Chapter 10 Feasibility Study on Three Projects

10. Feasibility Study on Three Projects

10.1 Recommended Channels and Ports subject to Feasibility Study

10.1.1 Selection Criteria

JICA Study Team identified several major development projects. They were subject to the feasibility study.

The criteria for the selection of the development projects are as follows:

- To meet the rapidly growing demand of the hinterland,
- To improve the less developed hinterland,
- To avoid an intensive development in a specific locality
- To give a priority to the below:
  - Navigational channel relatively difficult to maintain,
  - Training jetties which have caused or may cause relatively large coastal changes,
  - Channel maintenance methods other than dredging.

10.1.2 Candidate Channels and Ports

According to the criteria, the development needs of candidate channels examined are as follows:

(1) Sichon Channel (Commercial Port)

Sichon Commercial Port, which will be constructed as a gate port of the land bridge on the Gulf of Thailand, is not accepted for the feasibility study for the reasons below:

- Littoral drift is rather small.
- The navigational channel will be laid out deep at sea.
- There will be no severe sedimentation problems.

(2) Sichon Channel (Fishing Port)

The candidate channel of Sichon Fishing Port is considered to have an urgent need for the feasibility study for the reasons below:

- Accommodation of the 1,327 medium-sized fishing boats will be necessary, which is the third largest in the Study area after 1,462 vessels of Songkhla.
- An additional training jetty will be necessary besides the existing one. Invading waves through the navigation channels, which were generated by a storm in 1999, damaged houses at the fishing village.

- It is difficult at present to maintain the navigational channel by one jetty only.
- Fishing boats run aground because the channel is becoming shallower.
- JICA Study Team conducted a bathymetric survey as well as coastline survey at Sichon. Therefore, reliable study results are expected.

(3) Pak Phanang Channel

Pak Phanang Channel is excluded as a F/S target because:

- No training jetty but only maintenance dredging is required.
- When Sichon Commercial Port is open, Pak Phanang Channel will decline in importance.

(4) Songkhla Channel

Songkhla Port is considered as having a candidate channel for the reasons below:

- The port will remain the most important one in the study area.
- HD is currently working on an expansion of the container terminal.
- OMPC has a development plan for a coastal shipping terminal in the vicinity of the existing Songkhla Port.
- A rapid increase of the export of canned/frozen fish requires smooth loading/unloading in the port.
- The littoral drift along the coast and the siltation from Songkhla Lake are causing intensive sedimentation in the navigation channels.
- Siltation in front of the existing container terminal is also a serious problem.
- A new layout plan is required to solve the sedimentation problem in both the channel and basin.

(5) Pattani Channel

Pattani Port is considered as having a candidate channel for the reasons below:

- The depth of navigational channel must be maintained because the port accommodates many large commercial fishing boats.
- There are many support facilities for the fishing boats like fish loading berths, markets, fish process factories, shipbuilding/repairing workshops, etc.
- Both littoral drift near Laem Ta Chi Cape and the siltation from Pattani River are causing intensive sedimentation of the navigation channels.

(6) Bang Ra Pha Channel

Bang Ra Pha Channel is considered as a candidate channel for the reasons below:

- Channel maintenance will be the most urgent issue because of a large volume of littoral drift.
- In Bang Ra Pha Channel, HD has constructed a dual training jetty as a preventive measure against sedimentation in the navigation route. The information and technical experiences gained through the feasibility study of this channel may also be applied to many other channels, which are expected to suffer the same sedimentation problem in the near future.

(7) Panare Channel

Panare Channel is considered as a candidate channel for the reasons below:

- Even before the completion of the dual jetties, there is remarkable accretion and erosion of sand beside the jetties. The maintenance of the channel is very crucial.
- Like in Bang Ra Pha, a dual training jetty work is constructed at Panare to protect the navigation route. The results of F/S in Panare Channel is therefore to be applied in other channels with the same sedimentation problem.

10.1.3 Selection of Channels and Ports subjected to Feasibility Study

From the previous discussion, the five candidate channels identified were the following:

- Sichon Channel (Fishing Port)
- Songkhla Channel
- Pattani Channel
- Bang Ra Pha Channel
- Panare Channel

Based on the selection criteria, the above five channels were compared with each other as shown in Table 10.1.3-1.

From the table, the three channels, namely, Sichon Channel, Songkhla Channel and Bang Ra Pha Channel, were selected as those for feasibility study.

Table 10.1.3-1 Selection of F/S Channels and Ports

(Note: Grey indicates selection for Feasibility Study)

Selection Criteria	Sichon (Fishing Port))	Songkhla	Pattani	Panare	Bang Ra Pha	Remarks
Rapidly growing demand of hinterland.	○	◎	○	△	△	(1)
Improvement of less developed hinterland.	△	△	△	△	△	
To avoid spacious concentration of developments.	Nakorn Si Thammarat	Songkhla	Pattani	Pattani	Pattani	Province
Difficulty in maintaining navigational channel	○	◎	◎	△	○	HD dredging record (2)
Large coastal changes due to training jetties.	◎	△	△	◎	◎	
Measures other than dredging.	◎	◎	○	◎	◎	(3)
Collective Priority	2	1	4	4	3	

Legend: ◎：High Priority, ○: Mid Priority, △: Low Priority

Note (1): OMPC reported in the draft final report of "Coastal Transport Development Study," the priority ports are Tha Thong Port in Surat Thani Province, Sichon Commercial Port in Nakorn Si Thammarat Province and Songkhla Port in Songkhla Province.

Note (2): The channels dredged almost every year are high or middle ranked except Panare Channel. Sichon Channel has a single jetty only, which rather aggravated the sedimentation along the navigation channel and caused larger damage to village houses by storm waves.

Note (3): Pattani Channel can be maintained by dredging only.

10.2 Songkhla Port

10.2.1 Summary of Cargo Demand

According to the cargo demand forecast in Chapter 9, cargo-handling volume by handling method in the short-term development stage is summarized in the table below. Furthermore, based on the existing cargo handling condition, cargo commodities and types are forecast.

Table 10.2.1-1 Summaries of Cargo Demands

	Handling Volume (ton)			Main Commodity	Type	Share
	Year 2010	Year 2015	Year 2020			
Coastal Handling Cargo	125,000	258,000	350,000 (Same as Capacity)	Maize	Dry Bulk	90%
				Rice Powder Fertilizer Cement Shrimp Feed	Bag	
				Rubber, Furniture	Container	10%
Ro/Ro Handling Cargo	148,000	150,000 (Same as Capacity)	150,000 (Same as Capacity)	Container with chassis		
Total	273,000	408,000	500,000			

10.2.2 Requirements of Port Facilities

(1) Required Coastal Ship Dimension in Songkhla Port

The largest coastal vessel in Songkhla port is M.V. Chiang Mai, which has a draft of 6.71 m. In consideration of the present trend, the vessel size for coastal cargo will increase. Accordingly, the depth of coastal cargo (solid) berth in Songkhla port was determined as -7.5m to accommodate vessels of 5,000 DWT.

According to the information for Bang Saphan port, Ro/Ro vessel operation on the route of Bang Saphan port - Laem Chabang port will start in the year 2002. The size of Ro/Ro cargo vessel on this route is 5,000 DWT (7.5m vessel draft, 170 TEU loading capacity). This coastal Ro/Ro vessel operation will be the first case in Thailand. Based on the forecast cargo volume, Ro/Ro vessel size of Songkhla Port is estimated as 2,500 DWT (5.5m full load draft, 50 TEU capacity)

(2) Required Cargo Handling System for Coastal and Ro/Ro Cargo

Based on the existing cargo handling system, the requirements of cargo handling for coastal cargo were estimated. Furthermore, the required Ro/Ro cargo handling system was estimated, based on the planned route of Bang Saphan port - Laem Chabang port.

Table 10.2.2-1 Estimated Cargo Handling System for Coastal and Ro/Ro Cargo

	Cargo Type	Cargo Handling Equipment Loading/Unloading	Transport Vehicles	Remarks
Coastal Cargo Handling System	Bulk	Ship's Gear Truck Crane	Dump Truck	Direct transferring cargo to outside
	Bagged Cargo	Ship's Gear	Dump Truck, Forklift	Direct transferring cargo to outside or Store in T. Shed
	Container	Truck Crane	Trailer Forklift	Direct transferring cargo to outside or store in open area
Ro/Ro Cargo Handling System	Container	Roll on/ Roll off by Trailer In the Ro/Ro cargo vessel, only container with chassis setting up		

In view of efficiency, the above cargo handling equipment or transport vehicles shall be organized by coastal shipping companies or private management/operation companies.

(3) Required Port Related Facilities

According to the condition of cargo type in the existing port facilities and future assumptions, the following port related facilities were concluded to be necessary for cargo handling operation.

Facilities	Dimension	Remarks
Transit Shed including Administration Office	Transit shed floor area: 90m x 30m=2,700m^2 Administration office floor area: 30m x 10m x 2 Floor =600m^2	Cargo volume in the transit shed was estimated to be 20% of cargo handling capacity except container volume. Required floor area of transit shed was calculated by the following formula: A=(C x D x p) / (K x a x w) A : Required transit shed floor area (m^2) C : Annual cargo handling volume through transit shed (tons) D : Dwelling time (days) p : Peak ratio k : Operating days (days) a : Effective storage area ratio w : Volume of cargoes per unit area (ton/m^2) : C=94,500, D=7, p=1.3, k=350, a=0.6, w=1.5, Then, A=2,730m^2

Open yard	Yard area: 7,050m^2	Cargo handling capacity of all containers including both stuffed and empty containers in the open yard was estimated to be 10% of total coastal cargo handling capacity. Required number of ground slots is calculated by the following formula: Ns=(My x Ds x p)/(H x Dy) Ns : Required number of ground slots My: Capacity of container yard (TEU) Ds : Dwelling time (Days) p : Peak ratio H : Average stacking height Dy: Operating days (Days) - Stuffed container yard My=2,917, Ds=7, p=1.3, H=2, Dy=350, Then, Required Slot No.: Ns=51 - Empty Container Yard My=2,917, Ds=10, p=1.3, H=2.5, Dy=350, Then, Required Slot No.: Ns=43, Then 94 x 75 m^2= 7,050 m^2
Parking lot	Parking lot area: 7,500m^2	Area required for parking lots for vehicles for Ro/Ro vessels was obtained by the following formula. A1 = a x n x N x X x Y a: Required parking lot per vehicle (m^2) n: Number of vehicles per planned Ro/Ro vessel N: Berthing/deberthing ships in same time zone X: Utilization ratio (number of vehicles to use the parking lot) Y: Fluctuation ratio (seasonal variation) a=106.25, n=50, N=1, X=1, Y=1.2, Then 6,375m^2
Access Road	Width=16m, Distance=1,025m	Four-lane road
Access Bridge	Width=16m, Length=40m	For the protection of the canal with archaeological value
Entrance Gate and Checking Post	Area=40m^2	
Utilities	1 L/S	Electric, water supply, fire fighting and telecommunication system, wastewater treatment unit

(4) Recommended Management and Organization

1) Present port management in Songkhla international port

The government provided the infrastructure of Songkhla International Port. Government assets consist of quaywall, transit shed, and other buildings, utilities, fencing, tugs, pilot boats, harbour launches and cargo handling equipment. Then, in 1988, Songkhla International Port was transferred to management and operation by Chaophaya Terminal International Co., Ltd., under an agreement with the Treasury Department of the Ministry of Finance. The agreement stipulates that port-operating company has to pay the government a fee consisting of a fixed fee and variable revenue sharing fee.

2) Management in recommended coastal berth

The "Maritime Transport Infrastructure Development in Thailand (July 2001)" by NESDB, Royal Thai Government (RTG) stimulates a privatization policy (which provides necessary incentive for the private sector, sets rules for safety and environmental sustainability) to ensure adequate infrastructure (Multi-Modal Transport) and cooperation from various countries.

Depending on the present port management system and the above policy issues, JICA team recommends private coastal port operation for short-term development plan in Songkhla.

According to the present coastal shipping system, cargo tariff includes the cargo-handling fee (loading/unloading) at berth. Thus, concerned parties are responsible in coastal berth operation as follows.

Table 10.2.2-2 Responsibilities for Coastal Berth Operation

	Responsibilities
Port Operator	1) Management of port facilities 2) Safety management in port area
Shipping Company	Cargo handling management of storage and stevedoring
Harbour Department	Maintenance of port facilities, dredging, pilot and tugboat operation

3) Organization

Division of cargo-handling operation at coastal berth is not included in the organization chart since it is the responsibility of a shipping company. Total staff required is estimated at about 100 persons. (See Figure 10.2.2-1)

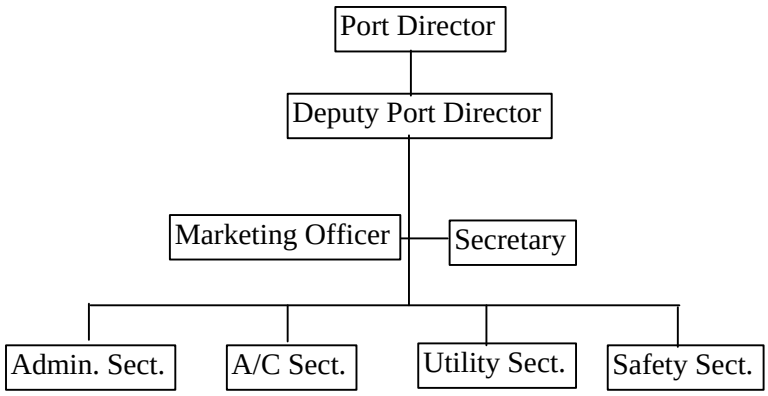

Figure10.2.2-1 Estimated Organization Chart

4) Operation cost and concession year

Table 10.2.2-3 shows an estimated operation cost for the development of Songkhla Port. Lease agreement would be 25 years to allow for the financing of improvements.

Table 10.2.2-3 Estimated Operation Cost

No.	Description	unit	Qty	Unit Rate (Baht)	Amount (Baht)	Remarks
1.	Personnel Expenses					
	Office Staffs	man	45	10,000	450,000	
	Workers	man	45	5,000	225,000	15 person x 3 shift
	Management Staffs	man	3	150,000	450,000	
	Sub-total of Personnel Expenses				1,125,000	
2.	Power Supply Expenses					
	Electric Power for Offices etc	L/S	1	50,000	50,000	
	Electric Power for Lighting	L/S	1	50,000	50,000	
	Fuel Expenses for Other Equipment	Hour	1,500	450	675,000	10 units x 6 hour x 25 days
	Sub-total of Power Supply Expenses				775,000	
3.	Maintenance Expenses					
	Other Equipment and Machines	L/S	1	200,000	200,000	
	Sub-total of Maintenance Expenses				200,000	
4.	Utility Expenses					
	Telephone, Water, Sewage	L/S	1	80,000	80,000	
	Total of Expenses				2,180,000	
5.	Overhead and Profit	L/S	0.15	2,180,000	327,000	15% of Total Expenses
	Grand Total of Terminal Operation				2,507,000	Monthly Basis
					30,000,000	Yearly Basis

10.2.3 Recommended Port Layout

According to the interview survey in the private coastal jetties in Songkhla, due to the provincial regulation, the expansion of berths is prohibited in terms of the limitation of construction in the water zone. Therefore, the public port is the target for expansion to meet future demand.

Many fishing nets are installed in the channel between international port and coastal berth area in Songkhla. Therefore, vessel maneuvering to navigate in this channel is very difficult.

Therefore, the construction of coastal and Ro/Ro berth was recommended to expand the existing Songkhla commercial port. Consequently, Songkhla commercial port will have two kinds of port functions of international and coastal shipping operations.

HD has an on-going project for the expansion of Songkhla Deep Sea Port. Therefore, the short-term development of this project need to be consistent with the expansion plan of HD.

The following basic issues were taken into the consideration in recommending port layout for the

coastal port facilities.

- Not disturb to the expansion of Songkhla Deep Sea Port conducted by HD
- Minimize construction cost of berths, channel, basin, access road as well as land reclamation
- Minimize maintenance cost for channel and basin
- Protect the archaeological preservation area around the existing Songkhla port
- Minimize the reclamation area so not to disturb the fishing activities around the existing Songkhla port
- Minimize the impact to inhabitants
- Make allowance for future expansion.

Above basic items, the short-term development plan is illustrated in Figure 9.3.1-1.

10.2.4 Development Program

Based on the coastal cargo forecast and estimation of intermodal of transport from road to coastal shipping, the short-term development plan (year 2010) and long-term development plan (year 2020) were formulated.

The construction schedule for tentative implementation of short-term development projects is shown in the following Figure 10.2.4-1.

Item	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Remarks
1. Selection of the Consultant											
2. Engineering Service											
- Detailed Design											
- Tender Assistance											
- Construction Supervision											
- Maintenance Period											
3. Selection of the Contractor											
a. P/Q											
b. Tender											
c. Evaluation											
d. Negotiation											
e. Contract											
4. Construction Works											
- Construction of Groin											
- Construction of Detached B/W											
- Port Facilities											
General Civil Works											
Coastal Terminal											
Ro/Ro Terminal											
5. Maintenance Period											

Figure 10.2.4-1 Tentative Implementation Program of Songkhla Port
(Short-term Development Program)

10.2.5 Project Cost

1) Dimension of Planned Vessel and Berth

The dimensions of planned Coastal and Ro/Ro Berth at the Songkhla Port are listed below.

Description	Coastal Berth	Ro/Ro Berth
1. Design Vessel	5,000 DWT	2,500 DWT
2. Overall Length	120.0m	115.0m
3. Molded Breadth	16.9m	18.5m
4. Full Load Draft	5.2m	5.5m
5. Planned Berth Length	130.0m	150.0m
6. Planned Berth Depth	-7.5m	-6.5m

2) Design Condition

The following design conditions are applied for the tentative design of the port structures.

a) Live Load

Yard Pavement	3.0 ton/m^2
Apron Pavement	3.0 ton/m^2
Transit Shed	3.0 ton/m^2

b) Dead Load

Reinforced Concrete	2.45 ton/m^3
Non-Reinforced	2.30 ton/m^3

c) Maximum Wind Velocity

Maximum Wind Velocity	20 m/sec

d) Design Seismic Coefficient (kh)

Design Seismic Coefficient (kh)	0.10

3) Design Concept, Construction Method of the Port Facilities for Short-Term Development Plan

a) General Layout Plan (Short Term Development Plan 2001 – 2010)

The general layout plan of the Coastal and Ro/Ro Berth is shown in Figure 10.2.5-1.

b) Construction of Groin and Detached Breakwater

As stated in, section 9.3 of the Chapter 9, Master Plan of Each Port and Channel, groins and detached breakwaters are required at northwest side of the Port. A total of six units of I-type of groin and six units of detached breakwater are planned to be constructed as shown in Figure 9.3.1-1.

c) Coastal Berth

The prestressed/precast concrete pile will be applied for the structure of coastal berth, which is easily procured in Thailand. The very soft sub-soil condition at the planned location and approximately –14m of existing seabed elevation, requires the dimension of the concrete

pile to be 34.0 m in length and 800 mm in diameter. Furthermore, in order to secure the water depth of the berth, a scour protection and revetment will be designed to withstand the turbulence caused by the vessels.

A typical cross section of the coastal berth is shown in Figure 10.2.5-2.

d) Ro/Ro Berth

The prestressed/precast concrete pile will be applied for the structure of Ro/Ro berth the same as the coastal berth. However, since the planned depth in front of the berth is shallower than the coastal berth, the required dimension of pile is estimated to be 28.0 m in length and 800 mm in diameter. Ro/Ro Berth will also be provided with scour protection and revetment the berth.

A typical cross section of the Ro/Ro Berth is shown in Figure 10.2.5-3.

e) Access Road

The access road to connect the existing road along the shoreline and port area was designed to be 16.0 m wide consisting of two traffic lanes of each being 6 m wide with sidewalks of 1.5m wide at the outer sides. The capacity was designed to bear a full container loaded vehicles.

A typical cross section is shown in Figure 10.2.5-4.

f) Access Bridge

An access bridge is planned to cross over the existing narrow channel through which small fishing vessels pass. The Bridge is designed to employ pre-stressed/pre-cast concrete pile.

A typical cross section is shown in Figure 10.2.5-4.

g) Movable Bridge

The movable bridge is designed to ensure the safe loading and unloading of vehicles onto and from the Ro/Ro Vessels. The length of movable bridge is planned as 15.0 m based on the tidal range, and the width is determined as 8.0 m considering the heavy duty vehicles which will use it.

The movable bridge is operated through the hydraulic power generated by hydraulic pump.

A typical cross section of the movable bridge is shown in Figure 10.2.5-5.

4) Cost Estimate of the Project

Table 10.2.5-1 shows the estimated project cost for the development of Songkhla Port.

Table 10.2.5-1 Project Cost

Project Items	Remarks (Quantity)	Project Cost (Baht)
A. Direct Cost		
1. Construction of Groins	L=1,000m	16,130,000
2. Construction of detached Breakwater	L=600m	9,678,000
3. Port Facilities		
- General Civil Work		
(1) Reclamation	V=195,000m^3	39,000,000
(2) Dredging	V=105,000m^3	7,350,000
(3) Access Road	L=980m	8,624,000
(4) Access Bridge	L=40m, W=16m	8,960,000
(5) Yard Pavement	A=18,900m^2	11,340,000
(6) Entrance Gate and Checking Post	A=40m^2	264,000
(7) Utility Works	L/S	5,000,000
- Construction of Coastal Cargo Berth		
(1) Coastal Shipping Berth	L=130m	94,900,000
(2) Transit Shed and Administration Office	A=3,000m^2	19,800,000
- Construction of Ro/Ro Berth		
(1) Ro/Ro Berth	L=150m	85,995,000
(2) Movable Bridge	1 unit	20,000,000
Total of Direct Cost		327,041,000
B. Indirect Cost		
1. Engineering Fee	L/S	32,704,000
2. Physical Contingency	L/S	32,704,000
Total of Indirect Cost		65,408,000
C. Total of Project Cost (excluding VAT)		392,449,000
D. VAT	7%	27,471,000
Total of Project Cost (2001 – 2010)		419,920,000

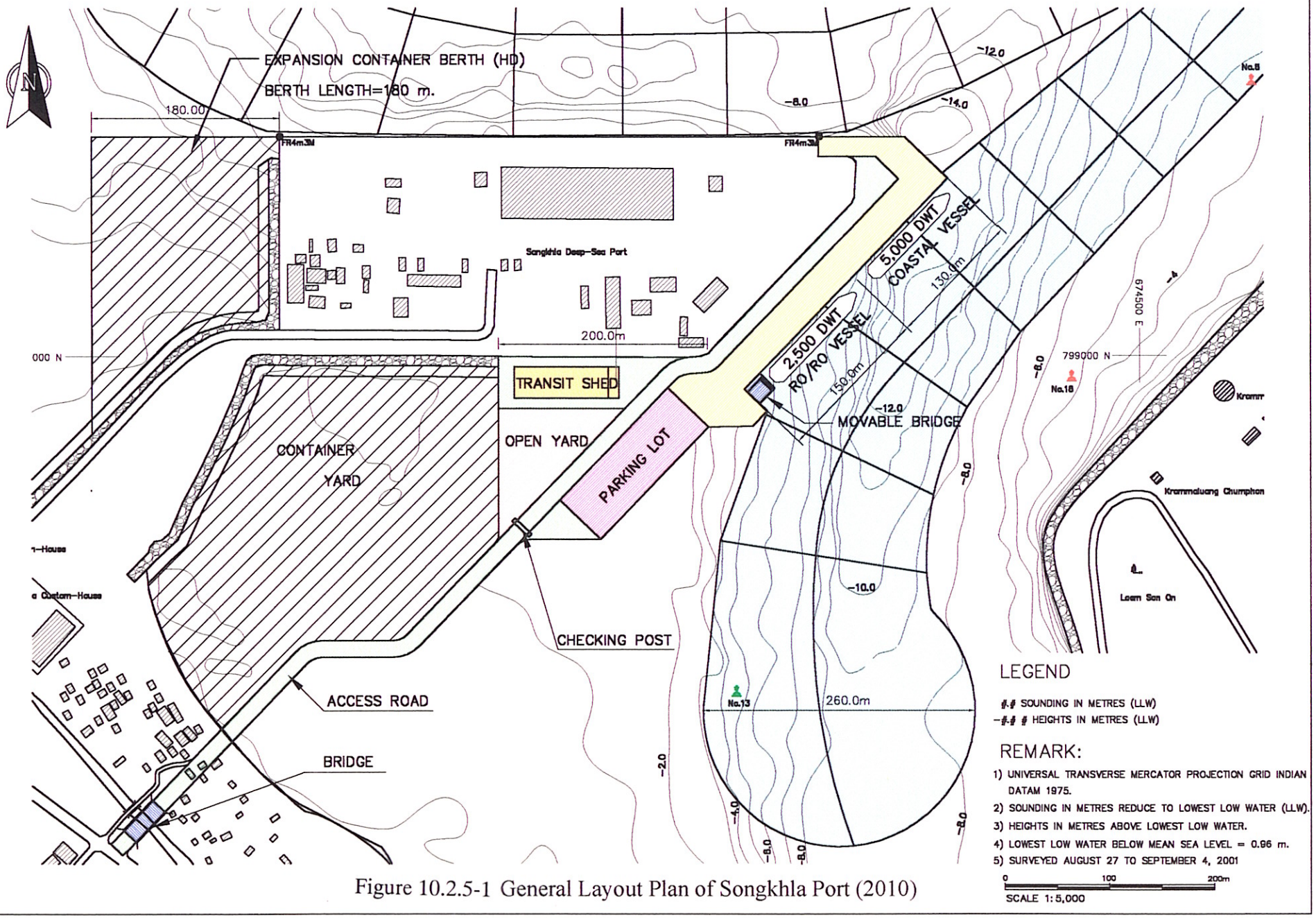

Figure 10.2.5-1 General Layout Plan of Songkhla Port (2010)

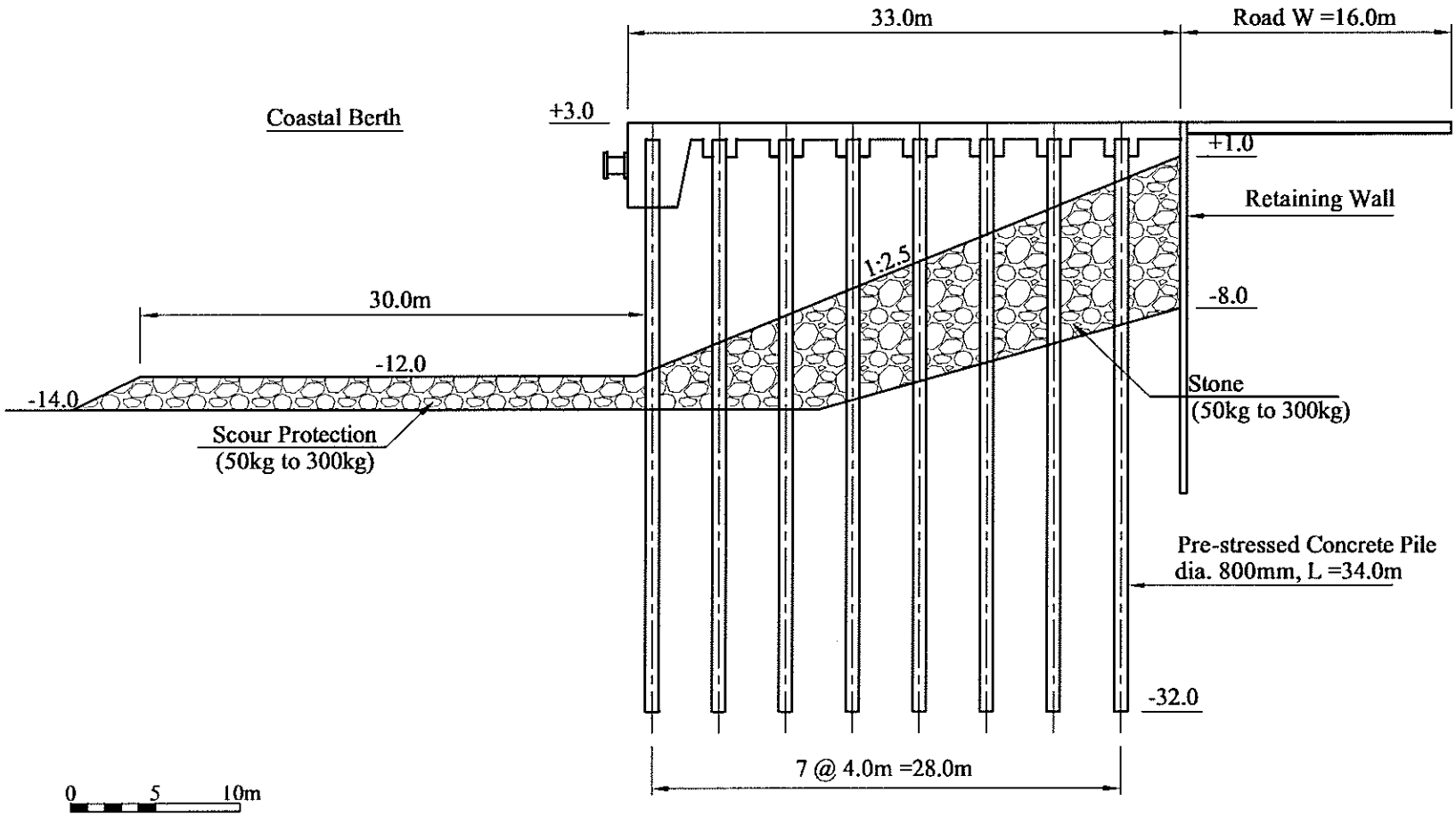

Figure 10.2.5-2 Typical Cross Section of Coastal Berth, Songkhla Port (2001 - 2010)

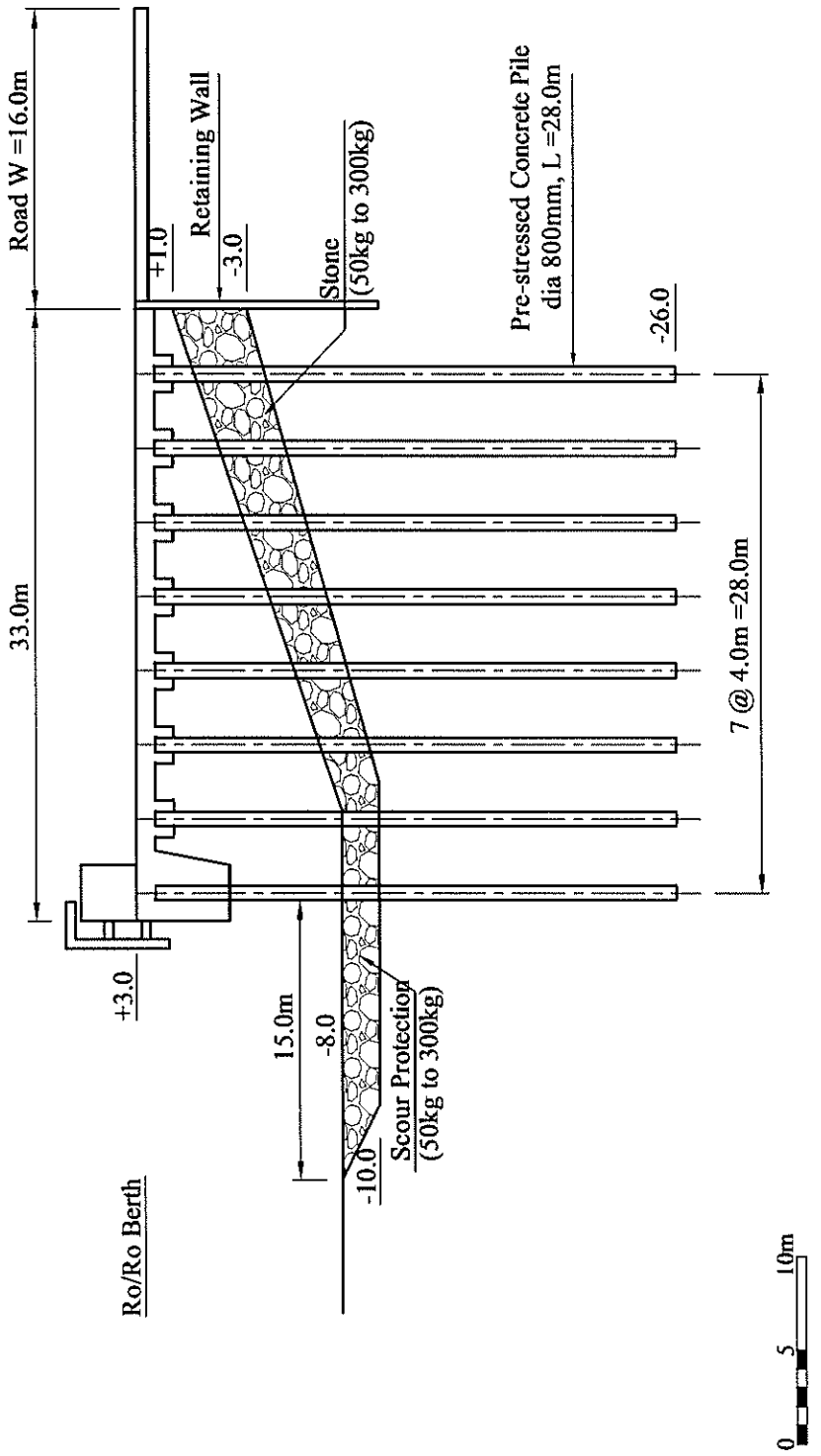

Figure 10.2.5-3 Typical Cross Section of Ro/Ro Berth, Songkhla Port (2001 - 2010)

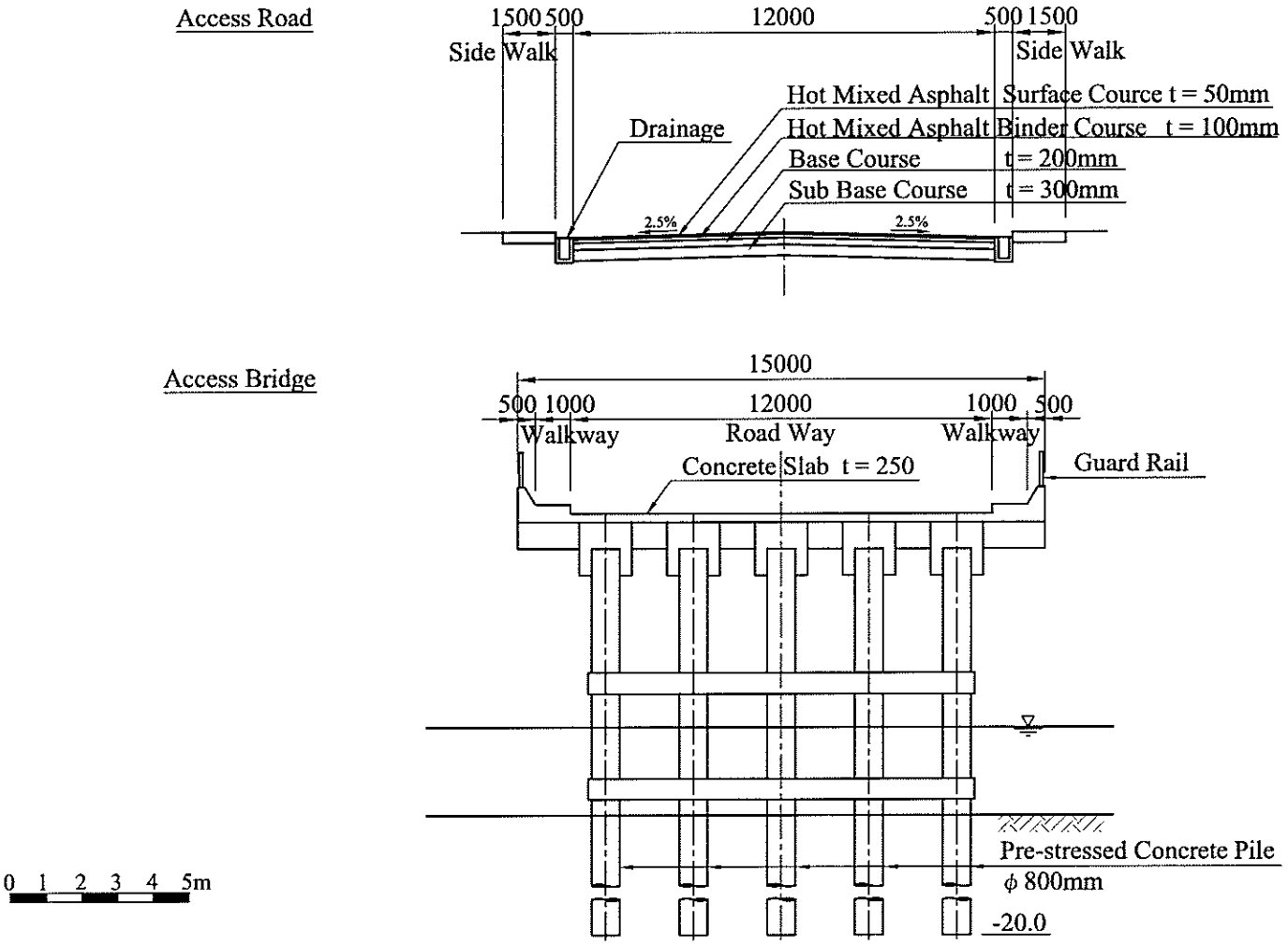

Figure 10.2.5-4 Typical Cross Section of Access Road and Access Bridge, Songkhla Port (2001 - 2010)

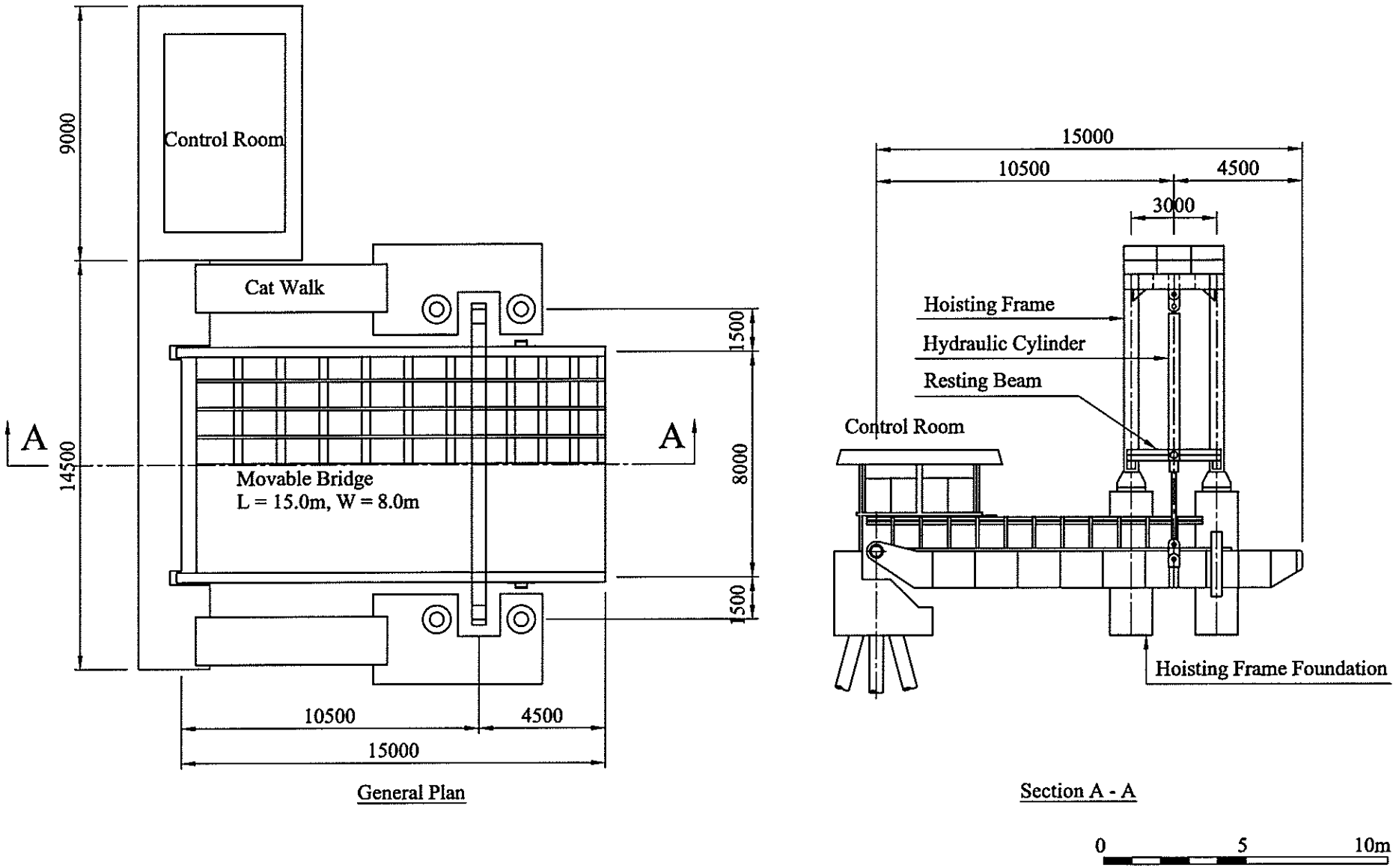

Figure 10.2.5-5 Typical Cross Section of Movable Bridge, Songkhla Port (2001 - 2010)