod of 50mm diameter and H shape 300mm x 300mm of anchor piles to be driven up to - 10.0m.

38. The surface soil of sea bed which is too soft to withstand the reasonable length of sheet pile for self stand is replaced up to the depth of -5.0m with fine sand material. The excavation and refilling volume is estimated at 15,000m^3 and 18,000m^3 respectively. The typical cross section of retaining wall is shown in Figure 4.1.2 (2).

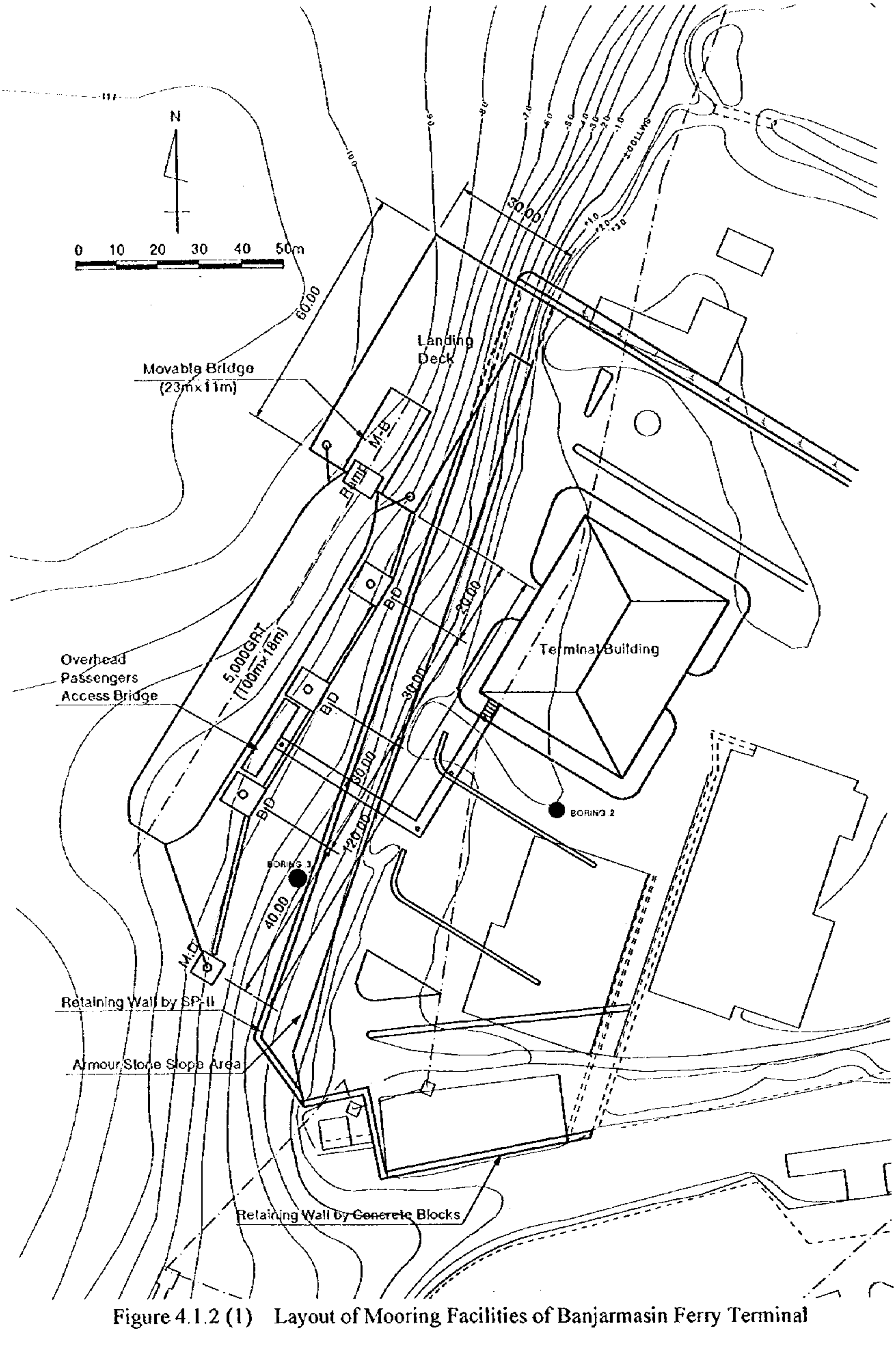


Figure 4.1.2 (1) Layout of Mooring Facilities of Banjarmasin Ferry Terminal

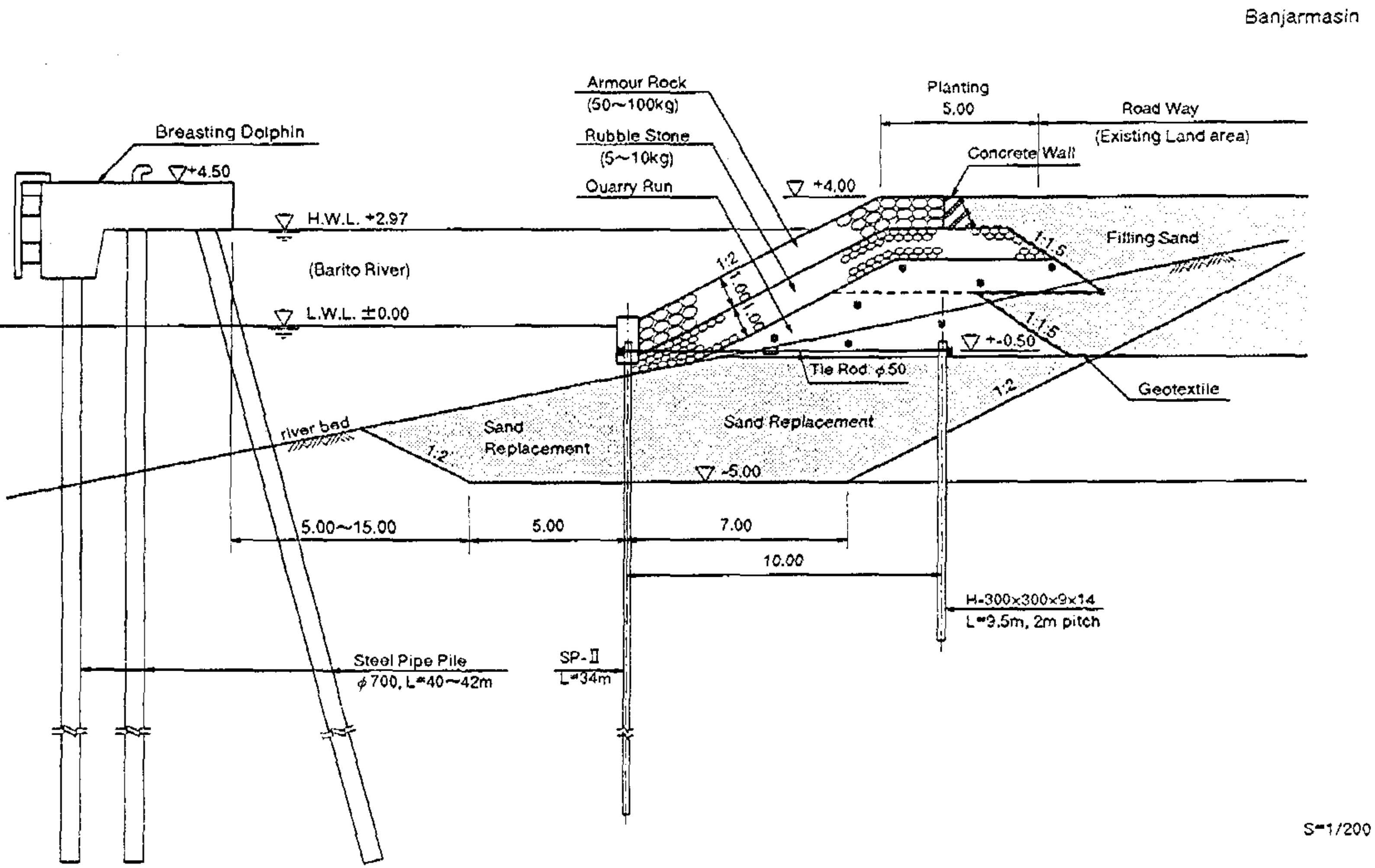


Figure 4.1.2 (2) Typical Cross Section of Revetment of Banjarmasin

(3) Selayar terminal

39. The layout plan of the mooring facilities and harbor basin of the Patumbukan terminal is shown in Figure 4.1.3(1).

1) Harbor basin and access channel

40. The water depth of the harbor basin and access channel is required of more than -4.50m below LWS for the planned ferry boat 1,000GRT. The sea bed material is soft clay silt. The area of the harbor basin and the access channel is determined as shown in Figure 4.1.3(2) based on the maneuverability and berthing operation of planned ferry boats. The required dredging volume is estimated to be some 99,200m³.

2) Breasting dolphin

41. Three breasting dolphins with the following dimensions are provided along the ship side in order to accommodate 1,000 GRT ferry boat. The berthing area for 50m width along these breasting dolphins are dredged to -4.50m depth. The typical cross section is shown in Figure 4.1.9.

Super structure :	Reinforced concrete 6.0m x 6.0m x 3.5m - 1.5m
Foundation pile :	Steel pipe piles 700mm diameter x 14 mm thick x 40m long, 9 pieces.
Mooring post :	25ton

42. Each breasting dolphin shall be able to absorb the ship berthing energy of 7.51 ton• m. Cell type rubber fender of 630mm in height with 2 pieces for one unit are installed. A mooring post of 25ton tractive force is installed on each dolphin. Reaction force of the fender is 45.6 ton which shall be withstood by one breasting dolphin.

3) Mooring dolphin

43. Three mooring dolphins are provided to moor 1,000GRT ferry boat and a mooring post of 25 ton tractive force is installed on each dolphin. One mooring dolphin is installed on the extension of breasting dolphin and other two mooring dolphins are installed separately, one on both sides of the movable bridge. The typical cross section is shown in Figure 4.1.10.

4) Bow breasting dolphin

44. Considering the ship berthing from the bow side at the Patumbukan terminal the breasting dolphin at the bow side of ship is designed to be able to absorb a berthing energy of 40.8 ton•m and 4 pieces of cell type rubber fenders of 800mm in height each are installed.

45. Reaction force of the fender of 117.6 ton is withstood by this breasting dolphin with the following dimensions;

Super structure : Reinforced concrete 9.0m x 2.5m x 1.5m
Foundation pile : Steel pipe piles, 800mm diameter x 12.3mm thick x 38m long, 6 pieces

The typical cross section is shown in Figure 4.1.12.

5) Movable bridge

46. The movable bridge is installed for berthing 1,000 GRT ferry boat from the landing deck, its length and width are determined by the process as shown in the Table 4.1.7. The typical conceptual section with foundation is shown in Figure 4.1.11.

47. An abutment for the movable bridge shoe foundation of 15m length and 3m width is provided to support the hinge shoe of the bridge and to be connected directly from the movable bridge to the on-land facilities area through the trestle. The typical cross section of abutment is shown in Figure 4.1.11 as parts of the movable bridge foundation.

6) Access way

48. The access way consists of a causeway at the shallow waters area up to a depth of -1.0m below LWS and a trestle at the deep water area till the abutment of movable bridge shoe. The length of causeway and trestle is determined as 17.50m and 42.50m respectively based on the sea bed depth and soft clay of soil conditions below the sea bed. The typical cross section of a causeway and trestle are shown in Figure 4.1.13 and Figure 4.1.14 respectively.

7) Revetment work

49. The revetment with riprap stones and armour stones for slop protection of

causeway and retaining of reclamation material for land preparation are provided. The typical section is shown in Figure 4.1.16.

8) Navigation aid facilities

50. Three light buoys are installed at the bending points of the access channel and one fairway buoy at the entrance of the channel to indicate the entrance of the ferry terminal.

9) Access road

51. The access road which has 8m width consisting of two vehicle lanes is connecting to the terminal and the existing national road by cutting and filling the existing mountain slope. The access road in the length of some 4.0 km is provided with concrete pavement.

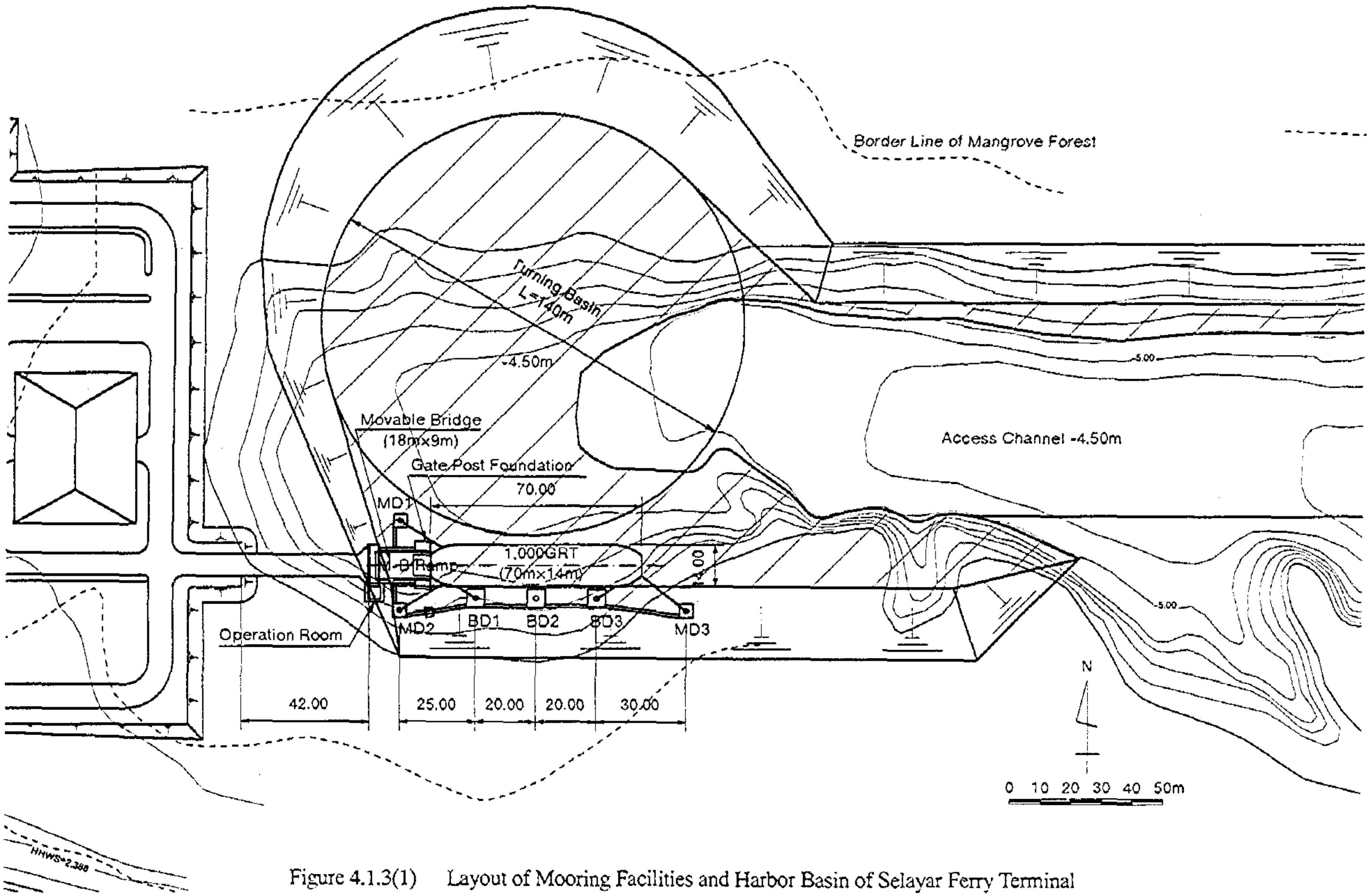


Figure 4.1.3(1) Layout of Mooring Facilities and Harbor Basin of Selayar Ferry Terminal

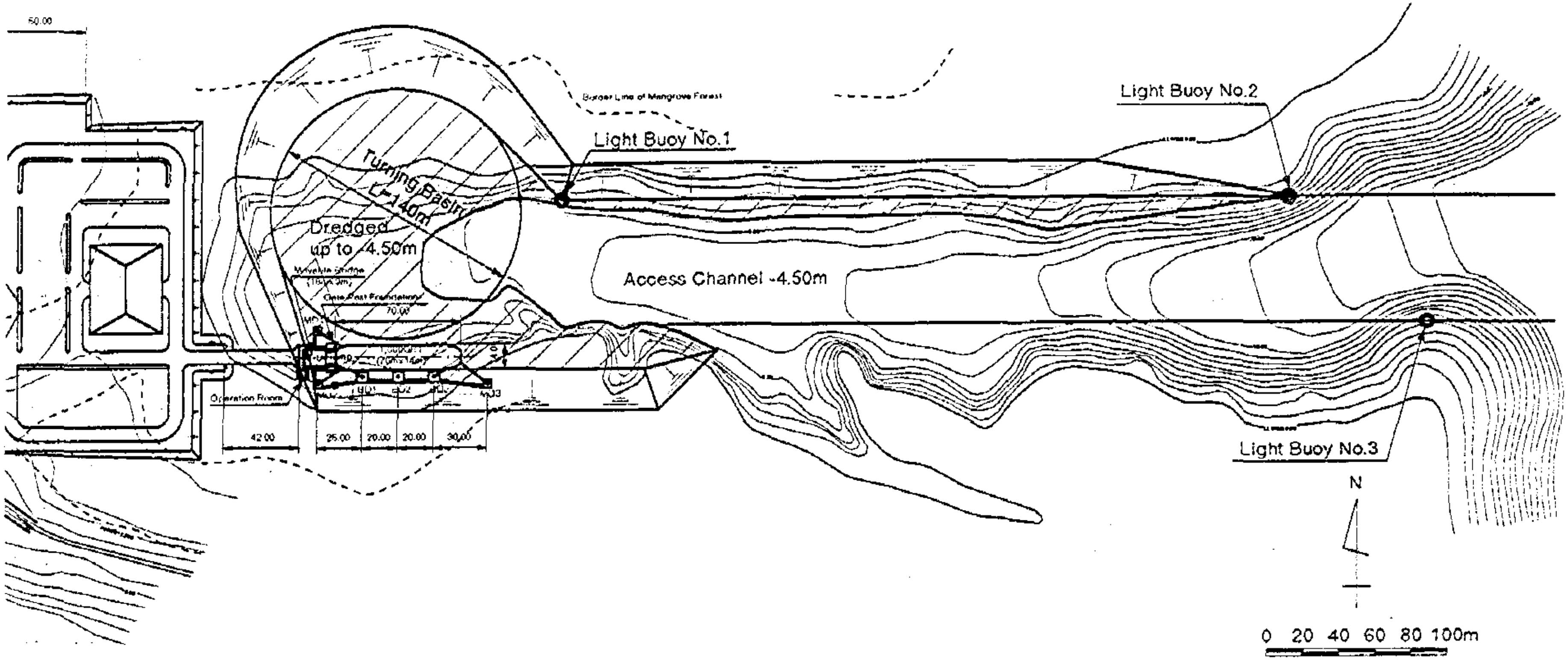


Figure 4.1.3(2) General Plan of Access Channel and Basin for Selayar Ferry Terminal

(4) Labuhan Bajo terminal

52. The layout plan of the mooring facilities of Labuhan Bajo terminal is shown in Figure 4.1.4 .

1) Breasting dolphin

53. The breasting dolphin shall be able to absorb the berthing energy of 7.51 ton•m with the cell type rubber fender of 630mm height x 2 pieces are installed at each dolphin. The existing dolphins with foundation piles which are not strong enough to absorb reaction force of 45.6 ton are demolished. Three new larger sized breasting dolphins of the following dimensions are installed to accommodate 1,000GRT to 500GRT ferry boats by utilizing the available movable bridge facilities;

Super structure :	Reinforced concrete 6.0m x 6.0m x 3.5 m to 1.5m
Foundation pile :	Steel pipe piles,700mm diameter x 14mm thick x 40m long, 9 pieces.
Mooring post :	25 ton

The typical cross section and dimensions are shown in Figure 4.1.9.

2) Mooring dolphin

54. Three existing mooring dolphins are demolished due to the same reason as above. Three new mooring dolphins of larger capacity are constructed with a mooring post of 25 ton tractive force on each dolphin. The structure type is designed with reinforced concrete structure supported by steel pile foundation. The typical cross section and dimensions are shown in Figure 4.1.10.

3) Movable bridge

55. The existing movable bridge shall be used with reinforcement of the bridge parts and hydraulic operational system.

4) Landing deck and access way

56. The existing landing deck between the movable bridge and the trestle of 6.50m width and 41.80m long and causeway of 31.50m long to connect the on-land facilities and

mooring facilities are used.

5) Revetment works for land development

57. The land area of 1,500m^2 reclaimed for expansion of capacity of parking lots and passengers waiting hall. The sea side slope is protected by revetment material.

(5) Wahai terminal

58. The layout plan of mooring facilities of Wahai terminal is shown in Figure 4.1.5.

1) Breasting dolphin

59. Three breasting dolphins with the following dimensions are provided along the ship side in order to accommodate 1,000GRT ferry boat. The typical cross section is shown in Figure 4.1.9.

60. Each breasting dolphin along the ship side shall be able to absorb the ship berthing energy of 7.51 ton•m by 1,000 GRT ferry boat. Cell type rubber fender of 630mm in height of 2 pieces for one unit are installed. A mooring post of 25ton tractive force is installed on each dolphin. Reaction force of the fender is 45.6 ton which shall be withstood by one breasting dolphin.

Super structure :	Reinforced concrete 6.0m x 6.0m x 4.0m to 1.5m
Foundation pile :	Steel pipe piles, 700mm diameter x 12mm thick x 33.5 - 35.5m long, 9 pieces.
Mooring post :	25 ton

2) Mooring dolphin

61. Three mooring dolphins are provided to moor 1,000GRT ferry boat and a mooring post of 25 ton tractive force is installed on each dolphin. One mooring dolphin is installed on the extended line of breasting dolphin and other two mooring dolphins are installed separately, one on the each side of the movable bridge. The typical cross section is shown in Figure 4.1.10.

3) Movable bridge

62. The movable bridge is installed for berthing 1,000GRT ferry boat from the landing deck, its length and width are determined by the process as shown on the Table 4.1.7 and its typical conceptual section with foundation is shown in Figure 4.1.11.

4) Landing deck

63. A landing deck of 16.0m width and 30.0m long to accommodate movements of a large truck on this deck is connected directly from the movable bridge to on land facilities area through the access way combined with the trestle and causeway. This deck is made of concrete beams and slab supported by steel pipe piles of 800mm diameter. The typical cross section of landing deck is shown on Figure 4.1.15.

5) Access way

64. The access way of 7.0m width consists of a causeway on the submerged area up to a depth of + 0.0m of LWS and a trestle at the deep water area till landing deck. The length of causeway and trestle are determined as 115.0m and 36.0m respectively based on the sea bed depth and soil conditions. The 12.0m width of the access way is planned with 7.0m for vehicle running way and 2.5m for walkway on both sides. Typical cross sections of a causeway and trestle are shown in Figure 4.1.13 and Figure 4.1.14 respectively.

6) Revetment work

65. The revetment for slope protection of the causeway and retaining of reclamation material for land preparation are provided. The typical section is shown in Figure 4.1.16.

7) Access road

66. The access road to connect the ferry terminal area and the national road in the distance of some 1.0km with the width of 10.0m for 2 lanes are provided with the asphalt concrete pavement.

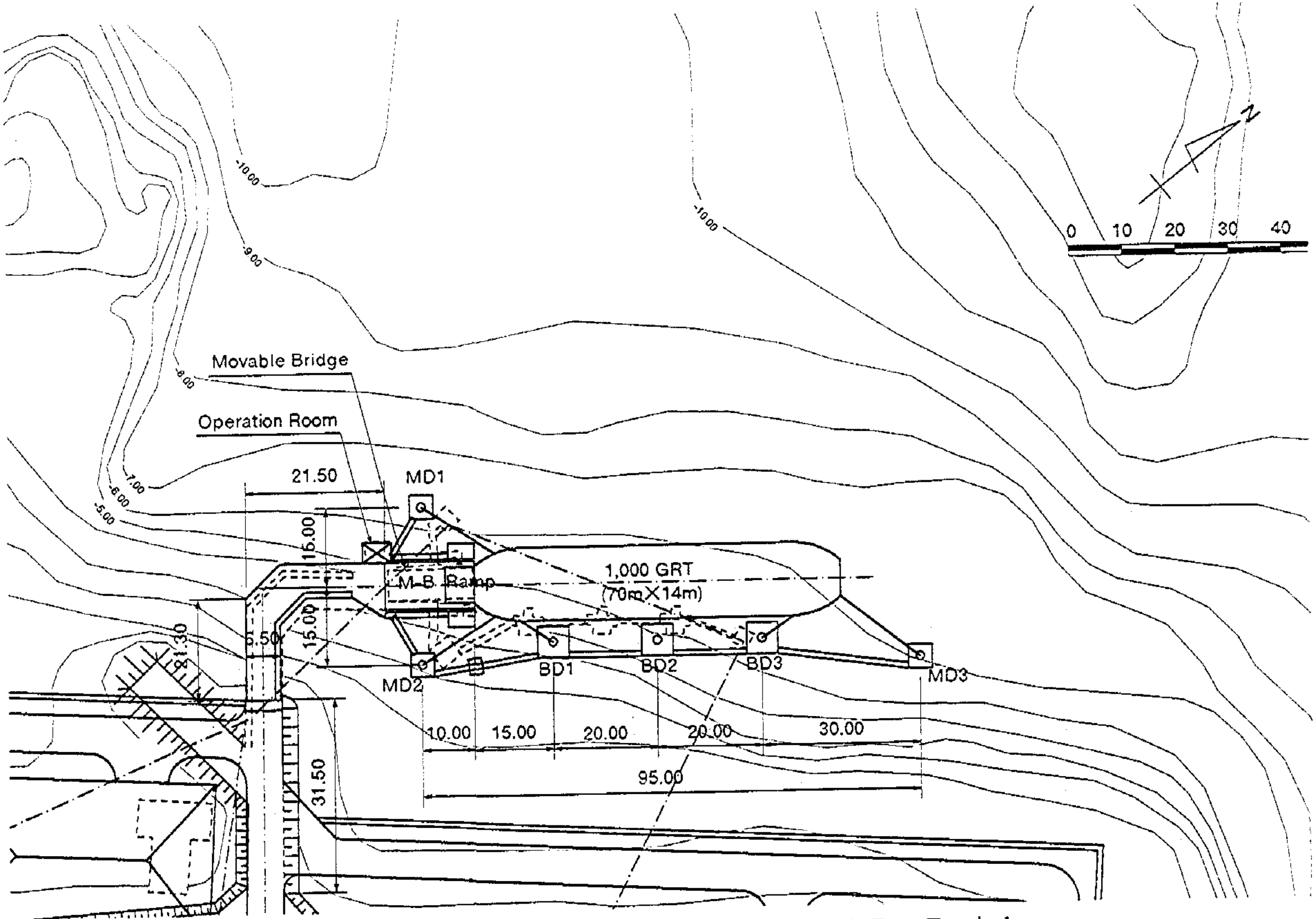


Figure 4.1.4 Layout of Mooring Facilities of Labuhan Bajo Ferry Terminal

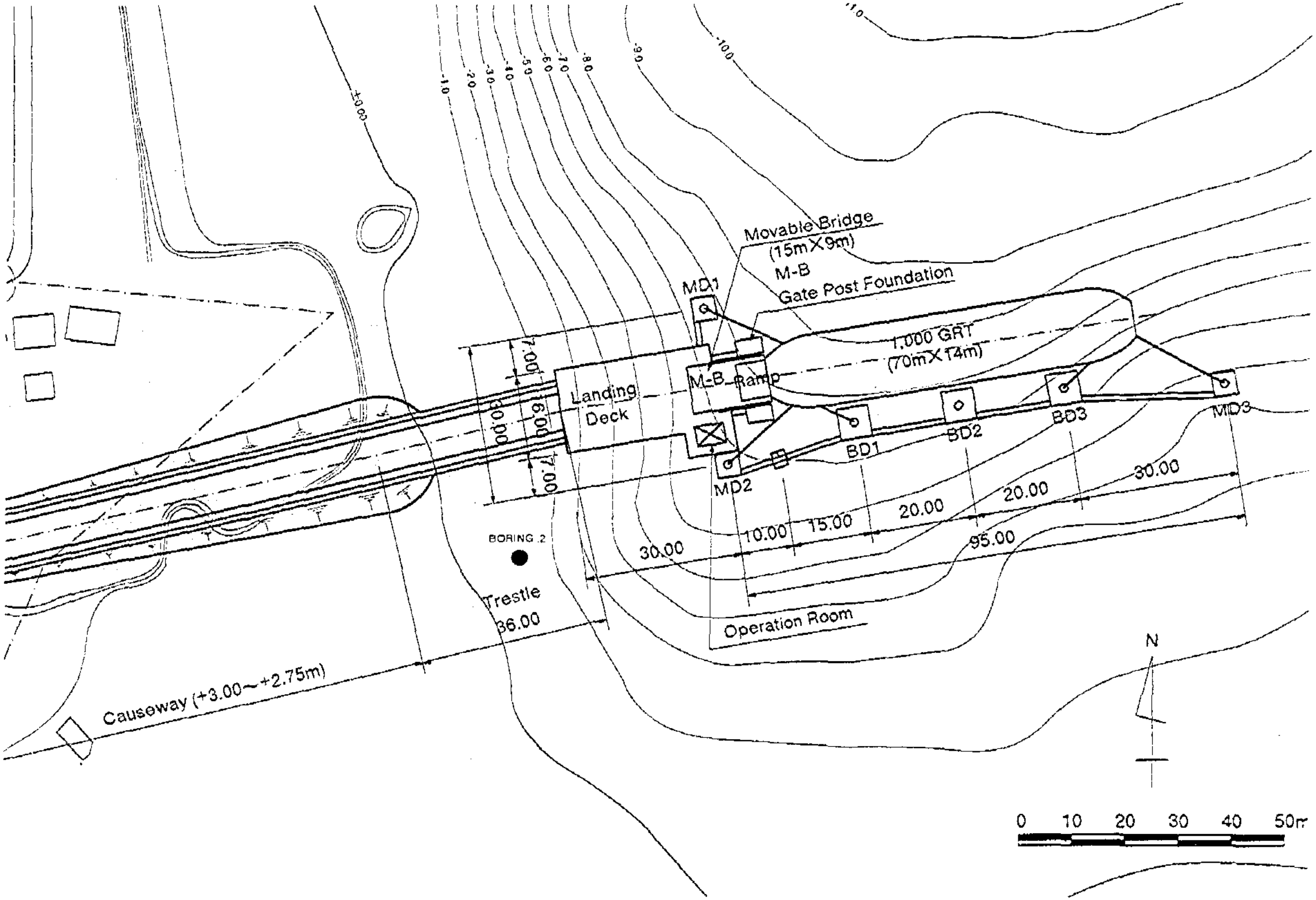


Figure 4.1.5 Layout of Mooring Facilities of Wahai Ferry Terminal

(6) Babang terminal

67. The layout plan of mooring facilities of the Babang terminal is shown in Figure 4.1.6.

1) Breasting dolphin

68. Three breasting dolphins with the following dimensions are provided at the depth of -5.0m to -20.0m due to the steep slope of sea bed along the ship side in order to accommodate 1,000GRT ferry boat. The typical cross section is shown in Figure 4.1.9.

69. Each breasting dolphin along the ship side shall be able to absorb the ship berthing energy of 7.51 ton•m by 1,000GRT ferry boat. Cell type rubber fender of 630mm in height of 2 pieces for one unit are installed. A mooring post of 25ton tractive force is installed on each dolphin. Reaction force of the fender is 45.6 ton which shall be withstood by one breasting dolphin.

Super structure :	Reinforced concrete 6.0m x 6.0m x 3.0m to 1.5m
Foundation pile :	Steel pipe piles, 600mm diameter x 12mm thick x 33.5 - 35.5m long, 9 pieces.
Mooring post :	25 ton

2) Mooring dolphin

70. Three mooring dolphins are provided to moor 1,000GRT ferry boat and a mooring post of 25ton tractive force is installed on each dolphin. One mooring dolphin is installed on the extended line of breasting dolphin, which is located at the depth of - 20.0m and supported by larger size of foundation piles and other two mooring dolphins are installed separately, one on each side of the movable bridge. The typical cross section is shown in Figure 4.1.9.

3) Bow breasting dolphin

71. Considering the ship berthing at bow side at the Babang terminal, the breasting dolphin at the bow side of ship is designed to be able to absorb a berthing energy of 40.8 ton• m, 4 pieces of cell type rubber fenders of 630mm height each are installed. Reaction force of the fender of 117.6 ton is withstood by this bow breasting dolphin with the following dimensions;

Super structure : Reinforced concrete 9.0m x 2.5m x 1.5m
Foundation pile : Steel pipe piles, 800mm diameter x 12mm thick x 35m long, 6pieces.

The typical cross section is shown in Figure 4.1.12 .

4) Movable bridge

72. The movable bridge is installed for berthing 1,000GRT ferry boat from the landing deck, its length and width are determined by the process as shown in Table 4.1.7. The typical conceptual section with foundation is shown in Figure 4.1.11.

5) Landing deck

73. A landing deck of 16.0m width and 30.0m long to accommodate movements of large truck on this deck is connected to the on-land facilities area through the trestle. This deck is made of concrete beams and slab supported by steel pipe piles of 800mm diameter. The typical cross section of the landing deck is shown in Figure 4.1.15.

6) Access way

74. The trestle structure of 10.0 m width as an access way from on land facilities till the landing deck is constructed. The length of trestle is determined as 16.0m based on the sea bed depth in steep slope and relative coarse sand material at sea bed. The typical cross section of trestle is shown in Figure 4.1.14.

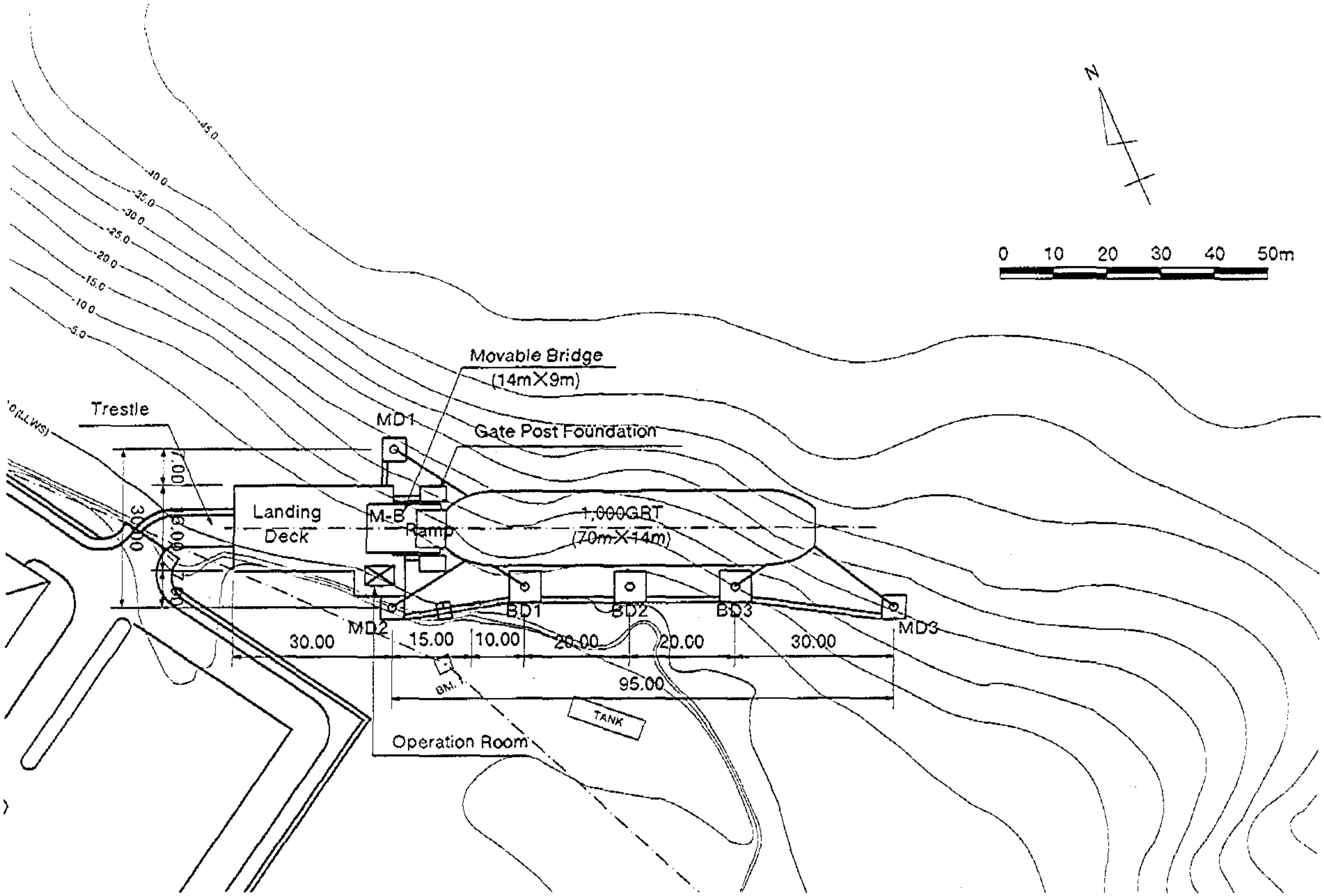


Figure 4.1.6 Layout of Mooring Facilities of Babang Ferry Terminal

(7) Manokwari terminal

75. The layout plan of mooring facilities of the Manokwari terminal is shown in Figure 4.1.7.

1) Breasting dolphin

76. Three breasting dolphins with the following dimensions are provided along the ship side in order to accommodate 1,000GRT ferry boat. The typical cross section is shown in Figure 4.1.9.

77. Each breasting dolphin along the ship side shall be able to absorb the ship berthing energy of 7.51 ton•m by 1,000GRT ferry boat. Cell type rubber fender of 630mm in height of 2 pieces for one unit are installed. A mooring post of 25ton tractive force is installed on each dolphin. Reaction force of the fender is 45.6ton which shall be withstood by one breasting dolphin.

Super structure :	Reinforced concrete 6.0m x 6.0m x 4.0 m to 1.5m
Foundation pile :	Steel pipe piles,700mm diameter x 14mm thick x 17.5 to 18.5m long, 9 pieces.
Mooring post :	25 ton

2) Mooring dolphin

78. Three mooring dolphins are provided to moor 1,000GRT ferry boat and a mooring post of 25ton tractive force is installed on each dolphin. One mooring dolphin is installed on the extension of breasting dolphin and other two mooring dolphins are installed separately, one on each side of the movable bridge. The typical cross section is shown in Figure 4.1.10.

3) Movable bridge

79. The movable bridge is installed for berthing 1,000GRT ferry boat from the landing deck, its length and width are determined by the process as shown in Table 4.1.7. The typical conceptual section with foundation is shown in Figure 4.1.11.

4) Access way

80. The access way consists of a causeway at the shallow waters area up to a depth of

-1.0m below LWS and a trestle at the deep water area till the landing deck. The length of causeway and trestle are determined as 30.0m and 55.0m respectively based on the sea bed depth and fine sand layer of soil conditions. The typical cross section of a causeway and trestle are shown in Figure 4.1.13 and Figure 4.1.14 respectively.

5) Revetment works

81. The revetment in the length of 270.0m for the slope protection of causeway and retaining of reclamation material for land preparation are provided. The typical section is shown in Figure 4.1.16.

6) Access road

82. The access road to connect to the terminal facilities and the national road in the distance of some 0.5km and the width of 10.0m for 2 lanes are provided on the existing land with asphalt concrete pavement.

(8) Biak terminal

83. The layout plan of mooring facilities of the Biak terminal (original plan was prepared by DGLC) is reviewed and shown in Figure 4.1.8.

1) Breasting dolphin

84. Three breasting dolphins with the following dimension are provided along the ship side in order to accommodate 1,000GRT ferry boat. The typical cross section is shown in Figure 4.1.9.

85. Each breasting dolphin along the ship side shall be able to absorb the ship berthing energy of 7.51 ton•m by 1,000GRT ferry boat. Cell type rubber fender of 630 mm in height of 2 pieces for one unit are installed. A mooring post of 25ton tractive force is installed on each dolphin. Reaction force of the fender is 45.6 ton which shall be withstood by one breasting dolphin.

Super structure : Reinforced concrete 6.0m x 6.0m x 4.0 m to 1.5m
Foundation pile : Steel pipe piles, 600mm diameter x 12mm thick x 21.0 - 22.0m long, 9 pieces.
Mooring post : 25 ton

2) Mooring dolphin

86. Three mooring dolphins are provided to moor 1,000GRT ferry boat and a mooring post of 25 ton tractive force is installed on each dolphin. One mooring dolphin is installed on the extension of breasting dolphin and other two mooring dolphins are installed separately, one on each side of the movable bridge. The typical cross section is shown in Figure 4.1.10.

3) Movable bridge

87. The movable bridge is installed for berthing 1,000GRT ferry boat from the landing deck, its length and width are determined by the process as shown in Table 4.1.7. The typical conceptual section with foundation is shown in Figure 4.1.11.

4) Access way

88. The access way is constructed by a trestle at the shallow water area till the landing deck. The length of the trestle is determined as 45.0m based on the sea bed depth and coarse sand in the upper layer below sea bed. The typical cross section of the trestle is shown in Figure .4.1.14.

5) Revetment works

89. A 300m revetment with riprap stones and armour stones for slope protection of retaining reclamation material for land development is provided. The typical section is shown in Figure 4.1.16.

6) Bow breasting dolphin

90. Considering the ship berthing at bow side at the Biak terminal, the breasting dolphin at the bow side of ship is designed to be able to absorb a berthing energy of 40.8 ton• m, 4 pieces of cell type rubber fenders of 630mm height each are installed. Reaction force of the fender of 117.6 ton is withstood by this bow breasting dolphin with the following dimensions. The typical Cross section is shown in Figure 4.1.12.

Super structure : Reinforced concrete 9.0m x 2.5m x 1.5m
Foundation pile : Steel pipe piles, 600mm diameter x 12mm thick x 22m long, 6 pieces.

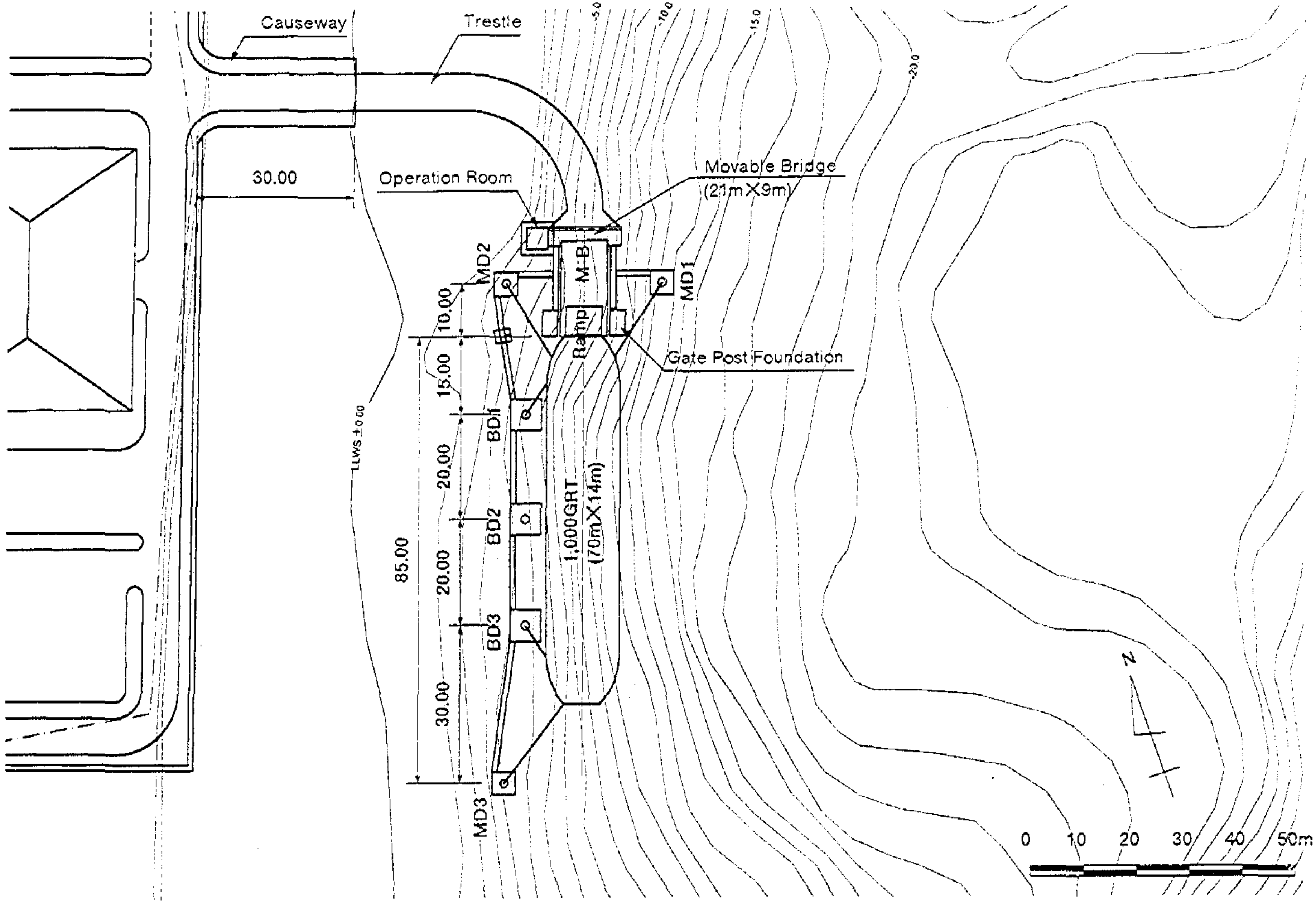


Figure 4.1.7 Layout of Mooring Facilities of Manokwari Ferry Terminal

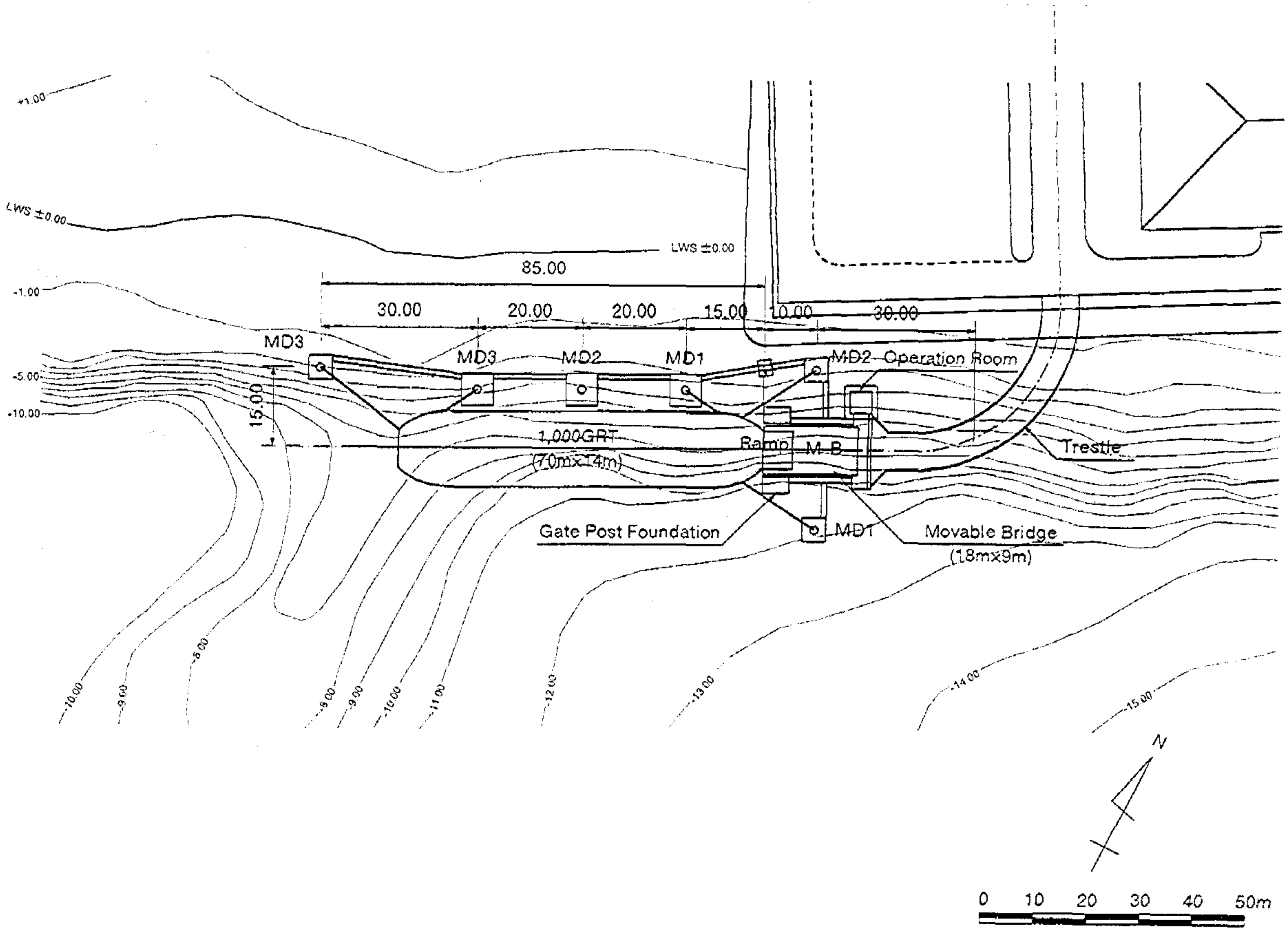
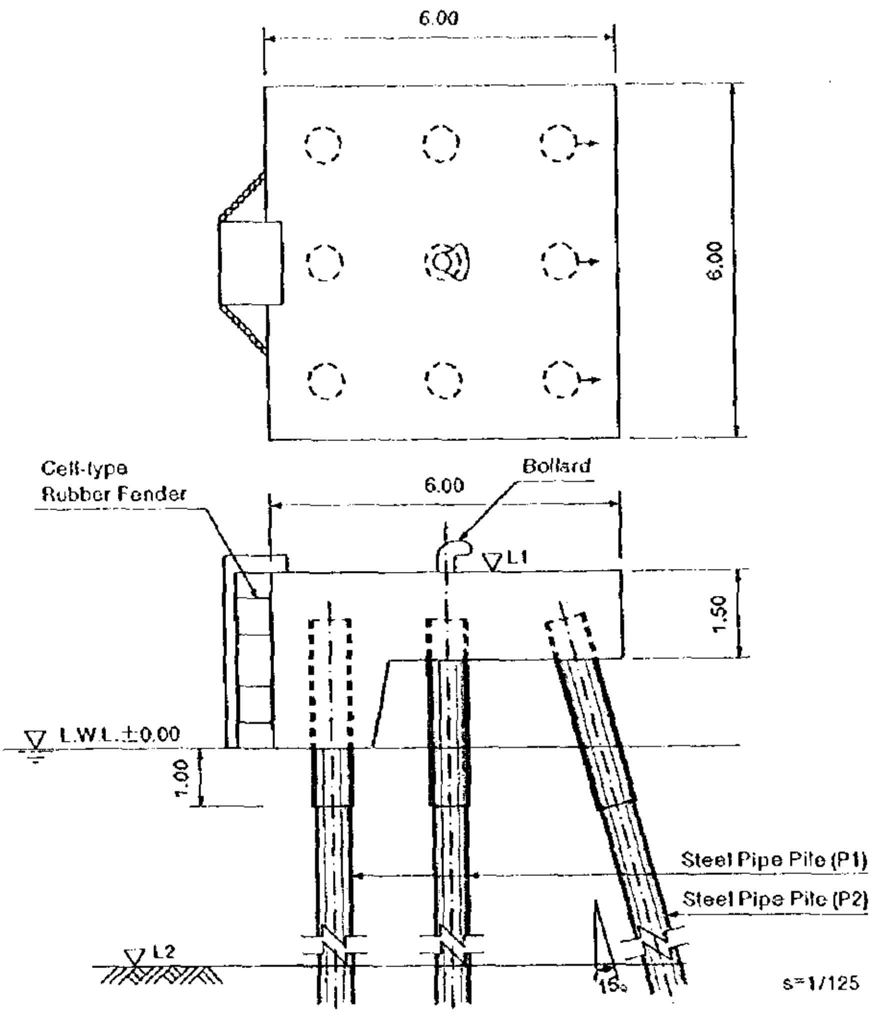


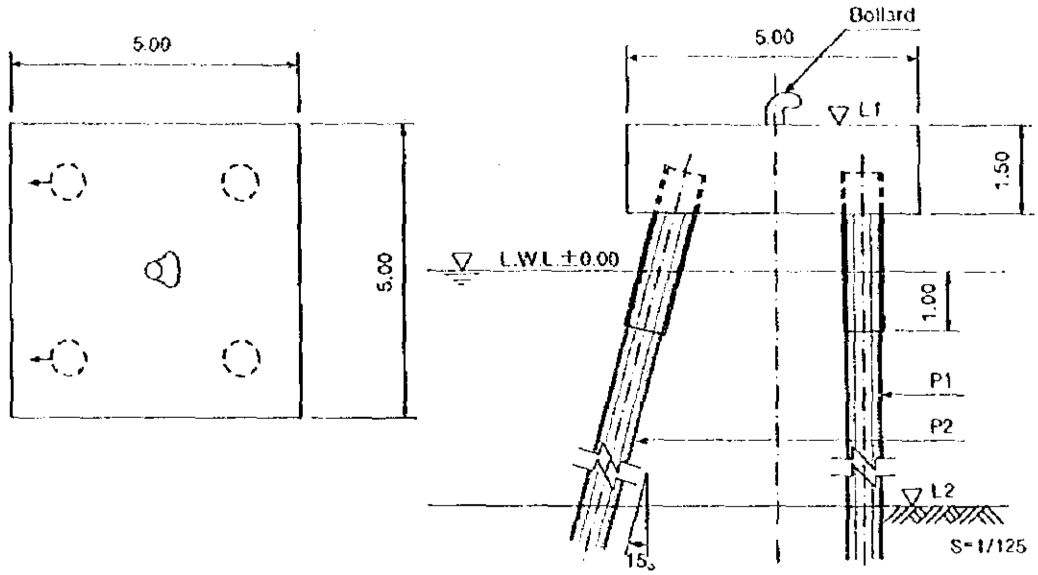
Figure 4.1.8 Layout of Mooring Facilities of Biak Ferry Terminal



(Datum Level = LWL)

Terminal	HWL (DL+, m)	L1 (DL+, m)	L2 (DL+, m)	Bollard	Rubber Fender Cell Type	Steel Pipe Pile P1	Steel Pipe Pile P2
Banjarmasin	2.97	4.50	-5.50	35 ton	800H (R1) 1 x 2	D700, 12mm,	D700, 12mm,
Selayar	2.39	3.50	-4.50	25 ton	630H (RH) 1 x 2	D700, 14mm,	D700, 14mm,
Labuhan Bajo	2.70	3.50	-4.0~ -5.5	25 ton	630H (RH) 1 x 2	D700, 14mm,	D700, 14mm,
Wahai	1.92	4.00	-6.50	25 ton	630H (RH) 1 x 2	D700, 12mm,	D700, 12mm,
Babang	1.35	3.00	-5.0~ -10.0	25 ton	630H (RH) 1 x 2	D600, 12mm,	D600, 12mm,
Manokwari	2.22	4.00	-5.00	25 ton	630H (RH) 1 x 2	D700, 14mm,	D700, 14mm,
Biak	1.55	3.75	-4.0~ -5.0	25 ton	630H (RH) 1 x 2	D600, 12mm,	D600, 12mm,

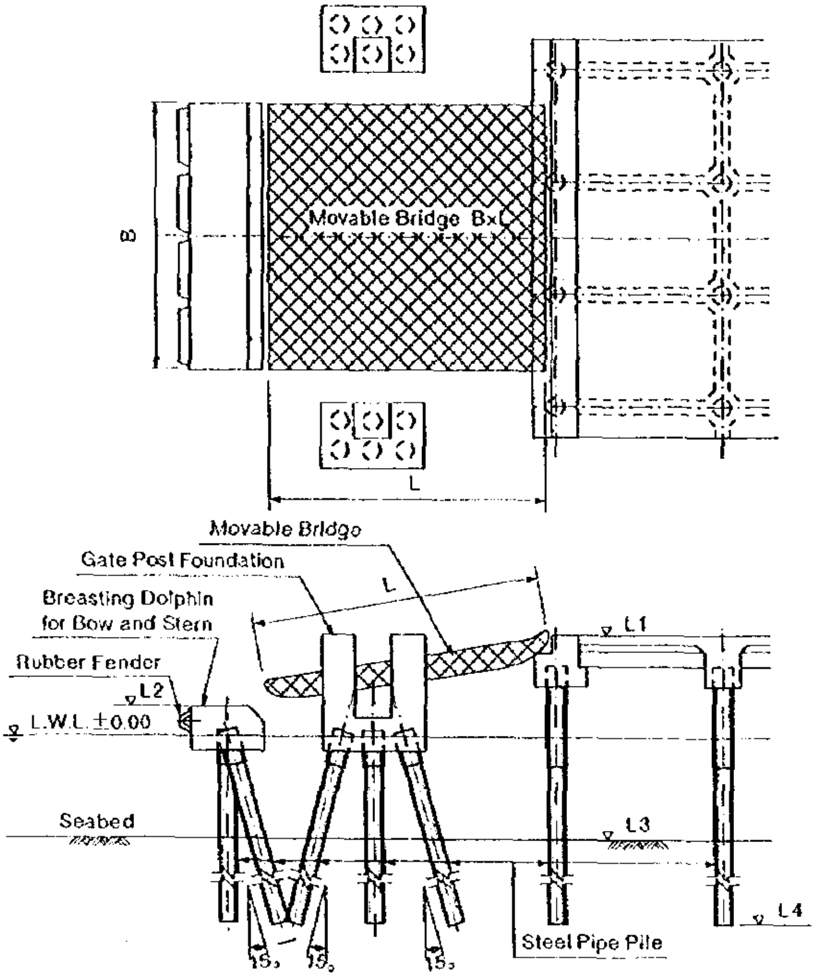
Figure 4.1.9 Typical Cross Section of Breasting Dolphin



(Datum Level = LWL)

Terminal	HWL (DL+, m)	L1 (DL+, m)	Bollard	MD 1			MD 2			MD 3		
				P1	P2	L2	P1	P2	L2	P1	P2	L2
Surabaya	2.74	4.50	35 ton	D700, 14mm, 60.0m	D700, 14mm, 62.0m	-12.00	D700, 16mm, 60.0m	D700, 16mm, 62.0m	-16.00	-	-	-
Banjarmasin	2.97	4.50	35 ton	D600, 14mm, 40.0m	D600, 14mm, 41.5m	-6.00	-	-	-	-	-	-
Selayar	2.39	3.50	25 ton	D700, 14mm, 37.0m	D700, 14mm, 38.0m	-3.00	D700, 14mm, 37.0m	D700, 14mm, 38.0m	-3.00	D700, 14mm, 37.0m	D700, 14mm, 38.0m	0.00
Labuhan Bajo	2.70	3.50	25 ton	D600, 12mm, 23.0m	D600, 12mm, 24.0m	-6.00	D600, 12mm, 23.0m	D600, 12mm, 24.0m	-2.00	D600, 12mm, 23.0m	D600, 12mm, 24.0m	-6.00
Wahai	1.92	4.00	25 ton	D600, 12mm, 33.5m	D600, 12mm, 35.5m	-6.00	D600, 12mm, 33.5m	D600, 12mm, 35.5m	-6.00	D600, 12mm, 33.5m	D600, 12mm, 35.5m	-4.00
Babang	1.35	3.00	25 ton	D600, 12mm, 34.5m	D700, 12mm, 36.0m	-18.00	D600, 12mm, 34.5m	D700, 12mm, 36.0m	0.00	D600, 14mm, 34.5m	D700, 14mm, 36.0m	-20.00
Manokwari	2.22	4.00	25 ton	D700, 14mm, 17.5m	D700, 14mm, 18.5m	-13.00	D700, 14mm, 17.5m	D700, 14mm, 18.5m	-2.00	D700, 14mm, 17.5m	D700, 14mm, 18.5m	-4.00
Biak	1.55	3.75	25 ton	D600, 12mm, 21.0m	D600, 12mm, 22.0m	-12.00	D600, 12mm, 21.0m	D600, 12mm, 22.0m	-3.00	D600, 12mm, 21.0m	D600, 12mm, 22.0m	-2.00

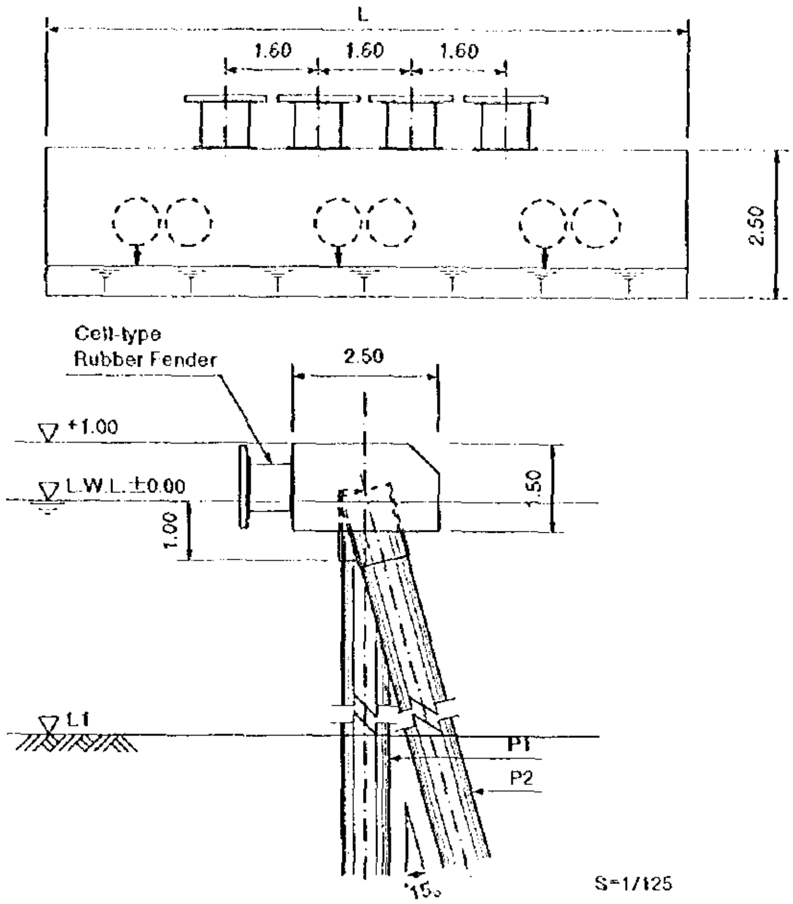
Figure 4.1.10 Typical Cross Section of Mooring Dolphin



(Datum Level = LWL)

Terminal	HWL (DL+, m)	Ground Level (DL+, m)	Hinge Level (DL+, m)	Length L (m)	Width B (m)	Design Level (DL+, m)			
						L1	L2	L3	L4
Surabaya	2.74	4.50	4.05	25.0	11.0	4.05	1.00	-6.00	-60.00
Banjarmasin	2.97	4.00	3.80	23.0	11.0	3.80	1.00	-6.00	-40.00
Selayar	2.39	3.50	3.20	18.0	9.0	3.20	1.00	-4.50	-37.00
Labuhan Bajo	2.70	3.50	3.50	20.0	9.0	3.50	1.00	-4.50	-24.00
Wahai	1.92	3.50	2.75	15.0	9.0	2.75	1.00	-4.50	-35.00
Babang	1.35	3.00	2.65	14.0	9.0	2.65	1.00	-4.50	-36.00
Manokwari	2.22	4.00	3.50	21.0	9.0	3.50	1.00	-4.50	-18.00
Biak	1.55	3.75	3.75	18.0	9.0	3.75	-	-4.50	-21.00

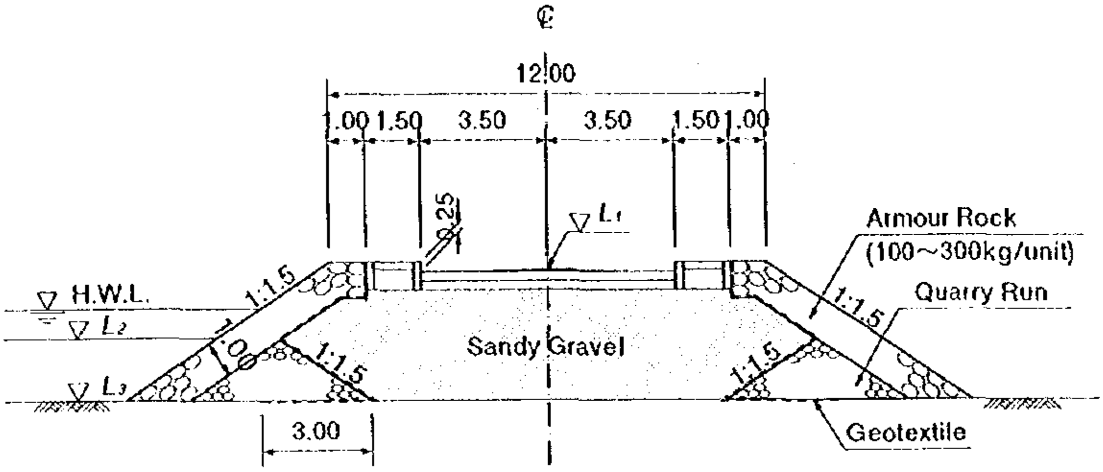
Figure 4.1.11 Plan and Typical Cross Section of Movable Bridge



(Datum Level = LWL)

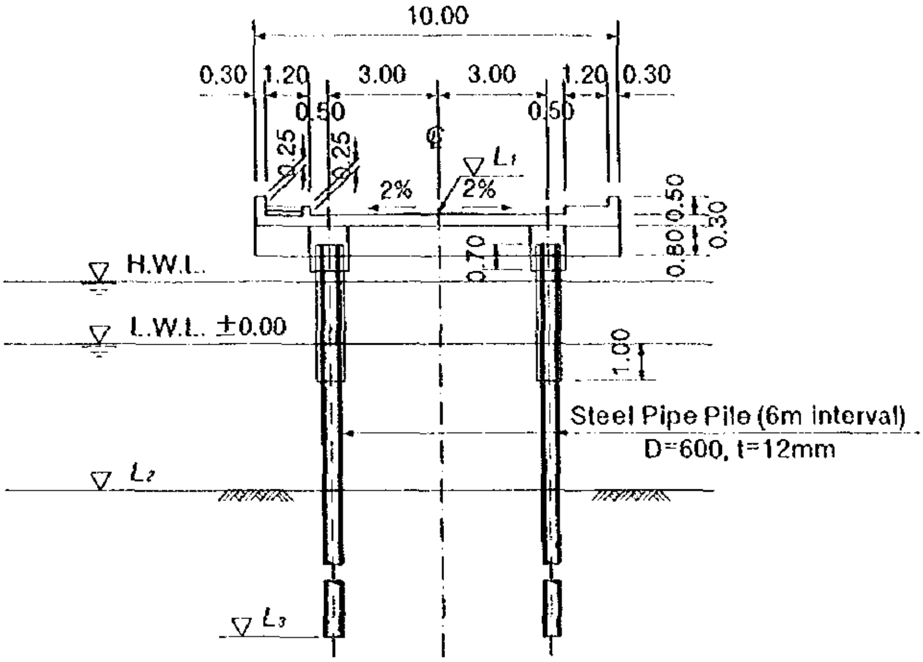
Terminal	HWL (DL+, m)	L1 (DL+, m)	Width L (m)	Rubber Fender Cell Type	Steel Pipe Pile	
					P1	P2
Surabaya	2.74	-	11.00	-	-	-
Banjarmasin	2.97	-8.00	11.00	800H (RE) 4 x 1	D800, 12mm,	D800, 12mm,
Selayar	2.39	-4.50	9.00	630H (R0+5) 4 x 1	D800, 12mm,	D800, 12mm,
Labuhan Bajo	2.70	-	9.00	-	-	-
Wahai	1.92	-	9.00	-	-	-
Babang	1.35	-6.0～ -12.(	9.00	630H (R0+5) 4 x 1	D800, 12mm,	D800, 12mm,
Manokwari	2.22	-	9.00	-	-	-
Biak	1.55	-5.0～ -10.(	9.00	630H (R0+5) 4 x 1	D600, 12mm,	D600, 12mm,

Figure 4.1.12 Typical Cross Section of Bow Breasting Dolphin



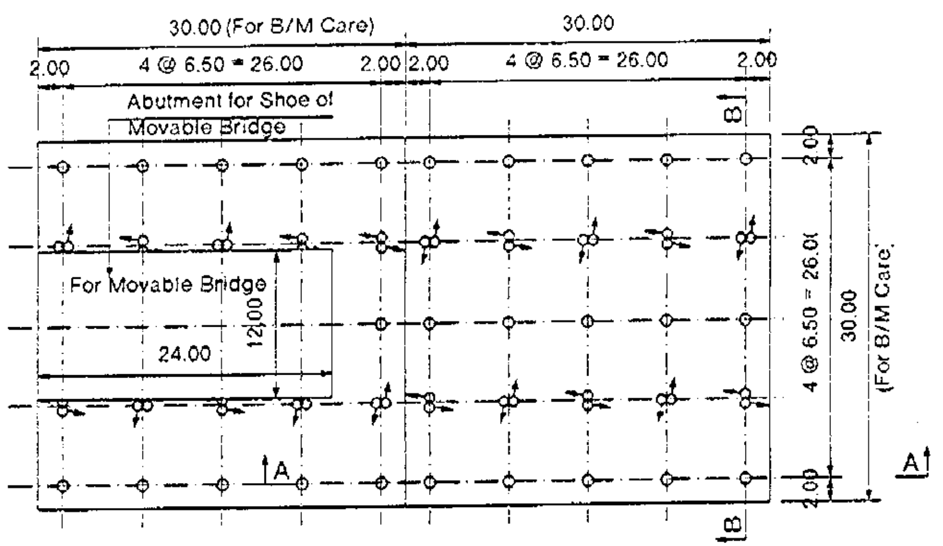
Terminal	HWL (DL+, m)	L1 (DL+, m)	L2 (DL+, m)	L3 (DL+, m)
Selayar	2.39	3.50	1.20	+1.0 ~ 0
Wahai	1.92	3.50	1.00	+1.0 ~ 0
Manokwari	2.22	4.00	1.10	+1.0 ~ 0

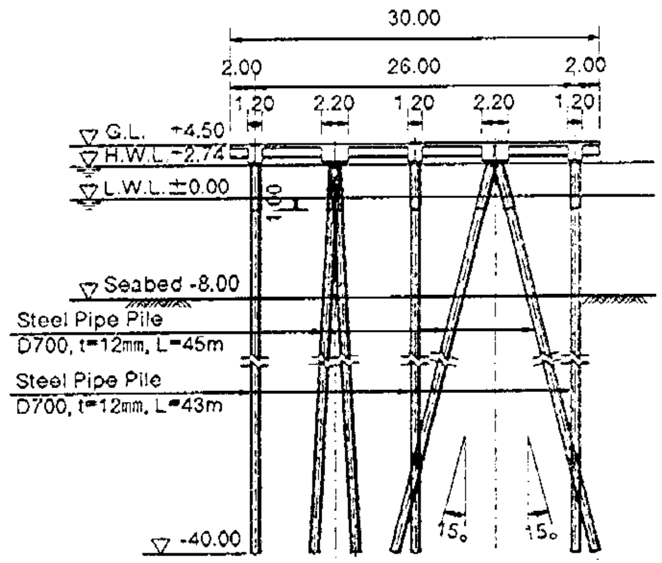
Figure 4.1.13 Typical Cross Section of Causeway



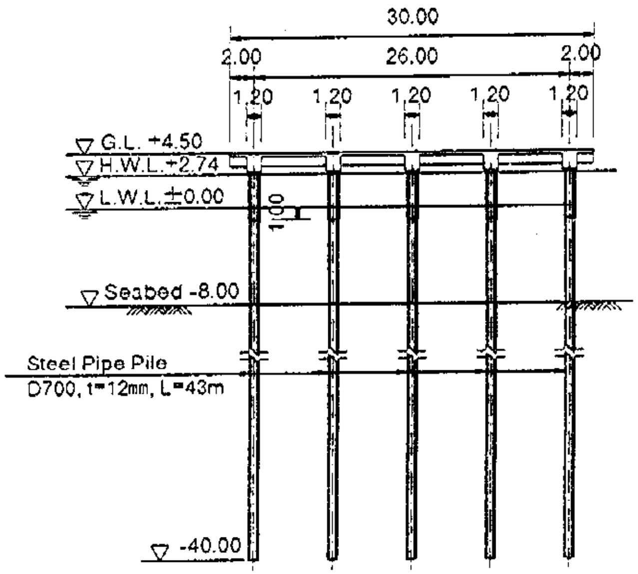
Terminal	HWL (DL+, m)	L1 (DL+, m)	L2 (DL+, m)	L3 (DL+, m)
Selayar	2.39	3.50	0 ~ -3.0	-34.0
Babang	1.35	3.00	0 ~ -3.0	-32.0
Manokwari	2.22	4.00	0 ~ -7.0	-14.0
Biak	1.55	3.75	0 ~ -9.0	-18.0

Figure 4.1.14 Typical Cross Section of Trestle





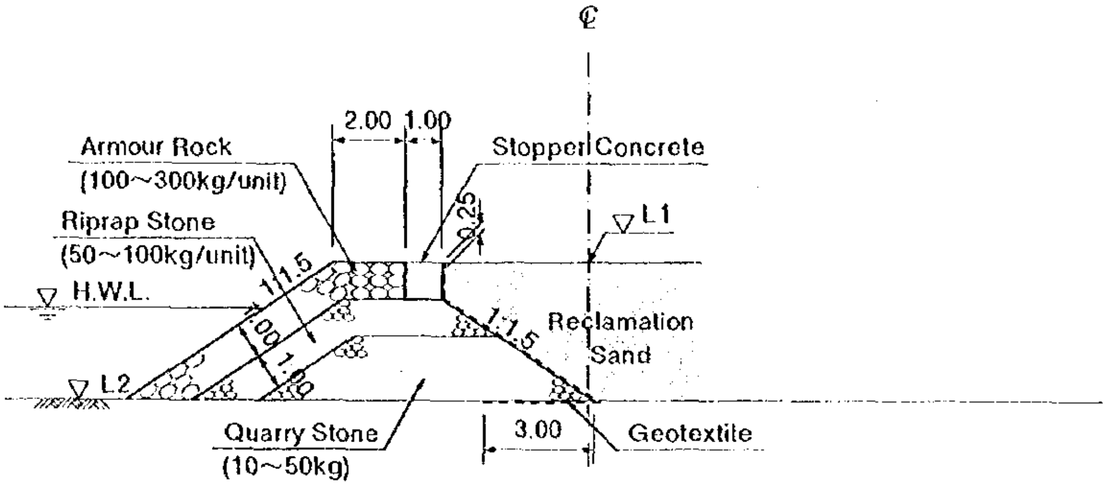
Section B-B



Section A-A

Terminal	Width (m)	Length (m)	Foundation Pile
Banjarmasin	30.0	60.0	D700, 12mm, L=43 - 45 m
Wahai	16.0	30.0	D600, 12mm, L=35 m
Babang	16.0	30.0	D600, 12mm, L=35 m

Figure 4.1.15 Unit Module of Landing Staff S=1/600



Terminal	L1 (DL, m)	L2 (DL, m)
Surabaya	3.50	+1.00
Selayar	3.50	0.00
Labuhan Bajo	3.50	-1.50
Wahai	4.00	+1.00
Manokwari	4.00	-1.00
Biak	3.75	-1.00

Figure 4.1.16 Typical Cross Section of Revetment

4.1.3 On Land Facilities

(1) Land preparation

91. The land for development of the ferry terminal area at the following sites are provided by reclamation. The required volume as estimated will be able to be obtained from mountains near the site.

Table 4.1.9 Reclamation Volume for Land Preparation

Name of Terminal	Terminal Area [m²]	The Reclamation Volume [m³]
Surabaya	38,000	95,000
Selayar	19,500	55,000
Labuhan Bajo	20,000	20,000
Wahai	17,000	25,500
Babang	15,000	7,500
Manokwari	19,500	19,000
Biak	19,500	36,500

(2) On land facilities

1) General

92. The following facilities are provided for each ferry terminal;

- Passenger terminal building
- Loading parking lots
- Waiting parking lots
- Shuttle bus parking lot
- Long distance bus terminal
- Commuter vehicles parking area
- Utility supply system and related buildings
- Truck scale at Surabaya and Banjarmasin terminals only

2) Passenger terminal building

93. The terminal building shall have the following facilities;

- Waiting room for passengers
- Kiosk and canteen
- Terminal operator's office
- Shipping companies office
- Ticket booth
- Praying room [Musholla]
- Toilet
- Storage
- Public hall and passage

3) Space demands

94. The required area for the passenger terminal building with the above facilities is estimated by the formula as detailed in Appendix A.7.1.1 of Part 2. The required area for the terminal building at each terminal are worked out and summarized as follows;

Table 4.1.10 Required Area of Terminal Building of Each Terminal

Name of Project Terminal	Required Area of Terminal Building [m²]		
	On Land	Off Shore	Total
Surabaya	4,000	2,400	6,400
Banjarmasin	4,000	-	4,000
Selayar	2,000	-	2,000
Labuhan Bajo	700 existing one 1,500 addition	-	2,200
Wahai	1,500	-	1,500
Babang	1,500	-	1,500
Manokwari	2,000	-	2,000
Biak	2,000	-	2,000

95. The existing terminal building at the Labuhan Bajo is used. As the area thereof is not enough, on additional terminal building of 1,500m² is provided separately on the reclaimed land area.

96. All the terminal buildings except the passenger terminal at the offshore of Surabaya will be one-story building. The passenger terminal building of 2,400m² offshore of Surabaya is provided on the 2nd floor of the detached platform in addition to the terminal building of the on land terminal area.

(3) Parking lots

97. The required area of the following parking lots are obtained by the formula as detailed in A7.1.1 of the Report.

- Loading parking area to be used for vehicles ready to board ferry
- Waiting parking area to be used for vehicle with passengers waiting to board

98. The required area of loading parking lot and waiting parking lot at each terminal is summarized as follows;

Table 4.1.11 Required Area of Parking Lots of Each Terminal

Name of Terminal	Loading Parking Lot [m²]	Waiting Parking Lot [m²]	Shuttle Bus Parking Lot [m²]	Total [m²]
Surabaya - on land	5,000	4,000	3,300	12,300
- off land		3,200	-	3,200
Banjarmasin	5,000	4,000	-	9,000
Selayar	2,500	2,500	-	5,000
Labuhan Bajo	2,500	2,500	-	5,000
Wahai	2,000	2,000	-	4,000
Babang	2,000	2,000	-	4,000
Manokwari	2,500	2,500	-	5,000
Biak	2,500	2,500	-	5,000

(4) Pavement of parking lot

99. Based on past performance of large ferry terminals around Jakarta, Surabaya, the concrete blocks pavement material have been observed efficient in the parking lots of the ferry terminal. Considering the following advantage, concrete blocks are used for pavement of loading and waiting parking lots with the proper drainage system inside the terminal area. Maintenance work is easy by replacement of broken parts. The damages by drained water can be minimized by the structure of block pavement, providing the space between the blocks and sand beds beneath the blocks which contribute to drain the surface water.

100. The concrete block pavement works can be started after the specified strength of compression in term of CBR more than 40% of sub base in thickness of 25cm over the sub grade and 80 % of base course in thickness of 20cm are obtained on the reclaimed land. The

concrete blocks in thickness of 10cm shall be placed on the compacted base course. The concrete pavement will be adopted around the truck scale area to absorb heavy friction by the stop and start of heavy loaded trucks.

101. The proper drainage arrangement inside the terminal area which shall be determined under the max. precipitation for the catchment area as the total terminal area is provided.

4.1.4 Electricity and Water Supply

(1) Electricity supply

102. Lighting is provided for the passenger terminal building, parking lots, approach road and mooring facilities. Air-conditioning is not provided for passenger waiting room but is provided for the office and canteen in the passenger terminal building. Power supply for the movable bridge and water pump is also considered.

103. The required electricity is planned to be supplied by diesel engine generator sets installed in each terminal, since there is still a possibility of temporary breakdown of the PLN supply.

104. The electricity supply required in each terminal has been estimated as follows;

1) Surabaya, Banjarmasin terminals

Lighting of terminal building:	6,400 m² *50 VA	=320 KVA
Lighting of outdoor facilities:	200*450 VA	= 90 KVA
Air-conditioning :	600 m²*100 VA	= 60 KVA
Movable Bridge :		20 KVA
Water Pump :		5 KVA
Total :		495 KVA

The above required power supply shall be obtained from PLN of Surabaya and Banjarmasin, the power distribution board. Necessary wiring facilities are provided and two (2) sets of 150 KVA diesel engine generator for emergency of movable bridge operation, water supply and office lighting are recommended to be installed at each terminal.

2) Selayar, Manokwari, Biak terminals

Lighting of terminal building:	2,000 m² * 50 VA=100 KVA
Lighting of outdoor facilities:	50 *450 VA=24 KVA
Air-conditioning :	200 m² *100 VA=20 KVA
Movable Bridge :	10 KVA
Water Pump :	10 KVA
Total :	164 KVA

Two sets of 170KVA diesel engine generator for self sufficient of power supply system are recommended to be installed in each terminal to create a self-sufficient power supply system.

3) Labuhan Bajo, Wahai, Babang terminals

Lighting of terminal building:	1,500 m² * 50 VA=75 KVA
Lighting of outdoor facilities:	40 *450 VA=18 KVA
Air-conditioning :	120 m² *100 VA=20 KVA
Movable Bridge :	10 KVA
Water Pump :	5 KVA
Total :	128 KVA

Two sets of 150KVA diesel engine generator for self sufficient of power supply system are recommended to be installed in each terminal to create a self-sufficient power supply system.

(2) Water supply

105. Water is supplied for the staff of the terminal, for passengers and for the ferry boats. It is planned that the water required will be obtained by deep well to be drilled near each terminal site except for Surabaya and Banjarmasin, which will obtain their water from the city water supply.

106. The well water flows into a ground reservoir in the terminal and the water from reservoir will be pumped up to an elevated water tank. Water is then distributed to the passenger building and ferry boats from this elevated tank.

107. The capacity of the reservoir tank is governed by the capacity of the ship's tank,

which is estimated at about 150m^3 for 5,000GRT and 70m^3 for 1,000GRT ferry boats. It is assumed that the supply to the ship is provided once in every two calls, since the water can be supplied at the terminal at either side of the route.

108. The water supply required at each terminal has been estimated as shown below;

1) Surabaya, Banjarmasin terminals (5,000GRT)

Staff	:	60 persons*100 l/day	=	6,000 l/day
Passengers	:	800 persons*1.5 times*10 l/day	=	12,000 l/day
Ship	:	100,000 l/ship* time/day	=	100,000 l/day
Total	:			118,000 l/day

2) Selayar, Labuhan Bajo, Manokwari, Biak, Wahai and Babang terminals (1,000 GRT)

Staff	:	20 persons*100 l/day	=	2,000 l/day
Passengers	:	500 persons*2 times*10 l/day	=	10,000 l/day
Ship	:	50,000 l/ship*1 times/day	=	50,000 l/day
Total	:			62,000 l/day

4.2 Cost Estimation

4.2.1 General

109. Following the cost research in August – September 1997, the research for the construction cost of each planned ferry terminal site was conducted again by re-visiting the main construction companies of the concerning regions in February - 1998. The information about changed unit prices of construction materials, construction equipment and labour costs were provided from those construction companies of the regions.

110. The prices of construction materials, equipment, labours and construction-related commodities soared due to the devaluation of Rupiah last year. The prices are still changing day by day, and this was probably the worst time to survey the construction cost in Indonesia.

111. The basic cost of the works and unit prices and those changes for the provinces have been surveyed and the differences are compared between the provinces concerning availability of materials, labour, construction equipment and accessibility to the sites.

4.2.2 Current Prices of Construction-related Commodities

(1) Steel product

112. One of the Indonesian steel manufacturers in Surabaya quoted the following new prices of deformed reinforcement bars to customers (January 26, 1998):

- Re-bars diameter up to 13mm: Rp.2,360/kg
  diameter up to 32mm: Rp.2,320/kg

- Pre-requirement and condition;
  (1) Cash payment is required in prior to receiving materials.
  (2) Above prices do not include VAT and transportation fees.
  (3) *Minimum quantity of order shall be 10 tons.*
  (4) The prices are not fixed and may be changed.

113. These prices had increased at least 55 – 60 percent over the former figure of Rp. 1,450 – 1,500/kg before July of 1997.

(2) Cement

114. State-owned cement manufacturer PT. Semen Gresik began exporting part of its production to Australia and Colombia from last March due to a continued fall of demand in the domestic market. And the company also proposed raising the retail price by 40 percent to Rp.14,300 per sack (50 kg) since February 2 to offset rising production costs. (February 24, 1998)

115. But in the market at Gresik nowadays, the price of cement has already been going higher, i.e. the market price in retailer level showed Rp.17,000 per sack in Gresik and Rp.18,000 per sack in Surabaya. (February 4, 1998)

(3) Petroleum and oil

116. From the beginning of February, the price of petroleum has been rising, reaching almost three times the former price in the cities in East Java (February 4, 1998). The price of petroleum was Rp.350 per litre until the end of January and the price had soared up to Rp.1,000 – 1,500 per litre during the holidays of Idul Fitri.

117. The price of the Pertamina-made lubricant ranged from Rp.7,500 to Rp.11,000 per litre-can compared to its previous price of Rp.5,700 (rose by 30 – 190 percent). [Jakarta Post, February 5, 1998]

4.2.3 Current Situation of Construction Cost

(1) Construction materials

118. In the Surabaya district, the price increase of construction materials compared to the last year was estimated by a construction company as follows.

- Manufactured materials: 100 – 200 percent rise.
- Imported materials: follow the devaluation rate of Rupiah against foreign currency, especially US Dollar.
- Local materials: 40 percent rise.

119. According to another construction company, the current market price of reinforcement steel bar was US$350/ton (as of February 1998) and construction companies were obliged to pay in US Dollars to the Indonesian suppliers.

120. Also advised by P.P. that the price of steel pipe pile, provided from Krakatau Steel in West Java, was fixed at the price of Rp.1,673.6/kg (as of January 1998; exchange rate of currency was also fixed at US$1.00 =Rp.2,400). It was considered that this might be the temporary fixed price by the governmental policy.

121. In the Banjarmasin district, following prices were quoted.

- Manufactured materials:
  - Cement: Rp.17,500/(50kg sack, on site, provided from Surabaya)
    Rp.16,000/(50kg sack, on site, provided from Ujung Pandang)
  - Steel Products (re-bar, steel pipe piles, sheet piles and so on) ;
    Rp.4,000/kg.
- Local materials (sand/rock, aggregates for concrete and so on);
  - Sand/rock Rp.40,000/m^3;
  - Aggregate Rp.50,000/m^3.
- Imported materials (such as geotextile sheet);
  According to a company's estimation, the market price had already risen by about 200 percent since last year.

122. In remote areas, for example Labuhan Bajo in Flores, unit price of steel pipe pile roughly rose by 120 percent, unit prices of materials for concrete roughly rose by 80 percent, local materials (sand, rock and so on) roughly rose by 30 – 40 percent.

(2) Construction equipment

123. Influenced by price increases of gasoline, solar (diesel fuel), wages of driver and/or operator, the cost for construction equipment has already risen. In Surabaya, equipment cost rose by 30 – 40 percent since last year, and 60 – 70 percent higher price and cash payment must be considered for procurement of new equipment.

124. For Sulawesi and Maluku regions, equipment and material costs have risen 80 percent. Since the major construction equipment and main construction materials are mobilized from the Java region, increased transportation cost is a major factor.

125. However, increases in the cost for construction equipment are restricted currently. A construction company in Surabaya stated that the contract price of equipment showed no change. According to a company in Banjarmasin, the market price of construction equipment rose 50 percent higher compared to last year, but the contract

price could not rise beyond 2 percent rise, corresponding to rise of oil and solar.

(3) Labour cost

126. A construction company in Ujung Pandang stated that labour costs in the Sulawesi and Maluku regions had risen about 20 percent on average between August 1997 until January 1998. Another company in Surabaya said costs had risen 25 percent.

127. However, rise of labour cost is also restricted by the government currently. According to a company in Banjarmasin, the market prices of construction labour had already risen by at least 20 percent as of last February, but only a 5 percent rise was accepted by employers in the latest contracts.

128. Table 4.2.1 shows the estimated construction cost of major work items and their changes between August 1997 and February 1998. Since the prices of life essential commodities have risen by at least 50 – 100 percent in past months, the labour cost will inevitably rise, and construction cost will inevitably be raised in accordance with the market prices. The market will have stable prices at a higher level in the near future.

4.2.4 Basic Cost of Construction Work

129. Unit price of each element such as labour, major material and major equipment were determined on the basis of the regional unit prices collected in the field survey in February – March 1998. The determination of the unit costs take into account the conditions of each region concerned as mentioned in the previous section.

130. The breakdown of unit costs of the construction works is prepared by accumulating labour cost, material cost, equipment cost and indirect cost such as general temporary works, overheads profit and so on. While the cost of the works such as building works, fabrication of movable bridge, supply of utilities and demolition work are hindcast on the basis of the empirical prices informed from the major contractors in each region.

131. Price of imported products such as major parts of PC structures, fender system and navigation aids are based on the CIF Jakarta price and adjusted considering import tax and some mobilization fee to the construction site. The basic costs of imported products are based on the exchange rate of foreign currency as follows; US$1.00 = 9,600Rupiah = ¥128 (approximate average exchange rate (TTM) by the daily figures

from January to March 1998).

Notes: *Monthly average exchange rate of Rupiah against US Dollar was as follows.*

January	9,805 Rupiah/US$,	129.5 Yen/US$
February	9,395 Rupiah/US$,	126.2 Yen/US$
March	9,598 Rupiah/US$,	128.7 Yen/US$

132. The estimation of construction cost in the following pages was carried out on the basis of current unit prices in the market (as of January and February 1998).

Table 4.2.1 Combined Construction Cost and Their Changes between August 1997 and February 1998

Work Items	Banjarmasin			Surabaya			Labuhan Bajo			Selayar		
(unit: 1,000 Rupiah)	Aug '97	Feb '98	Inflation	Aug '97	Feb '98	Inflation	Aug '97	Feb '98	Inflation	Aug '97	Feb '98	Inflation
Steel Pipe Piling (D=600 mm)	543	1,119	106%	530	1,208	128%	717	1,701	137%	593	1,165	96%
(D=800 mm)	687	1,436	109%	674	1,556	131%	912	2,165	137%	751	1,482	97%
(D=1000 mm)	831	1,752	111%	818	1,905	133%	1,106	2,628	138%	910	1,799	98%
Concrete Work Wharf, Dolphin	1,215	2,145	77%	1,035	1,739	68%	1,374	3,134	128%	1,262	2,164	71%
Revetment, Wall	641	1,154	80%	575	951	65%	750	1,614	115%	672	1,245	85%
Sheet Piling (type II)	207	290	40%	-	-	-	-	-	-	-	-	-
Tie-rod & Block Concrete	1,068	2,549	139%	-	-	-	-	-	-	-	-	-
Asphalt Concrete Pavement	65	120	85%	38	58	53%	169	253	50%	42	127	202%
Walkway Pavement	49	68	39%	26	37	42%	87	145	67%	33	76	130%
Mound Stone	-	-	-	-	-	-	64	105	64%	-	-	-
Dredging and Reclamation	-	-	-	-	-	-	-	-	-	27	51	89%
Filling Work	21	57	171%	24	38	58%	22	54	145%	22	41	86%
Slope Protection by Stone Work	63	84	33%	39	65	67%	86	137	59%	71	105	48%
Filter Sheet by Geotextile	9	27	200%	8	24	200%	9	27	200%	9	26	189%

Work Items	Babang			Wahai			Biak			Manokwari		
(unit: 1,000 Rupiah)	Aug '97	Feb '98	Inflation	Aug '97	Feb '98	Inflation	Aug '97	Feb '98	Inflation	Aug '97	Feb '98	Inflation
Steel Pipe Piling (D=600 mm)	741	1,212	64%	699	1,188	70%	743	1,283	73%	763	1,307	71%
(D=800 mm)	950	1,544	63%	894	1,513	69%	952	1,640	72%	979	1,671	71%
(D=1000 mm)	1,159	1,877	62%	1,088	1,838	69%	1,160	1,996	72%	1,195	2,035	70%
Concrete Work Wharf, Dolphin	1,431	2,303	61%	1,374	2,300	67%	1,508	2,519	67%	1,572	2,459	56%
Revetment, Wall	798	1,370	72%	750	1,367	82%	878	1,542	76%	921	1,486	61%
Sheet Piling	-	-	-	-	-	-	-	-	-	-	-	-
Tie-rod & Block Concrete	-	-	-	-	-	-	-	-	-	-	-	-
Asphalt Concrete Pavement	53	140	164%	57	138	142%	77	177	130%	69	145	110%
Walkway Pavement	38	87	129%	39	82	110%	50	108	116%	47	96	104%
Mound Stone	-	-	-	64	112	75%	58	333	474%	79	152	92%
Dredging and Reclamation	-	-	-	-	-	-	-	-	-	-	-	-
Filling Work	28	74	164%	22	87	295%	28	173	518%	28	60	114%
Slope Protection by Stone Work	72	168	133%	86	152	77%	87	343	294%	86	152	77%
Filter Sheet by Geotextile	9	29	222%	9	29	222%	9	32	256%	9	32	256%

4.2.5 Estimation of Construction Cost of Planned Terminals

133. After the preliminary design of the proposed facilities at each terminal site (refer to the previous section, 4.1) is prepared based on the topographic and hydrographic survey charts and the soil investigation report, the quantities of works of such designed facilities and development of the respective terminal sites are estimated.

134. The construction costs of all the works and facilities are estimated for the espective proposed sites and divided into local currency portion and foreign currency portion depending on the components of materials or works.

135. The local currency portion is the estimated cost of the materials, equipment, labour and products that are available to be procured domestically in Indonesia. The foreign currency portion is the estimated cost of the imported materials such as steel products, maritime facilities (fender, navigation aids, etc.), use of imported components of equipment and/or employment of expatriate engineers.

136. Considering the above aspects and components of works the proportions of the local and foreign currency were introduced to the unit prices in the breakdown of cost estimation.

137. The detail quantities of works of the planned facilities and costs estimated at each proposed site are shown in Tables A4.2.1 – A4.2.8, Estimation of Construction Cost, in Part 3 of the Appendices. The construction costs of the main items of waterfront facilities and onland facilities with the respective quantities are shown in the next section, 4.3, along the planned construction schedule.

138. The total construction cost of development of the proposed terminal site for the feasibility study is summarized as shown in Table 4.2.2. The total construction cost comprises the following cost items.

- Direct construction cost estimated by the preliminary design of facilities.
- Engineering fee of consulting services for the stages of design and construction.
- Physical contingency for the construction works.
- Value Added Tax (VAT) for the contract.

139. Engineering fee is estimated taking into account provision of the following scope

of services.

- Topographic/hydrographic surveys and soil investigations required at each terminal site,
- Detailed design of all the facilities at each terminal site,
- Construction supervisory services at each terminal site for a two years period (two and half year period for the Surabaya – Banjarmasin route).

140. A physical contingency is required for the construction works and is estimated as 10% of summation of construction cost and engineering fee.

141. The taxes required for the works or materials, such as import tax, are considered to be included in the unit prices of the works or materials. The Value Added Tax for the contract is assured for the construction cost to be 10% of the total construction cost.

Table 4.2.2 Summary of Construction Cost

Surabaya - Banjarmasin (Unit in 1,000 Rupiah)

		Local	Foreign	Total
Construction Cost	Surabaya	189,412,166	136,113,365	325,525,531
	Banjarmasin	19,502,944	16,904,726	36,407,670
	(1) Sub-Total	208,915,110	153,018,091	361,933,201
Engineering Fee	(2)=(1) x 8%	17,372,795	11,581,861	28,954,656
Physical Contingency	(3)=[(1)+(2)] x 10%	22,628,791	16,459,995	39,088,786
VAT	(4)=[(1)+(2)+(3)] x 10%	42,997,664	-	42,997,664
Total	(1)+(2)+(3)+(4)	291,914,360	181,059,947	472,974,307

Selayar - Labuhan Bajo (Unit in 1,000 Rupiah)

		Local	Foreign	Total
Construction Cost	Labuhan Bajo	6,188,504	4,755,682	10,944,186
	Selayar	13,264,713	9,270,794	22,535,507
	(1) Sub-Total	19,453,217	14,026,476	33,479,693
Engineering Fee	(2)=(1) x 10%	2,008,781	1,339,188	3,347,969
Physical Contingency	(3)=[(1)+(2)] x 10%	2,146,200	1,536,566	3,682,766
VAT	(4)=[(1)+(2)+(3)] x 10%	4,051,043	-	4,051,043
Total	(1)+(2)+(3)+(4)	27,659,241	16,902,230	44,561,471

Manokwari - Biak (Unit in 1,000 Rupiah)

		Local	Foreign	Total
Construction Cost	Manokwari	9,350,718	6,916,568	16,267,286
	Biak	10,282,623	7,303,043	17,585,666
	(1) Sub-Total	19,633,341	14,219,611	33,852,952
Engineering Fee	(2)=(1) x 10%	2,031,177	1,354,118	3,385,295
Physical Contingency	(3)=[(1)+(2)] x 10%	2,166,452	1,557,373	3,723,825
VAT	(4)=[(1)+(2)+(3)] x 10%	4,096,207	-	4,096,207
Total	(1)+(2)+(3)+(4)	27,927,177	17,131,102	45,058,279

Wahai - Babang (Unit in 1,000 Rupiah)

		Local	Foreign	Total
Construction Cost	Wahai	9,428,874	7,431,380	16,860,254
	Babang	7,471,098	7,183,754	14,654,852
	(1) Sub-Total	16,899,972	14,615,134	31,515,106
Engineering Fee	(2)=(1) x 10%	1,890,907	1,260,604	3,151,511
Physical Contingency	(3)=[(1)+(2)] x 10%	1,879,088	1,587,574	3,466,662
VAT	(4)=[(1)+(2)+(3)] x 10%	3,813,328	-	3,813,328
Total	(1)+(2)+(3)+(4)	24,483,295	17,463,312	41,946,607