Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Project outline

(1) Priority Issues and Project Purpose

Angolan's transportation network which was severely damaged by civil war lasting 27 years has prevented its economic recovery and development. The government of Angola has drawn up Poverty Reduction Strategy Paper (PRSP) in January 2004 in order to improve this condition and to satisfy both postwar recovery and medium-term economic growth. Together with PRSP, development of traffic infrastructure including domestic main ports is marked as an important issue in Priority Phase Multi-sector Rehabilitation and Reconstruction Program (PPMRRP2003-07). Especially, as common concrete issues in Angolan Ports, the delaying in taking action for deterioration of facilities and containerization which is the main instrument of marine transport in recent years has been pointed out. Target of this Project are the infrastructure development for economic recovery and the development of regional community by the recovery of function of Port of Lobito and Namibe where are needed urgent reaction of main local ports from the result of The Study on Urgent Rehabilitation program of Ports in the Republic of Angola. Overall of project is shown in Figure 2-1.(1).

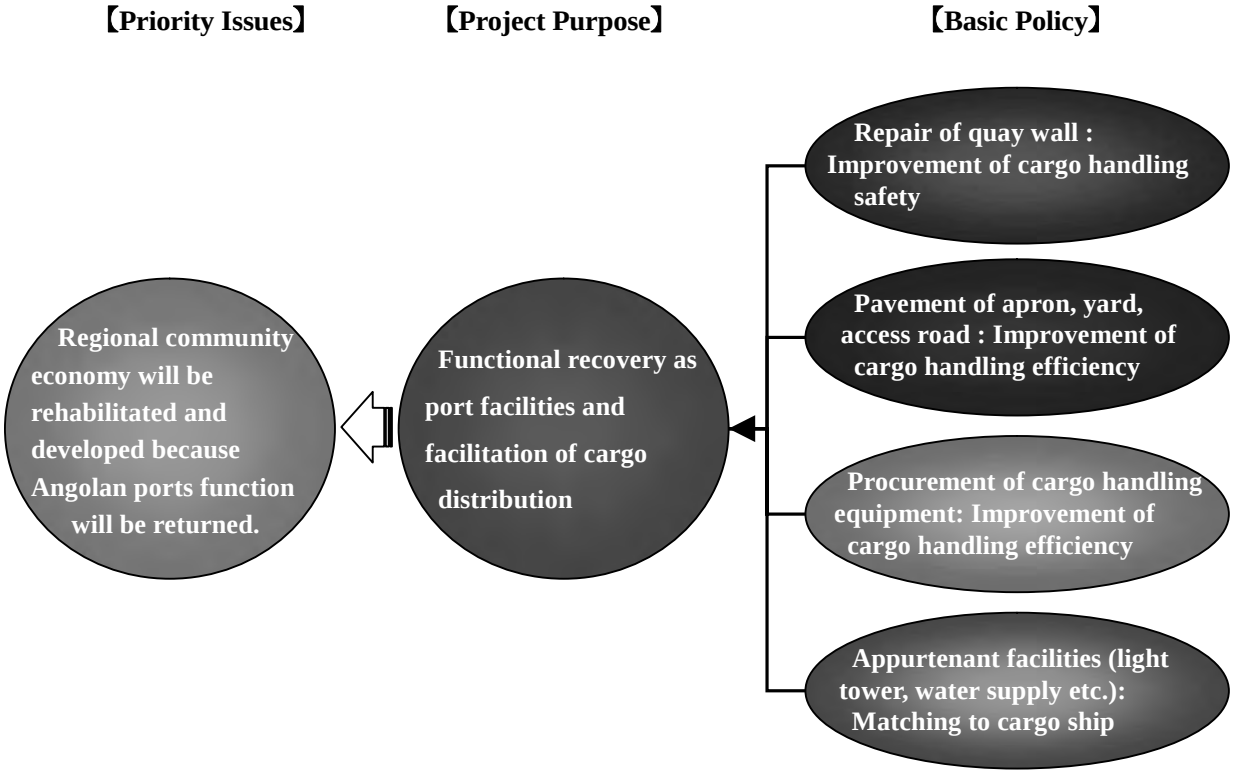


Figure 2-1.(1) Overall of Project

(2) Project outline

This project will execute the urgent improvement of facilities in Port of Lobito and Namibe and at the same time their operation, maintenance and management will be carried out in order to achieve purpose described in the above (1).Recovery of port function and facilitation of cargo distribution are expected by this project. In this project, mooring and landing facilities will be constructed in Port of Lobito and mooring, landing and water supply facilities will be constructed in Port of Namibe and cargo handling equipment will be procured for both ports. The project outline is summarized in Table 2-1.(1).

Table 2-1.(1) Priority Issues/Project Purpose /Outputs/Outputs Barometer

Priority Issues	Regional community economy will be rehabilitated and developed because Angolan ports function will be returned.
Coverage Area	Benguela Province/Port of Lobito, Namibe Province/Port of Namibe
Recipient	(Direct Beneficiary) Ports representatives, shippers forwarding agent and ship-owners (Indirect Beneficiary) All Angolan people about 15,500,000 (Benguela Province and peripheral people about 5,600,000 and Namibe Province and peripheral people about 900,000) People in neighboring countries about 30,300,000 Total 45,800,000 persons
Relevant Authorities	(Main Government Organization) Ministry of Transport(MINTRANS)， Institute of Maritime and Ports (Implementing Agency) The Port of Lobito E.P, The Port of Namibe E.P
Project Purpose	The original port function will be returned and physical distribution is promoted
Inputs	Responsibility of Japan side Rehabilitation of port facilities, Procurement of cargo handling equipment、Technical assistance by minimum term experts Responsibility of Angolan side To secure land for project, To remove existing quay crane, Providing C/P(counterpart), Tax exemption, Operation, maintenance and management, To secure various permissions, Protection of Japanese, Working Permission for Japanese, Security for project implementation
Activity	Rehabilitation of facilities and purchasing of equipment and their operation, maintenance and management
Feature of the Project	Rehabilitation of ports facilities, Procurement of cargo handling equipment, technical assistance by minimum term experts
Outputs	Restoration of ports facilities in Lobito and Namibe
Outputs Barometer	Berthing frequency of vessels, Cargo handling time at yard and apron, Protection for dust during container handling work at apron and yard, Advisability for water supply to vessel and night work in Port of Namibe

Requested contents and the responsibility of Japan side are shown at Table 2-1.(2)(3)

Table 2-1.(2) Components of Port of Lobito

Category	Facilities/Equipment	Items requested	Items to be provided
Facility	Rehabilitation of Quay	Rehabilitation of quay No. 8 and a part of No.7 (240m)	Width of coping at quay 3.0(3.15)m, reconstruction of concrete structure (240m)
			Modification of electric connecters (8 nos.), protection and modification of electric cable
			Protection of water valves and pipe
			Restoration of pits for electric and water supply (16 nos.)
		Installation of car stoppers（240m）	Installation of Car Stoppers（208m）
		Installation of mooring bollards（8 nos.）	Installation of mooring bollards（8 nos.）
		Installation of fenders（20 nos.）	Installation of fenders (16 nos.）, installation of maintenance ladders（2nos.）
		Re-installation of rails for quay cranes (1 rail with 240m length)	Re-installation of rails for quay cranes (1 rail with 240m length)
Facility	Pavement on apron and yard	Removal of existing pavement and new pavement (46,600m^2)	Removal of existing pavement and base-course and new concrete pavement (43,074m^2, pavement on apron 3,384m^2, pavement in yard 39,400m^2, sloping between existing and new pavement 290m^2) End revetment 275m(55 m^2)
			Concrete drain with 5m width at sloping area between existing and new pavement (1,646m^2) Concrete drain with 1m width (204m^2)
			Protection of existing structure (13 places)
			Soaking pit (11 nos.), drain pit (7 nos.), drain pipe (117m)
		Re-installation of rails for quay cranes (1 rail with 240m length)	Re-installation of rails for quay cranes (1 rail with 240m length, 288 m^2)
		Re-installation of rails for inner port railways on apron (2 sets with 240m length each) (additional request on Draft Final Reporting 1)	Re-installation of rails for inner port railways on apron (2 sets with 240m length each)
		Re-installation of rails for inner port railways in yard (3 sets)	Re-installation of rails for inner port railways in yard (3 sets with 190m length each)
Facility	Installation of water and oil supply pipes	Installation of water and oil supply pipes in quay No.8 and a part of no.7	Not providing Protection of existing water pipe
Facility	Installation of reefer facilities	Installation of reefer plugs (64 nos.) and power generator	Not providing
Equipment	Cargo handling equipment	Reach stacker and Toplift Container Handler: 1 each	Reach stacker(40 t): 1

Table 2-1.(3) Components of Port of Namibe

Category	Facilities/Equipment	Items requested	Items to be provided
Facility	Rehabilitation of quay	Rehabilitation of quay (240m)	Crown of quay wall width(2.6m), Reconstruction of concrete structure (240m), Part rehabilitation (204m), Reconstruction of upper block (36m)
			Modification of electric connectors (8nos.), Protection and modification of electric cable
			Repair damaged manholes, hand holes and water tapped boxes (16 nos.)
		Installation of car stoppers （240m）	Installation of car stoppers (208m)
		Installation of mooring bollards（8 nos.）	Installation of mooring bollards（8 nos.）
		Installation of fenders（20 nos.）	Installation of fenders (16 nos.), Installation of maintenance ladders (2 nos.)
		Re-installation of rails for quay cranes (240m)	Re-installation of rails for quay cranes (240m)
Facility	Pavement on apron and yard	Removal of existing pavement and new pavement（24,000m^2）	Removal of existing pavement and new pavement (about 18,210m^2) (Apron:3,312m^2, Yard:4,800m^2, Transition:98m^2) End revetment 274m (55 m^2)
			Concrete drain with 5m width at sloping area between existing and new pavement (about 1,480m^2)
			Protection of existing structures (3 places)
			Drain works: infiltration inlet(14 nos.)
		Removal of warehouse	Not providing
		Re-installation of rails for quay crane on apron	Re-installation of rails for quay crane on apron : 240m (288 m^2)
		Re-installation of rails for inner port railways in apron	Re-installation of rails for inner port railways in apron 2 sets: 240m long x 2sets (1200 m^2)
Facility	Repair of port road	Length 620m(＋ extent of the impact)	Concrete pavement (including crossings and extent of the impact): length about 666m×width 10.0m＋ 4 crossings + Entrance gate area totaling 7,965m^2
			Road portion about 6,660m^2 by concrete pavement
			Crossing portion 4 nos. (except main roads)1200m^2: Concrete pavement
			Entrance gate portion 105m^2 Concrete pavement, Recovery of crossing rails 26 m^2
			0.5m width L-type side ditch:1,112 m, infiltration inlet: 45nos.

Category	Facilities/Equipment	Items requested	Items to be provided
Facility	Installation of water supply facility	Installation to Berth No.3A	Water supply facility: facilities to supply water to vessels, water tank (300m^3)。
			Extension of water supply pipe:1,043m、supply valve(7 nos.), stop tap and repair branch pipes: 5 places, water tank, booster pump station
Facility	Installation of fuel supply facility	Installation to Berth No.3A	Not providing
Facility	Construction of lighting tower	2, in the corner of the yard behind berth No. 3A	Construction of lighting facilities at yard behind berth No. 3A
			Lighting Tower(6000W)×2nos.
Facility	Facilities for reefer container	Reefer plug 64nos. +Power Generator	Not providing
Equipment	Cargo handling machine	Reach stacker: 1 unit, Forklift: 1 unit, Mobile crane: 1 unit	Reach stacker(40t)1unit, Forklift (40t) 1 unit, Mobile crane (60t) 1 unit

2-2 Basis Design of Project

2-2-1 Design Criteria

(1) Background of design criteria

1) Basic policy

Grain, construction material and equipment, industrial product and others have been depended on their import in Angola and the port as the infrastructure to support the activities for reconstruction and economic recovery has taken an important role. Under such circumstance, in Port of Lobito, the pavement of apron and yard has been damaged so that no effective and safety work of handling machines were realized. What is worse, it takes time for vessels mooring and cargo handling because old tires have been used in stead of rubber fenders. And, recent increase of container cargo makes a shortage of cargo handling equipment. In Port of Namibe, the apron, yard and rubber fenders have been the same as Port of Lobito. The damage of quay concrete has especially severe. There are many potholes, damaged manholes, ruts and cracks on inner port road. Most of handling machines are now under repair. Like this situation makes the cargo handling efficiency worse and also it makes to unsafe port. For the settlement of the above mentioned problems considering the request from the government of Angola, field survey and discussion to rehabilitate aprons and yard and procurement of cargo handling equipment in both ports, Study Team decided to plan the project with the following policies. (However, the facilities for reefer plugs and power generator are decided not to provide since both ports have satisfied present demand including the demand even up to 2010)

2) Policy to Natural Condition

(a) Port of Lobito

① Temperature

The average yearly temperature is about 25 degrees C however maximum temperature from November to May is about 30 degrees C. In case of concreting it is necessary to have construction method to prevent its deterioration of quality such as keeping soil and form in wet condition and

quick curing. Basically, hot-weather concrete may not be used.

② Precipitation

There are about 12days per year to have more than 10mm per day and it is less necessary to consider the impact to construction works such as work stoppage by rain. However, daily maximum precipitation with 50mm to 90mm during November to April has been recorded. And, Study Team has confirmed thunder shower with hourly about 50mm continued 10 to 20 minutes at rainy season. Therefore, the drainage plan in apron and yard should not be excessive but secure the necessary drainage capability.

(b) Port of Namibe

① Temperature

The average yearly temperature is about 22degree C however maximum temperature from October to May is about 25degree C. In case of concreting it is necessary to have construction method to prevent its deterioration of quality such as keeping soil and form in wet condition and quick curing. Basically, hot-weather concrete may not be used.

② Precipitation

There are about 5 days per year to have more than 10mm per day and it is less necessary to consider the impact to construction works such as work stoppage by rain. The daily maximum precipitation is about 15mm however in the rainy season rainfall intensity get high. Therefore, the drainage plan in apron and yard should not be too much but secure the necessary drainage capability.

3) Socioeconomic condition

(a) Price index

Angola has been in extreme inflated condition with over 90% before 2003 since then the tendency is continued to hit the ceiling. However, the inflation rate is still high with 23% according to the IMF data in 2005 therefore it is necessary to carefully study unit prices to be used for estimation considering procurement conditions.

(b) Working Permit

It is necessary to get visa at Angolan Embassy in Tokyo when visits Angola. The required visa is Sub-Type E ; Employee covered by Cooperation Agreement under the category of Work visa under among Consular Visa when apply at the time of commencing the project. The application forms is sent to Angola and examined and approved in the Immigration Authority there therefore, it takes 60 days minimum in its acceptance. Thereafter, the visit will be realized after getting returned the passport with visa stamp from the Embassy in Tokyo. The visa is valid during the approved period and it is multiple exit-type. There requires employment contract or employment commitment paper at the time of application. The above situation shall be considered when construction schedule is planned.

4) Policy for construction and procurement circumstances

(a) Design standard

Angola has no design standard for port structures nor exists the unified methodology for port facilities. Therefore, Technical Standards for Port and Harbor Facilities with Commentary in Japan

has been adopted as design standard.

(b) Procurement

① Construction material and equipment

The most of construction materials and equipment except cement, aggregate, asphalt product which are produced in Angola are relied on the import. Cement is apt to be short due to the recent boom and the production stoppage by CIMANGOLA. The selection of aggregate has to be careful since the quality is not stable. And, it is difficult to procure as ready-mixed concrete since concrete and asphalt plants are belonged to construction companies. Such plant has to be considered to bring into site in construction planning.

② Equipment

There is no production of cargo handling machines in Angola, the procurement from the third countries or Japan is considered.

5) Policy to apply local contractor

The technical level of construction companies in Angola is still low and the short of construction machines are shown although it was taken 5 years already after the civil war. There appeared construction booming for economic recovery though overseas big construction companies are constructing most of large size project like roads and buildings. Therefore, the construction will be done calling specialized engineers and skilled engineers from the third countries or Japan.

6) Policy for operation, maintenance and management

(a) Policy for operation and maintenance of cargo handling machine

The oil leakage by using old machines has been observed on apron and yard. The tire track by the operation of large cargo handling equipment is also observed. Taking these into consideration, the paving material will be oil protected and durable concrete.

(b) Equipment

The cargo handling machines will be preferably selected the same type of machines which are now used in Port Authority and the operation training by manufacturers is considered after the procurement.

7) Policy for setting up facilities and equipment

(a) Quay (Port of Lobito and Port of Namibe)

The quay is peeled off in specific part and new concrete is added. The installation location of rubber fenders and mooring bollards is studied considering design vessels.

(b) Apron, Container Yard (Port of Lobito and Port of Namibe)

Existing facility is damaged and not leveled because the oil leakage from old machinery and wheel ruts by turning wheel when heavy-duty machinery is stopped are common in the port. The pavement on apron and container yard is concrete. (Appropriate pavement structure according to Technical Standards for Port Harbor Facilities with Commentary of Japan.) And the pavement will be applied for reinforced concrete slab pavement since the type of design load is heavy vehicle for container and both storage container and loaded container will be 3 tires and empty container will be 5 to 6tiers. Therefore, reinforced concrete pavement is planned so as to bear the load of 40 tons forklift truck.

(c) Road (Port of Namibe)

Existing inner port road is damaged and not leveled because the oil leakage from trucks and turning wheel when heavy-duty machinery is stopped are common in the port. Concrete pavement will be conducted on road, crossing and the extent of the impact in Port of Namibe..

(d) Fuel and Water facilities (Port of Lobito and Port of Namibe)

Fuel supply facility was excluded in this project because there are existing fuel supply facilities near Port of Lobito and Namibe. Water tank and booster pump will be installed in Port of Namibe in order not to cut in water supply of Namibe urban area. Water supply facility plan was excluded in this project because existing water supply facility has been improved at the quay wall of project site in Port of Lobito.

(e) Lighting Facilities (Port of Namibe)

Lighting facilities in Port of Namibe are properly selected in its luminous intensity and the number according to Technical Standards for Port Harbor Facilities with Commentary of Japan.

(f) Equipment (Port of Lobito and Port of Namibe)

① Port of Lobito

Considering the volume of container and the space of container yard the reach stacker that can handle 3 rows 3 tiers of 40feet loaded containers is planned.

② Port of Namibe

Considering the volume and the space of container yard and the number of current cargo handling machines, the reach stacker is planned to be able to handle loaded 40feet containers with 3 rows 3 tiers. And the fork lift is also planned to be able to handle granite with the maximum weight of 40 tons. Furthermore, mobile crane to handle general cargoes is not equipped therefore, one fork lift is planned for stocking in the yard and transportation to outside of port.

(g) Power Outlets Facilities for Reefer Container (Port of Lobito and Port of Namibe)

Power outlets facilities were excluded in this project because existing power outlets facilities for reefer container that have been improved by their own in Port of Lobito and Namibe are seemed to be sufficient to meet with the demand until 2010.

(h) Demolition of Existing Damaged Warehouse

Demolition of existing damaged warehouse that has not been used was excluded in this project and study team explained to the Government of Angola that such work is not met with the grant aid project.

8) Policy for construction and procurement method and schedule

(a) Improvement plan

Both Port of Lobito and Namibe are local international ports where many number of vessels call and many cargoes are handled. As the project sites are the quays and yards which are currently active in service, the following points are necessary to be kept in mind.

① The plan and the design to minimize the impacts of construction works to ports activities are necessary.

② The partial construction completion dividing sections is necessary in order to minimize the

influence to port cargo handling by the project.

(b) Cost saving and securing quality

① The securing quality is the main purpose. The firm security of quality of structures and procured equipment are attained first and the cost saving of total project life cycle by averting accidents, cost saving at initial stage of maintenance and management and avoiding occurrence of claims is conducted.

② Feasible plan and the design are drawn up considering many aspects of procurement including cost in comparison with local procurement, third country procurement and the procurement in Japan.

③ The plan and the design are drawn up in accordance with the current status of each project site, environment and condition. Especially, as civil facilities are single line of products, to secure minimum necessary size and content considering special condition and status of each site and at the same time to meet with required quality as Japan's ODA are necessary.

(2) Design Condition

1) Port of Lobito

Design condition of Port of Lobito is shown at Table 2-2-1 (1)

Table 2-2-1.(1) Design condition of Port of Lobito

① Quay specification	Crown height	+3.5 m
	Planning depth	10 m
② Design conditions	Maximum design ship	LOA：204m Maximum draft：10.6m Gross Tonnage：19,546 tons
	Minimum design ship	LOA：58m Maximum draft：3.7m Gross Tonnage：223 tons
	Tractive force of ship(mooring post)	1,000 kN
	Tractive force of ship (bollard)	700 kN
	Berthing velocity	0.1 m/second
	Maximum DWT of design vessel	22,211 tons
	Gross weight of the vehicle (tractor trailer for 40 feet container)	34,210 kg
	Load Condition(Truck)	T-25
	Load Condition	35 tons Folk Truck and 50 tons Mobile Crane
	Maximum gross tonnage (40feet, 1AAA/1AA/1A/1AX)	30,480 kg
	Classification of pavement on apron and yard	Reinforced Concrete Slab Pavement for 40 t Reach Stacker
③ Natural condition	Tide	M.H.W.S:1.7m, M.L.W.S:0.5m
	Maximum wind velocity	SW 7.5～10.0m/second
	Design CBR(California Bearing Ratio)	Over 16
	K30 value of sub-grade	Over 100

2) Port of Namibe

Design condition is shown at Table 2-2-1.(2)

Table 2-2-1.(2) Design conditions of Port of Namibe

① Quay specification	Crown height	+3.5 m
	Planning depth	10 m
② Design conditions	Maximum design ship	LOA：204m Maximum draft：10.6m DWT：6,669 tons
	Minimum design ship	LOA：133m Maximum draft：7.7m DWT：4,270 tons
	Tractive force of ship(mooring post)	1,000 kN
	Tractive force of ship (bollard)	700 kN
	Berthing velocity	0.1 m/second
	Maximum DWT of design vessel	22,219 tons
	Gross weight of the vehicle (tractor trailer for 40 feet container)	34,210 kg
	Load condition (truck)	T-25
	Load condition	35 tons Folk Truck and 50 tons Mobile Crane
	Container maximum gross weight(40feet ,1AAA/1AA/1A/1AX)	30,480 kg
	Classification of pavement on apron and yard	Reinforced Concrete Slab Pavement for 40 t Reach Stacker
	Lighting tower on apron(for general cargo/container)	50 lux
	Lighting facility on yard	20 lux
③ Natural conditions	Tide	M.H.W.S 1.7m M.L.W.S 0.5m
	Maximum wind velocity	SSW 12.5～15.0m/second
	Design CBR (California Bearing Ratio)	Over 12
	K30 value of sub-grade	Over 50

2-2-2 Basic Design （Facility Plan／Equipment Plan）

(1)The result of site survey

1) Port of Lobito

(a) Volume of handling cargo and number of calling vessels

The demand to the port is well increasing.

Table 2-2-2.(1) Volume of handling cargo(Port of Lobito)

Year	2004	2005	2006
Number of calling vessels(nos.)	742	722	829
General cargo(t)	872,349	1,025,100	1,337,700
Container(unit)	38,050	40,667	51,802

① Angola is now recovery stage after ending civil war in 2002. The improvement of ports facilities bearing the basis of international supports and economic activities is the most important issue.

② Congestion and inefficiency of Port of Luanda where bears most of port handling cargoes of Angola has become an obstacle for economic control of all projects in Angola.

③ As almost of daily commodities in Angola are imported the status of above ② could be one of the cause of high cost of living.

④ Port of Lobito where is located at the entrance of Benguela Province having one of greatest economy level and number of population in Angola and the urgent recovery , rehabilitation and procurement will have a great significance.

⑤ High expectation and support to the rehabilitation project of Port of Lobito were expressed during the period of site survey by not only people there, the government of Angola but also UNDP and other consultant

(b) Rate of Effective Working Days at Berth

This project is the rehabilitation program of ports facilities now actively used.

Table 2-2-2(2) Rate of effective working days at berth (Port of Lobito as of 2006)

Number of calling vessels(nos.)	829
Daily average calling vessels (nos.)	2.3
Average calling time (hours)	38 hours
Number of berths	8 berths
Yearly average mooring days of each berth	164days/berth

(c) Typical specification of calling vessels

Maximum design vessel is NDS PROSTERIT and the minimum is R.MBRIGE.

Table 2-2-2(3) Typical specification of calling vessels (Port of Lobito)

Type of vessel/Specification		**GT**	**DWT**	**LOA**	**Full load draft(m)**
Container vessel	Maximum (NDS PROSTERIT)	(19,546*)	22,211	204	(10.6*)
	Minimum (JUTHA SIAM)	5,491	9,354	150	(8.5*)
General cargo vessel	Maximum (ASTRA-SEA)	5,090	9,475	147	(8.2*)
	Minimum (R.MBRIGE)	223	746	(58*)	(3.7*)
RoRoVessel	Maximum (NDS PROMINENCE)	(17,946*)	22,211	204	(9.5*)

Remarks: (*) is the assumption value from standard type of vessel.

(d) Docking, mooring and undocking operation of heavy vessel (NDS Line)

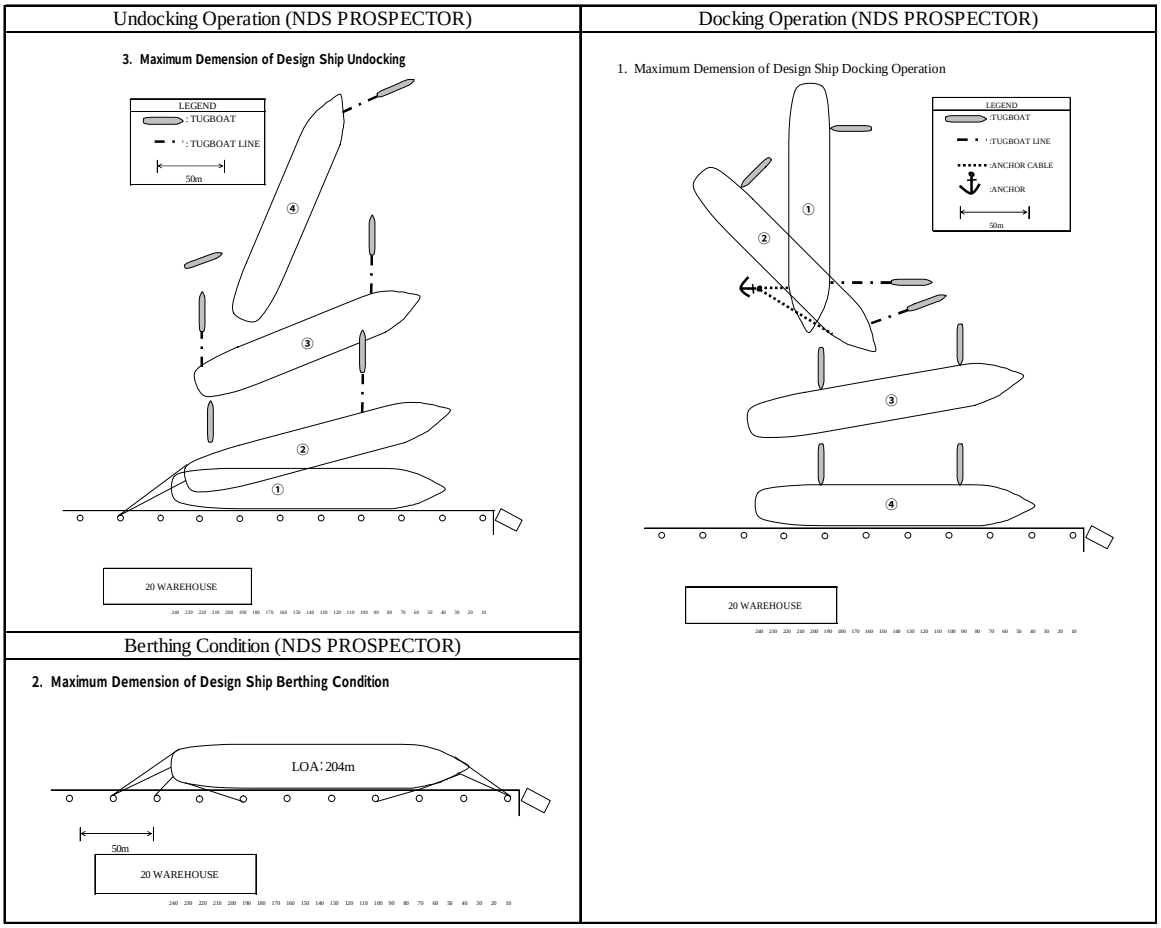


Figure 2-2-2.(1) Docking and Undocking Operation of Cargo Vessel in Port of Lobito

2) Port of Namibe

(a) Cargo volume and number of calling vessel

The demand to the port is well increasing.

Table2-2-2.(4) Cargo handling volume (Port of Namibe)

Year	2004	2005	2006
Number of calling vessels(nos.)	422	427	463
General cargo(t)	261,065	317,821	414,375
Container(unit)	5,158	8,096	10,926

① Port of Namibe is located at Namibe province where is the main province in southern Angola and the urgent rehabilitation, improvement and procurement have a great significance.

② Great expectation and the support to the project of improvement of port facilities of Namibe during the period of basic design study not only by people there and the government of Angola but also International Organizations like UNDP were expressed.

(b) Rate of Effective Working Days at Berth

This project is the rehabilitation program of ports facilities now actively used.

Table 2-2-2.(5) Rate of Effective Working Days at Berth （Port of Namibe as of 2006）

Number of calling vessels(nos.)	463
Daily average calling vessels (nos.)	1.3
Average calling time (hours)	71
Number of berths	4
Yearly average mooring days of each berth	341

(c) Typical specification of calling vessels

Maximum design vessel is NDS PROSPECTION, and the minimum is LIMPOPO.

Table 2-2-2.(6) Typical specification of calling vessel (Port of Namibe)

Type of vessel/Specification		GT(tons)	DWT(tons)	LOA(m)	Maximum draft (m)
Container Vessel	Max. (NDS PROSPECTION)	6,669	22,219	204	(10.6*)
	Min. (LIMPOPO)	4,270	8,639	133	(7.7*)
General Cargo Vessel	Max. (NATS EMPERROR)	18,347	22,540	183	(9.1*)
	Min. (MALDIVE ENTERPRISE)	4,891	10,080	150	(8.2*)

Remarks: (*) is the assumption value from standard type of vessel.

(d) Docking, mooring and undocking operation of heavy vessel（NDS Line）

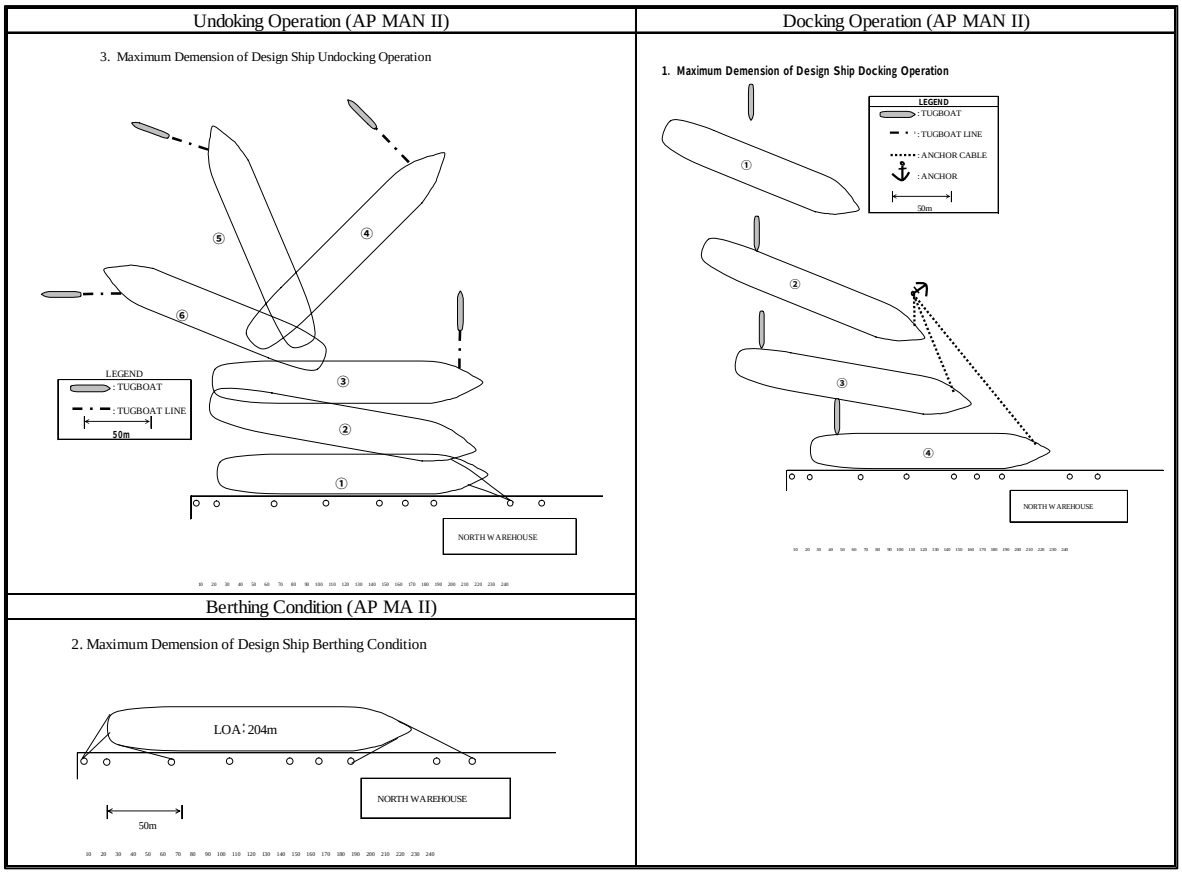


Figure 2-2-2.(2) Docking and Undocking Operation of Cargo Vessel in Port of Namibe

(2) Order of priority of requested contents

1) Port of Lobito

The study result of order priority for facilities improvement and procurement of equipment in the request letter to Port of Lobito are shown as follows.

(a) Improvement of superstructure of quay wall

(b) Pavement of apron and yard

(c) Procurement of cargo handling machines

(d) Plug facilities for reefer container, improvement of water supply and fuel supply facilities

2) Port of Namibe

The study result of order priority for facilities improvement and procurement of equipment in the request letter to Port of Namibe are shown as follows.

(a) Improvement of super structure of quay wall

(b) Pavement on apron and yard

(c) Improvement of pavement on inner roads

(d) Procurement of cargo handling machines

(e) Installation of lighting facilities

(f) Plug facilities for reefer container, improvement of water supply and fuel supply facilities

(g) Demolition of existing damaged warehouse

(3) Overall plan: Study of requested components

1) Port of Lobito

The project area of quay wall and apron covers 240m in length from where the initial point is 10m from east end of South Quay. The paving area of apron and container yard is defined as an area of 44,202 sq. meters where is located backside of quay and apron. Fuel and water supply facilities are not provided this time. One reach stacker is provided considering the volume of cargo handling, scale of port facilities and conditions of cargo handling machines in Port of Lobito.

2) Port of Namibe

The project area of quay wall and apron covers 240m in length from where the initial point is 10m from north end of berth No. 3A. The paving area of apron and container yard is defined an area of 18,210 sq. meters where is located backside of quay and apron. Fuel and water supply facilities are not provided this time. Considering space of container yard, volume of handling containers and current conditions of cargo handling machines, one reach stacker with maximum lifting capacity for the height of more than 3 rows and 3 stacks of loaded 40 feet containers and one forklift to be able to handle granite are provided. And, as this port has not equipped mobile crane so as to handle general cargoes on yard, one proper mobile crane for the storage at yard and transportation to outside of port is selected. Demolition of existing damaged warehouse that has not been used was excluded in this project and study team explained to the Government of Angola that such work is not met with the grant aid project.

(4) Facility Plan

1) Port of Lobito

(a) Rehabilitation of super structure of quay wall

As quay wall concrete is deteriorated and damaged, the existing concrete is chipped with the

width of 3.0 to 3.15m from quay face line, the height of 3m and the thickness of 50cm and new concrete is poured. Present crown height is 3.4m at No. 7 quay and 3.2m at east side of No.8 quay and the plan is met with this height. Mounting area of mooring bollards is chipped with the length of 2m to the direction of quay wall face line , the depth of 20cm to 120 cm due to the necessity to fix anchor-bolt and new mooring bollards are installed. Design of fender considers the maximum dimension vessel and the installation spacing considers the shortest LOA vessel. As the upper concrete of water supply pipes and culvert for electric wires located backside of sea side crane rail are also damaged, the concrete with the thickness of 50cm is chipped and the concrete cover is placed. This concrete cover must be the size to be lifted and moved by crane or forklift etc. for maintenance of water supply pipe and power cable. In the result of alternative plans shown at Table 2-2-2.(7), the first alternative is adopted.

Table 2-2-2.(7) Improvement alternatives of superstructure of Quay Wall 1st to 4th (Port of Lobito)

1st alternative	2nd alternative	3rd alternative	4th alternative
Crown width of quay wall: 3m～3.15m, Length: 240m concrete replacing	Crown width of quay wall:3m～3.15m, Length: 240m concrete replacing	Installation of fender and bollard + improvement of damaged area	Installation of fender and bollard + improvement of damaged area
Installation of car stoppage	Installation of car stoppage		
Installation of 8 bollards	Installation of 8 bollards	Installation of 8 bollards	Installation of 8 bollards
Installation of 16 fenders	Installation of 16 fenders	Installation of 16 fenders	Installation of 16 fenders
Reinstallation of quay crane rail in 240m	Filling concrete after removal of crane rail：240m in length	Reinstallation of quay crane rail in 240m	Filling concrete after removal of crane rail：240m in length
Improvement 8 power supply connectors, protection/improvement of power supply cable, Protection/rehabilitation of water supply tap and pipe, 16 electric hand holes/water supply boxes, Request of Government of Angola is satisfied with beautiful completion. The reminder is fundamental to maintenance work by Angolan side due to the concerns remained on strength of rails	Improvement 8 power supply connectors, protection/improvement of power supply cable, Protection/rehabilitation of water supply tap and pipe, 16 electric hand holes/water supply boxes, Request of Government of Angola is not satisfied but with beautiful completion. The strength weakness of rails will be resolved.	Improvement 8 power supply connectors, protection/improvement of power supply cable, Protection/rehabilitation of water supply tap and pipe, 16 electric hand holes/water supply boxes, Request of Government of Angola is almost satisfied but it is unattractive. The reminder is fundamental to maintenance work by Angolan side due to the concerns remained on strength of rails.	Improvement 8 power supply connectors, protection/improvement of power supply cable, Protection/rehabilitation of water supply tap and pipe, 16 electric hand holes/water supply boxes, Request of Government of Angola is almost satisfied but it is unattractive. The strength weakness of rails will be resolved.
◎	○	△	△

(b) Pavement on apron and yard

The apron is defined as the area with 20m width from backside of quay concrete block and the pavement is concrete one. The gradient of apron is to have similar slope as presently the grand level becomes lower from quay face to yard and the water drain away to east end. And the existing drain facility at south side of yard is utilized and at the same time storm-water infiltration inlet is installed at both ends of project site. Currently, both loaded and empty containers are with 3 box stacks and the reach stacker can handle up to 6 box stackers therefore, the project is planned as 3 stacks of loaded and 5 stacks of empty boxes. 1st alternative was adopted as the result of study of the alternatives shown at table 2-2-2.(8). And, studying alternatives shown at 2-2-2.(9), the concrete pavement which has well durability and long expected life out of other pavement structures was adopted.

Table 2-2-2.(8) Alternatives of pavement for apron and yard 1st to 4th (Port of Lobito)

1st alternative	2nd alternative	3rd alternative	4th alternative
Removal of existing pavement and base course and new pavement with 43,074m^2	Removal of existing pavement and base course and new pavement with 44,202m^2	Removal of existing pavement and base course and new pavement with about 31,000m^2	Removal of existing pavement and base course and new pavement with about 31,000m^2
Excavation and leveling of the extent of impact and pavement with about 1,850m^2	Excavation and leveling of the extent of impact and pavement with about 1,850m^2	Excavation and leveling of the extent of impact and pavement with about 1,850m^2	Excavation and leveling of the extent of impact and pavement with about 1,850m^2
Curing of existing structures with 13 places	Curing of existing structures with 13 places	Curing of existing structures with 13 places	Curing of existing structures with 13 places
Re-installation of quay crane rail : 240m in length		Re-installation of quay crane rail : 240m in length	
Re-installation of 3 pairs of inner port railways rail: 570m in total			
Road ancillary facilities like drainage inlet: 18 inlets and 117m of storm water pipe	Road ancillary facilities like drainage: 2 each to north south direction)and 5 each to east and west direction totaling a 1,612m	Road ancillary facilities like drainage: 2 each to north south direction)and 3 each to east and west direction totaling a 1,188m	Road ancillary facilities like drainage: 2 each to north south direction)and 3 each to east and west direction totaling a 1,188m
Meet with Angolan's request	Does not meet with Angolan's request	Does not partly meet with Angolan's request	Does not meet with Angolan's request
The reminder is fundamental to maintenance work by Angolan side due to the concerns remained on strength of rails	The strength weakness of rails will be resolved.	The reminder is fundamental to maintenance work by Angolan side due to the concerns remained on strength of quay crane rails on apron. The strength weakness of rails on yard will be resolved.	The strength weakness of rails will be resolved.
◎	○	△	△

Table 2-2-2.(9) Structures of pavement (draft)①～③

Structure of pavement	① Concrete pavement	② Asphalt concrete pavement	③ Block/Interlocking block pavement
Features of structure	① Adequate pavement structure can be obtained regardless bearing capacity of subgrade and its non-uniformity. Therefore, subgrade may be thinner. ◎ ② The pavement is strong against big contact pressure and intensive load therefore, it is advantageous for outrigger of truck crane. ◎	① This pavement can be coped with a certain extent of differential settlement being existed deeper than subgrade. Crack and difference in level are apt to be occurred. × ② The pavement is weak for the load of big intensive contact pressure and basically strength is weak. ×	① This pavement can be coped with a certain extent of differential settlement being existed deeper than subgrade. Difference in level is apt to be occurred. × ② The pavement is weak for the load of big intensive contact pressure. × ③ Traveling performance is not good due to the weakness of joint par.× ④ Basically strength is weak. ×
	◎	×	×
Productivity	① Concrete plant is easy one to handle at project site. ◎ ② Production method is easy to use aggregate, cement and water in normal temperature. ◎	① Asphalt structure and operation are complicated due to built in structure of banner and drum in the plant and handling at project site is not easy. × ③ It is produced to use aggregate, asphalt, filler warming up over 150 degree. The production method is complicated. ×	① In comparison with concrete plant, this has pressure structure in the plant and the structure and operation are complicated. Handling at project site is not easy. × ② The material is aggregate, cement and water and it is pressed by normal temperature. The method of production is complicated. ×
	◎	×	×
Workmanship	① Construction procedure will be important. Effective construction can be done by mechanized construction. ○ ② It is possible to balance between curing period and construction period by conducting staggered construction method. ○ ③ There are comparatively less problems in construction supervision of developing country ◎	① It is easy to progress construction step by step. Because of this, construction settlement is proceeded during construction and the pavement will be conducted after reinforcement of sub-grade. ◎ ② As curing period is very short, immediate service can be done. ◎ ③ Temperature control and Marshall stability test is required in the construction supervision and it is troublesome. ×	① Construction procedure will be important. It is difficult to conduct mechanized construction and construction itself is troublesome. × ② The service can not be commenced until required space is completed. End of block is easy to peel off. × ③ There requires large size crane for large size block pavement and construction speed is slow. × ④ Base concrete has to be poured after all when conducting interlocking block pavement. × ⑤ Roughness control is required for construction of block installation in its construction supervision and it is troublesome. ×
	○	○	×
Maintenance and management	① Durability of concrete slab is big and expected life time of concrete pavement is long. ◎ ② Surface abrasion resistance is big and is tough against	① Repair is easy however, the high frequency is required. ○ ② Duration of life of asphalt concrete is comparatively short with low surface	① There requires technical skill to replace blocks. Therefore, if block production and arrangement of skilled labors are available, the damage by settling can be repaired. ×

Structure of pavement	① Concrete pavement	② Asphalt concrete pavement	③ Block/Interlocking block pavement
	damages by handling machines or etc. ◎	durability. × ③ This is week for load at rest with big contact pressure or load repeatedly passing thru same point.. un-leveling and rut are easy to generated.× It is easy to be deteriorated by oil and heat so it is not usable at the place where oil leakage may be there.×	② Durability of block is not big enough. ×
	◎	×	×
Applying place	Apron, Yard and Inner port road	Road except crossings and stops	Sidewalks, passenger facilities
Overall evaluation	◎	△	×

(c) Reefer container outlet facilities

Table 2-2-2.(10) shows alternatives. It is found that self improvement by Port of Lobito E.P. is already conducted according to study result. And, the scale is seemed to meet with the demand of reefer container in 2010 therefore, 3rd alternative will be adopted.

Table 2-2-2.(10) Reefer container outlet facilities (draft)①～③(Port of Lobito)

	① 64 containers	② 39 containers	③ not provide
Content of improvement	・ This number is met with the demand after 2013 by rapid increase of reefer container cargoes.	・ This number is met with the demand after 201２ by rapid increase of reefer container cargoes.	・ There were maximum 75 reefer containers stored during survey. ・ The number of current reefer container outlet facilities is 60 of existing fixed outlet and 100 of portable one including under production and total 160 containers are available for reefer use. Demand prediction of container at the time of Development Study was that the increase during 2007 to 2010 will be 1.70 times in high side and 1.55 times in low side. ・ If the number of reefer container is considered to increase the same level, it was 75 boxes in maximum during survey and it will be 128 boxes in high side and 117 boxes in low side. Therefore, present number of outlets for reefer container is adequate.
Specification	64 nos. of outlet for 40‘/20’reefer containers	39 nos. outlets for 40‘/20’ reefer containers	
Remark			Port of Lobito E.P. has the plan to improve against increasing demand of reefer containers.
Evaluation	×	△	◎

(d) Improvement for water supply and fuel supply facilities

Table 2-2-2.(11) shows the contents. From the result of site survey, it was found that Port of Lobito E.P. already improved water supply facilities. And it was also confirmed that fuel supply facilities of SONAGOL group are in service in the center of Lobito bay. Therefore, water supply and fuel supply facilities will not be provided.

Table 2-2-2.(11) Improvement of Water/Oil supply Facilities in Port of Lobito

Improvement Plan	① Not providing
Improvement Plan	**Water supply facilities**：It has no trouble with water supply facilities, because already constructed desalination plant, changed water supply pipe from leakage galvanized pipe to polyvinyl chloride pipe in 2006. **Oil supply facilities**：Oil supply facilities at South quay was relocated to bunkering facility belonged to SONANGOL.
Evaluation	○

(e) Rehabilitation of Inner Port Railways in Apron

①Background of Additional Request

When draft report explanation has executed, the rehabilitation of 2 sets of rails for inner port railways, 480 m in total length, in apron were additionally requested by Port of Lobito Enterprise.

②Assessment of Necessity

Necessity of above-mentioned request has been examined. According to the confirmation of Angolan officials, necessity of the request is justified with the following process of verification.

i) Rehabilitation of Benguela Railways (CFB) and its Operation Plan

* As the present utilization of CFB, general cargo is transported within 150 km in distance between Lobito and Kubal. Also container is transported between Lobito and Benguela. 878 numbers of wagons were recorded in Port of Lobito in 2006.

** CFB connects Port of Lobito and inland countries such as Democratic Republic of Congo and Zambia. Rehabilitation of CFB has been assisted by China and its completion is expected in the year of 2010.

Temporary yards of railways are prepared along them and removal of mines at inland area in Angola is proceeded. Construction of the major structures will be started soon.

*** Rehabilitation of CFB is categorized by 4 phases. First phase is 400 km in distance from Lobito to Uanbo. Second phase is the rehabilitation between Uanbo and Luau.

**** After rehabilitation of CFB, Port of Lobito will receive 6 sets of 30 wagons per day. Also a few general cargo trains per day will be received.

According to above-mentioned information, existing rails are seemed to be utilized at present. At the time of completion of the Project, it is difficult to obtain absolute guarantee for the completion of whole the rehabilitation of CFB. Beside, partial utilization of CFB such as from Lobito to Uanbo will be expected at least, because the rehabilitation works will be executed from coast to inland area year by year.

ii) Technical Justification to the Project

If this project does not include the additional requested rails, the construction will be carried out by the governmental funds of Angola with following two risks. In this case,

construction areas between this project and their rails project will be carried out in the same area at the same time. If their rails project is constructed after completion of this project, concrete pavement along the rails will be damaged.

iii) Result of Assessment of Necessity

As the result of above-mentioned studies, rehabilitation of the rails is decided to include in this project.

2) Port of Namibe

(a) Rehabilitation for super structure of quay wall

As quay wall concrete is deteriorated and damaged, the existing whole surface concrete is chipped with the thickness of 50cm and the front surface is also chipped with the height of 3m and the thickness of 20cm and new concrete is poured. In addition, super structure in 104 m to 140 m from north end of quay has been significantly damaged therefore this part will be improved by reinforced concrete. The design crown height is planned as 3.5m and this is met with the present crown height which is over 3.4m at No. 3A quay. Mounting area of mooring bollards is chipped with the length of 2m to the direction of quay wall face line, the depth of 20cm to 120cm due to the necessity to mount anchor-bolt there. Design of fender considers the maximum dimension vessel and the installation spacing considers the shortest LOA vessel. As the upper concrete of water supply pipes and culvert for electric wires located backside of sea side crane rail are also damaged, the concrete with the thickness of 50 cm is chipped and the concrete cover is placed. This concrete cover must be the size to be lifted and moved by crane or forklift etc. for maintenance of water supply pipe and power cable. As the result of study for alternative plans shown at Table 2-2-2.(12), the first alternative was adopted.

Table 2-2-2.(12) Improvement alternative of superstructure of Quay Wall(Prot of Namibe)

1st alternative	2nd alternative
Concrete replacing of superstructure in 240m.	Concrete replacing with 1m crown width of quay wall in 240m
Installation of car stoppage	Installation of car stoppage
Installation of 8 bollards	Installation of 8 bollards
Installation of 16 fenders	Installation of 20 fenders
Reinstallation of quay crane rail in 240m.	Filling concrete after removal of quay crane rail：240 m in length
Improvement 8 power supply connectors and protection/improvement of power supply cable.	Improvement 8 power supply connectors, protection/improvement of power supply cable.
Improvement of 16 hand holes	Improvement of 16 hand holes
Request of Government of Angola is satisfied with beautiful completion. The reminder is fundamental to maintenance work by Angolan side due to the remaining concern to strength of rails.	Request of Government of Angola is not satisfied, but beautiful completion. The weakness of rail strength will be resolved.
◎	○

(b) Pavement on apron and yard

The apron defined as the area with 20m width from backside of quay concrete block and the pavement is concrete one. The gradient of apron is less than 1.0% and drain away to sea side from land side. Currently, both loaded and empty containers are tiered with 3 box stacks but, the project is planned as 3 stacks for loaded boxes and 5-6 stacks for empty boxes. The concrete pavement which has well durability and long expected life comparing with other pavement structures was adopted. Cross slope of road is less than 1.0% at sea side and also less than 1.0% at land side from

road center line. Infiltration of storm-water inlet is installed at border with paved container yard for the protection of land scour of non paved land. As the result of study for alternative plans shown at Table 2-2-2.(13), the first alternative was adopted. And, the concrete pavement having well durability and long expected life in comparison with other pavement structures was adopted in the same manner as Port of Lobito.

Table 2-2-2.(13) Alternatives of pavement for apron and yard (Port of Namibe)

1st alternative	2nd alternative	3rd alternative	4th alternative
Removal of existing pavement and new pavement with about 18,210m^2.	Removal of existing pavement and new pavement with about 23,000m^2.	Removal of existing pavement and new pavement with about 16,500m^2.	Removal of existing pavement and new pavement with about 16,500m^2.
Excavation and leveling of the extent of impact and pavement with about 1,480m^2	Excavation and leveling of the extent of impact and pavement with about 2,700m^2	Excavation and leveling of the extent of impact and pavement with about 5,000m^2	Excavation and leveling of the extent of impact and pavement with about 5,000m^2
Improvement of 3 damaged hand holes.	Improvement of 10 damaged hand holes.	Improvement of 10 damaged hand holes.	Improvement of 10 damaged hand holes.
Re-installation of quay crane rail in 240m		Re-installation of quay crane rail in 240m	
Re-installation of 2 pairs of rails on an apron : 480m in total		Re-installation of 2 pairs of rails on an apron : 480m in total	
Improvement of 14 drainage inlets and other road accessories	Improvement of 5drains for north south direction and 2 drains for east west direction and other road accessories totaling about 1,325m in length.	Improvement of 5drains for north south direction and 2 drains for east west direction and other road accessories totaling about 1,325m in length.	Improvement of 5drains for north south direction and 2 drains for east west direction and other road accessories totaling about 1,325m in length.
Meet with Angolan's present condition The reminder is fundamental to maintenance work by Angolan side due to the remaining concern to strength of rails.	Dose not meet with Angolan's request The weakness of rail strength will be resolved.	Dose not partially meet with Angolan's request. The reminder is fundamental to maintenance work by Angolan side due to the remaining concern to strength of quay crane rails on apron. The weakness of rail strength will be resolved.	Dose not meet with Angolan's request The weakness of rail strength will be resolved.
◎	○	△	△

(c) Inner port road

The concrete pavement having well durability for road and crossing area was adopted. As the result of study for alternative plans shown at Table 2-2-2.(14), the first alternative was adopted.

Table 2-2-2.(14) Alternatives of pavement for inner port road(Port of Namibe)

1st alternative	2nd alternative	3rd alternative
Replacing concrete pavement including part of crossroads ： Length about 666m x width 10.0m (t=25cm) Concrete pavement for road area is about 6,660m^2	Asphalt concrete pavement only for straight line of inner port road and replacing concrete at crossings and main gate ：Approx. length is 666m×width 10.0m. Asphalt concrete pavement for road area is about 6,660m^2	Asphalt concrete pavement including the extent of impact and replacing concrete at main gate and crossings: about 666m in length x 10.0m width. Asphalt concrete pavement for road area is about 6,660m^2

1st alternative	2nd alternative	3rd alternative
The extent of impact of concrete pavement with about 1,200m^2	The extent of impact of concrete pavement with about 1,200m^2	The extent of impact of asphalt concrete pavement with about 1,200m^2
4 crossings: concrete pavement The main gate area with 105m^2 :concrete pavement + restoration of crossings with railway Ancillary facilities: improvement/ rehabilitation of 45 manholes alongside road and approx. 1,112m of drains by concrete.	4 crossings: concrete pavement The main gate area with 105m^2 :concrete pavement + restoration of crossings with railway Ancillary facilities: improvement/ rehabilitation of 45 manholes alongside road and approx. 1,112m of drains by concrete.	4 crossings: concrete pavement The main gate area with 105m^2 :concrete pavement + restoration of crossings with railway Ancillary facilities: improvement/ rehabilitation of 45 manholes alongside road and approx. 1,112m of drains by concrete.
Coping with wheel turning when vehicles stopping and oil leakage by heavy duty vehicles. Maintenance cost is reduced after completion. The possibility to occur problem is low within one year after completion.	Coping with wheel turning when vehicles stopping and oil leakage by heavy duty vehicles at only crossings and the extent of impact area. Maintenance work for straight line is necessary to commence soonest after completion by Angolan side. The occurrence of problem within one year after completion is possible.	Coping with wheel turning when vehicles stopping and oil leakage by heavy duty vehicles at crossing only. Maintenance work for straight line and the extent of impact area is necessary to commence soonest after completion by Angolan side. There is much possibility to occur problem within one year after completion.
◎	○	△

(Note：Subject to the existence of hot mixing asphalt concrete plant in Namibe)

(d) Reefer container outlet facilities

Table 2-2-2.(15) shows alternatives. It is found that self improvement by Port of Namibe E.P. has already conducted by the result of field study. And, the present scale is seemed to meet with the future frequency of usage and the demand of reefer container. Therefore, reefer container outlet facilities are not provided in Port of Namibe.

Table 2-2-2.(15) Reefer container outlet facilities (draft) (Port of Namibe)

	① Not providing
Content of improvement	There were maximum five reefer containers stored during survey. And, the number of current reefer container outlet facilities is 24. Therefore, present usage rate is 21% Demand prediction of container at the time of Development Study was that the increase during 2007 to 2010 will be 1.66 times in high side and 1.27 times in low side. If the number of reefer container is considered to increase with the same level, Maximum 5 boxes during survey will be 8 boxes in high side and 7 boxes in low side. Therefore, present number of outlets for reefer container is adequate and outlets for reefer container are not necessary to be provided.

(e) Water supply and Fuel supply facilities

At present, cement fiber pipe is used as water supply pipe but water is partly leaked. Water supply pipe will be installed at road sides where is less influenced by vehicle load, and water supply pipe will be laid underground deeper enough not to be influenced by the vehicle load. And, it was confirmed that fuel supply facilities in Sacco Mar port where is located at east side of Namibe Bay, therefore fuel supply facilities are not provided. As the study results of alternative plans shown at Table 2-2-2.(16), the first alternative is adopted.

Table 2-2-2.(16) Improvement for water/fuel supply facilities ①～②(Draft) (Port of Namibe)

Content	① **Water supply facilities: Water supply facilities for ship, water tank with 300m^3** **Fuel supply facilities：not provided**	② **Water supply facilities：Water supply facilities for ship, water tank with 100m^3** **Fuel supply facilities：not provided**
Content of improvement	**Water supply facilities**： Public water supply system in Namibe is fed water from five water tanks with 1,000m^3 each. . ・ It will be water outage during power outage as the water is well water. There is a plan to install stand-by generator for power outage but this plan is not realized yet. ・ Cement fiber pipe has been used in Public water system which was installed about 60 years ago, therefore water leakages have partly occurred by the deterioration and they have replaced by PVC pipes. ・ Cement fiver pipe is also used in the Port of Namibe and aging pipes and the water leakage were observed, therefore 150mm water pipe supplying water to ship is now out of service.. Presently feed water tank truck or fire engine is supplying water to ship. Further more, there are 100mm diameter pipes supplying water to work shop, canteen, sheds and immigration office under the access road. Frequent leakages have occurred and the repair places are covered by steel plates.・Water tank will be constructed in order to supply water in good condition as the countermeasure for water outage. And, water tank (with water distribution pump) capacity is regarded as 300m^3(150m^3 /hour/each x maximum 2 times in a day) every hour once water supply to ship and twice supply water is maximum. ・It is regarded 7 water taps (valves) with an interval of 30m and total length is regarded as 1,043m. **Fuel supply facilities**： Fuel supply facilities are not provided because it is operated at Sacco Mar port where is located at 10km north from Port of Namibe.	・ **Water supply facilities**：Same as on the left. However, if water outage is prolonged, water is not able to supply since the capacity of water tank is planned in one-third of alternative □. ・ Fuel supply facilities are not provided because it is operated at Sacco Mar port where is located at 10km north from Port of Namibe.
Specification	Total length of water pipe in 1,043m, 7 valves and improvement five stop valves/branch pipes. Water tank, Booster pump station.	Total length of water pipe in 1,043m, 7 valves and improvement five stop valves/branch pipes. Water tank, Booster pump station.
Overall evaluation	◎	△

(f) Lighting facilities

At present, lighting of cargo handling machines is the only lighting system for night work in No.3A berth. Appropriate number of lighting towers will be installed at apron/container yard. As the study result of alternative plans shown at Table 2-2-2.(17), the first alternative is adopted.

Table 2-2-2.(17) Installation of lighting tower

Content	① 2of (6000Watt) lighting towers	② One 6000Watt lighting tower One 1000Watt outdoor security light	③ One 1000Watt outdoor security light
Content of improvement	・ Four medium size lighting towers in total of 24KW and 4 small lighting towers in total of 12KW.have been installed in 2006. However, it is very difficult to work at night and security is anxious as they do not cover the yard and apron in No.3A berth. ・ Two high pole type light towers will be installed at apron with 50 lux and at container yard with 20 lux in accordance with reference illumination in outdoor facilities of Technical Standards for Port and Harbor Facilities in Japan.	Standard illumination of outdoor facilities area except certain part defined by Technical Standards for Port and Harbor Facilities in Japan is not secured. . However, it is high effect for possible crime prevention.	・ Standard illumination of outdoor facilities area except certain part defined by Technical Standards for Port and Harbor Facilities in Japan is not secured. . However, it is high effect for possible crime prevention.
Specification	2 lighting towers : 12,000W	One lighting tower : 6,000W One outdoor security light: 1,000W	One outdoor security light: 1,000W
Overall evaluation	◎	○	△

(5) Equipment Plan

1) Equipment to be procured in Port of Lobito and Port of Namibe

Three alternatives have been studied out of the requested components and one reach stacker was decided considering the present sharp growing demand of container cargo in Lobito Port. Three alternatives against the requested components were also studied for Namibe Port and one reach stacker, one forklift and one mobile crane were adopted as per Angola's request considering each field of the cargo handling equipment.

(a) Port of Lobito

Equipment is made a selection based on present number of cargo handling equipment, demand of container, working time of cargo handling equipment and future pavement of apron and container yard. And, equipment must be selected considering easy driving and maintenance. As the study result of alternative plans shown at Table 2-2-2.(18), the first alternative is adopted.

Table 2-2-2.(18) Procurement plan for cargo handling equipment①～②(Port of Lobito)

Content of procurement plan	① One 40tons reach stacker	② Not provided
Content of procurement	・ Cargo handling in several berths is required by rapid increase of container cargoes. ・ At present when two ships moored at two berths, two ship gears and 4 reach stackers are used for the handling. (Quay crane may be used in case of the weight of container less than 22 tons) ・ 4 reach stackers work at container yard in order to stack and distribute container after transported by trailer or railway. ・ Total number of reach stackers is 11 if include two for distribution, one for preparatory in fixing/periodical inspection. ・Reach stacker is effective and good for 3 rows storage in container yard but top lifter is enough for container handling at apron. ・ Container handling at several berths is required when container cargoes are rapidly increased and in that case, one preparatory reach stacker is used.	・ Port of Lobito E.P. bought 2 reach stackers by themselves after Japanese Development Study, they are going to have a equipment purchase plan by themselves in the future as well.
Specification	Reach stacker : full loaded 40 feet container, 40 tons, over 3 row 3 tiers	—
Remarks	At present empty container ratio is 40%, however reach stacker for empty container has no general versatility therefore, reach stacker is provided with 40tons capacity.	—
Overall evaluation	◎	△

(b) Port of Namibe

Equipment is made a selection based on present number of cargo handling equipment, demand of container, working time of cargo handling equipment and future pavement of apron and container yard. And, equipment must be selected considering easy driving and maintenance. As the study result of alternative plans shown at Table 2-2-2.(19), the first alternative is adopted.

Table 2-2-2.(19) Procurement plan for cargo handling equipment①～②(Port of Namibe)

Content of procurement plan	①One 40tons reach stacker, One 40tons forklift , One 50 to 60 tons mobile crane	② One 40tons forklift , One 50 to 60 tons mobile crane
Content of procurement	**Reach stacker**: ・ Port of Namibe has one 40 tons reach stacker of 2002 make for full loaded container box and used for transportation, stacking and distribution for container. ・ In addition to the above, they have 2 top lifters (’92 and ’98 make) but both are out of order. ・ Container ship called Namibe port has been	**Reach stacker**: ・It is important to repair reach stackers which are now out of order. Therefore new reach stacker is not provided. **Forklift**:Same as on the left **Mobile Crane**:Same as on

	required to equip more than 2 ship gears and two reach stackers are needed for effective container handling. ・ Due to the availability of only one reach stacker they are obliged to temporary stack boxes at backside of quay and load container onto trailer and transport to yard after ship left which is very inefficient to solve the problem. ・ Present top lifter is already over life of machine (generally 6 years), this machine should be replaced. ・ In addition container handling works are behind in their works when reach stacker is break down or under maintenance. One container ship has to wait when two container ships are mooring at one time. ・ Therefore, one reach stacker for full loaded container will be procured in order to handle container smoothly. **Forklift**: ・ Present 40 tons forklift (’95 make) is used for handling large size granite (10 to 40 tons weight) from field yard to apron. ・ Recently granite export is increasing and the volume is 95,000 tons per year. Granite handling is behind the schedule when forklift is breakdown or under maintenance services. ・ Present forklift is over life of machine (generally 6 years), therefore forklift will be procured in order not to make handling delay. **Mobile Crane** ・ Port of Namibe has no cargo handling machine for general cargo nor mobile crane to transport to yard. Therefore they are handling general cargo unsafely by reach stacker which should handle only for container boxes or mobile crane is rented from outside. . ・ While, ship gear or quay crane is used for unloading work. Present seven quay cranes are old type which is over 30 years old and 3 out of 7 are not operated. And two quay cranes out of 4 which must be in use is out of order now. ・ One quay crane is now upgraded from 6 tons to 22 tons however, this actual capacity may be about 4 to 10 tons. ・ Therefore, one mobile crane is procured to secure safety work at yard and loading and unloading work at apron. Mobile crane capacity is decided as 50 to 60 tons and 3 ton lifting capacity in 24m of working envelope considered the ship’s width of 21 m to 24 m for 10,000DWT to 18,000DWT.	the left
Specification	**Reach stacker**: Full loaded 40 feet container, 40 tons, over 3 row 3 tiers **Forklift**: 40 ton **Mobile Crane**: Lifting capacity is 50 to 60 ton, 3 ton lifting capacity in 24m of working envelope	**Forklift**: Same as on the left **Mobile crane**: Same as on the left
Overall evaluation	◎	△

2) Basic Specifications of Equipment and Cargo Handling Operation

Table 2-2-2.(20) shows the basic specification of equipment and each cargo handling operation required in this project.

Table 2-2-2.(20) Basic specifications of the procured equipment and each cargo handling operation

Port	Equipment	Cargo Handling Operation	Examination of Specification	Basic Specification
Port of Lobito	Reach stacker	Container cargo handling operation	・In the beginning of 2007, due to increasing container-handling capacities, the Lobito Port Enterprises procured 2 reach stackers and making a total of 9 stackers at present. ・Due to the present sharp increace of container cargo, 10 stackers are necessary to cope by 5 stackers each for 2 conatiner vessels and 2 berths further one stacker is necessary to be purchased.	・Good for loading of full loaded container of 20ft and 40ft ・Stacking Capacity: more than 3 rows 3 tiers ・Lifting capacity : 40 ton
Port of Namibe	Reach stacker	Container cargo handling operation	・ In 2006, due to increasing container-handling capacities, the Lobito Port Enterprises procured one used container stacker. Total container stackers became 4, but 3 stackers were breakdown, only one stacker is operated now. ・Only one stacker is absolutely insufficient for operation at both quayside and container yard area simultaneously. And, if one stacker is broken down, the operation cannot be continued.	・ Good for full loaded containers of 20ft and 40ft ・Stacking Capacity: more than 3 rows 3 tiers ・Lifting capacity : 40 ton
	Forklift	Granite cargo handling operation	・At present, only one forklift operates about 100,000 ton/year of granite cargo (3 times increase in 5 years) ・Only one forklift is absolutely insufficient for operation at both quayside and open yard area simultaneously. And, if one is broken down, the operation cannot be continued. ・One granite weight is from 10 ton to 40 ton, therefore, forklift with 40 ton lifting capacity is necessary .	Maximum Lifting capacity: 40 ton class

	Mobile crane	General cargo handling operation	・Because the Namibe Port Enterprises does not own mobile crane, reach stacker that is exclusively use for container handling is used for unloading general cargo to open yard that is very dangerous. ・Loading/unloading cargo from/to vessel is operated by ship gear or quay crane. The quay crane in Namibe port is inefficient due to the troubles by aging. ・Mobile crane having more than 3 ton lifting capacity in 20m of working envelope is procured to be possible to handle lengthy general cargo	・Lifting capacity: 60 ton class

3) Spare Parts Procurement

For ensuring of smooth operation of equipment to be procured in the Project, spare parts of each equipment are to be chosen based on the following items and procured at the expenses of Japanese side.

(a) About the content of the spare parts, there should be mainly chosen spare parts for periodical maintenance or consumables, in the view of preserving of equipment function avoiding any troubles that may arise.

(b) The periodical maintenance spare parts and consumables should be chosen for cargo handling operation in a period of about one year that is presently implemented in the Lobito Port Enterprise.

(c) A ceiling cost of the spare parts should be set at 5% of the price of equipment.

4) Installation/Assemble Plan

Mobile crane in the equipment is procured as delivered to the site without installation work. However, the installation works are required on the reach stacker and forklift in Lobito and Namibe Port. Reach Stacker will be divided into 4 parts and transport to Lobito and Namibe Port. Unloading them from ship by ship's gear, loading onto trailer, transport to maintenance area near work shop and assemble them there. And, the forklift is also transported with three parts and they are assembled there in the maintenance area as well as reach stacker. Sample of shipping cargo of reach stacker shows Table 2-2-2.(21) and Figure 2-2-2.(3).

Table 2-2-2.(21) Sample of Shipping Cargo of Reach Stacker

Description	Q'TY	TYPE	GROSS Kgs	M'MENT m^3	L mm	W mm	H mm	AREA m^2
1. BASE + CABIN + BOOM CYLINDERS	1	UNIT	34,070	122.039	8,110	4,180	3,600	34
2. COUNTER WEIGHT	1	BARE	14,500	12.930	3,600	2,460	1,460	9
3. BOOM	1	SKID	14,450	49.434	10,500	2,200	2,140	23
4. TELESCOPIC SPREADER	1	SKID	9,300	34.979	6,040	2,540	2,280	15
TOTAL	4		72,320	219.382				

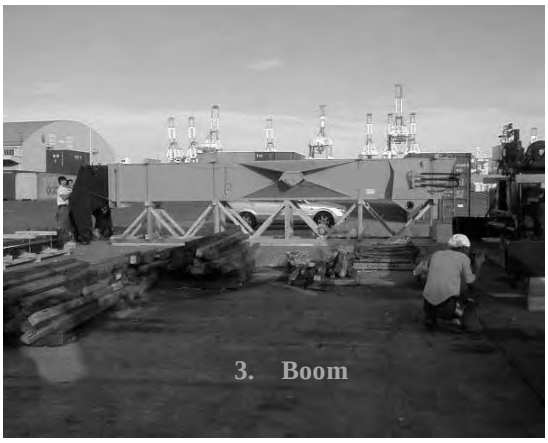


Figure 2-2-2.(3) Assemble of Reach Stacker

2-2-3 Basic Design Drawing

(1) Port of Lobito

Table 2-2-3.(1) Outline of facilities and equipment in Port of Lobito

Facilities	Scale	Content of plan
Replacing quay wall	Length : 240m	Width : 3.0m to 3.15m
Car stopper	Length : 208m	Width : 0.4m, Height : 0.3m
Bollard	8 bollards	Two 100 ton, six 70 ton bollards
Fender	16 fenders	Coverage for Design ship
Apron/yard pavement	Pavement area : 43,074m^2	Reinforced Concrete Pavement
Reach stacker	1 unit	40 ton

(2) Port of Namibe

Table 2-2-3.(2) Outline of facilities and equipment in Port of Namibe

Facilities	Scale	Content of plan
Replacing quay wall	Length : 240m	Width : 2.6m
Car stopper	Length : 208m	Width : 0.4m, Height : 0.3m
Bollard	8 bollards	Two 100 ton, six 70 ton bollards
Fender	16 fenders	Coverage for Design ship
Apron/yard pavement	Pavement area : 18,210m^2	Reinforced Concrete Pavement
Improvement of inner port road	Length : 666m	Width : 10.0m (t=25cm as concrete slab)
Water supply facilities	Length : 1,043m	7 water valves, 5 stop taps/branch pipes Water tank, Pump station
Lighting Tower	Two 6,000Watt towers	12,000W
Reach stacker	1 unit	40 ton
Top lifter	1 unit	40 ton
Mobile crane	1 unit	60 ton

(3) Basic design drawing

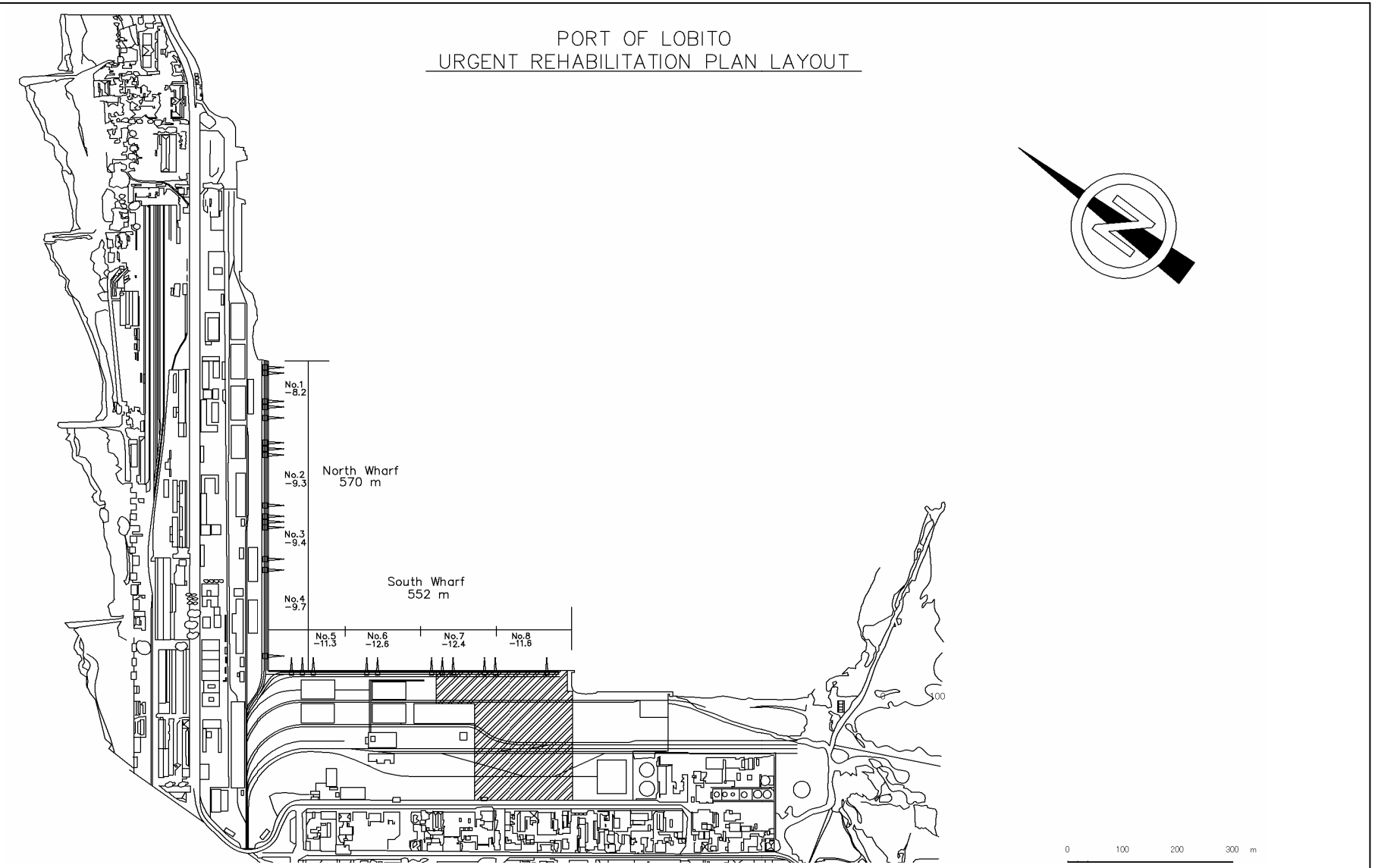


Figure 2-2-3(1) General Layout Plan in Port of Lobito

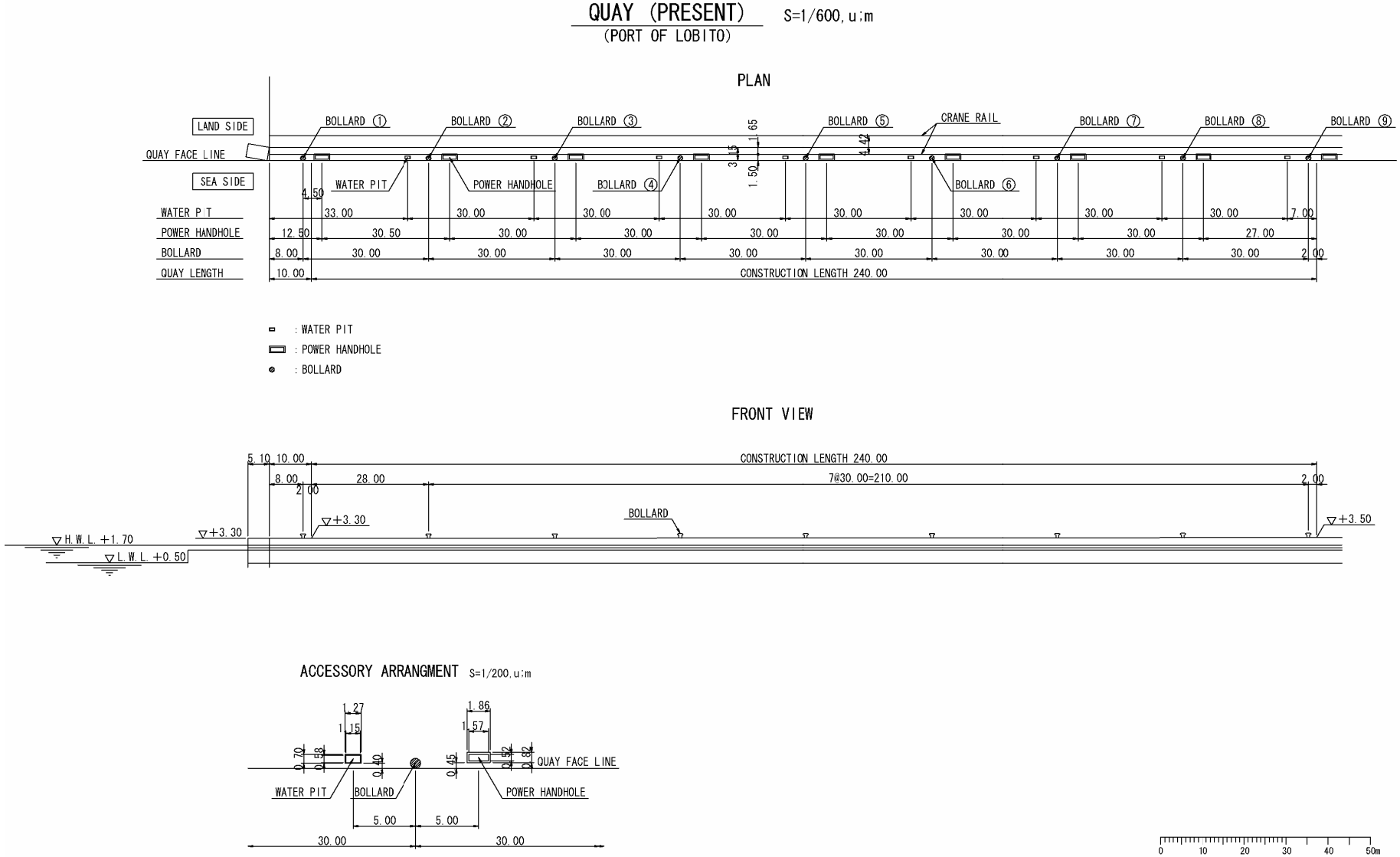


Figure 2-2-3(2) Panorama of Quay Wall in Port of Lobito (Existing)

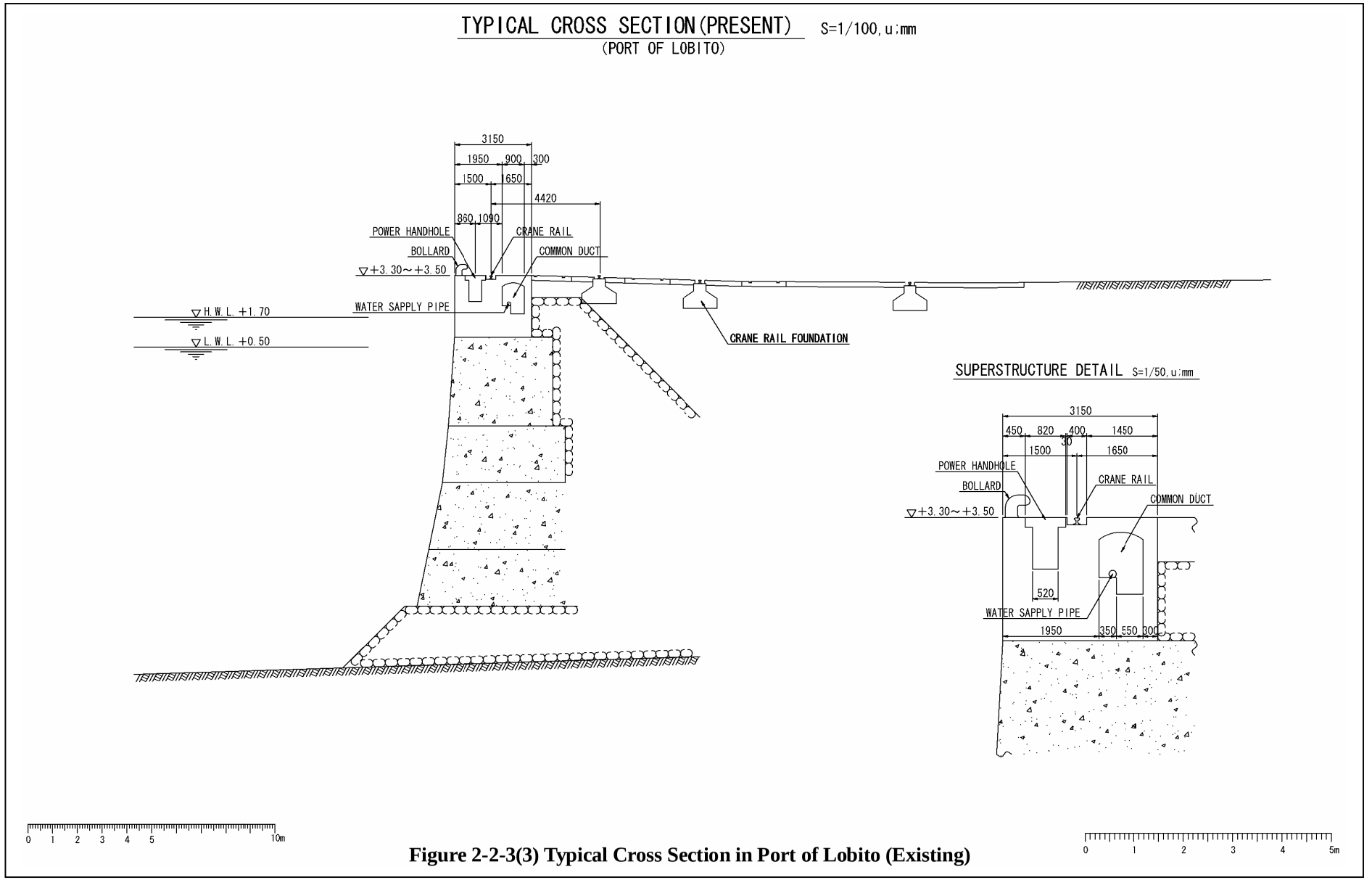


Figure 2-2-3(3) Typical Cross Section in Port of Lobito (Existing)

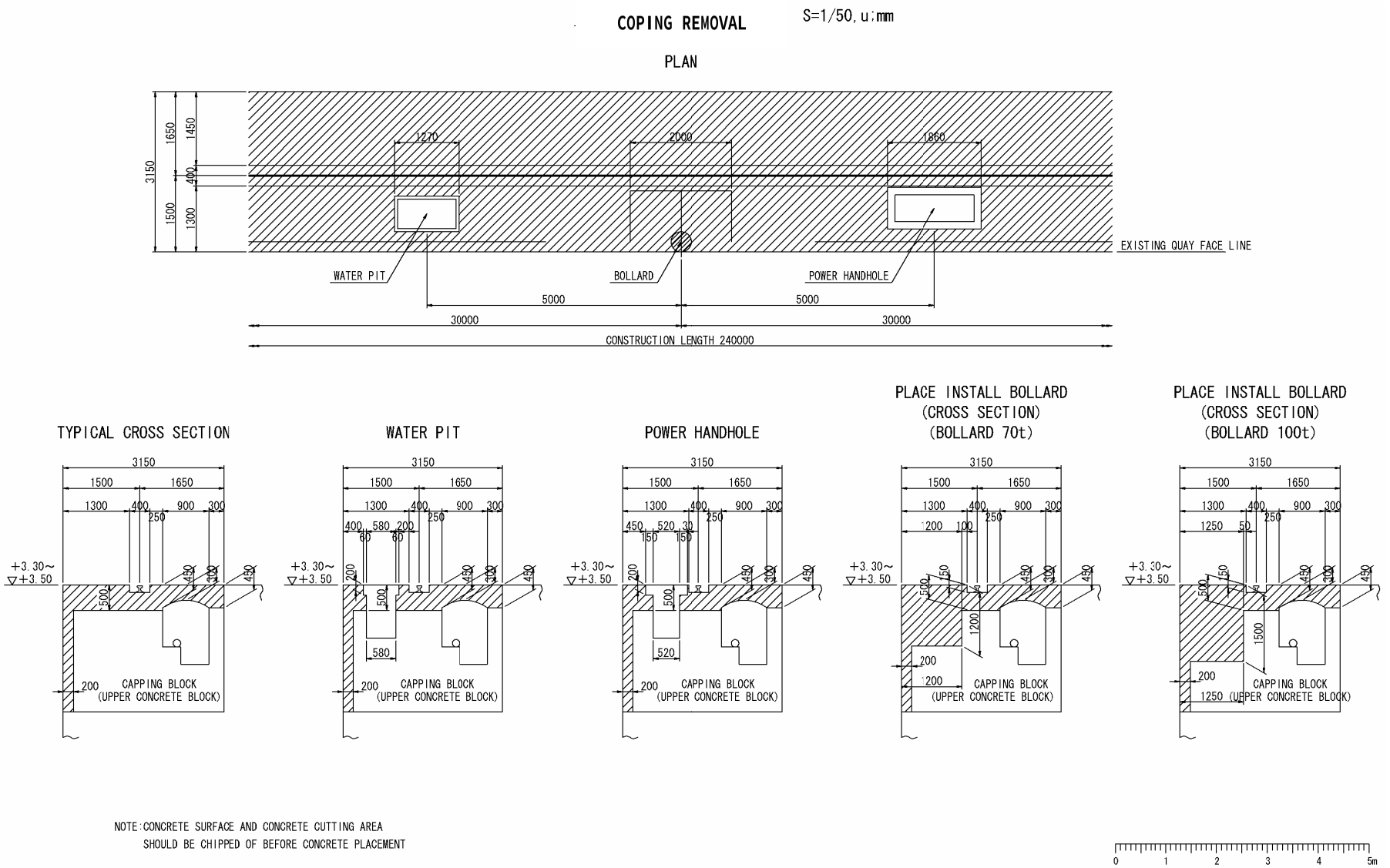


Figure 2-2-3(4) Removal of Coping Concrete in Port of Lobito

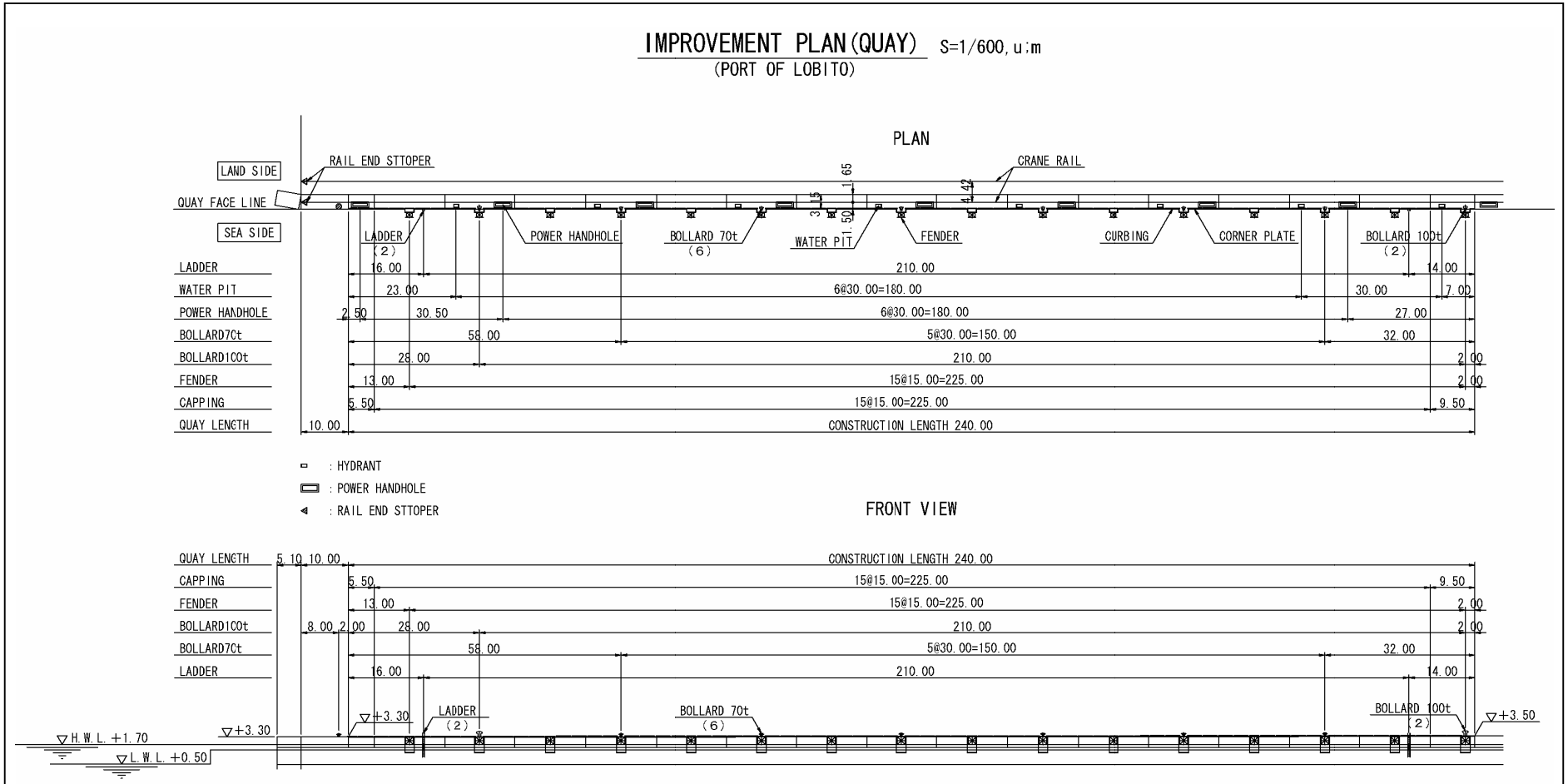


Figure 3-2-3(5) Quay Improvement Plan in Port of Lobito

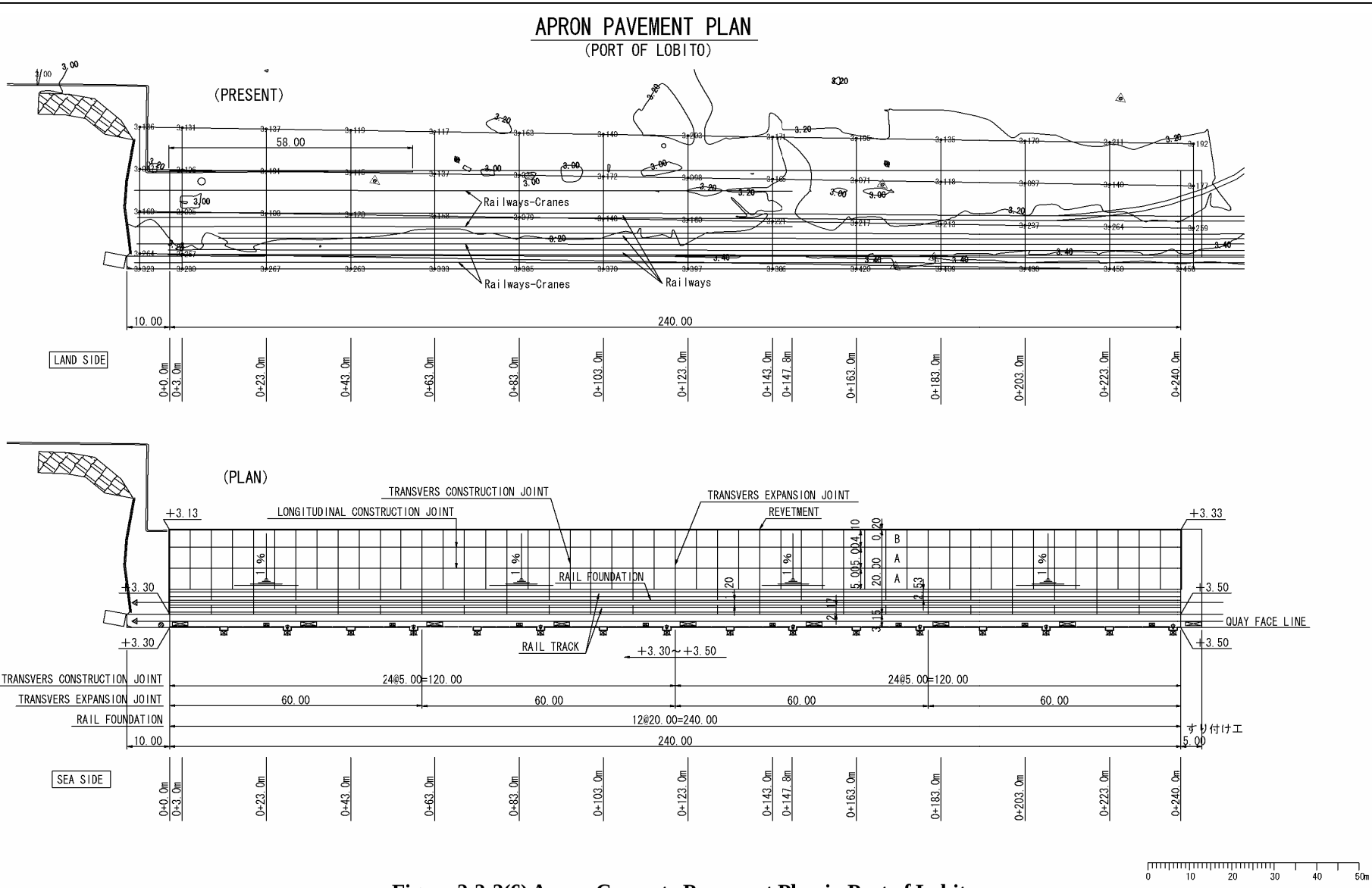


Figure 2-2-3(6) Apron Concrete Pavement Plan in Port of Lobito

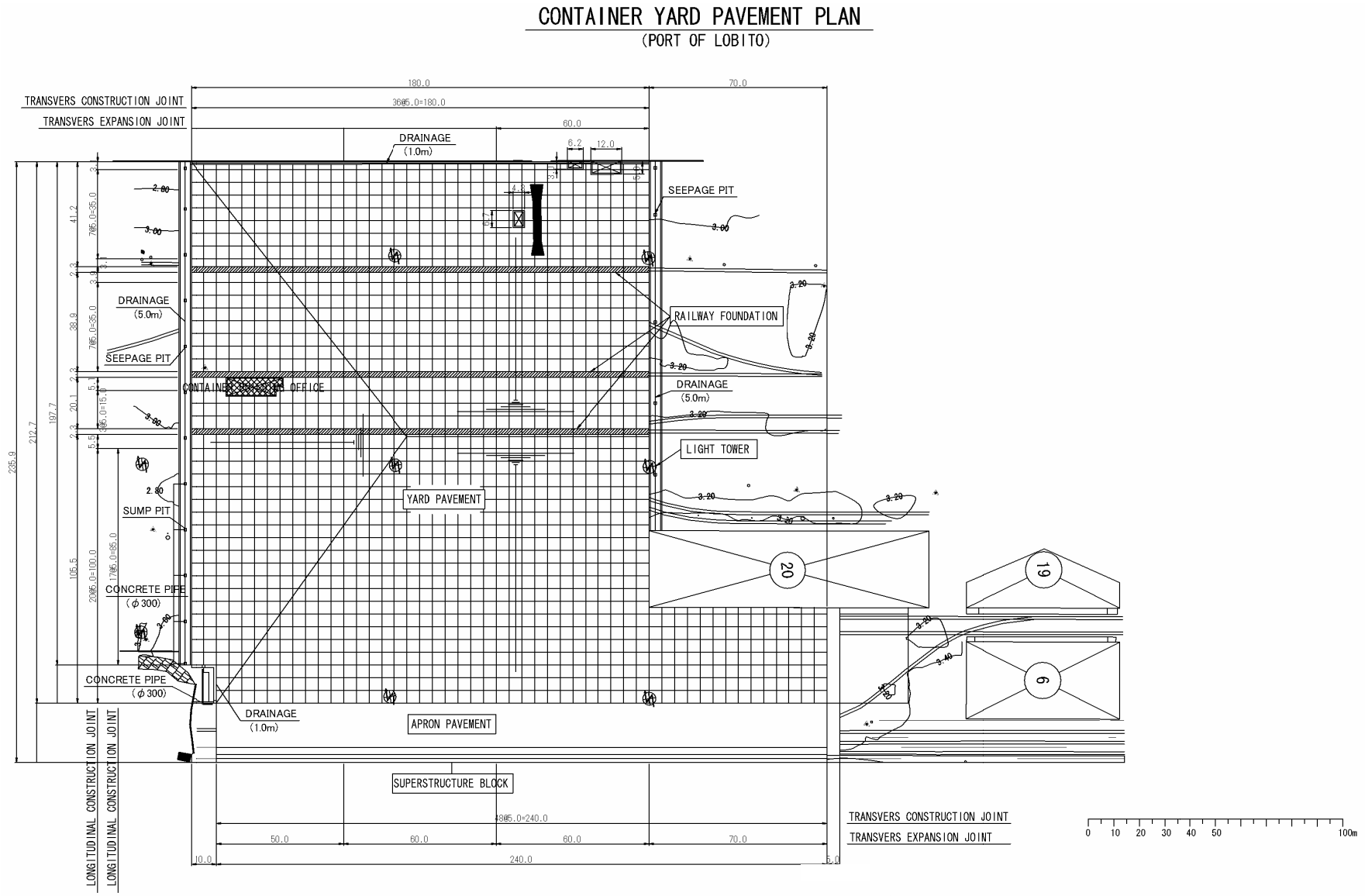


Figure 2-2-3(7) Container Yard Pavement Plan in Port of Lobito

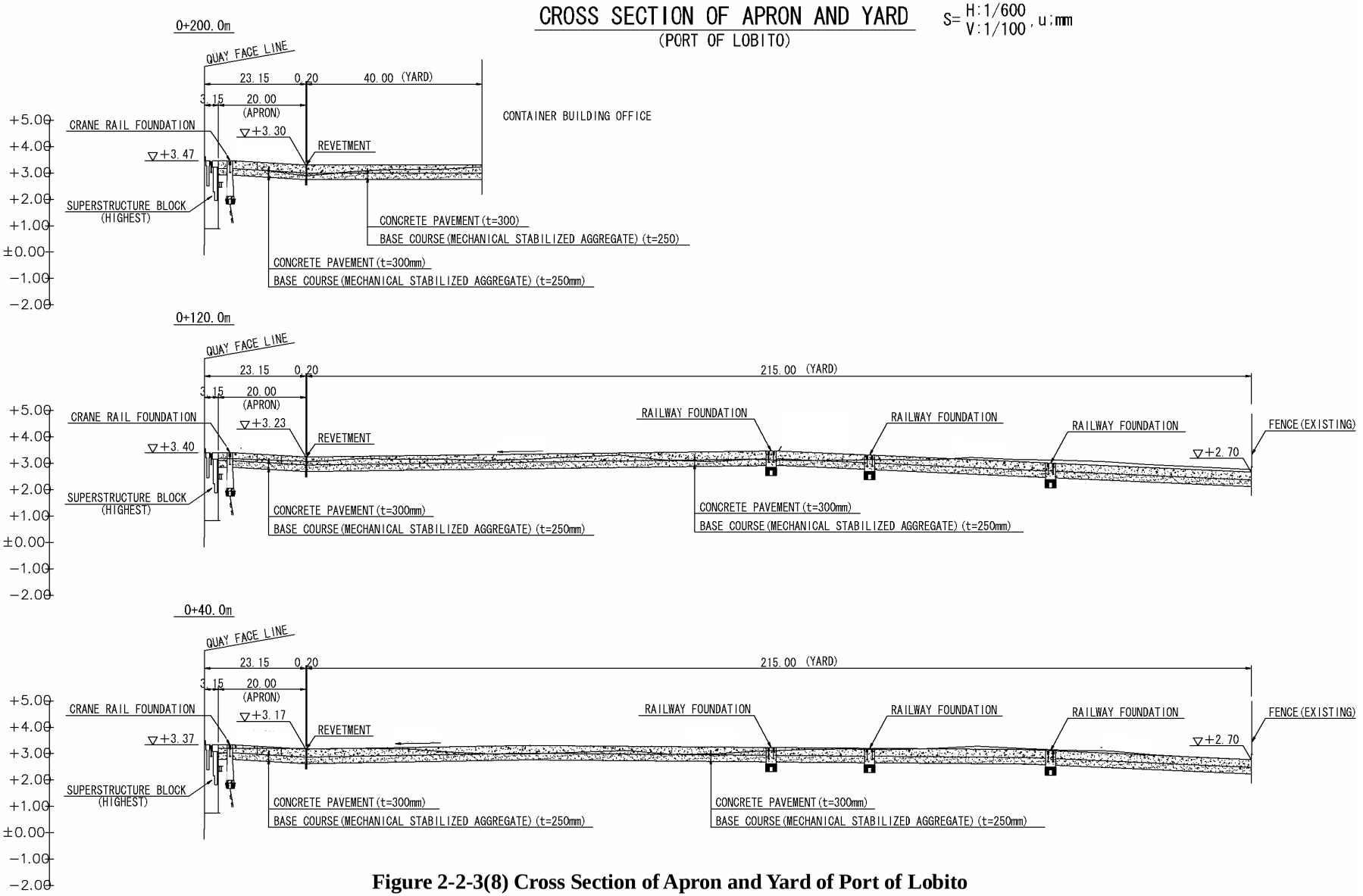


Figure 2-2-3(8) Cross Section of Apron and Yard of Port of Lobito

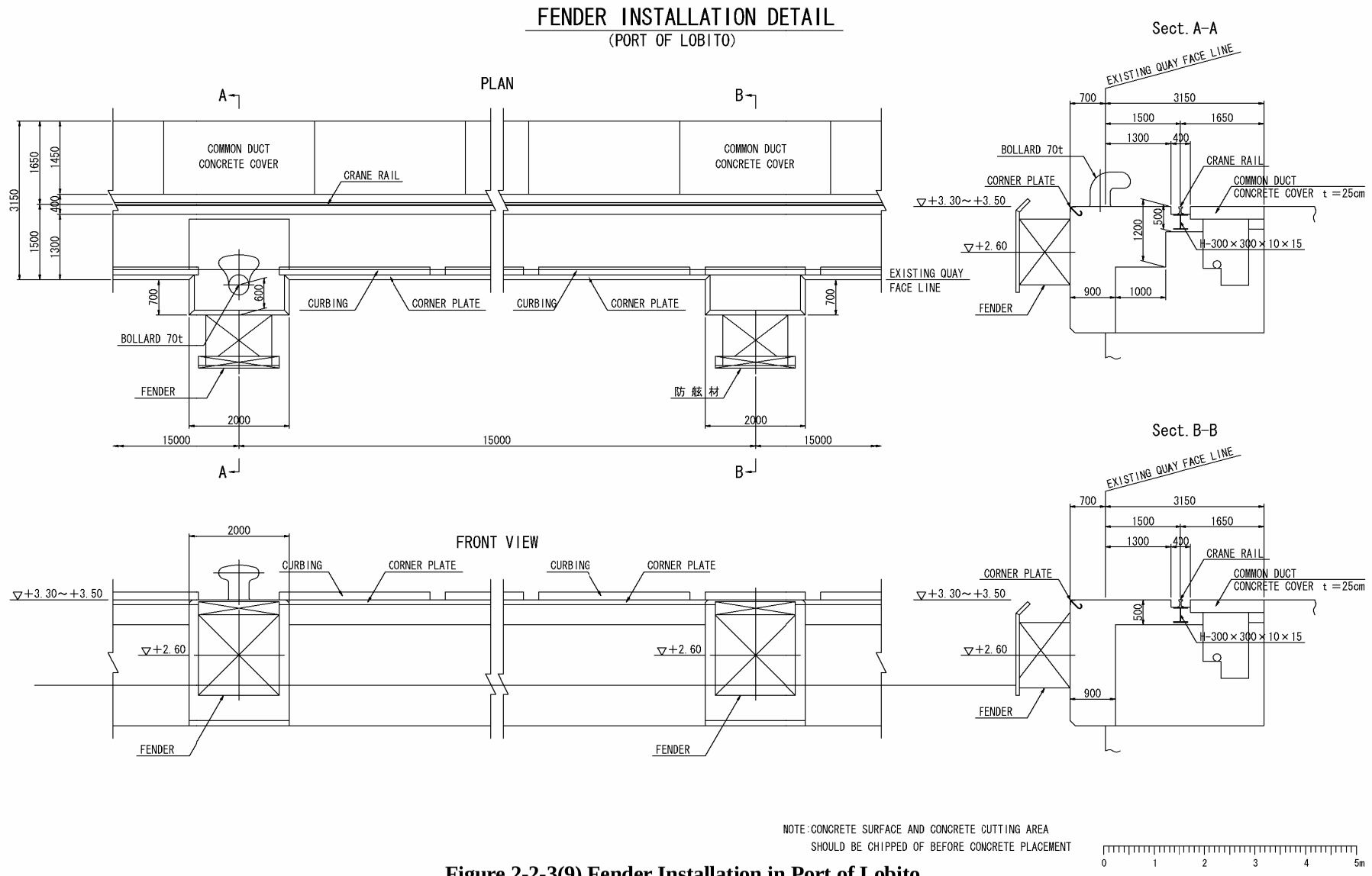


Figure 2-2-3(9) Fender Installation in Port of Lobito

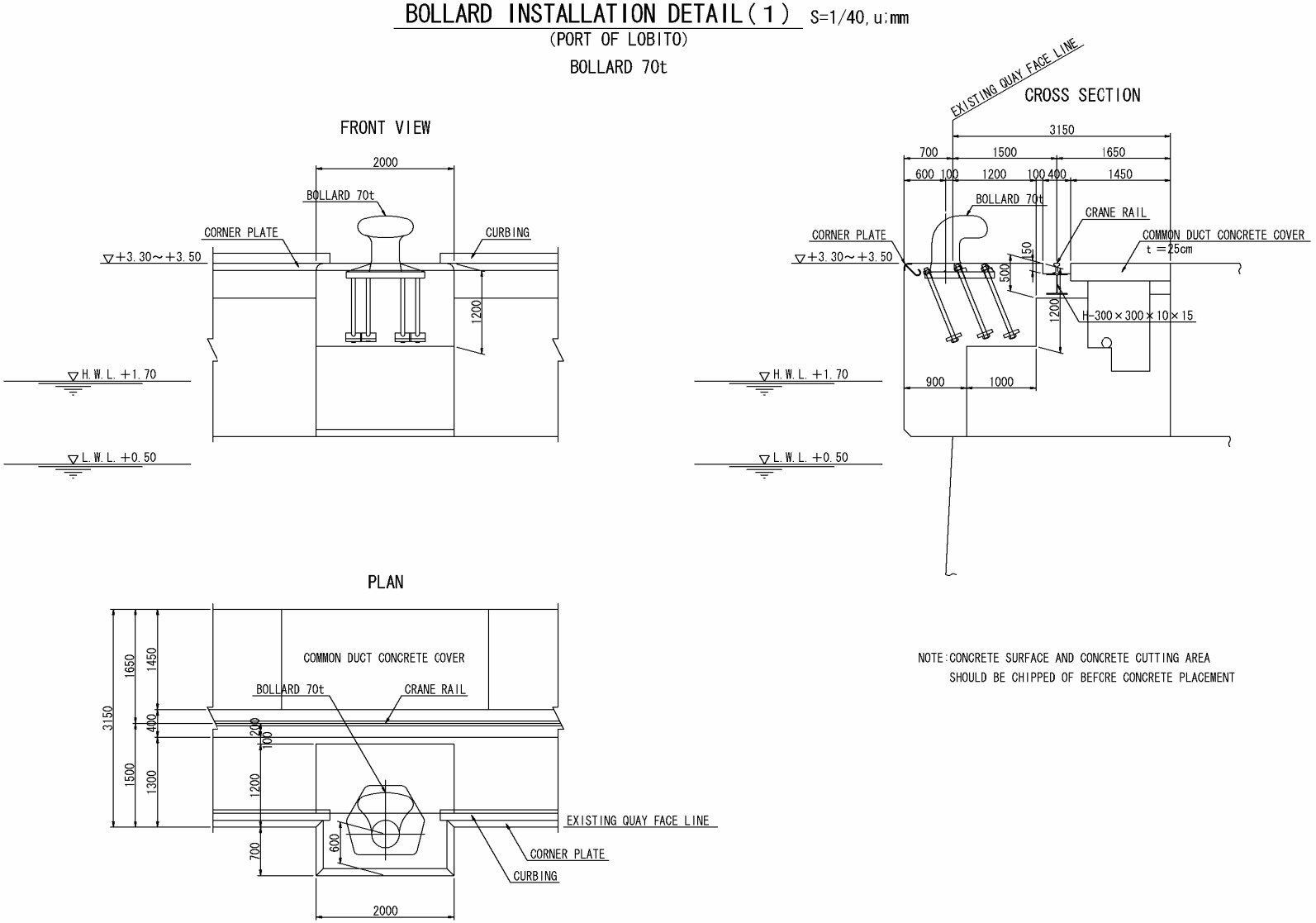


Figure 2-2-3(10) Bollard Detail in Port of Lobito

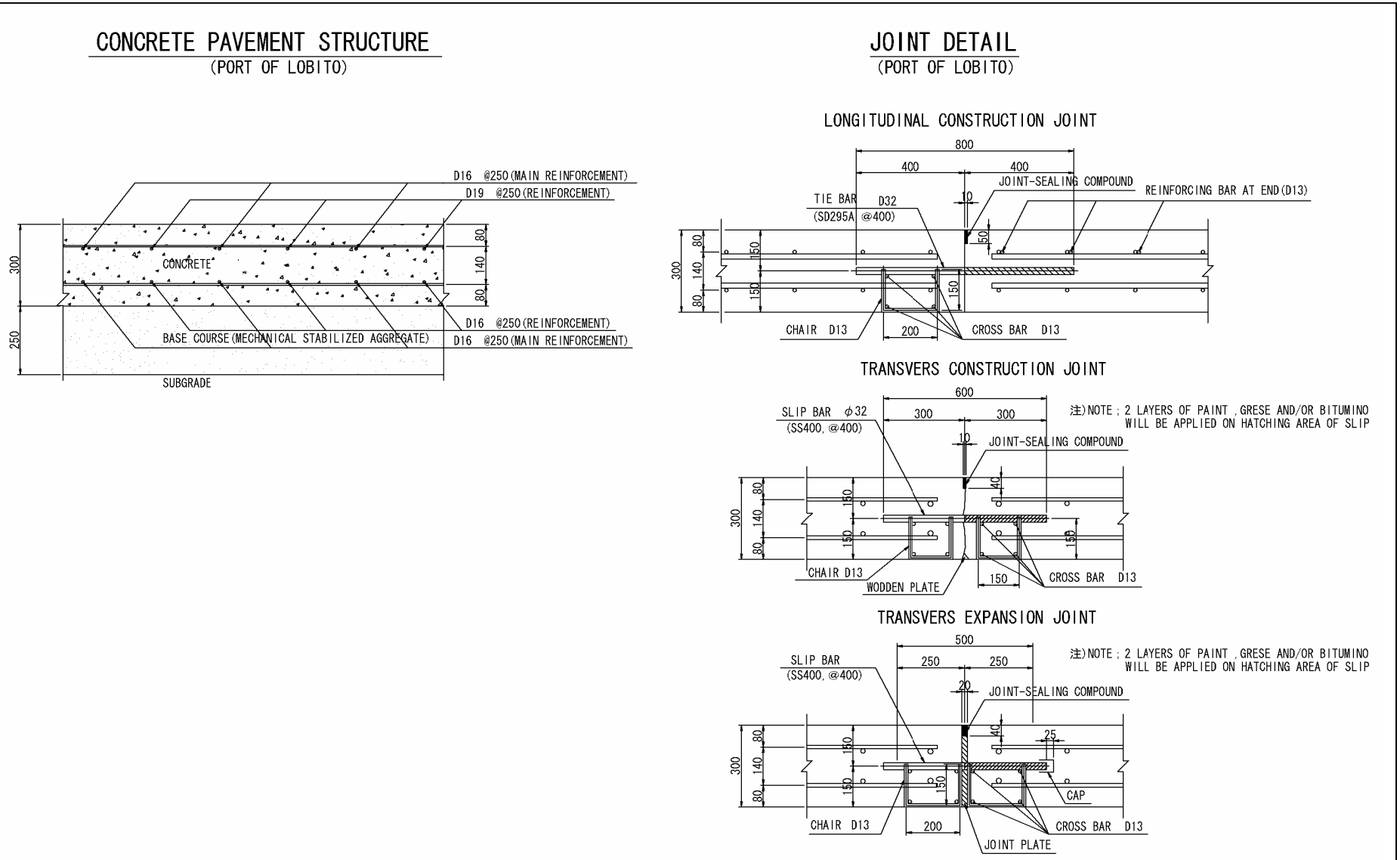
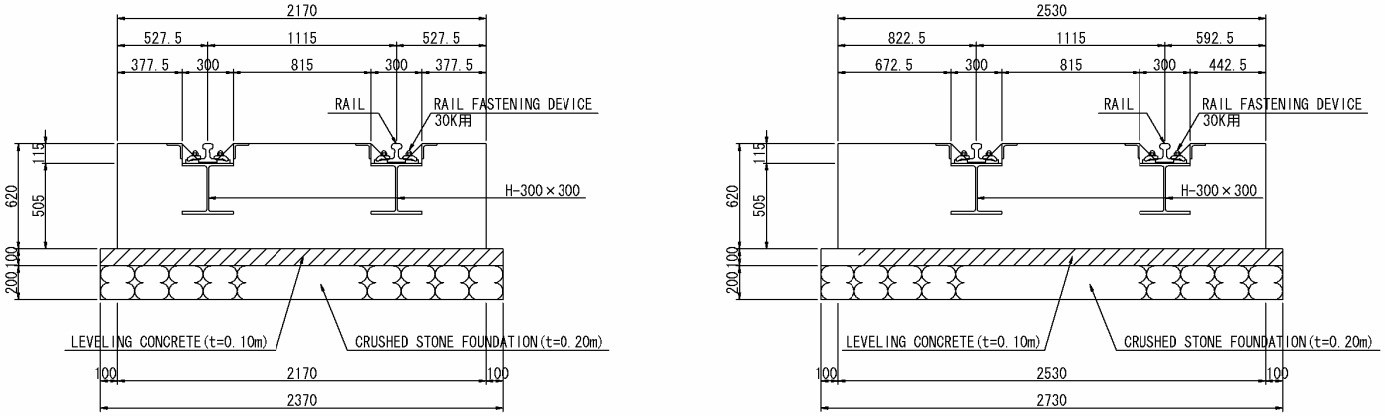


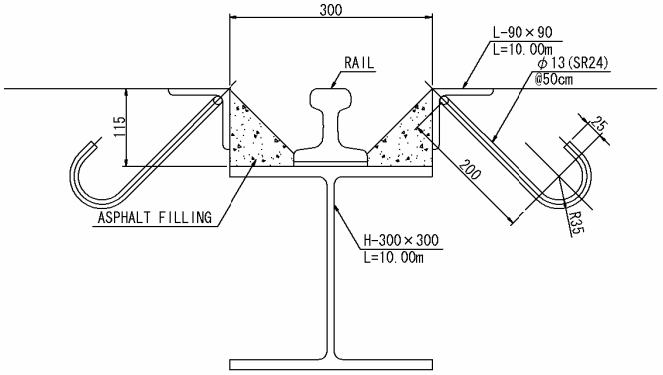
Figure 2-2-3(11) Yard Concrete Pavement Structure in Port of Lobito

RAILWAY FOUNDATION STRUCTURE
(PORT OF LOBITO)

RAIL STRUCTURE



RAIL DETAIL



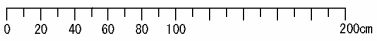


Figure 2-2-3(12) Railway Foundation Structure in Port of Lobito

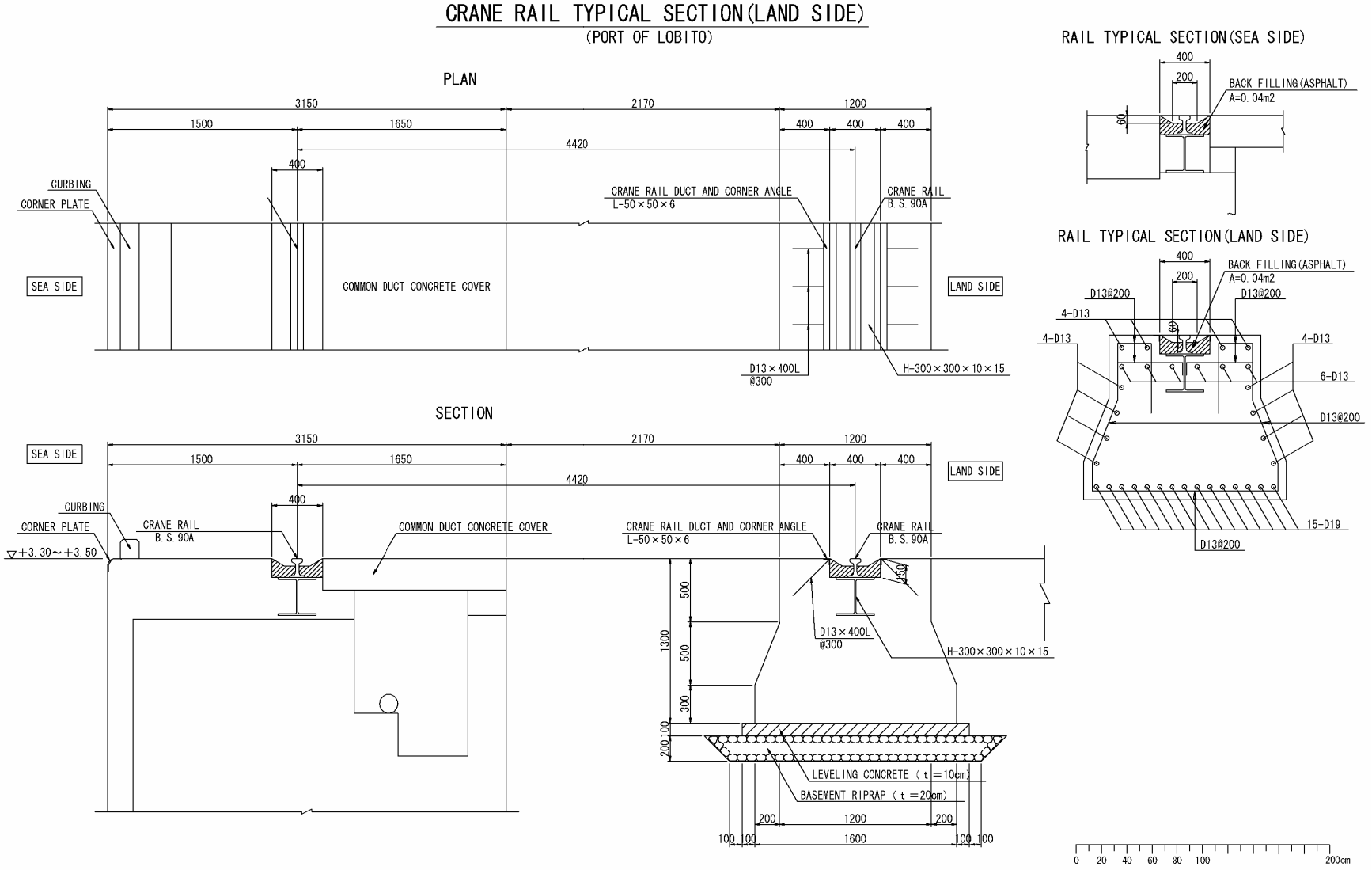


Figure 2-2-3(13) Crane rail Foundation Structure in Port of Lobito

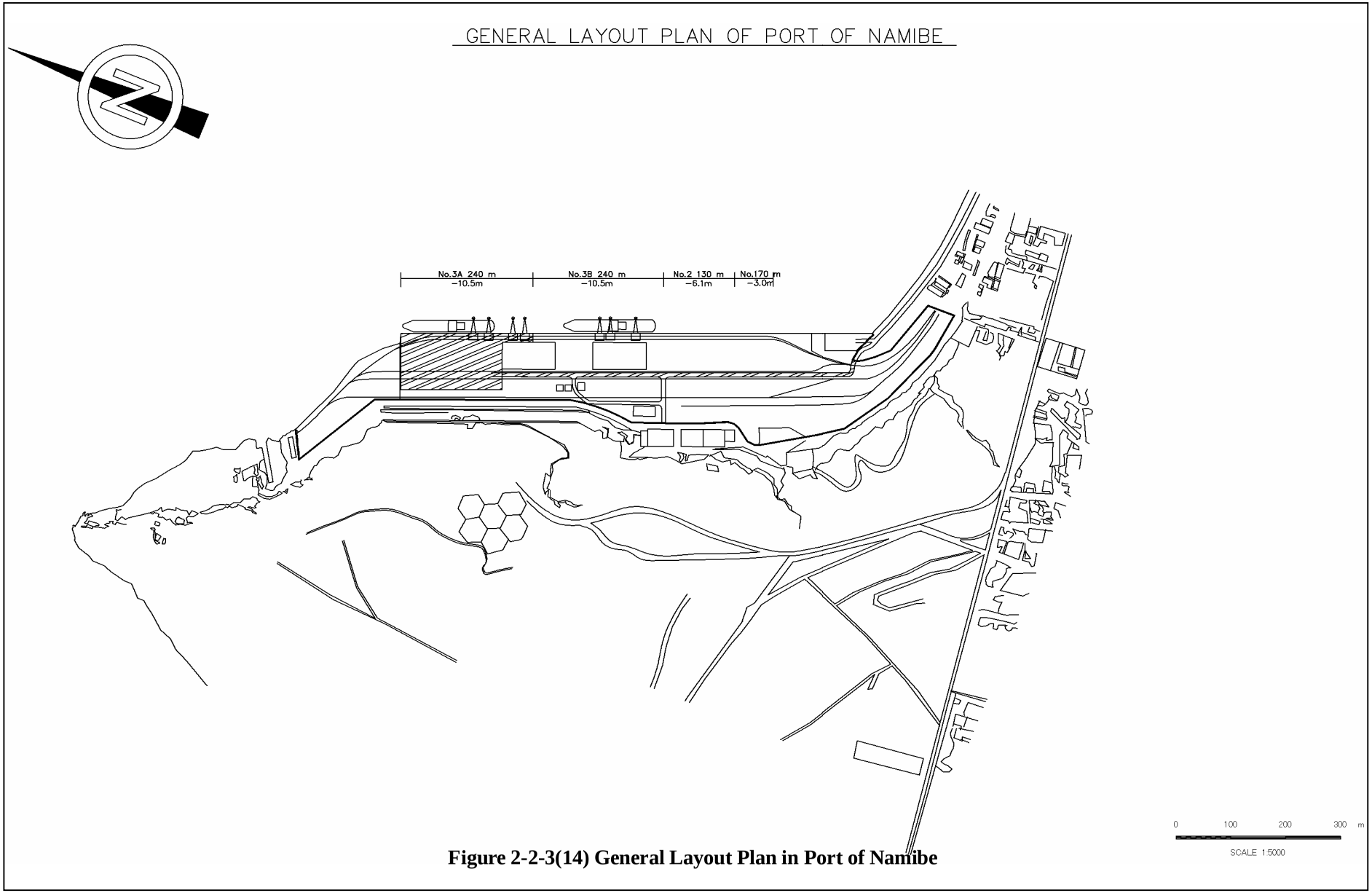


Figure 2-2-3(14) General Layout Plan in Port of Namibe

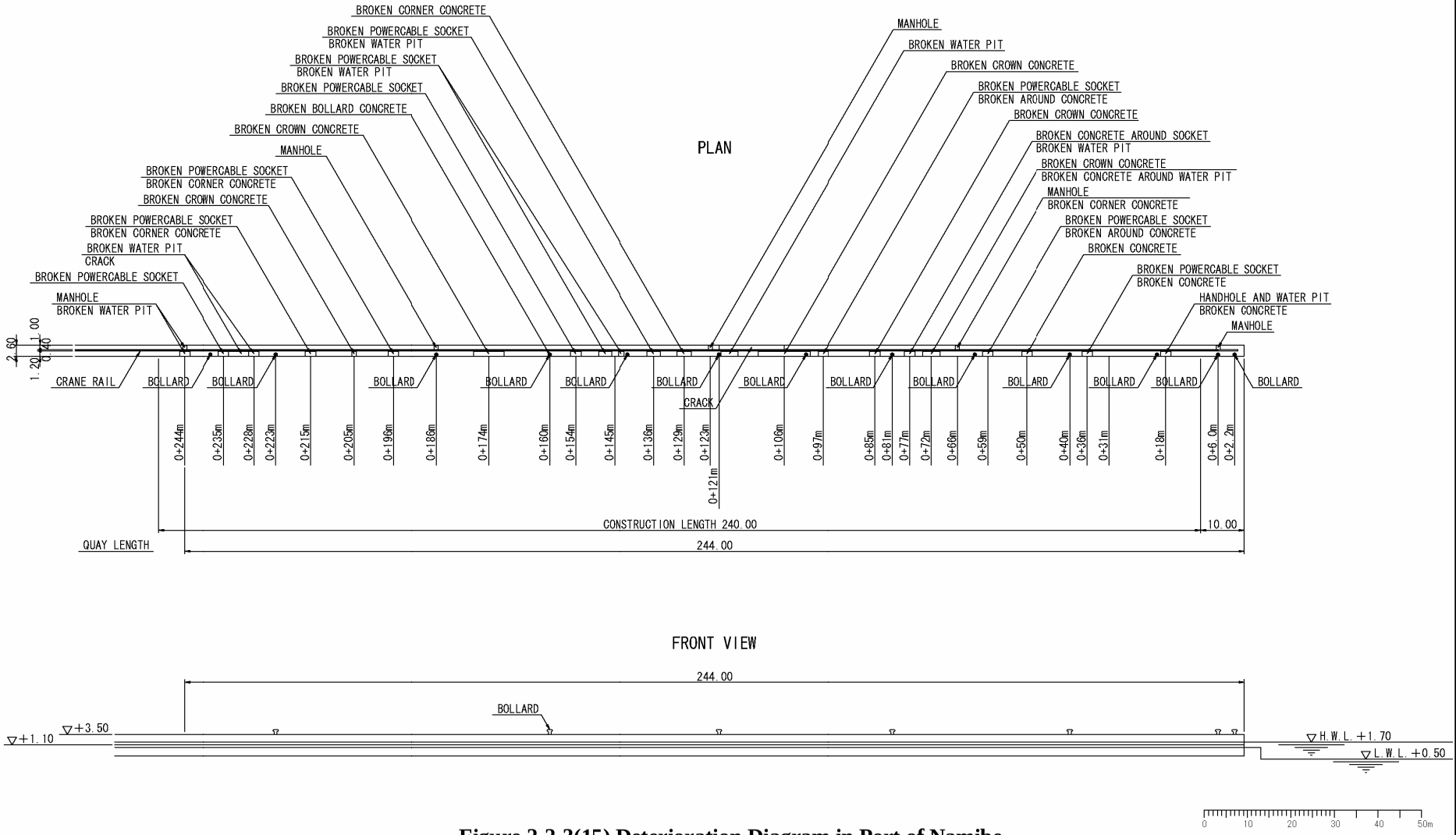


Figure 2-2-3(15) Deterioration Diagram in Port of Namibe

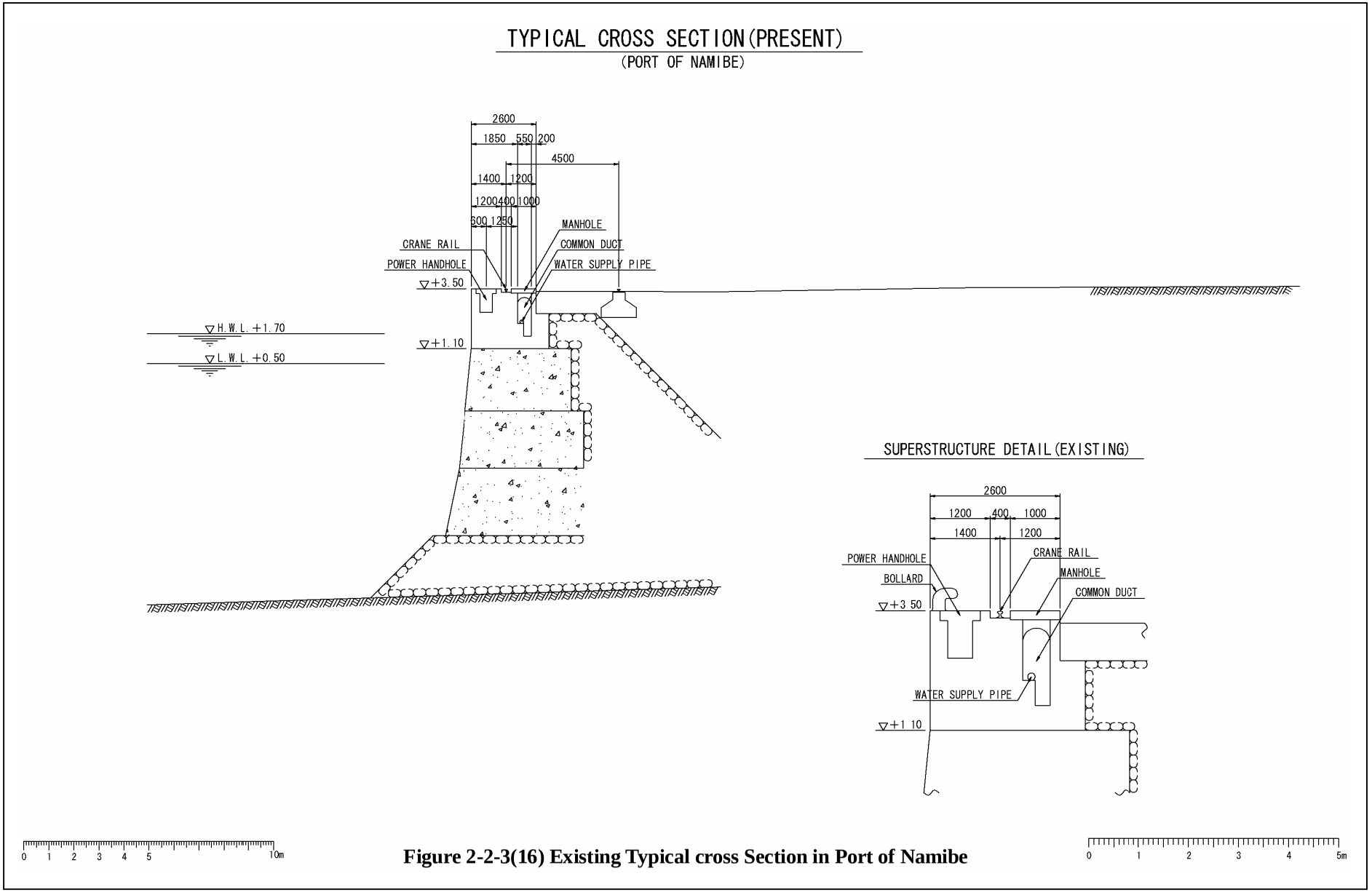


Figure 2-2-3(16) Existing Typical cross Section in Port of Namibe

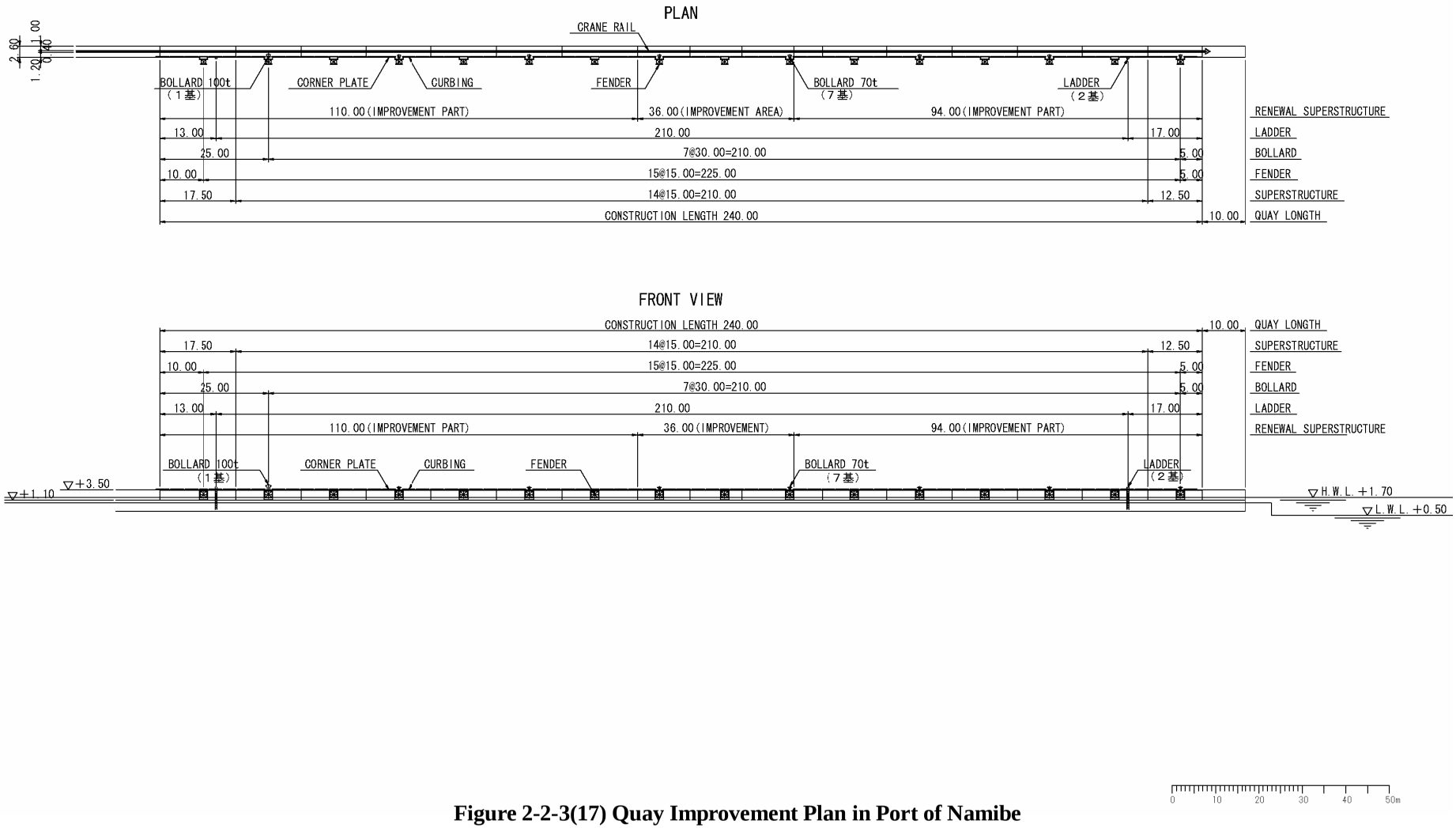


Figure 2-2-3(17) Quay Improvement Plan in Port of Namibe

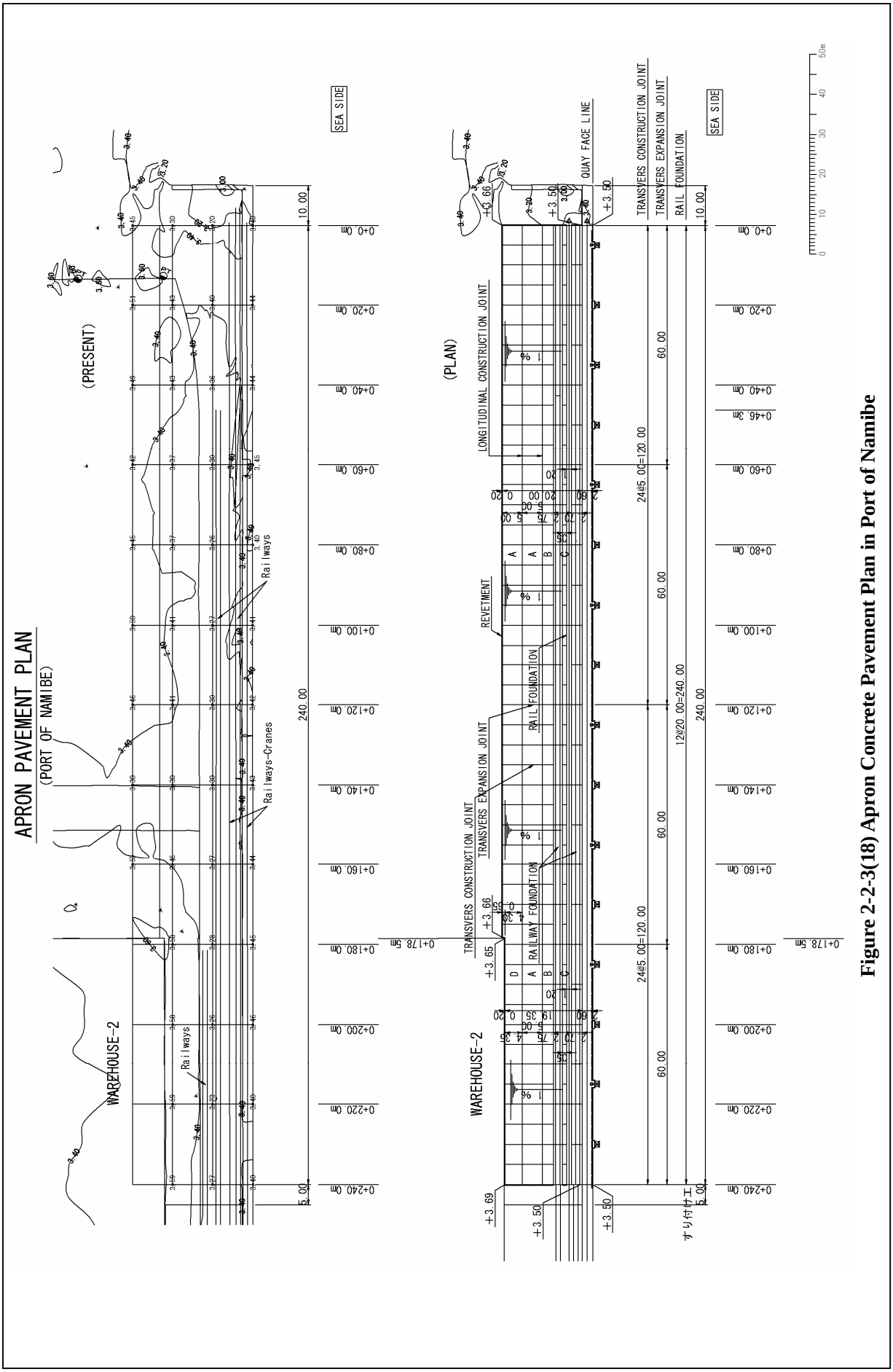


Figure 2-2-3(18) Apron Concrete Pavement Plan in Port of Namibe

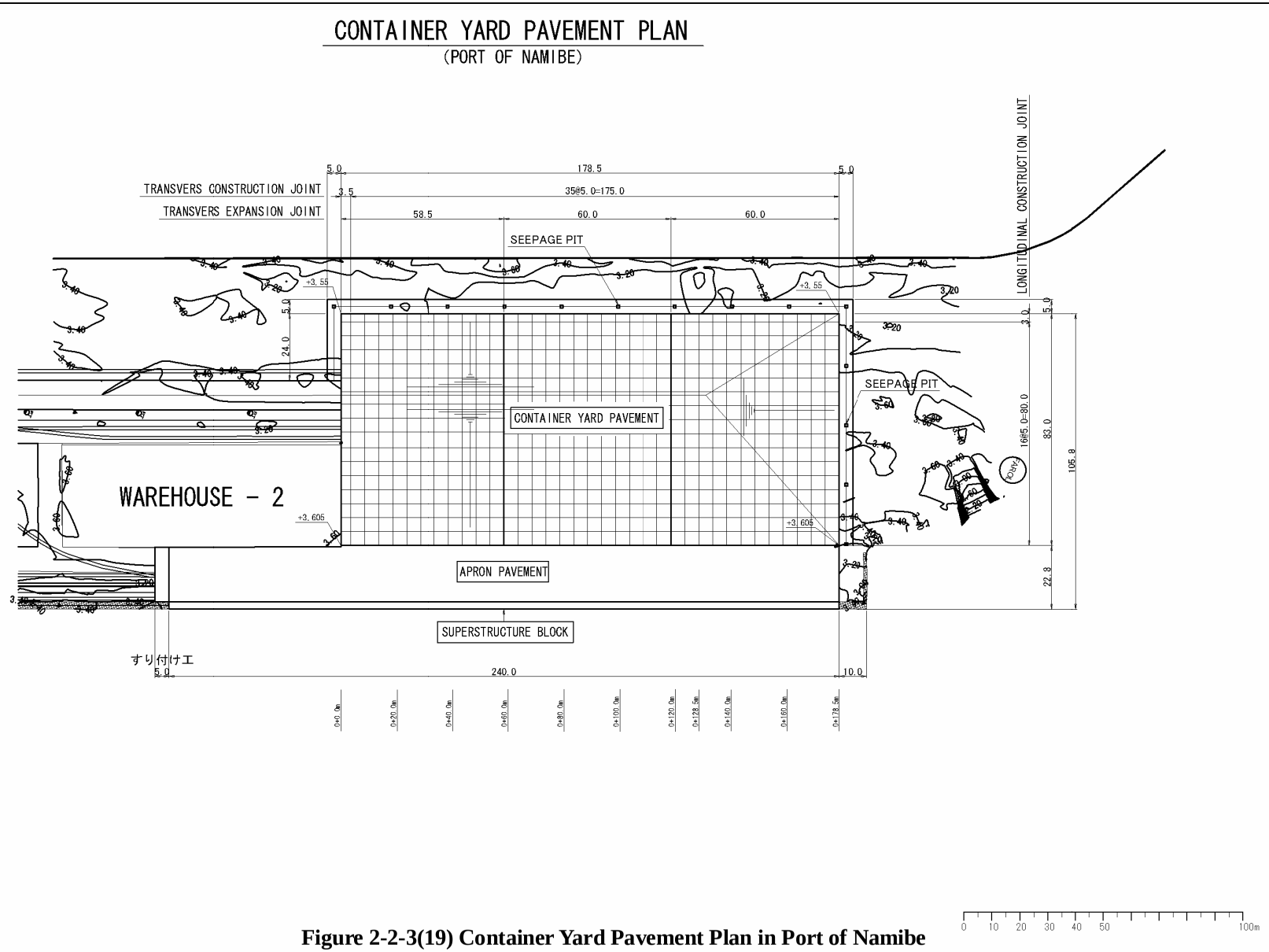


Figure 2-2-3(19) Container Yard Pavement Plan in Port of Namibe

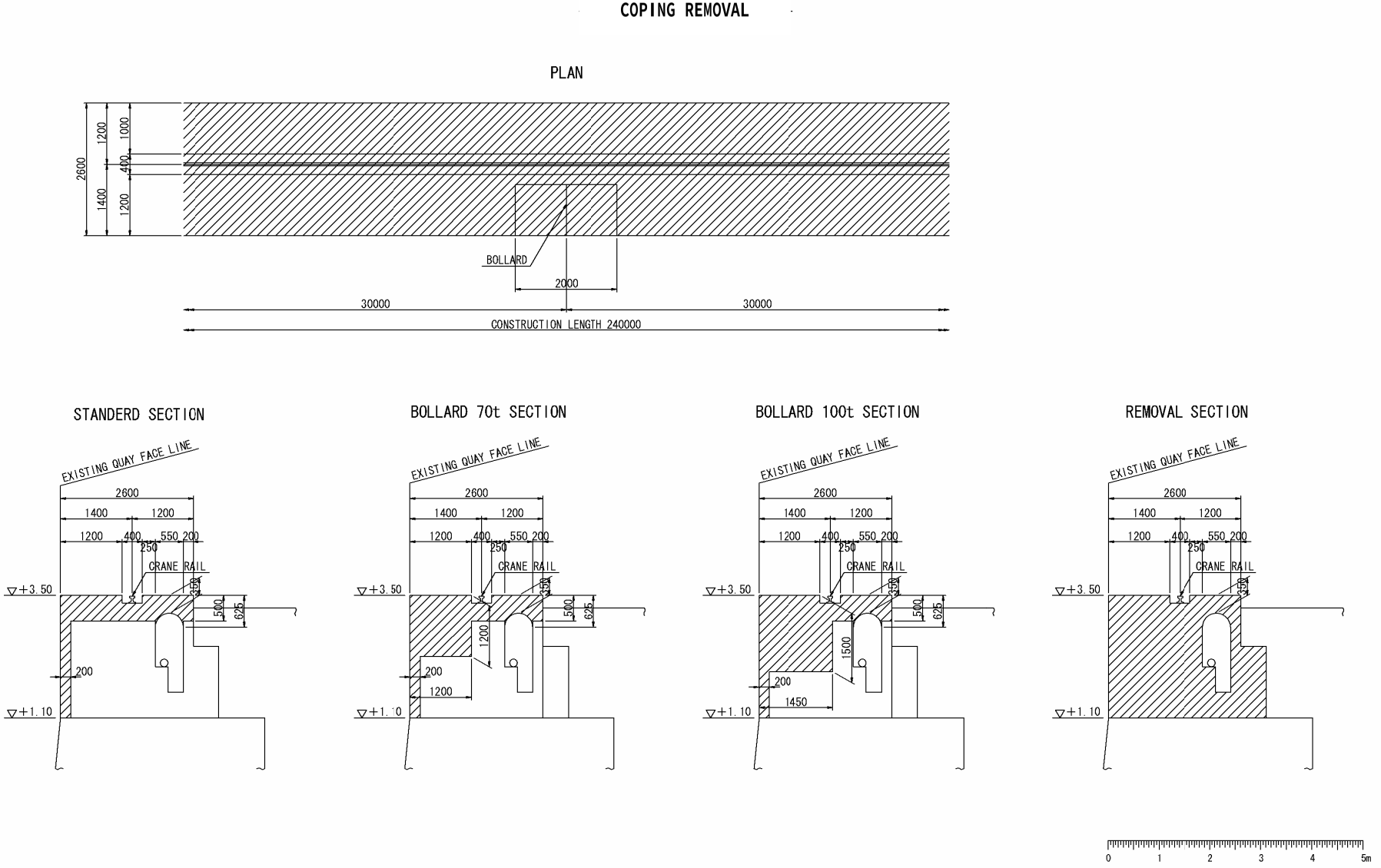


Figure 2-2-3(20) Removal of Coping Concrete of Port in Port of Namibe

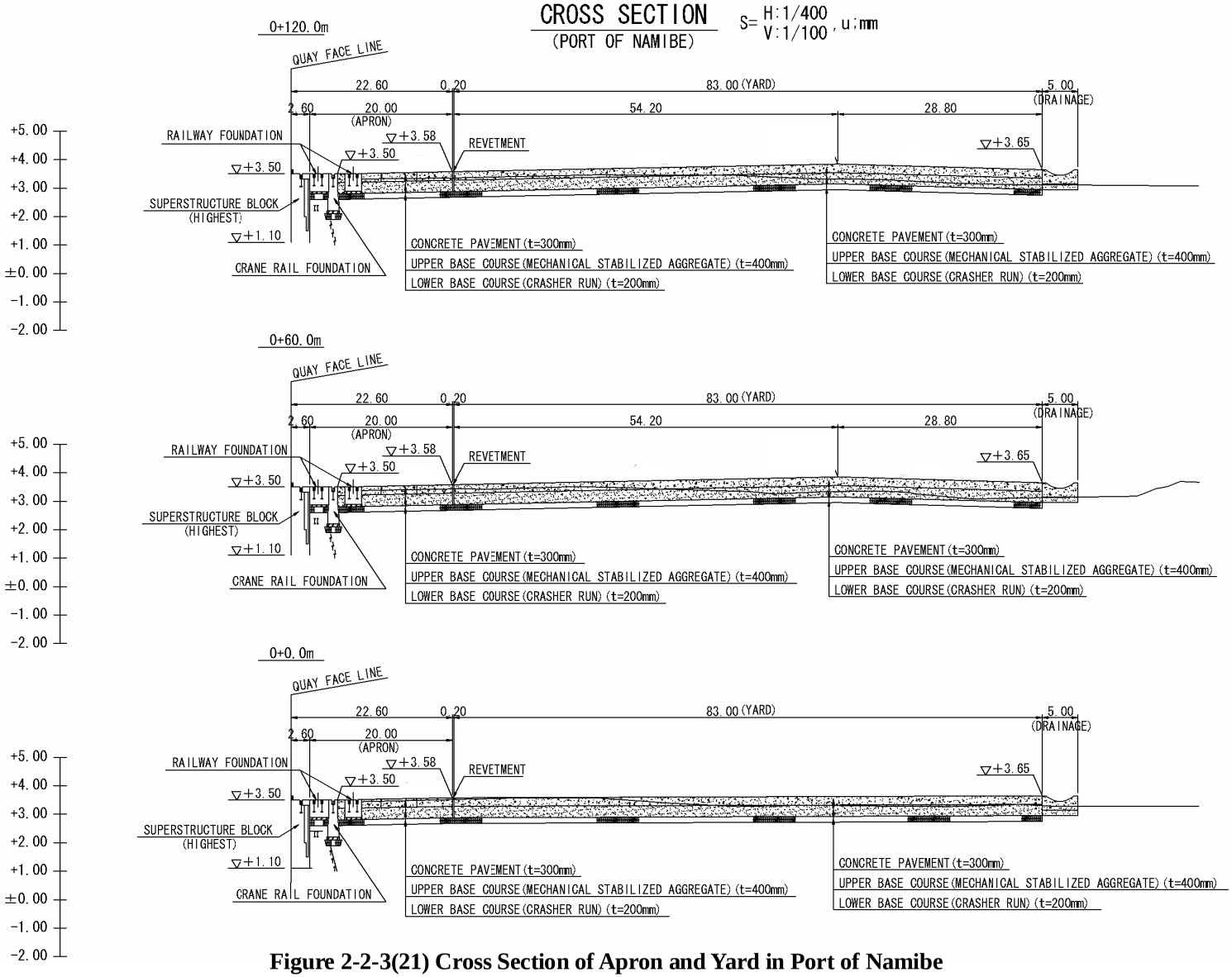


Figure 2-2-3(21) Cross Section of Apron and Yard in Port of Namibe

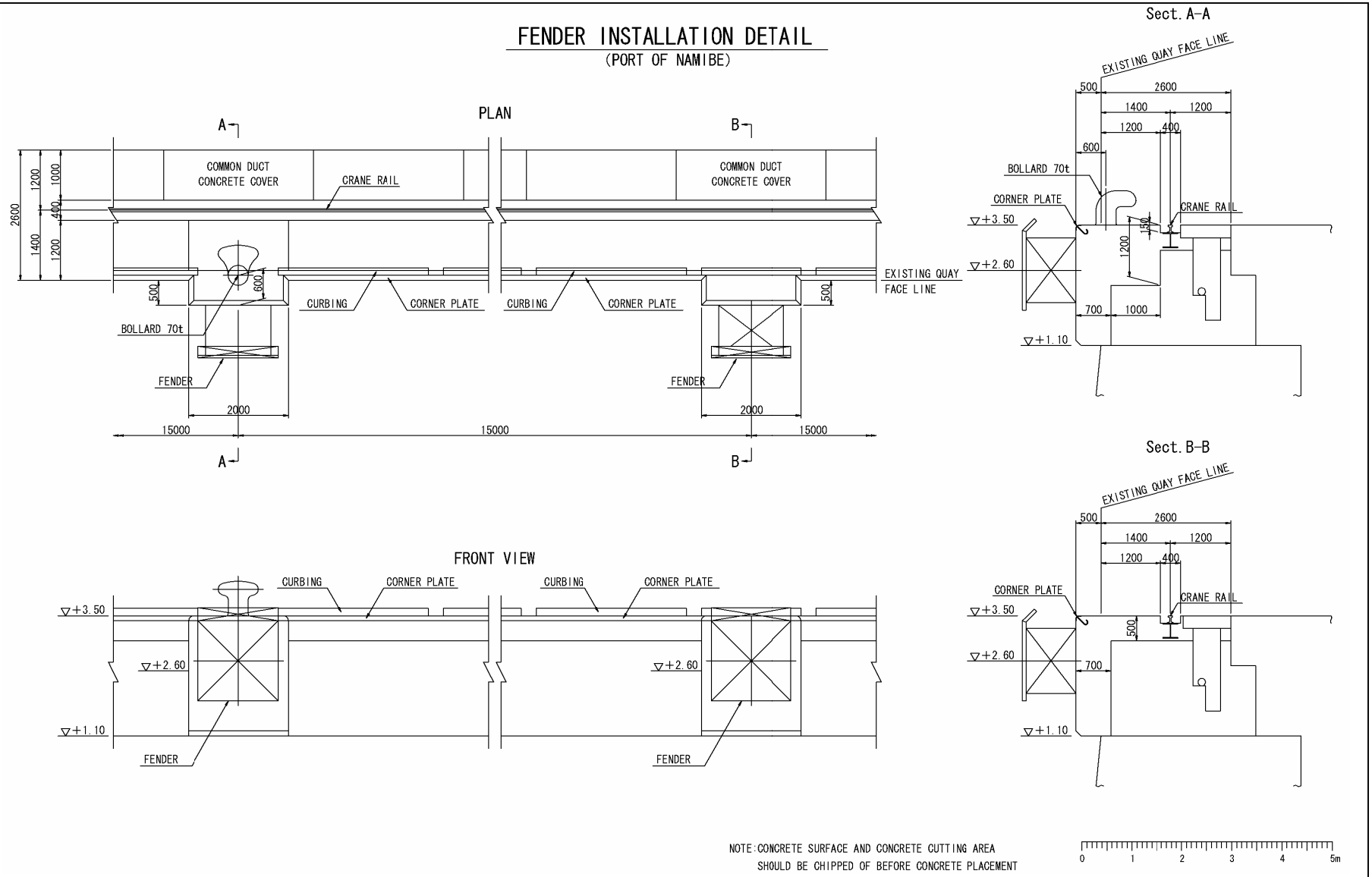


Figure 2-2-3(22) Fender Installation in Port of Namibe

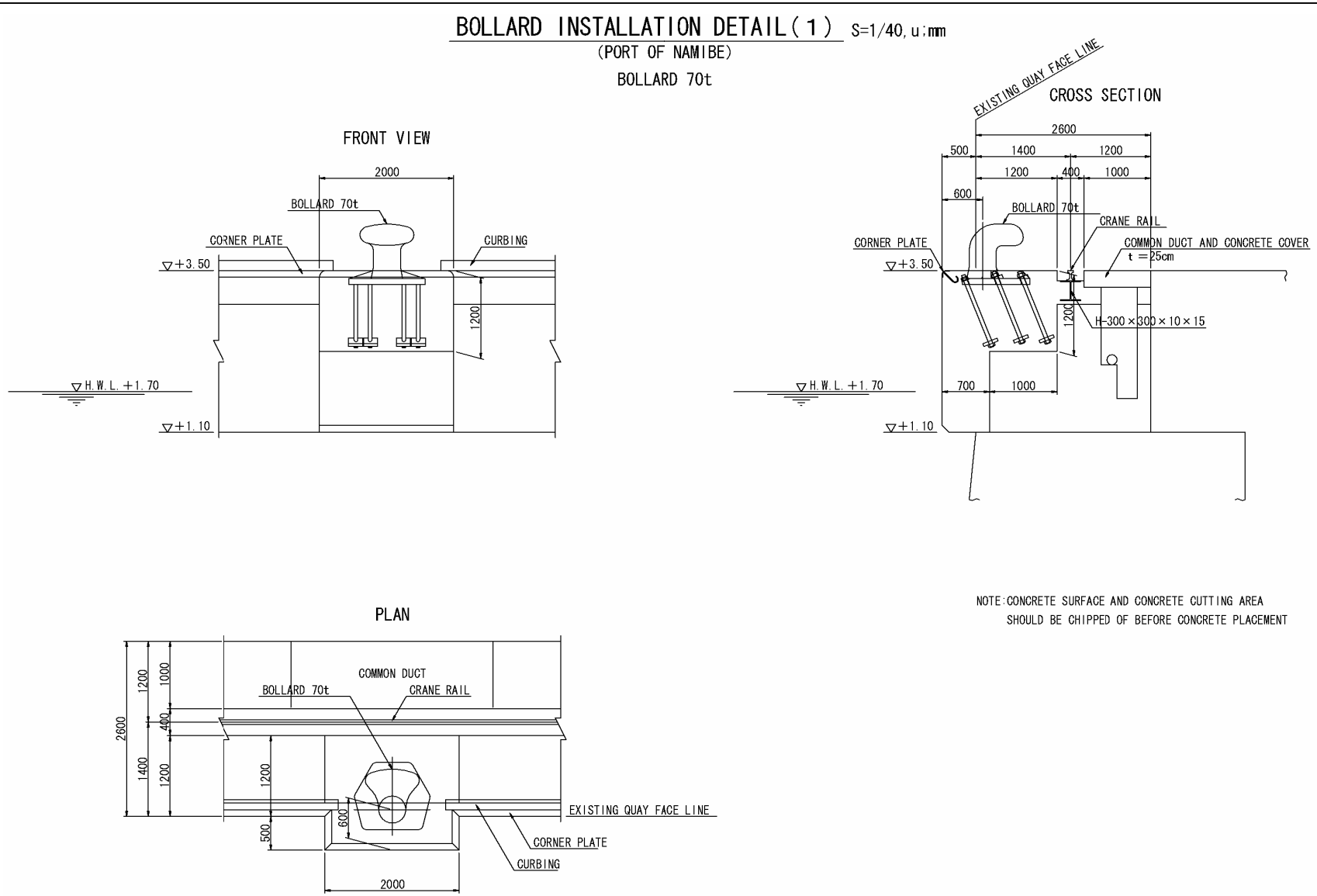


Figure 2-2-3(23) Bollard Detail in Port of Namibe

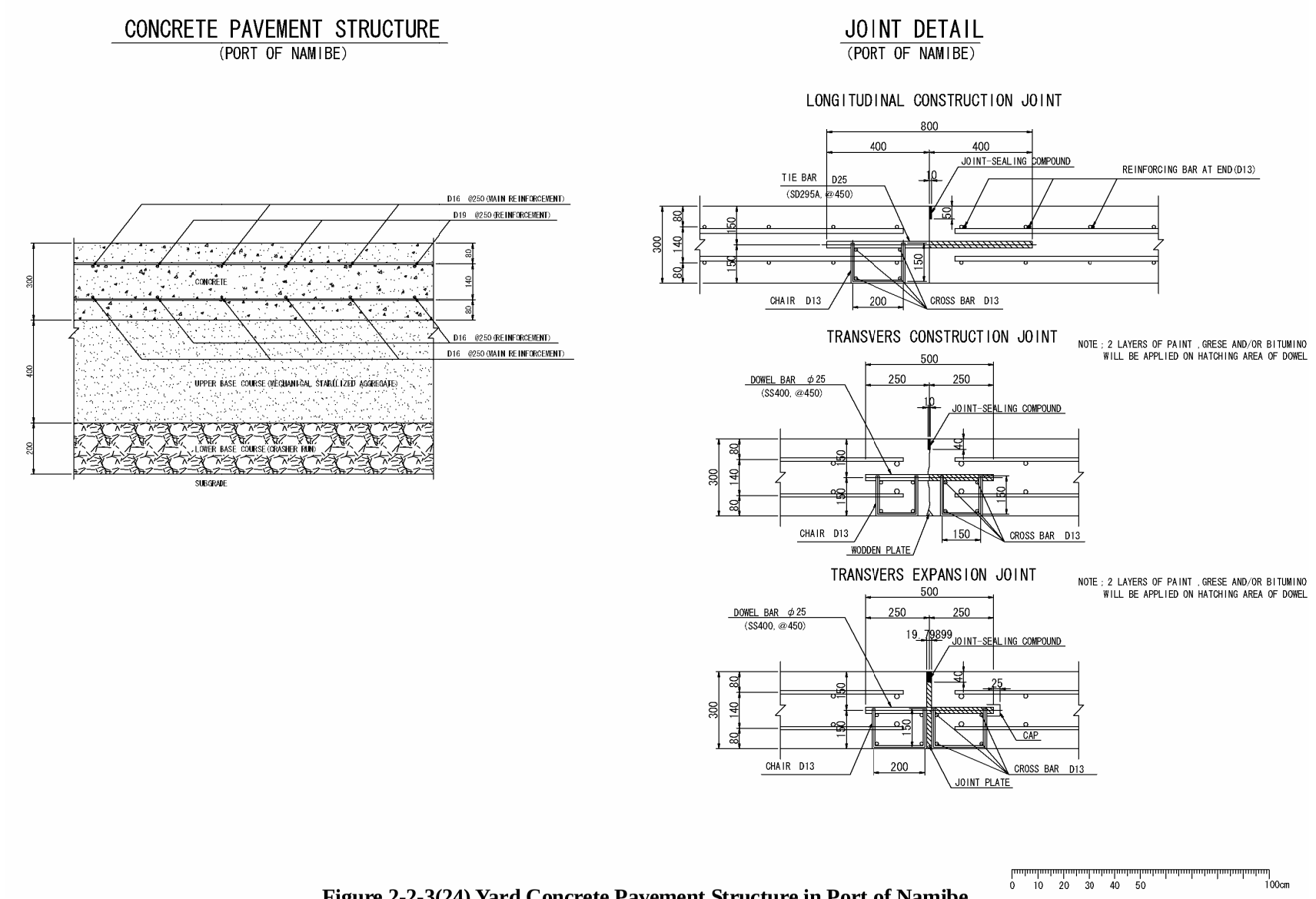


Figure 2-2-3(24) Yard Concrete Pavement Structure in Port of Namibe

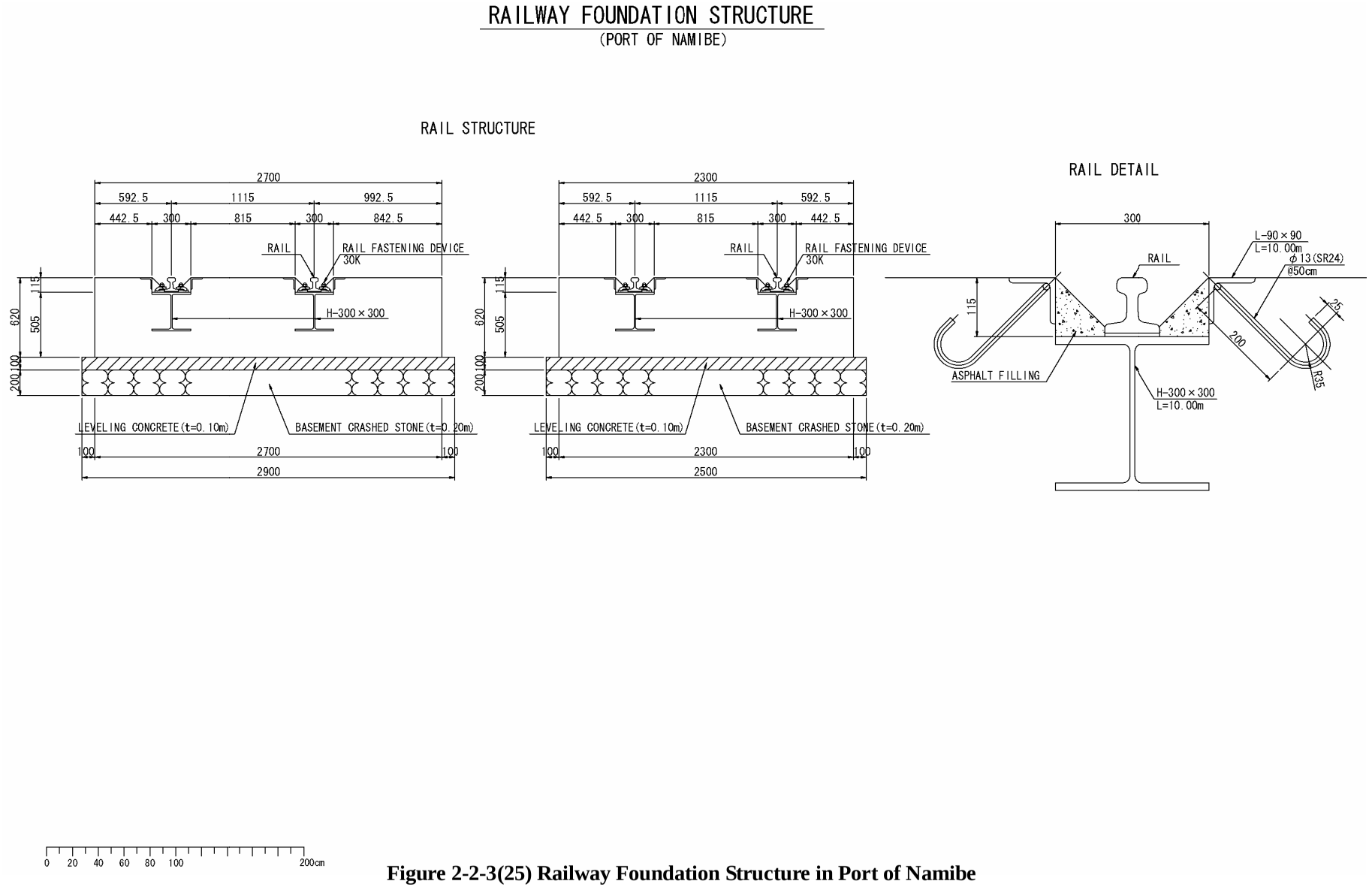


Figure 2-2-3(25) Railway Foundation Structure in Port of Namibe

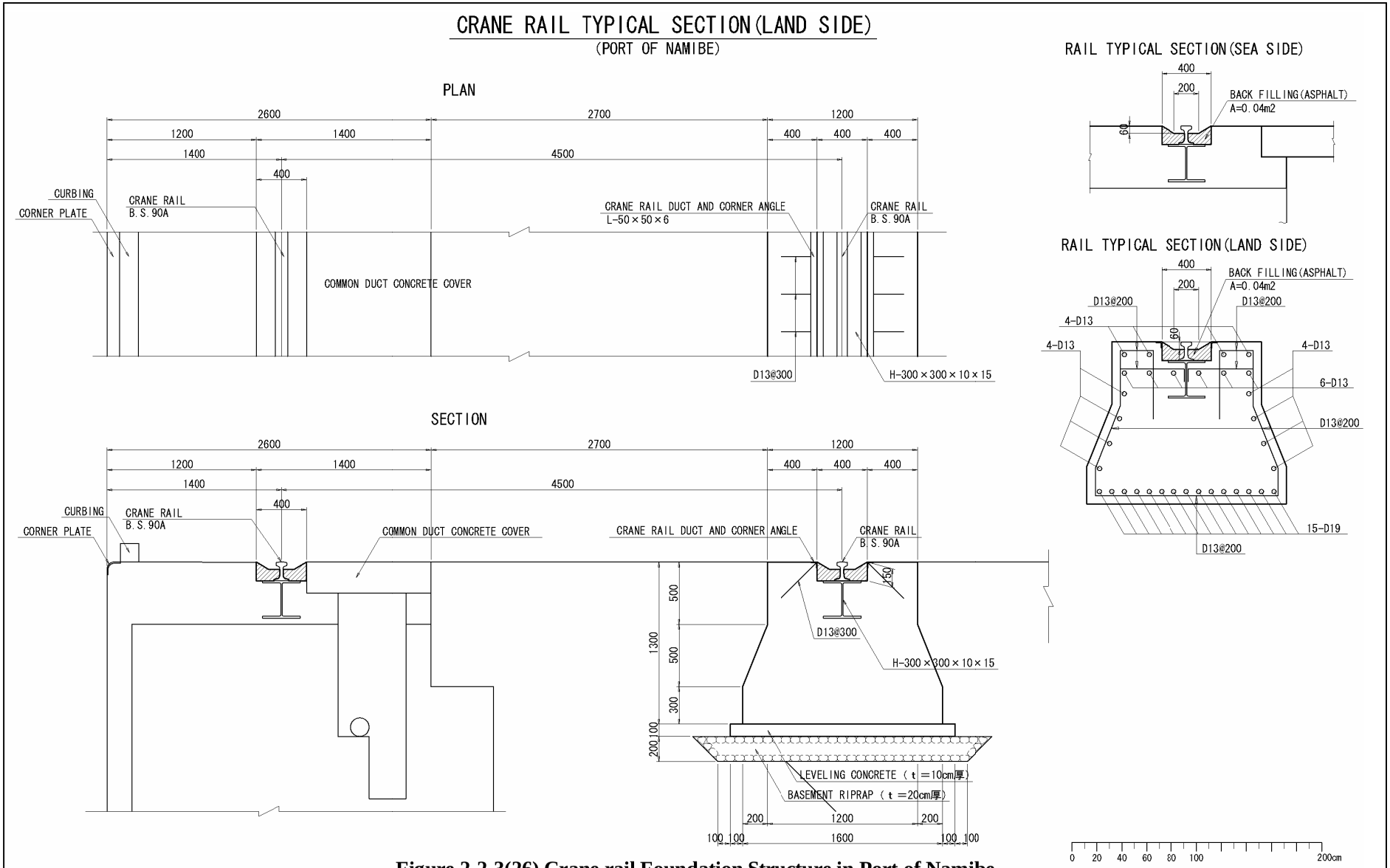


Figure 2-2-3(26) Crane rail Foundation Structure in Port of Namibe

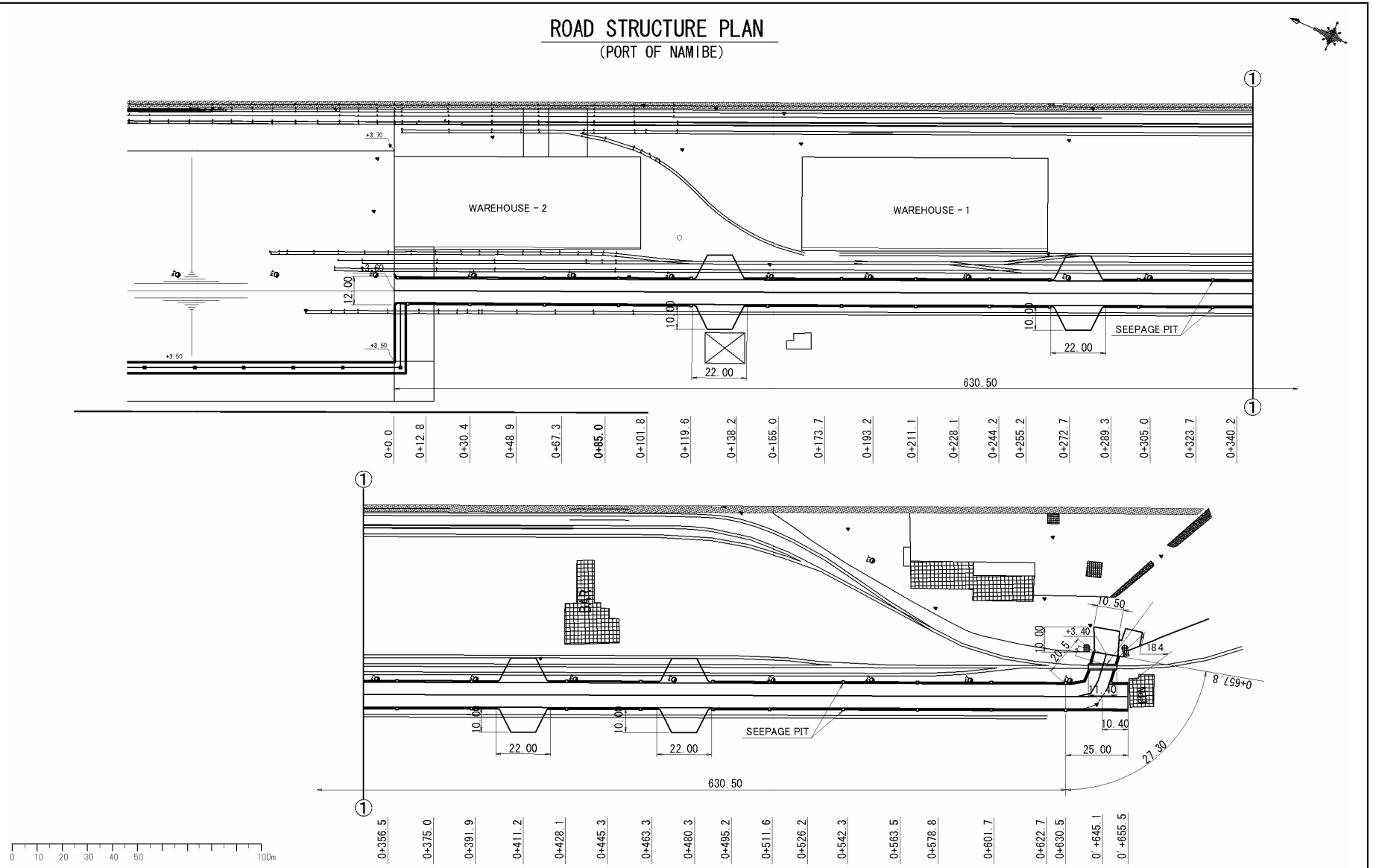


Figure 2-2-3(27) Access Road Layout Plan in Port of Namibe

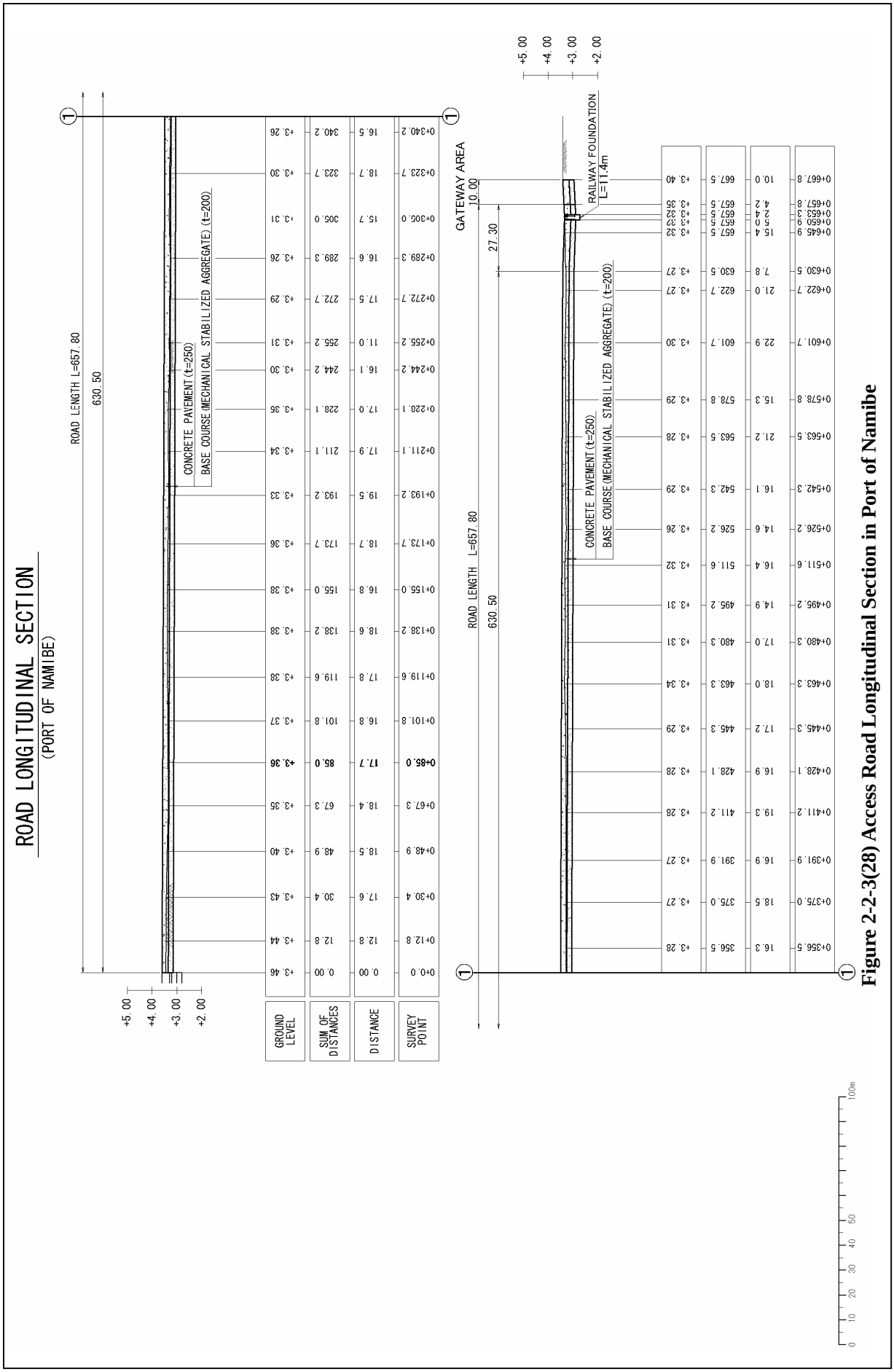
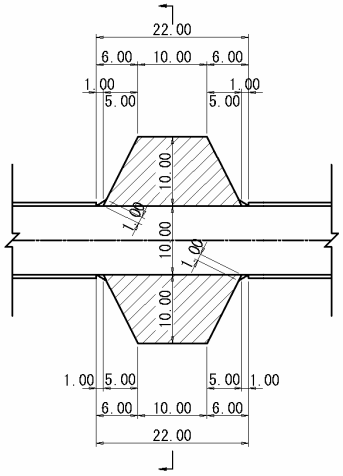


Figure 2-2-3(28) Access Road Longitudinal Section in Port of Namibe

ROAD JUNCTION STRUCTURE
(PORT OF NAMIBE)

ROAD JUNCTION PLAN



CROSS SECTION OF ROAD JUNCTION

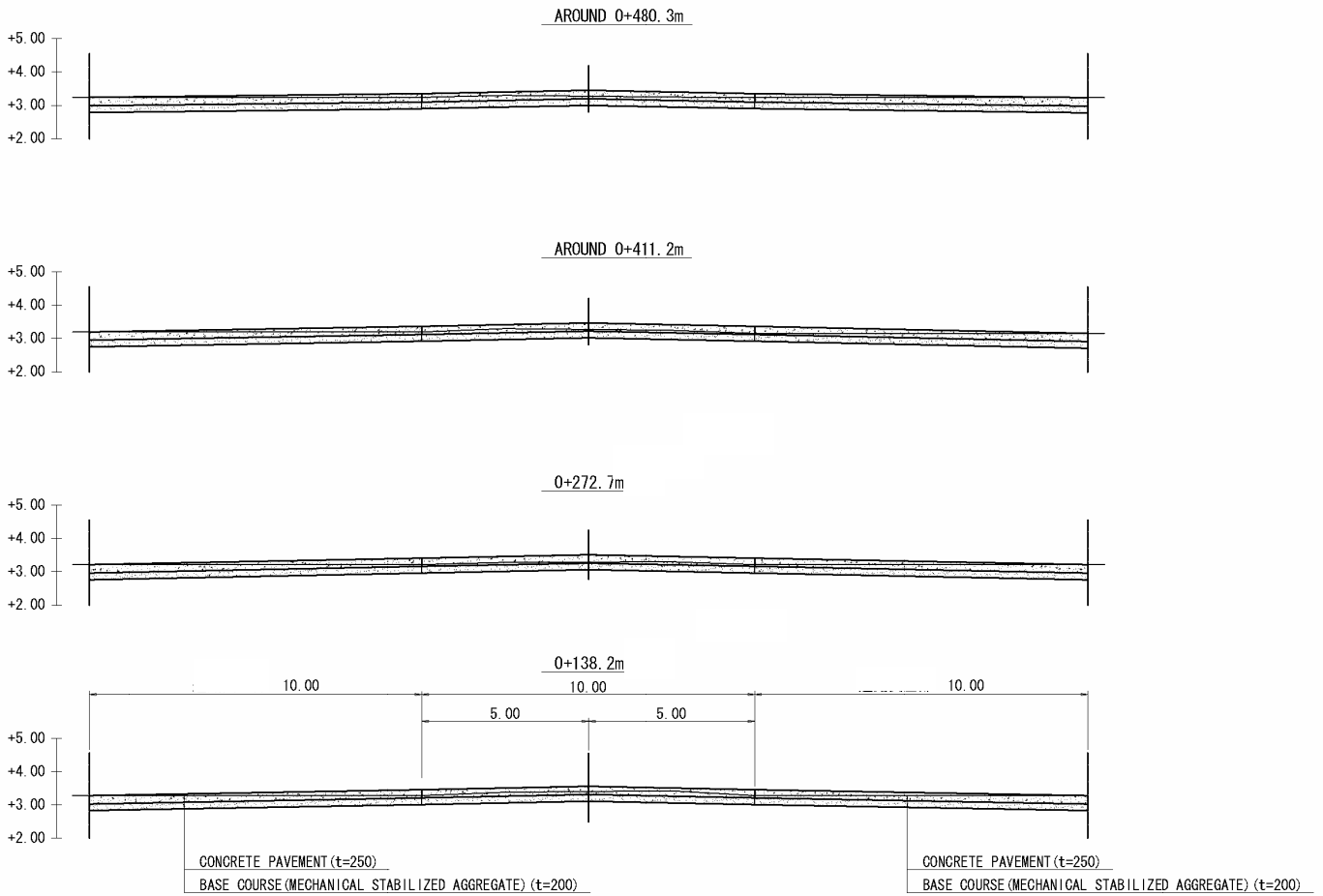


Figure 2-2-3(29) Access Road Junction Structure in Port of Namibe

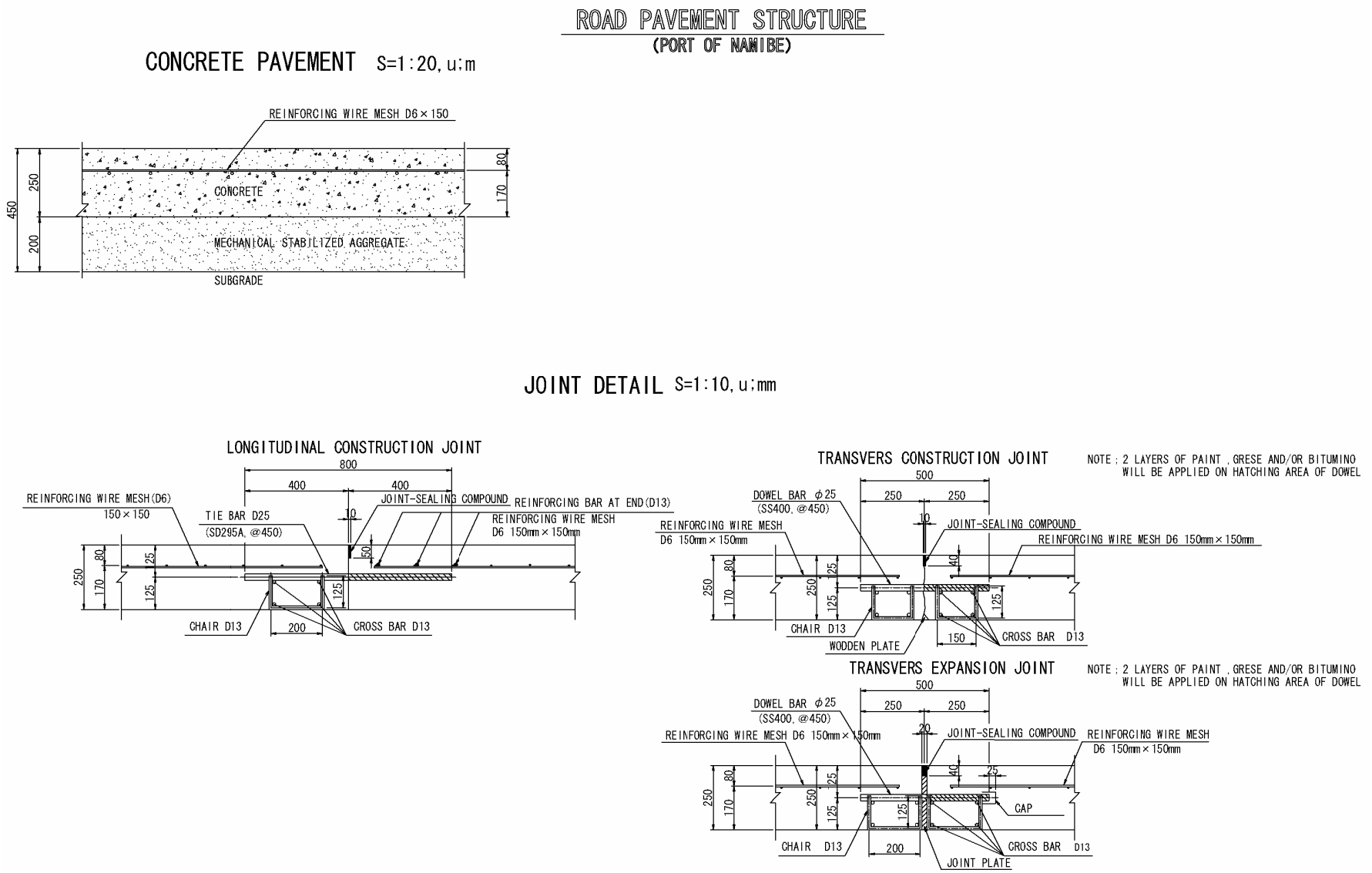


Figure 2-2-3(30) Road Pavement Structure in Port of Namibe

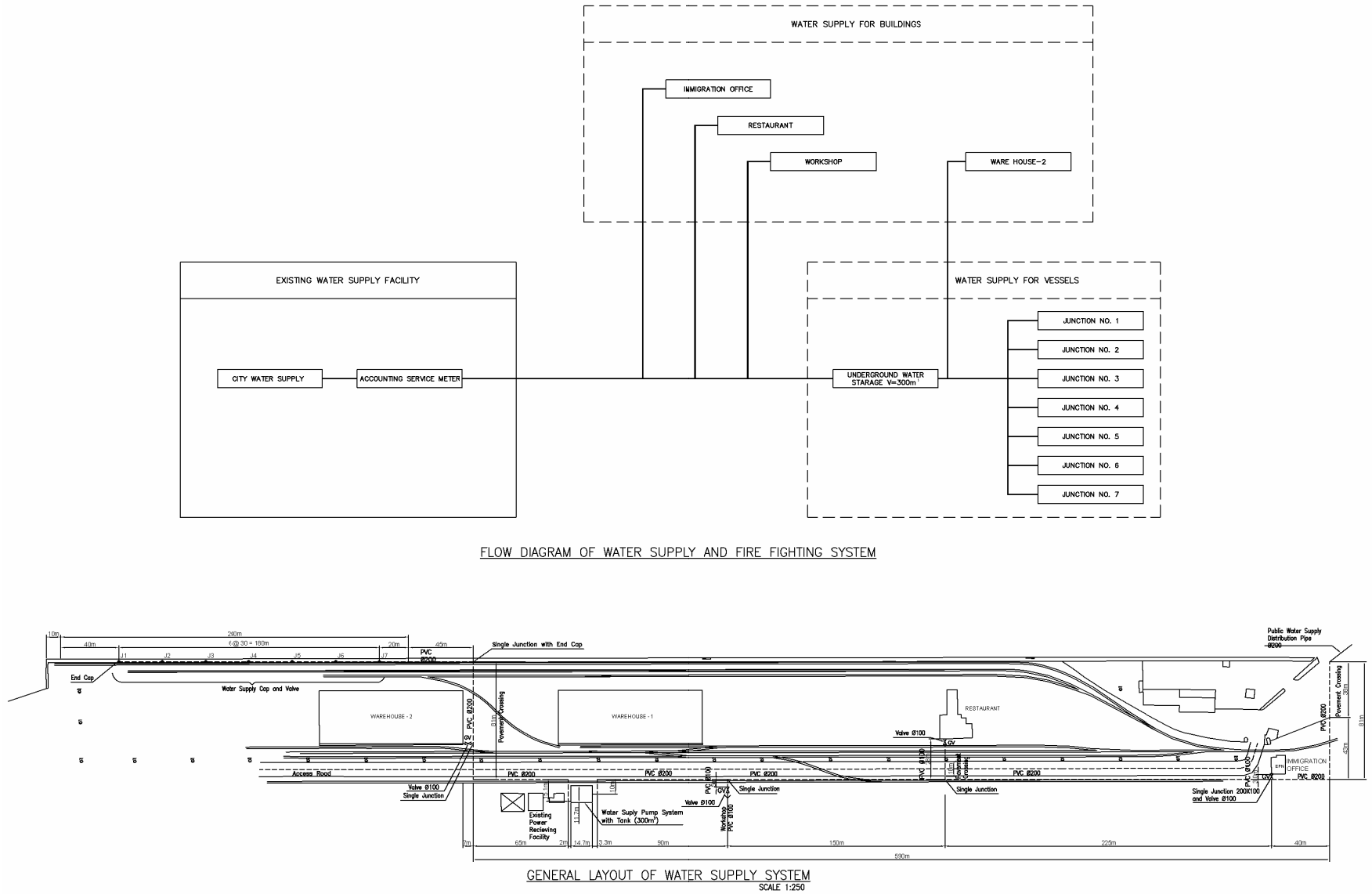


Figure 2-2-3(31) Flow Diagram of Water Supply in Port of Namibe

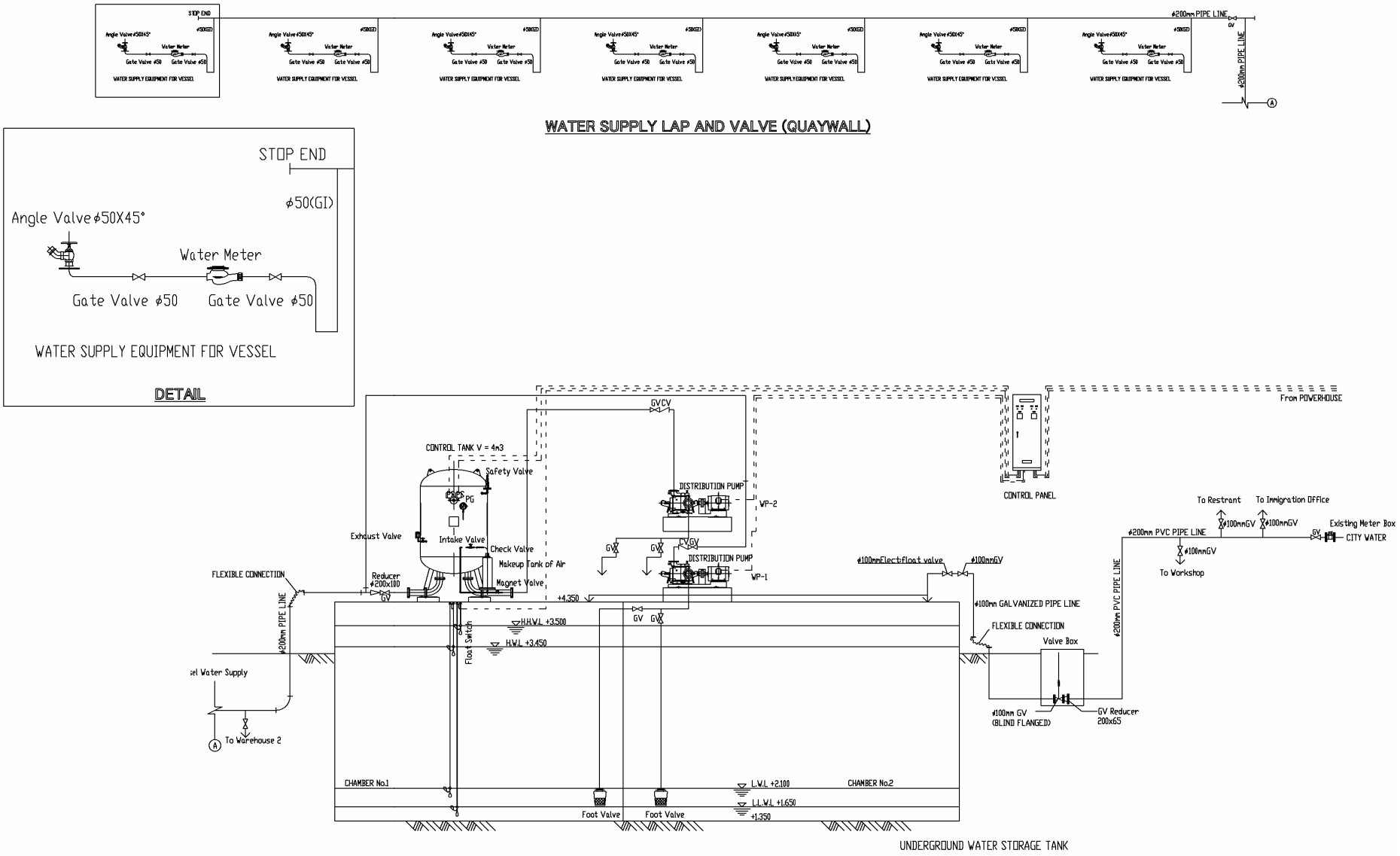
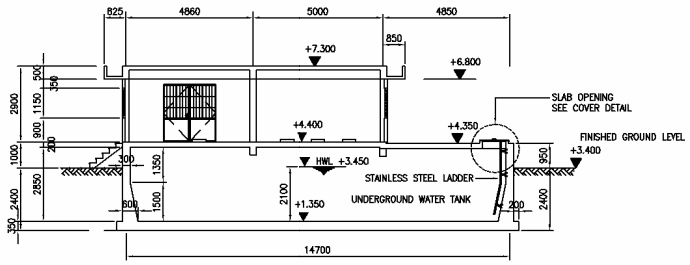
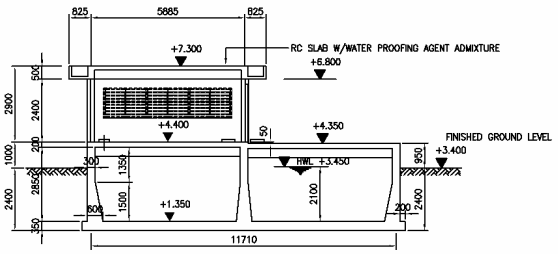


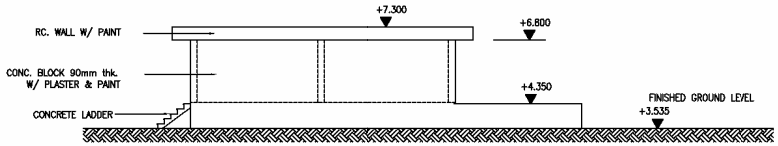
Figure 2-2-3(32) Piping Diagram of Water Supply System in Port of Namibe



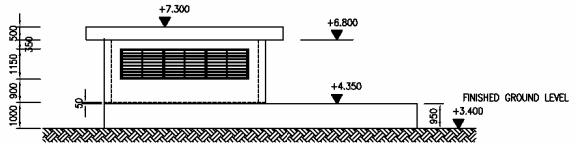
C SECTION
SCALE 1:200



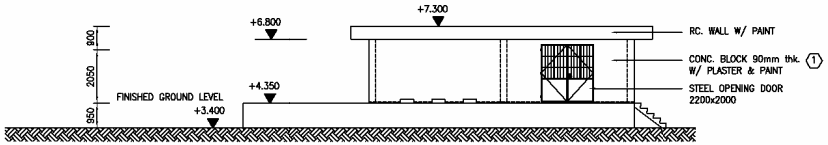
B SECTION
SCALE 1:200



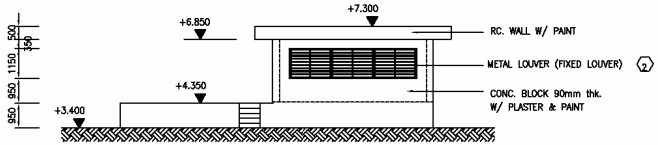
1 ELEVATION
SCALE 1:200



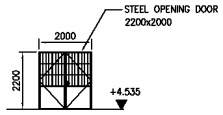
2 ELEVATION
SCALE 1:200

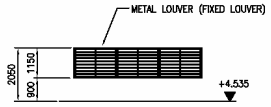


3 ELEVATION
SCALE 1:200



4 ELEVATION
SCALE 1:200





FINISHING SCHEDULE

FLOOR :

PUMP ROOM : STEEL TROWEL FINISH

UNDERGROUND WATER TANK : RC SLAB W/WATER PROOFING AGENT ADMIXTURE AND WATERPROOF TREATMENT COATING.

WALL:

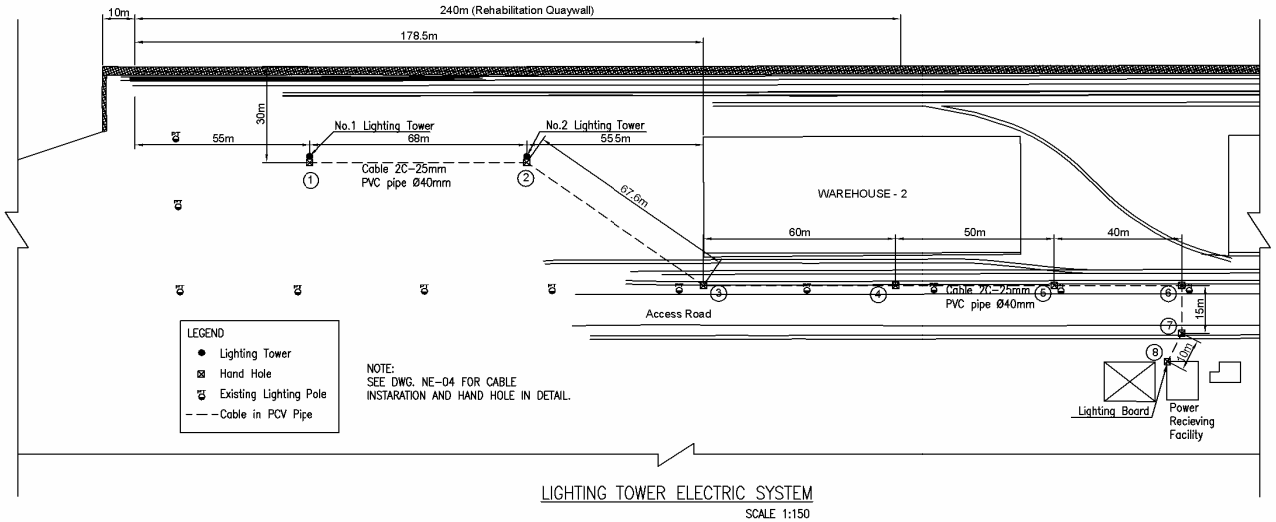
PUMP ROOM : CONCRETE BLOCK W/ PLASTER AND PAINT

UNDERGROUND WATER TANK : RC SLAB W/WATER PROOFING AGENT ADMIXTURE AND WATERPROOF TREATMENT COATING.

NOTE:

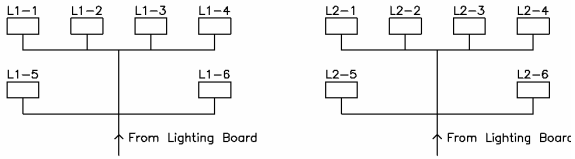
1. ALL DIMENSION ARE IN MILLIMETER UNLESS OTHERWISE INDICATED
2. ALL CONCRETE SHALL BE GRADE "B"

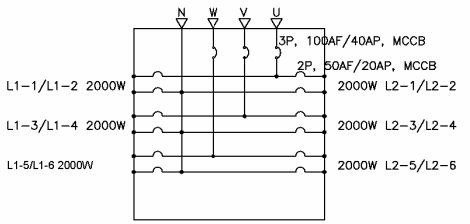
Figure 2-2-3(33) Pump Station for Water Supply System in Port of Namibe



LIGHTING TOWER ELECTRIC SYSTEM

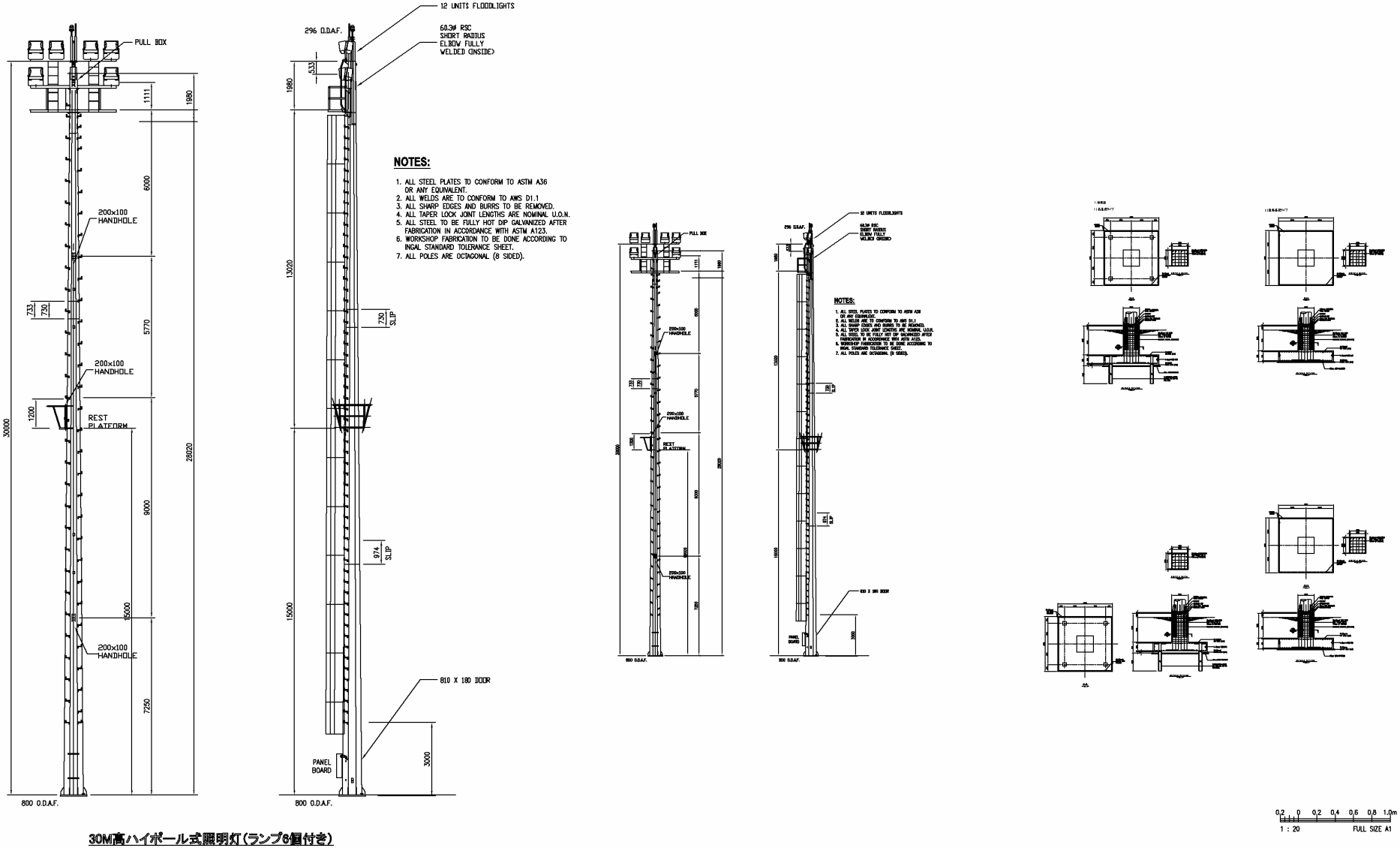
SCALE 1:150





LIGHTING TOWER ELECTRIC SYSTEM

Figure 2-2-3(34) Lighting Facilities Layout Plan in Port of Namibe



30M高ハイポール式照明灯（ランプ6個付き）
30 MTS. HIGHMAST 6 LUMINAIRES
SCALE 1:75

Figure 2-2-3(35) Elevation and Foundation of Lighting Tower of Namibe

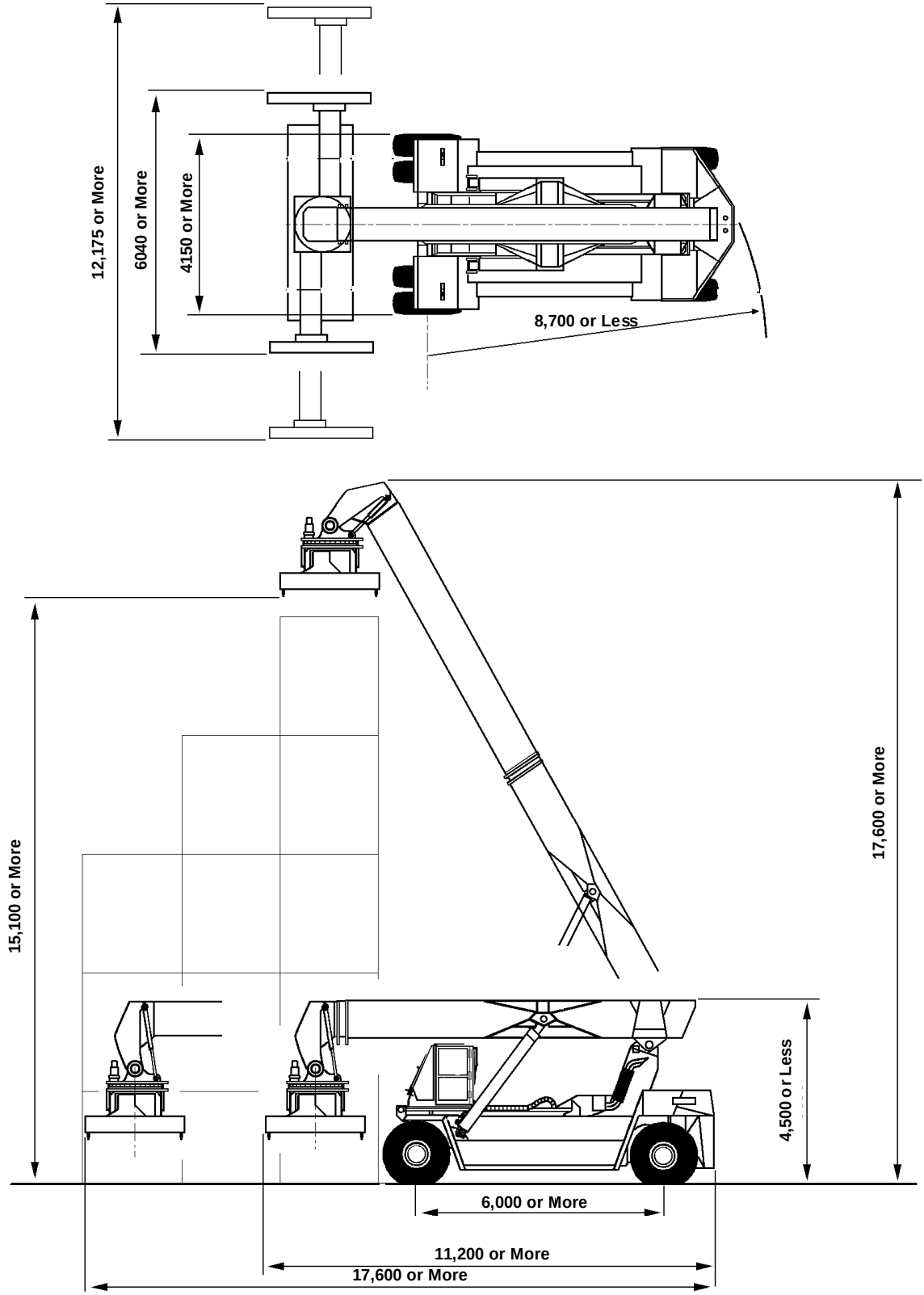


Figure 2-2-3(36) Reach Stacker for Reference

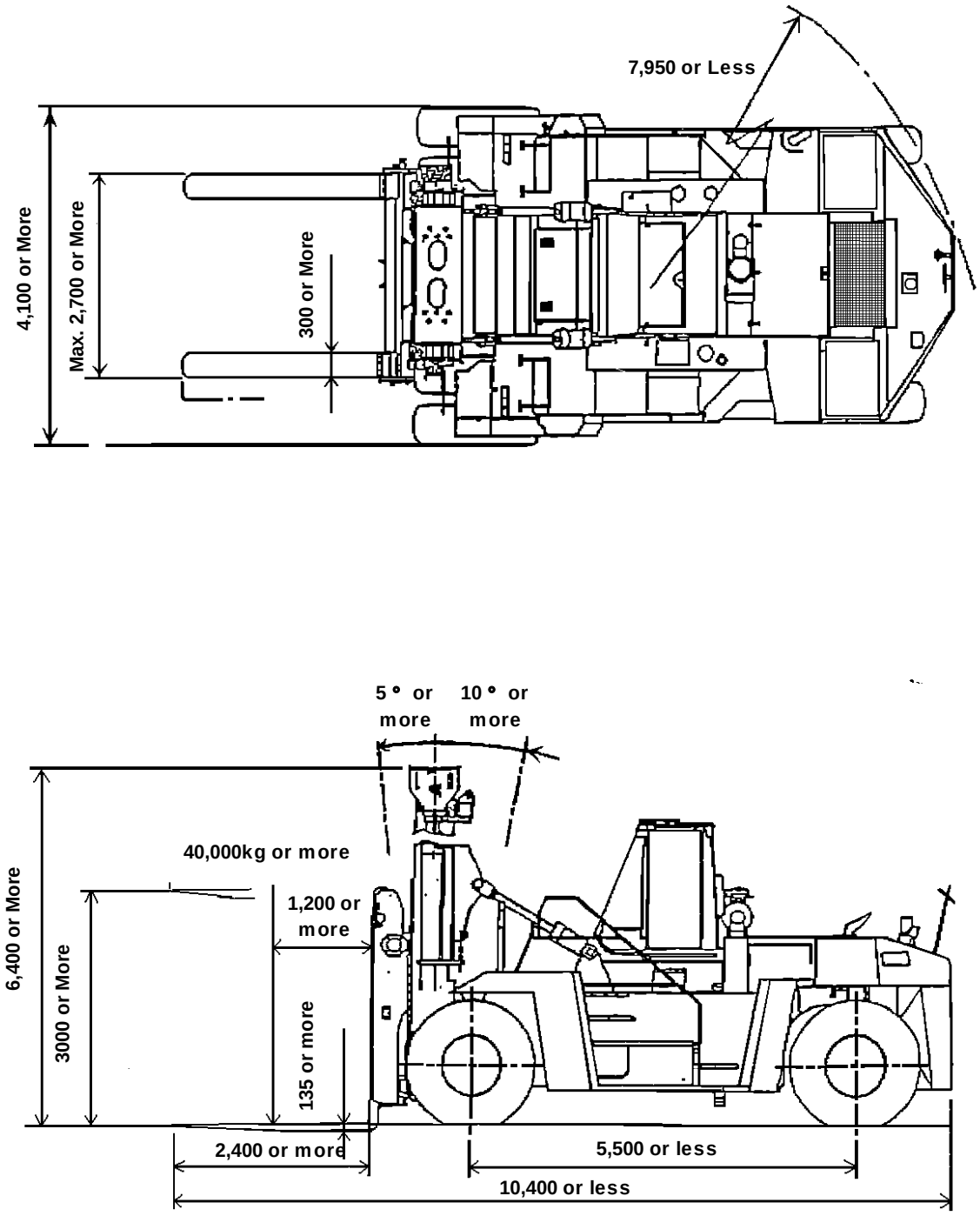


Figure 2-2-3(37) Forklift for Reference

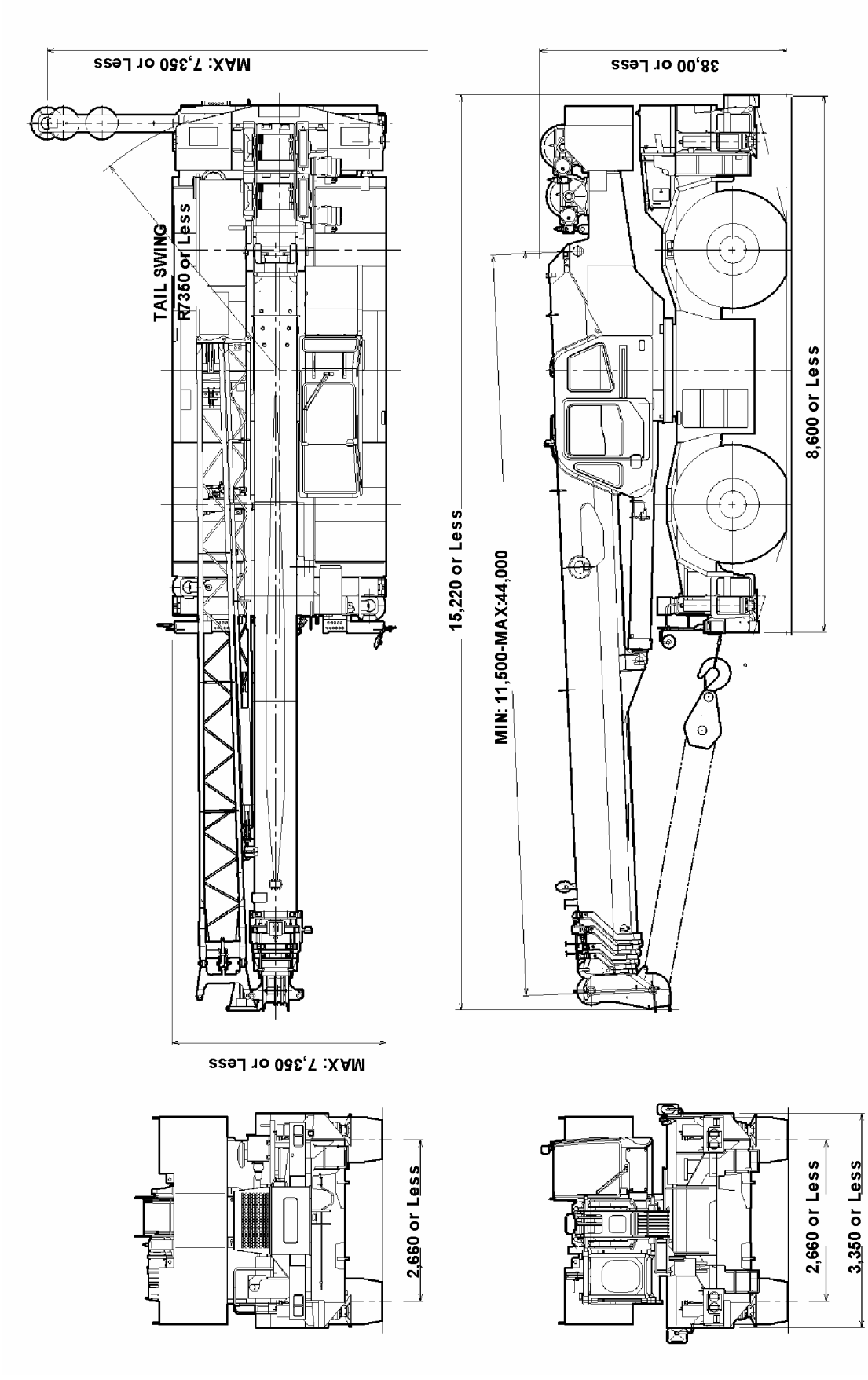


Figure 2-2-3(38) Mobile Crane for Reference

2-2-4 Implementation Plan

This project is conducted under the urgent requirement to cope with increasing port cargo volume and secure the safety for present cargo handling activity and mooring for calling vessel. The plan is made for construction and procurement plan assuming that grant aid project will be done by the Government of Japan. After civil war ended in 2002 the economy of Angola has been rapidly developed due to the immediate improvement of traffic infrastructure by the supports of other donors. According to hearing survey from construction company, however, as it has been 5 years has passed from the end of civil war the large scale construction works have been conducted by leading construction companies of foreign capitals such as Portugal, South Africa and Brazil since local contractors have not enough technical capabilities, fund and shortage of construction equipment.

While the necessary procurement for construction is needed to set up the procurement plan considering construction cost and Angolan economy which has tendency of rising in price. Especially, consumer prices is still going up in combination with the life relying on imported commodity including foodstuff due to the mine risk being expanded throughout inland area and the concentration of population to urban area located coast line where have less minefield in addition to the port congestion at Port of Luanda, capital city. This situation leads to the same situation on construction materials that rely on the import for the most part. According to a leading construction company of foreign capital, the purchasing construction material under the above circumstance has a lot of risk during construction period therefore, they purchase construction material and equipment project by project from overseas.

With the above, it is important to study construction method, procurement plan for material and equipment, preparing schedule, quality control program considering the difficulty of safety aspect to use existing port, reduction of construction period and procurement of material and equipment and conduct construction works under proper standard of construction and construction supervision.

2-2-4-1 Implementation Policy

(1) Construction Policy

1) Specific Consideration

This project is the construction work to be carried out in the existing ports where are actively in use and the securement of necessary container yard area becomes difficult by recent strong container demand. Therefore, this improvement works are inevitable to give some impacts on the functions and activities of present ports during construction period. It is important to put emphasize on the safety first and shortening construction period as possible.

2) Simultaneous Construction of Two Sites

It requires reduction of construction period due to the urgent construction work therefore, the simultaneous construction work in Port of Lobito and Namibe shall be carried out and attain the reduction of construction period. Although the purchasing of construction material will be influenced by port condition in Angola when they are imported, it takes minimum 16 months for each construction site.

3) Local Consultant and Construction Company

It is supposed that there are no consultants who are able to do quality control, survey and construction management in Lobito and Namibe. There are consultants who are able to do a part of quality control, survey and construction management in Luanda. Foreign capital and Angolan construction companies are working as project base in Lobito area. And, some Angolan construction companies reside in Namibe.

4) Necessity for Dispatch of Technical Engineer

Dispatch of concrete pavement worker, supervisor and construction equipment operator will be needed.

5) Implementation System of Government of Angola and Specific Construction Policy

In the result of field study, the implementation system of Government of Angola for the improvement works of Port of Lobito and Namibe and the construction policy shall be decided as follows.

(a) Port of Lobito

The implementation system for this project of Port of Lobito E.P. is shown at Table 2-2-4-1.(1). And specific construction policy is shown at Table 2-2-4-1(2).

Table 2-2-4-1.(1) Implementation system for This Project (Port of Lobito)

Implementation Content of Project	Organization of Port of Lobito
Counter Part	Director General
The Person in charge of Assistance Service at Site	Technical Sector Deputy Director General
Implementation of Angola's Obligation	Maintenance/Civil Engineering Sector
Provision of Services for Japanese Company	Economic/Administrative Deputy Director General
The Department in charge of Security at Temporary Yard in the Port Guard for Japanese in Working Hour	Security/Guard Sector

Table 2-2-4-1.(2) Construction Policy at Port of Lobito

Prior Condition (Element)	Construction Policy
①Cargo handling activity is carrying out at project site of No.7 and No.8 berths area and container yard behind the berth which is narrow area. There are many containers stacked at the container yard in the project site. And some H-piles which will be the obstacle of construction is observed.	1) Construction works will be commenced after Port of Lobito relocates containers and demolish H-pile. 2) Port of Lobito has purchased a bland-new reach stacker and has planned 5-6 stacks height from 3 stacks, also is considering to move container inland deposit area located at south ward from Port of Lobito.
②Temporary yard will be prepared at east side of project site. There are granaries which are rented to private company and work shop for crane behind the temporary yard area.	3) Improvement works will be commenced from No.7 berth because of useful berth handing over to port. 4) Safety measure is needed to restrict the speed of construction vehicles. 5) As existing buildings in temporary yard can not be demolished, the traffic plan and guide of cars have to be planned in order to cope with the safety considering impact to existing warehouse by the construction works. When setting up construction period unlike the new ordinary construction this construction work will be enforced to stop working days due to the active port activities. Therefore such working procedure has to be planned. 6) Project is divided into two sections and first section hands over when complete this section and 2nd section will follow then.

③Water and power lines are laid under the ground of project site and water side of quay.	1) On construction, it is needed to consider location of water pipe and power cable.
④Three main gates to access north quay are adjoined to project site. Therefore, construction vehicle, inner port vehicle and general traffics will be congested each other and the traffic safety is uncertain.	1) The placement of guide for cars is necessary in order to prevent traffic accident by the congestion of existing cargo handling equipment, construction vehicle and construction equipment.
⑤Enough disposal area for construction debris is located at north side of port property. Construction vehicle and cargo handling equipment cannot be helped congesting each other caused by traffic line from site to disposal area.	2) It is necessary to specify gate use rules considering vehicles traffic lines in order to secure the safety of vehicles congestion in addition to placing guide for cars at three gates. 3) Especially, enough safety measures are required for the traffic from project site to disposal site since the vehicles have to move through port activity area.
⑥Counter measure against fugitive dust is needed during construction period because fugitive dust generated by vehicles get in and out of port is recognized as social problem.	1) Countermeasure for water sprinkling in the project site and construction vehicles and the speed limitation of the vehicles are required.
⑦In the improvement works for quay wall, appropriate water depth same as the depth before the work have to be kept since ships are going to use even after the work.	1) With the demolition of existing quay wall, in order not to damage to water depth in front of quay wall by falling down of concrete debris, the installation of preventive facilities is necessary. 2) The sounding survey to check whether designed depth is kept will be carried out before construction commencement and after completion.
⑧Electric power outage is about 23 % throughout a year judging from electricity consumption.	1) In order not to affect any trouble to construction works by electric outage, the preparation of generator is necessary.

(b) Port of Namibe

Implementation system for this project of Port of Namibe E.P. is shown at Table 2-2-4-1.(3). And specific construction policy is shown at Table 2-2-4-1(4).

Table 2-2-4-1.(3) Implementation system for This Project (Port of Namibe)

Implementation Content of Project	Organization of Port of Namibe
Counter Part	Director General
The Person in charge of Assistance Service at Site	Research / Planning / Finance Department
Implementation of Angolan's Obligation	Production Department
Provision of Services for Japanese Company	Marketing / Insurance Department
The Department in charge of Security at Temporary Yard in the Port Guard for Japanese in Working Hour	Security / Guard Department

Table 2-2-4-1.(4) Construction Policy at Port of Namibe

Prior Condition (Element)	Construction Policy
①Working efficiency of No. 3A berth is very high caused by deep water. Also working efficiency is high at container yard behind the apron. Many containers are stacked at project site. But, container handling equipment are limited.	1) Construction works will be commenced after Port of Lobito moves containers. 2) Port of Namibe considers that containers will be stacked at open space near the gate. And inland deposit site will be used for disposal site for construction debris. 3) It is to be desired that construction work will be commenced from north end of quay wall in order to make less influence against cargo handling work. 4) Safety counter measure is needed to secure the speed of construction vehicles. 5) Construction work will be carried out with safety considering existing warehouse to be in the hands of port and

	arrangement guide for cars. 6) In the present, project site is used for cargo handling activity, the construction site can not be enclosed for exclusive use. Project is divided into two sections and first section hands over when complete this section and 2nd section will follow then.
②There are water pipe line and power cable under ground of the project site. But, those pipes and cables are out of order now. Water pipe line and pit are distributed under the inner port road.	1) On construction, it is needed to consider location of water pipe and power cable.
④The port is elongated and one inner port road is passing middle of port. Port of Namibe has only one gate. Therefore, it is concerned safety and congestion of construction, port and private vehicles. ⑤Disposal site is located about 8 km north side from port. This site is expected to be future inland deposit for container.	1) Guide for cars will be arranged at important point in order to prevent traffic accident. 2) Guide for cars will be arranged near the gate area in order to keep safety. 3) Temporary road will be constructed alongside inner port road as the safety measure.
⑥ On improvement works for quay wall, appropriate planned depth has been secured in order to berth ship after improvement works.	1) With the demolition of existing quay wall, in order not to damage to water depth in front of quay wall by falling down of concrete debris, the installation of preventive facilities is necessary. 2) The sounding survey to check whether designed depth is kept will be carried out before construction commencement and after completion.
⑦Although, it is not taken long time to recover since port has a generator for electric outage, it happens every 4 or 5 hours in a day.	1) In order not to affect any trouble to construction works by electric outage, the preparation of generator is necessary.

(2) Procurement Policy

1) Result of Field Survey

As this project is large scale one, it is supposed to be expensive construction cost because most of material such as cement, aggregate and steel and construction equipment cost will be imported. Therefore study team made interview for the unit price not only to Angolan construction company and material supplier but also South African's company. As the result of interview, study team found the following procurement conditions for construction material and equipment to carry out this project.

(a) Foreign construction companies such as Portugal, South Africa and Brazil are engaged Angolan large scale construction projects.

(b) It is difficult to construct large scale project by local construction companies that have not enough techniques, machineries and engineers.

(c) Most of the construction materials and equipment are imported with project by project base. It needs sufficient care for the procurement of construction materials and equipment due to the remarkable price escalation and unstable economy in Angola. Consumer price has increased to 40% in 2004, 24% in 2005 and 13% in 2006 as the ratio to the previous year. In the interview to hardware shop, construction material price was increased 10% to 20% as the ratio to the previous year.

(d) Construction materials and equipment are procured from South-East Asia including Singapore considering condition of procurement.

(e) The receipt of import commodity may have been taken three months in Port of Luanda due to always saturated condition of handling cargos in the port..

(f) There are three quarries with crushing and asphalt plant in about 30 km distance from the Port of Lobito. And the road between Benguela and Lobito has been improved. There are two quarries around the Port of Namibe, one is located at 3 km from project site near the Namibe air port and another one is located at 20 km from project site where is north ward from Saco Mar. And also, there is one quarry in 80 km from project site alongside road to city of Lubango. But it is not useful due to the distance required two hours from project site. At present, no road is constructed and no asphalt plants are there.

(g) There are no concrete plants near the Port of Lobito and Namibe. Therefore concrete unit price is very high because local subcontractor has to prepare concrete plant when they are awarded by the Japanese construction company.

(h) Usually Cement produces by Nova Cimangola, but Nova Cimangola does not produce cement now. Nova Cimangola and construction companies import cement form Portugal, China and Ukraine to cope with recent construction boom. Angola Press wrote up shortage of cement titled “Industry Minister Defends Increase of Cement Production” on March 27, 2007.

(i) Concerning procurement construction materials and equipment from South Africa, we have to consider that South Africa will become construction boom due to his host country of the next world cup of foot ball.

With the above mentioned conditions, study team decides procurement policy for this project as follows.

2) Point of Special Reference

Concrete mixing plant will be prepared at both sites of Port of Lobito and Namibe. Asphalt concrete pavement was once studied to use for inner port road in Port of Namibe, but concrete pavement was proposed because construction cost becomes high due to the installation of both concrete plant and asphalt plant.

3) Local Consultant and Construction Company

Foreign capital construction company will be selected as subcontractor because local construction company has not enough techniques except the employment of local labor.

4) Procurement from Third Country

Construction materials and equipment that are not possible to purchase locally or in shortage situation will be procured from the third countries, South Africa, South East Asia and Japan in order and timely procurement to meet with construction schedule. However procurement from Japan will be kept to the minimum due to the expensive price.

5) Dispatch of Engineers

In procurement of cargo handling equipments, it is ideal to procure the same make of existing one in order to keep it with easy maintenance but if it is difficult caused by cost, the operation training may be done. And, it is considered that instructors for assembling and handling of mobile crane and cargo handling equipment will be dispatched to the port.

6) Implementation System of Government of Angola

Port of Lobito E.P. and Port of Namibe E.P. are believed to arrange implementation system also for procurement as shown at Table 2-2-4-1.(1)(3).

2-2-4-2 Implementation Conditions

(1) General Conditions and the Local Features

The economy of Angola is still on the way to the development led by strong oil industry and infrastructures such as road construction have been promoted although inflation is getting tougher in recent years. In recent years, infrastructure improvement such as road construction is carrying out in a positive way as inflation is still boosting in Angola. There is a construction boom in the construction industry, but suspended project is not negligible due to shortage of funds. It is hoped for good enough security at project site because the town security situation is deteriorated.

(2) Legal Point of Reference

1) When Japanese visits for the Project

(a) Work Permit

Person who is in charge of this project have to apply work permit to Embassy of Angola in Japan before leaving Japan.

(b) Visa

Persons who visited by work permit have to submit exit visa when person leaving Angola.

(c) International Certificate of Vaccination or Revaccination against Yellow Fever (Yellow Card)

Persons who visit to Angola have to submit “International Certificate of Vaccination or Revaccination against Yellow Fever”.

2) Certification of Environment

Government of Angola has recognized when they request this project that this project have to carry out EIA and have to get certification of environment issued by Ministry of Urban Affairs and Environment (MINUA). All of this procedure will be carried out by MINTRANS and MINUA in the capacity of Angolan responsibility. Government of Angola has recognized when they request this project that this project have to carry out EIA. But Ministry of Transport of Government of Angola issued official letter that EIA study is not needed to study team on May 21, 2007 with the reason that this project is improvement works. Copy of official letter is attached to Appendices 6 References (letter from Government of Angola) (2).

(3) Points of Concern on Construction Work

This project is improvement works of existing ports and content of works are improvement of quay wall and large scale concrete pavement of apron and container yard. In the Port of Lobito, quay wall improvement works is 240 meter in total length and concrete pavement for apron and container yard is about 43,074 square meter in total area. And in the Port of Namibe, quay wall improvement works is 240 meter in total length, concrete pavement for apron and container yard is about 18,210 square meter in total area and inner port road pavement is 7,965 square meter. It is expected to take long time to procure construction materials and equipment at both sites as described before. It takes about 2 and half months to procure and transport materials and equipment and takes 2 months to assemble concrete plant including

trial mixing test. Total construction period for improvement works at Port of Lobito, is taken about 16 months, made up about 6 months for improvement of quay wall, about 7 months for pavement of apron and 10 and half months for pavement of container yard. Total construction period for improvement works at Port of Namibe, is taken about 16 months, made up about 6 months for improvement of quay wall, about 8 and half months for pavement of apron, about 8 and half months for pavement of container yard and about 7 months for water, electric and lighting facilities. As cargo are handled very actively at both Port of Lobito and Namibe, it is necessary to consider against safety, security and prevent burglar during construction period at project sites. Points of concern for project sites are shown as follow.

1) Port of Lobito

(a) Removal of Obstacle and Container at Project Site

Construction will be commenced after removal obstacle and container. According to Port of Lobito, they will stack empty containers from 3 tiers to 5 tiers and / or remove to inland deposit area because the container yard in existing port area is quite limited.

And also, they will remove quay cranes by themselves before commencement work.

Figure 2-2-4-2(1) Containers in Project Site (They will be moved before commencement of construction by Government of Angola)

Figure 2-2-4-2(2) Containers in Project Site (They will be moved before commencement of construction by Government of Angola)

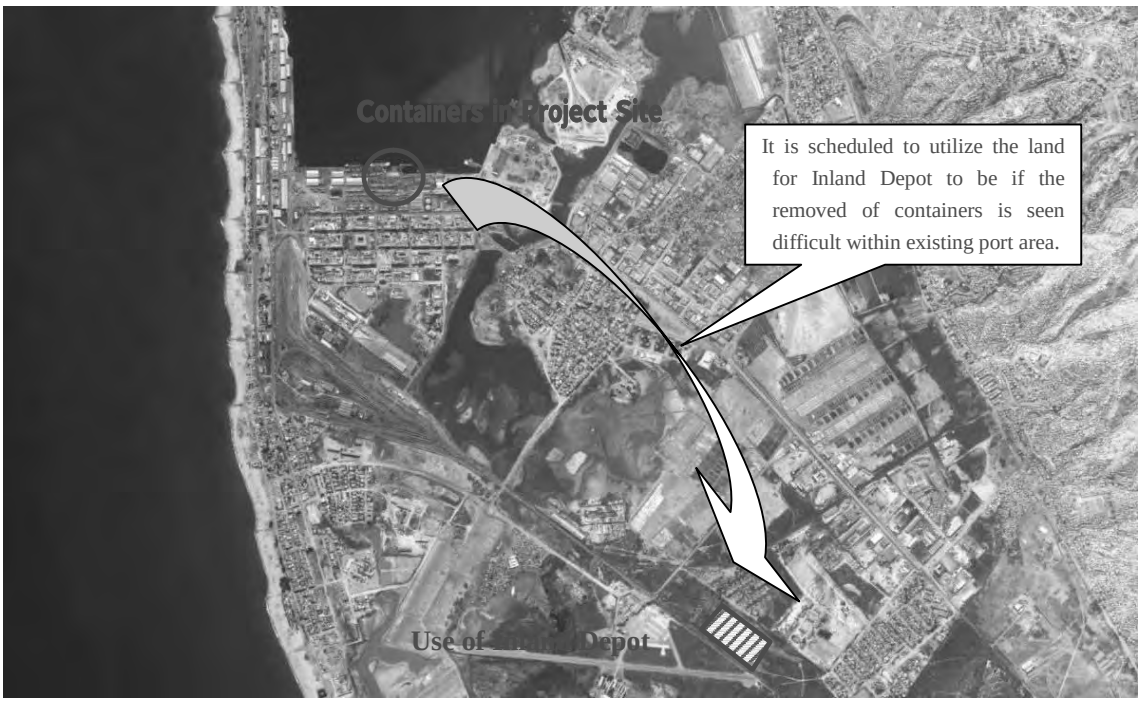


Figure 2-2-4-2(3) Use of Inland Depot

(b) Construction of Temporary Yard and Disposal Area

Port of Lobito will offer temporary yard to be used as site office and parking area of materials and equipment where is located at east side of No.8 Berth. Disposal area for concrete debris and soil disposal will be offered at south ward of port area by Port of Lobito. Port of Lobito approved to use these land where is in port land for disposal area.

Figure 2-2-4-2.(4) Temporary Yard and Surplus Disposal Site

(c) Considered Traffic Control for Safety in Construction Period (Traffic Circulation Planning and Allocation of Traffic Control Staff)

Following traffic circulation planning of construction vehicle will be assumed considering port user's and general vehicles. It is ideal to arrange 5 traffic control staff will be allocated to control congested vehicles.

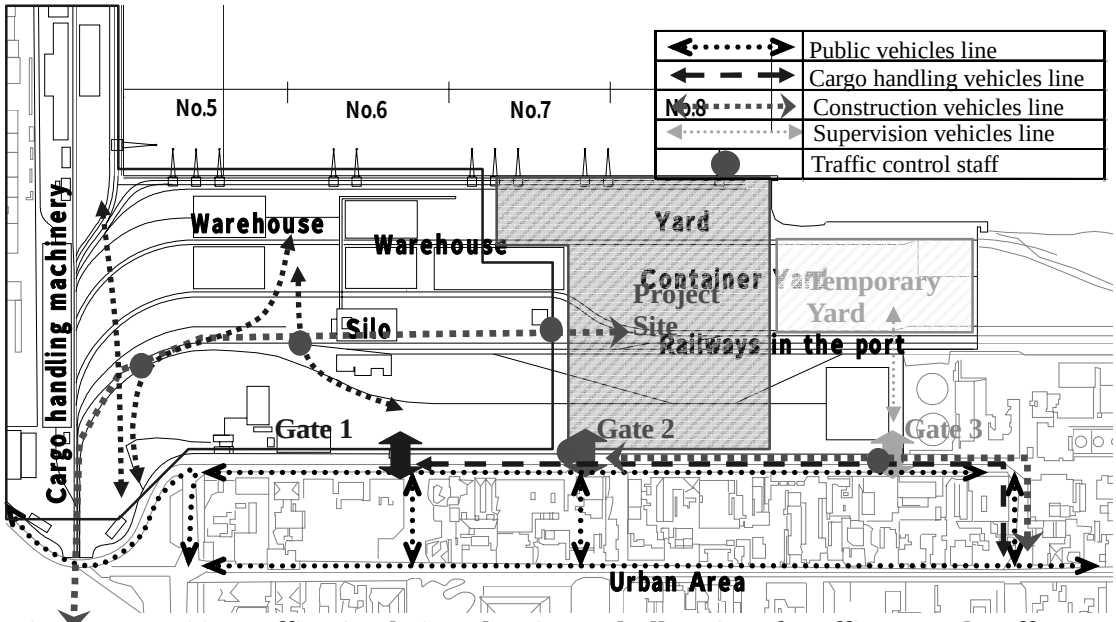


Figure 2-2-4-2(5) Traffic Circulation Planning and Allocation of Traffic Control Staff

Figure 2-2-4-2.(6) Gate behind Project Site and Public Road near Port

(d) Minefield

Caution is required as there are minefields in Catumbela where is located 10 km south from Port of Lobito.

2) Port of Namibe

(a) Removal of Obstacle and Container at Project Site

Construction will be commenced after removal container and quay crane. According to Port of Namibe, they will move containers to open area near main gate and inland deposit area in 8 km north from Port of Namibe. Disposal area for concrete debris and soil disposal will be offered at inland deposit area by Port of Namibe.

Figure 2-2-4-2.(7) Containers in Project Site （They will be moved before commencement of construction by Government of Angola）

Figure 2-2-4-2.(8) Containers and Scrap Metals will be moved to Open Space by Government of Angola

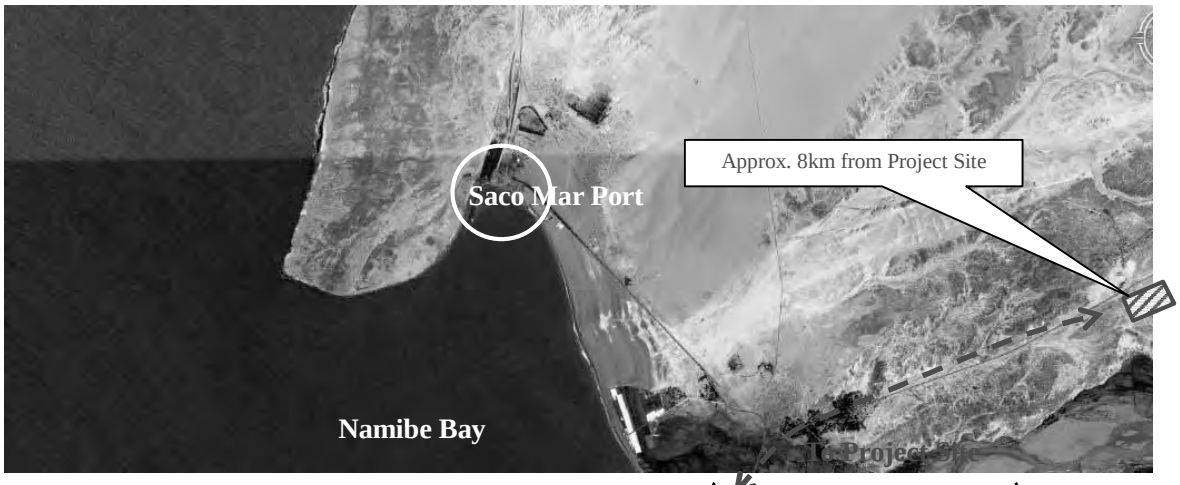


Figure 2-2-4-2.(9) Surplus Soil Disposal Site （Future Inland Depot Site）

(b) Construction of Temporary Yard

Port of Namibe will offer temporary yard to be used as site office and parking area of materials and equipment where is located open space near the main gate. And Port of Namibe E.P. already approved to use.

Figure 2-2-4-2.(10) Location of Temporary Yard

(c) Considered Traffic Control for Safety in Construction Period (Traffic Circulation Planning and Allocation of Traffic Control Staff)

Following traffic circulation planning of construction vehicle will be assumed considering port user's and general vehicles. It is ideal to arrange 6 traffic control staff will be allocated to control congested vehicles.

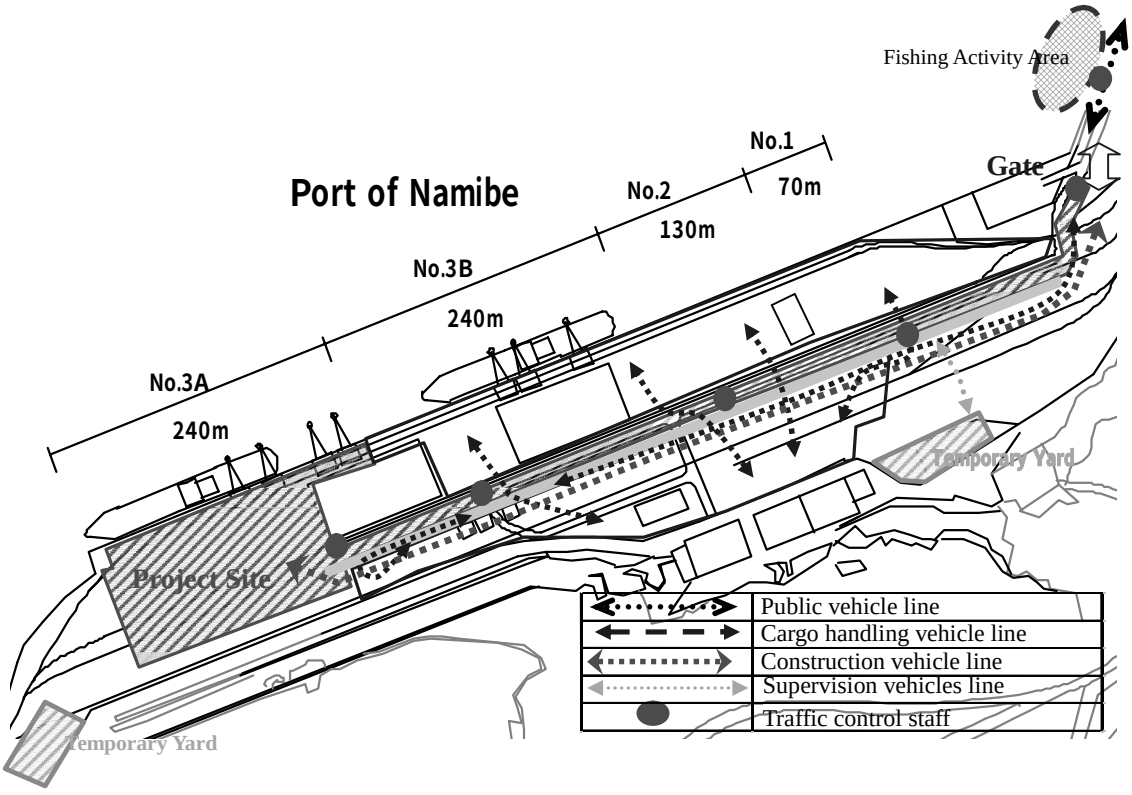


Figure 2-2-4-2.(11) Traffic Line and Traffic Control Staff

(4) Important Matters concerning Procurement

1) Construction Company / Labor

(a) There are foreign capital leading construction company from South Africa, Portugal, Brazil and Belgium in Angola and they are constructing buildings, roads and bridges.

(b) Large scale project (improvement work for Benguela Rail Way) by Chinese aid is carrying out

with their own material and equipment.

(c) Local construction companies have not enough equipments, engineers and techniques therefore it seems difficult to construct large scale project.

(d) Local construction companies concentrate to capital city of Luanda and number of construction companies and material suppliers are getting fewer in the order corresponding to Namibe, Lobito and Luanda.

2) Construction Equipment

(a) There are few construction equipment rental companies in Angola. Foreign capital construction companies procure construction equipment by head quarter based on project.

(b) There are not ready mixed concrete suppliers in south ward from Lobito.

3) Construction Material

(a) It is capable to procure cement and aggregate in Angola but reinforcing bar and wood products are imported from South Africa, Portugal, Brazil and Belgium.

(b) Cement production falls into abeyance in Angola therefore cement is imported now.

(c) Three construction companies have quarries for aggregate production in the vicinity of the Lobito and Benguela where are located about half to one and half hours from Port of Lobito. Also there are three quarries where one is located near the air port, the second one is located north of Saco Mar Port and the third one is located 80 km from Port of Namibe.

2-2-4-3 Scope of Works

(1) Scope of Work Undertaken by the Government of Japan

1) Consulting on detailed design, tendering assistance, and design management, etc.

2) Supply all construction materials and labor required for the construction work on the Japanese side of this project.

3) Implementation of marine and inland transportation needed for construction work and procurement on the Japanese side of this project and the increase premium.

4) Quality inspections required for materials procurement and construction on the Japanese side of this project and

5) With regard to the relevant infrastructure for lighting towers, the basic scope is as follows: all power supplies after the entrainment work on the nearest utility poles to the project site as the boundaries for the responsibility, all water supplies after the water pipes have been laid internally from the project site boundary line, all waste water and telephones up to the overhead cabling within the skeleton.

(2) Scope of Work Undertaken by the Government of Angola

1) To secure land being necessary for the sites of the project and to clear the debris (existing quay cranes, stored containers, existing buildings and other objects) on the project site.

2) To install water supply pipes from the main supply pipes to the boundary of the project site.

3) To supply electricity to the nearest power utility pole to the boundary of the project site.

4) To procure the land of temporary yards and dumping sites

5) To introduce the quarries and suppliers.

(3) Areas of Constructions

Construction area in Port of Lobito is indicated in Figure 2-2-4-2(1). And the same in Port of Namibe is indicated in Figure 2-2-4-2(2).

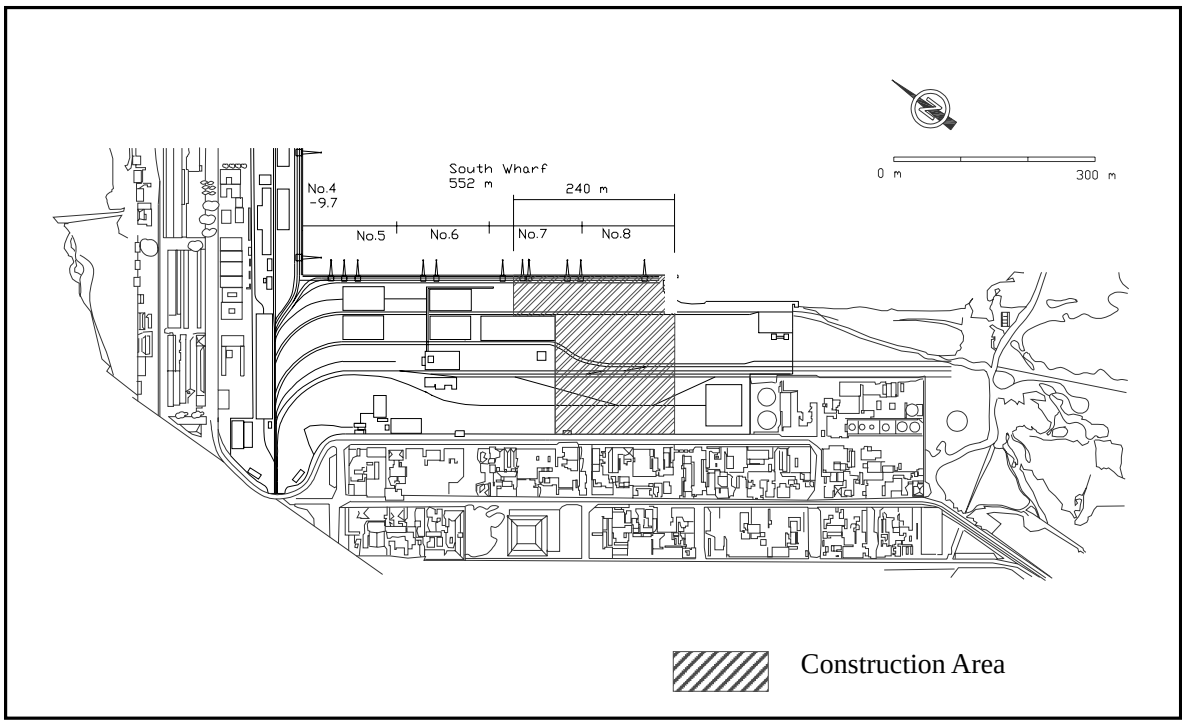


Figure 2-2-4-3 (1) Construction Area in Port of Lobito

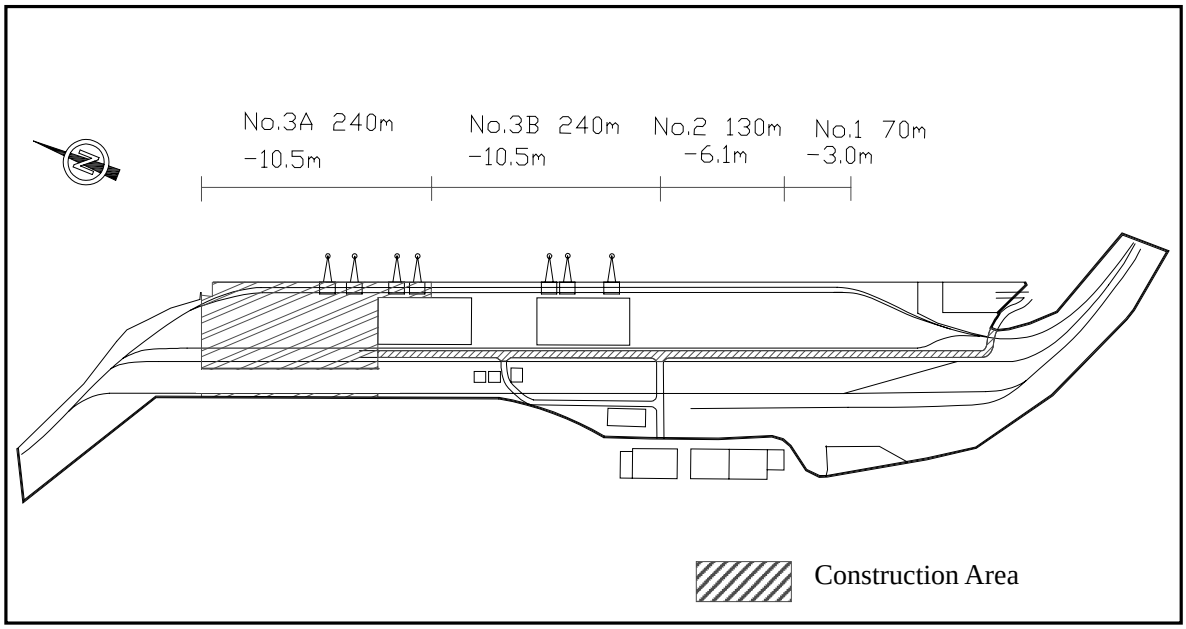


Figure 2-2-4-3 (2) Construction Area in Port of Namibe

2-2-4-4 Consultant Supervision

Based on the policy of the grant aid scheme, smooth and consistent consultancy work of detailed design work and supervisory work is implemented by a consulting firm which acquires the full knowledge of the project contents prepared in the basic design study. At the construction management stage, the consulting firm appoints a resident engineer with sufficient experiences of construction management and engineers with expertise are dispatched at the necessary timing for inspection and instructions for proper

site management.

(1) Implementation Supervision Policy

1) Close contact and communications

The consulting firm will render appropriate services for early completion of the facilities without delay of the schedule through the close contact and communications with the relevant organizations of the both countries and the staff concerned.

2) Appropriate advices and instruction

The consulting firm will provide personnel concerned of the contractor with immediate and appropriate advices and instruction to complete the facilities in conformity with the contract documents.

3) Offering occasions for technical transfer

Implementation of the project should help to show effects under the grant aid scheme, offering occasions for technical transfer of construction methods and technologies.

4) Appropriate advices and instructions of management and operation

Appropriate advices and instructions should be given to the recipient sector for smooth management and operation of the facilities after delivery.

(2) Supervisory Duties

1) Assistance on contracting

The consulting firm will provide assistance on selection of contractor, determine the type of contract, draft contract documents, evaluate bill of quantities and witness contract awarding.

2) Evaluation and approval of Shop Drawings

The consulting firm will evaluate and approve proper shop drawings as well as materials and equipment proposed and submitted by the contractor.

3) Management and supervision of construction work

The consulting firm will review the construction plans and schedule, etc., provide instructions to the contractor and report the progress of works to the client and JICA.

4) Assistance in procedure of payment

The consulting firm will evaluate and approve the proper invoice for the payment to the contractor, confirming the progress of the work upon partial completion and final completion.

5) Quality control

(a) This project is rehabilitation project of existing port facilities. Concreting works will be major construction item.

(b) Because construction items on land includes rehabilitation of inner port railways, inner port road, electricity distribution and water supply facilities, accuracy of constructions between new and existing facilities should be important to improve the efficiency of cargo handling after handing over.

(c) In case of berth rehabilitation, appropriate procedures of construction and methods should be executed to secure proper activity in neighboring berth in the Ports.

(d) Consultant firm should dispatch Japanese residential consultant who has proper capabilities to supervise the Contractor under above mentioned conditions.

(e) The Contractor should dispatch Japanese project manager who has proper capabilities to manage the construction works under above mentioned conditions.

(f) The consulting firm will inspect the work partially completed when requested by the contractor, give instructions if necessary and certify the partial and whole completion with suitable quantities and qualities.

6) Progress control

(a) Enough preparation of skilled labors and supply of construction material are key factors for smooth progress of the project.

(b) Construction works in Port of Lobito and Namibe should be commenced at the same time because the project is urgent rehabilitation work.

(c) The Contractor should have heavy responsibilities to keep the progress on schedule with enough manpower, smooth mobilization and logistic and suitable construction methods.

(d) The Contractor should be requested to establish the flexible and practical construction team utilizing material, manpower and machinery in third countries.

(e) The Contractor and supplier should instruct maintenance and operation skill to Angolan staffs securing proper operation in the timing of assembling, trial operation and handing over of the equipment.

(f) For works in Port of Namibe, the Contractor should dispatch local specialists of electricity and mechanical works to the site for one month to confirm the proper functions of facilities for the lighting towers and water supply system.

7) Safety control

(a) Residential consultant, project manager and engineers should produce the safety committees in project site to accord the constructions in existing active commercial ports.

(b) Safety construction plan with layout of guide persons should be corresponded for heavy traffics in the project site and its neighboring area.

(c) Interpreters and translators should be hired in the project site to maintain the tight communication between project staff and stake holders.

(d) Employing the skilled labors is not easy in the developing countries. Daily safety movement in the project sites will be recommended to prevent the accidents.

(e) Existing of the mines in the vicinity of Catumbela between Lobito and Benguela should be noticed to all staff of the project.

(f) Armed securities should be employed to the offices and accommodations to secure the security. Also stand-by generators and water tanks should be installed to them for ordinal human life.

(g) Satellite telephone should be prepared to the project site because telecommunication in the vicinities of Port of Lobito and Namibe is poor.

8) Inspection and Witness

The consulting firm will inspect the work partially completed when requested by the contractor, give instructions if necessary and certify the partial completion. Upon the confirmation of completion of the works and fulfillment requirements of the contract, the consulting firm will witness the delivery of all the facilities specified in the contract and complete its duties with the client’s acceptance.

The consulting firm will also prepare reports to the Government of Japan in relation to the progress of the works, payment procedures and delivery of completed facilities.

(3) Supervisory of Equipment Procurement

In supervisory of equipment procurement, following management should be concerned.

1) Management of procurement by the consultant
2) Inspection by professional third party before shipping
3) Operation instruction of cargo handling equipment after handed over

2-2-4-5 Quality Control Plan

Regarding the quality control of the work, the details will be indicated in the specifications of tender documents for the project, which are based on the "Criteria of Quality Control for Port Construction Work" from the "Common Specifications for Port Construction Work in Japan". In addition to the specifications, Standards SA, ASTM, BS, etc. will be applied to the project, if necessary.

Table 2-2-4-5 (1) Quality Control Items of Major Construction Category / Test Methods

Major Construction Category	Detailed Category	Quality Control Items	Test Methods
Pavement	Base course and sub base course	Material quality	Grain index, Specific gravity, Absorption and Configuration of grain tests
		Compaction density	Water content, Plate bearing and Field density tests
Concreting	Rebar setting	Material quality	Chemical ingredient, Physical properties and Configuration of grain tests
	Concreting	Material quality	Quality of cement, water and aggregate
		Concrete quality	Slump, Air content, Compressive strengthen, Chloride ion concentration and temperature measurements
Installation of Rubber Fender	Rubber fender	Material quality	Physical properties of rubber, Size measurements
Installation of Bollards	Bollards	Material quality	Chemical ingredient, Physical properties and Size measurements

2-2-4-6 Procurement Plan

Following points should be considered in particular when procuring construction materials, machinery and equipment being necessary for implementing the plan.

(1) Procurement Policy

Machinery, Materials and equipment being available in the local market should be procured as many as possible and procurement of them from Japan or third countries will be considered only to the goods which have poor affordability in Angola..

(2) Procurement of Spare Parts for Cargo Handling Equipment

Variation of spare parts will be mainly for ordinal consumption parts and periodical changing parts concerning the appropriate functions and the prevention of troubles of equipment. In the project, ordinal consumption parts and periodical changing parts for 1 year will be provided following the maintenance manner in Port of Lobito. Maximum cost of spare parts will be limited by 5 % of body price of each cargo handling equipment.

(3) Guarantee Policy

Except accidents and troubles caused by artificially produced, guaranty period of new cargo handling equipment will be 1 year from the time of handing over to the final inspection one year passing since handed over

(4) Transportation Policy

Equipment and material which need order making production and domestic processing will require certain period for ordering, producing, packing and delivering. Therefore, transportation plan of them needs to direct delivery to Port of Lobito and Namibe avoiding unnecessary time consumption by preparation of the project.

(5) Procurement items

1) Construction material

Source of procurement is described in Table 3-2-4-6(1).

Table 2-2-4-6(1) Source of Material Procurement

Material		Source of procurement		
Works	**Material**	**Local**	**Japan**	**3rd Country**
Civil & Building	Sand and aggregates	○		
	Stones	○		
	Rebar		○	
	Cement	○		
	Concrete	○		
	Molds and timber	○		
	Steel （rail and wide-flange beams）		○	
Utility	Water pipe and electric pipe	○		
	Lighting	○		
Civil	Fenders		○	
	Bollards		○	

2) Construction machinery

Source of construction machinery is described in Table 3-2-4-6(2).

Table 2-2-4-6(2) Source of Construction Machinery

Major Construction Machines	Source of procurement		
	Local	Japan	3rd countries
Backhoe（0.6m^3）	○		
Dump truck（10t）	○		
Bull dozer（21t）	○		
Truck crane (Hydraulic 25t)	○		
Truck crane (Hydraulic 50t)			○
Giant breaker（600～800kg）			○
Concrete Cutter（Diameter：300）	○		
Air compressor（3.5～3.7m^3/h）	○		
Truck with crane（4t load、2t sling）	○		
Motor grader（3.1m）	○		
Macadam roller（10～12t）	○		
Concrete finisher（3～7.5m）			○
Trailer（20t）	○		
Water truck（5,500-6,500L）	○		
Concrete Plant（60m^3/h）			○
Concrete agitator truck（4.5m^3）	○		
Wheel loader（2.1m^3）	○		
Hydraulic Hummer（with platform）			○
Welder（300A）	○		
Vibrating roller（0.8～1.1t）	○		
Generator（200KVA）	○		

2) Procurement Cargo Handling Equipment

Source of cargo handling equipment procured by the project is described in Table 3-2-4-6(3). Countries in EU stipulated in 1995, NAFTA and Japan should be recommended as the source.

Table 3-2-4-6(3) Source of Cargo Handling Equipment Procured by the Project

Cargo Handling Equipment Procured by the Project	Source of procurement		
	Local	Japan	3rd countries
Reach Stacker (40t)		○	○
Folk lift (40t)		○	○
Mobile crane (60t)		○	○

2-2-4-7. Operation Guidance Plan

(1) Initial Operation Training Plan

1) Port of Lobito

A reach stacker provided by the project is the same type of container handling equipment utilized in Port of Lobito, presently. Only short explanation of operation and maintenance will be enough when it will be handed over to the Port. Special initial operation training will not be required.

2) Port of Namibe

Cargo handling equipment which is a reach stacker, a folk lift and a mobile crane will be procured to Port of Namibe. These reach stacker and folk lift are the same type of cargo handling equipment utilized in Port of Namibe, presently. Therefore, special initial operation training will not be required. However, it will be necessary to give initial operation training for mobile crane because the operators in the Port are mainly familiar with the quay cranes. They have general knowledge and skill how to operate the crane. For example, initial operation training in 5 days for safety operation and appropriate maintenance for 2 operators, 2 mechanics, 2 electricians and 2 engineers will be recommended. The example of details is described in Table 2-2-4-7 (1).

Table 2-2-4-7(1) Example of Initial Operation Training for Mobile Crane in Port of Namibe

Training Items	Trainees	Methods of Training	Remarks
Instruction of Operation for 3 days	2 Operators and 1 Field Engineer	1st day: Basic operation, advanced operation, explanation of manuals and daily maintenance in workshop 2nd day: Basic operation in the yard 3rd day: Advanced operation in the yard	Include Japanese Specialist described in Clause 2-2-4-8, if possible
Instruction of Repair and Maintenance for 2 days	2 Mechanics, 2 Electricians and 1 Maintenance Engineer	1st day: Ordinal maintenance, spare parts handling in workshop and yard 2nd day: Preparation to immediate trouble, purchase procedure of spare parts, preparation to usual trouble	Include Japanese Specialist described in Clause 2-2-4-8, if possible

(2) Management Instruction Plan

Rehabilitation of port function to maintain smooth logistics as the major purpose of the project is needed for efficient container yard utilization and appropriate cargo equipment operation which improve the efficiency of cargo handling of the port. Example of technical cooperation to above mentioned field will be described in Clause 2-2-4-8.

2-2-4-8. Technical Assistance Plan

(1) Capacity Development Concerning Port Management

1) Contents of Technical Cooperation

Technical cooperation to the Ports for “Introduce the electric data processing into the port management” and “Reduce the container clearance time in the ports” will be recommended.

2) Trainees of Technical Cooperation

(a) Proceeding the electric data processing to representatives of the ports

Electric data processing will surely improve the port management to enhance the capabilities

of documentation and cargo information by representatives of the ports.

(b) Individual capacity building to executives of the ports

Capability of organization should be improved by individual capacity development. For example, capacity development to the executives of the ports is essentially important to establish the port development plan and enrich the safety circumstance of port workers.

(2) Port of Lobito

1) Electric Data Processing; training to representatives of the ports in Japan or third country

Electric data processing should be introduced to Port of Lobito shortly because container handling volume is more than 50,000TEU.

2) Individual capacity building; technical transfer to executives of the port trained by Japanese specialist

Rapid increasing of container handling volume causes inaccurate container management by personal knowledge for containers location and contents of container. Logical method of container management should be taught to executives of the port.

3) Technical Transfer Concerning Maintenance Dredging

According to the result of vessel onboard interview to the captain of MSC CANADA, the container vessel, and the pilot of Port of Lobito, width of channel at mouth of Lobito Bay is narrow for the calling vessels. Although Port of Lobito has not been dredged since 1970, monitoring depth survey and establishing the detailed dredging plan will be concerned.

(3) Port of Namibe

1) Electric Data Processing; training to representatives of the ports in Japan or third country

Electric data processing should be introduced to Port of Namibe shortly because container handling volume is more than 10,000TEU. Continuous training utilizing the barcode devices and personal computers which are granted in Development Study is necessary to proceed to electric data processing.

2) Individual Capacity Development; technical transfer to executives of the port trained by Japanese specialist

Rapid increasing of container handling volume causes inaccurate container management by personal knowledge for containers location and contents of container. Logical method of container management should be taught to executives of the port.

3) Technical Transfer Concerning Maintenance of Cargo Handling Equipment; training to representatives of the ports in Japan or third country

According to the results of site survey in this basic design study, enhancing the capability of workshop in Port of Namibe will be required, because some existing cargo handling equipment were out of service due to lack of spare parts. Improvement of capability of workshop is important to enhance the future port functions of cargo handling.

(4) Scale and Schedule of Technical Cooperation

Scales and schedules of technical transfers coordinating with this basic design study are described in Table 2-2-4(1) below.

Table 2-2-4-8(1) Scales and Schedules of Technical Transfers

Method	Technical Field	Number of Person	Schedule	Period
Dispatching the Short Term Specialists	Port Management	1 Person	Japan's Fiscal Year in 2008	3.0 months
	Cargo Handling	1 Person		3.0 months

2-2-4-9 Implementation Schedule

<Detailed Design Stage>: In implementing the project under the Japan's grant aid scheme, after signing the Exchange of Notes (E/N) for detailed design, a Japanese consulting firm will be contracted by the Government of Angola with concluding a consultancy agreement. Thereafter, the work will be completed with steps of detailed design and documentation for tendering by the contracted consultant.

<Construction and Procurement Stage> : Besides, after signing the Exchange of Notes (E/N) for construction and procurement, Japanese consulting firm (same with detailed design) will be contracted by the Government of Angola with concluding a consultancy agreement. Thereafter, tendering and contracting will be completed by the Government of Angola assisted by the contracted Japanese consultant. Then selected Japanese firm such as contractors and others will conduct construction and procurement supervised by the consultant and approved by the Government of Angola..

(1) Implementation Schedule

1) Services of Detailed Design

After the consultant contract has been concluded between the Japanese consulting firm and the Government of Angola, the consulting firm will start detailed design with verification of the contract from the Japanese Government. During the detailed design stage, a full set of design documents should be prepared for tendering, based on the basic design study report. Through discussions with the Government of Angola on details of facilities and machinery, approval of all the tender documents should be obtained from the Government of Angola. The detailed design stage will take about 4.0 months, if serious objections and difficulties are not occurred.

2) Tendering

The Contractor, which is a Japanese construction company, is selected by tender. The tender is performed in the following order, and require 3 months, if serious objections and difficulties are not occurred. Firstly, letters of interest, pre-qualifications, distribution of tender documents and tender are conducted. Then, evaluation of tenders and determination of a company will be done. Finally contracting between the Government of Angola and Japanese contractor will be signed.

3) Construction and Procurement Works

After the construction contract is verified by the Government of Japan, construction work will be commenced. In starting the site work, the contractor will need 3-5 months for preparation term as preparation of concrete plant, shipping of material from Japan, etc. If serious objections and difficulties are not occurred, total construction term including the preparation term is expected to be 16 months, to be expected.

The implementation schedule for detailed design services and tendering of the project is described in Figure 2-2-4-9 (1) showing the processes from signing the Exchange of Notes (E/N) to the completion. Also the implementation schedule for construction and procurement of the project is

described in Figure 2-2-4-9 (2) showing the processes from signing the Exchange of Notes (E/N) to the completion.

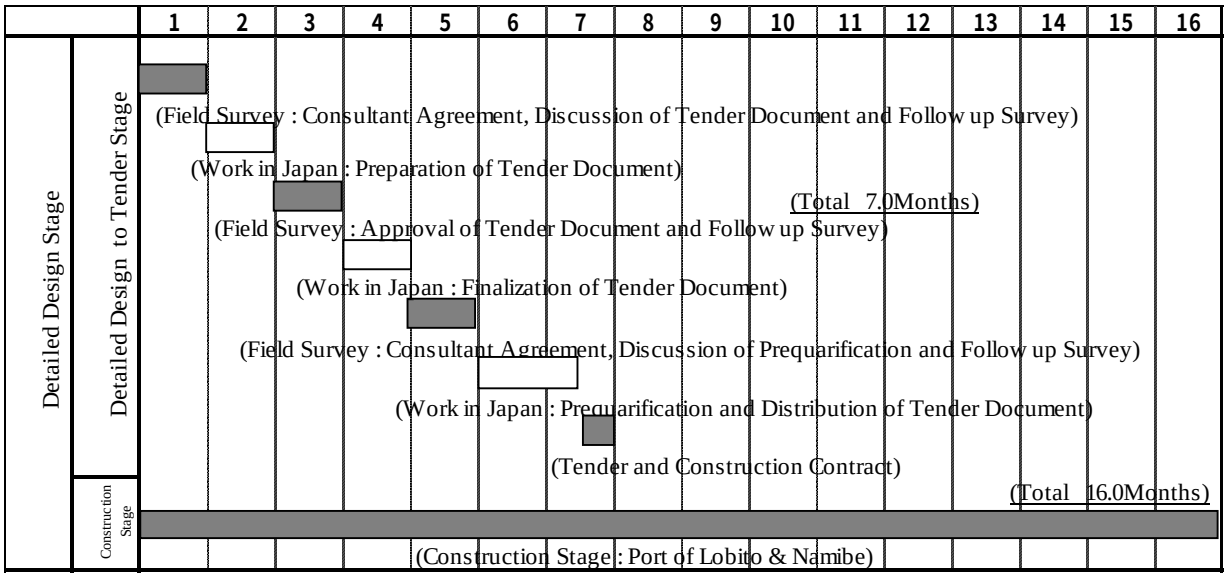


Figure 2-2-4-9(1) Schedule of Detailed Design Services and Tendering

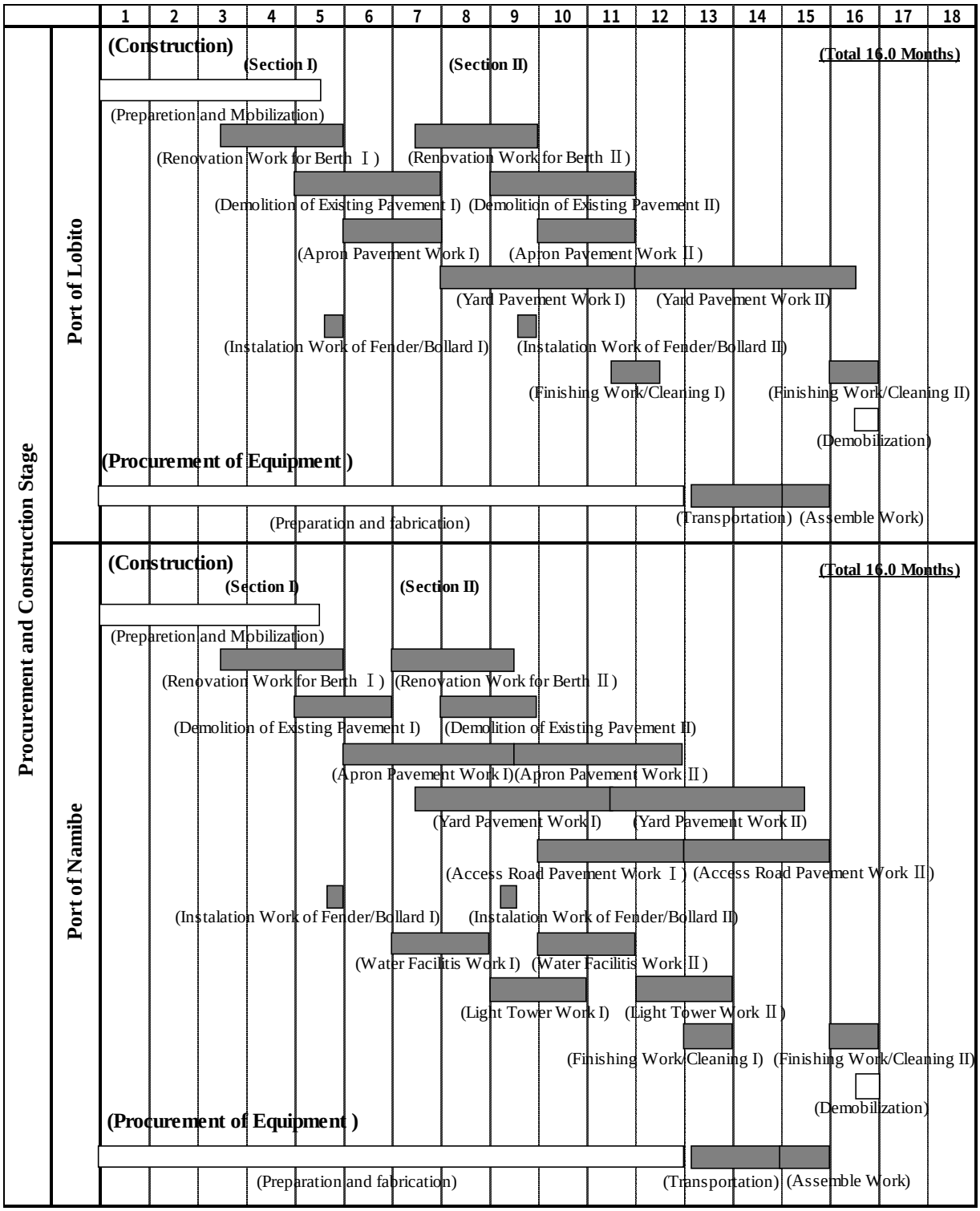


Figure 2-2-4-9(2) Schedule of Construction and Procurement

(2) Expected Issues to the Schedule

Issues which will effect to the schedule are listed in Table 2-2-4-9 (1) below.

The Government of Angola should take initiative to prevent, avoid, mitigate or settle the described issues.

Table 2-2-4-9 (1) Expected Issues to the Schedule

Stage of Construction and Procurement	Expected Issues
Before Preparation	Delay of Construction Permit Delay of Signing and Notification of Contract Delay of Working Permit
Preparation Works	Delay of Maritime Transport Delay of Inner Port Cargo Handling and Custom Clearance
Actual Construction and Procurement	Decrease of Affordability of Material, Equipment and Manpower Inflation of Construction Material, Equipment and Manpower

(3) Expected Procedure of Construction

1) Port of Lobito

Expected procedure of construction in Port of Lobito is described in Figure 2-2-4-9(3).

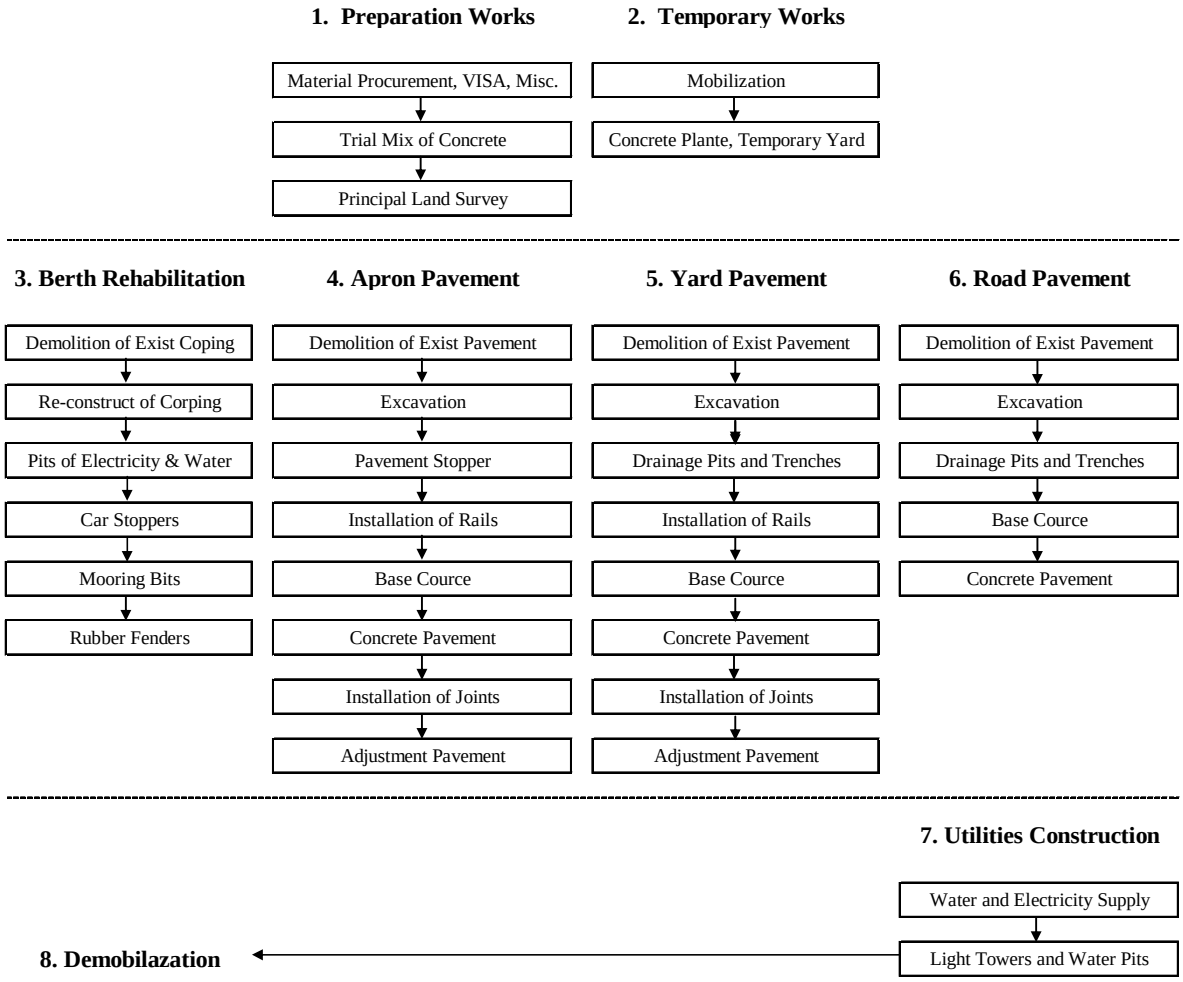


Figure 2-2-4-9(3) Expected Procedure of Construction in Port of Lobito

2) Port of Namibe

Expected procedure of construction in Port of Namibe is described in Figure 2-2-4-9(4).

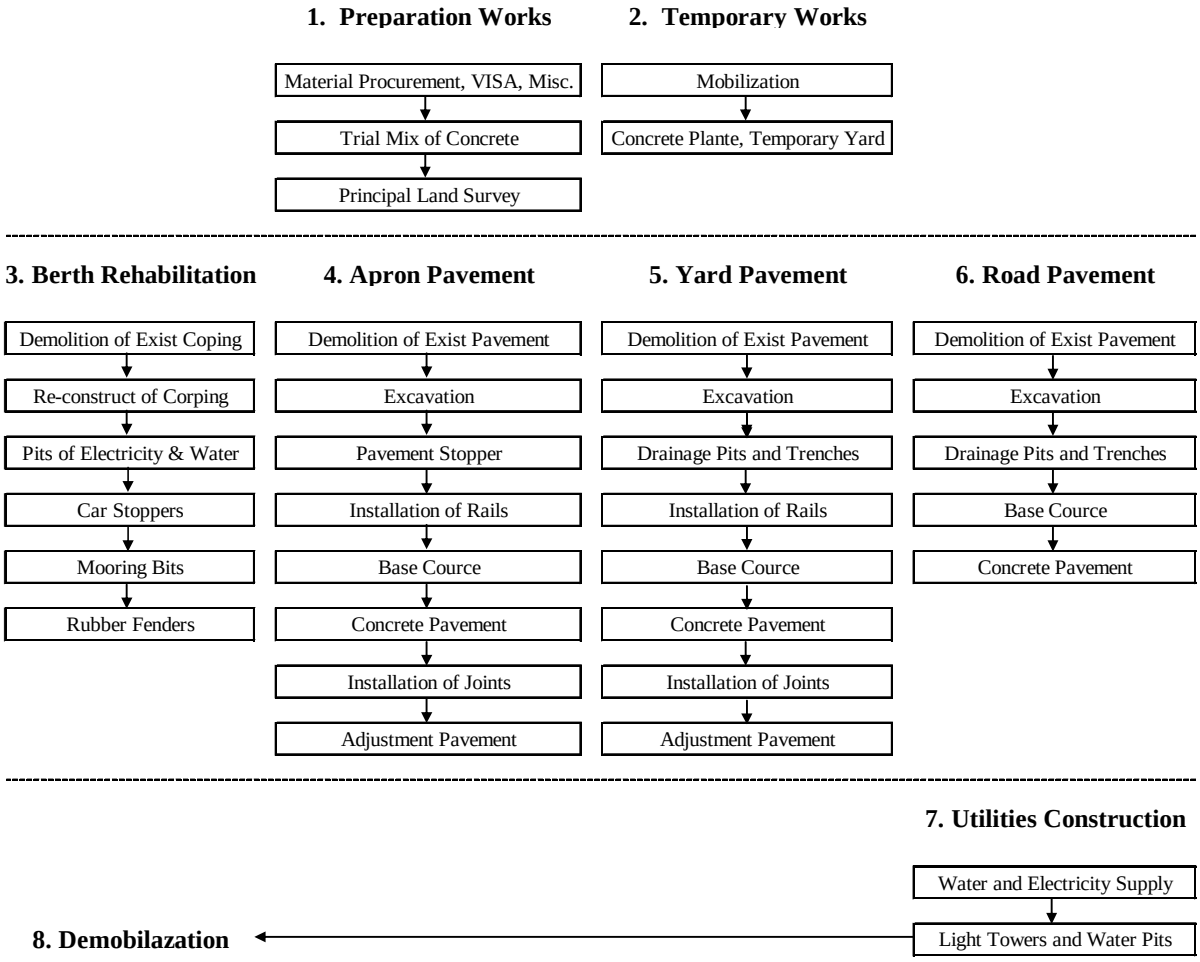


Figure 2-2-4-9(4) Expected Procedure of Construction in Port of Namibe

2-3 Obligations of Recipient Country

The obligations of the Government of Angola have been confirmed by the government and the study team as described in the minutes of discussions, record of discussions and inception report during the Basic Design Study.

They are listed below.

(1) Ministry of Transport Institute of Maritime and Ports in Angola (IMPA)

The obligations of IMPA have been indicated in Table 2-3 (1).

Concerning with scale of organization, staffs and budget, it will not be found serious difficulties to execute the obligations.

Table 2-3 (1) Obligations of IMPA

Items	Cost Estimation
1. To ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid	

Items	Cost Estimation
2. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts To establish the national budget of Angola for above-mentioned tax exemptions	Government budget of Angola in 2008 should include the cost of left-mentioned tax exemptions. (According to the discussion with IMPA, Port of Lobito and Namibe will bear the cost in the future, to be expected.)
3. To accord Japanese nationals, whose service may be required in connection with the supply of the products and the services under the verified contact, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	
4. To bear the following commissions to the Japanese bank for banking services based upon the B/A (Banking Arrangement), Advising commission of A/P (Authorization to pay) and Modified A/P and Payment commission	More than 3.4 million Japanese Yen
5. To bear all the necessary expenses, other than those to be borne by the Grant	
6. To carry out the cooperation with other Ministries to secure smooth implementation of the project	
7. To prepare permission for Japanese firms to work in Angola as the Consultant and Contractor for the Project	
8. To prepare the permission and agreement of implementation of the Project	
9. To ensure immediate assist for the smooth entry, leave and stay in the recipient country to Japanese nationals performing of their work in the Project	

(2) Port of Lobito Enterprise

The obligations of Port of Lobito Enterprise have been indicated in Table 2-3 (2). Concerning with scale of organization, staffs and budget, it seems not to be found serious difficulties to execute the obligations.

Table 2-3 (2) Obligations of Port of Lobito Enterprise

Items	Cost Estimation
1. To secure enough land being necessary for the construction of the Project and to clear the site	2 million Japanese Yen to be expected（works in 2 weeks）
2. To secure an appropriate dumping site which has leveling land, good access and near from the project site	1 million Japanese Yen to be expected（works in 1 week）
3. To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities	4 million Japanese Yen to be expected（works in 1 week）

Items	Cost Estimation
4. To maintain and use properly and effectively the facilities contracted and equipment provided under the Grant	
5. To remove existing quay cranes in the project site	
6. To remove existing fuel supply tank and pipes in the project site	To cooperate with SONANGOL and relevant firms
7. To remove existing rails in the project site	2 million Japanese Yen to be expected（works in 2 weeks）
8. To remove existing objects and obstacles such as vertical H steels in the project site	2 million Japanese Yen to be expected（works in 2 weeks）
9. To remove existing utilities such as water and electricity supplying facilities and drainages in the project site	2 million Japanese Yen to be expected（works in 2 weeks）
10. To secure the borrow pit and quarries	
11. To prepare the permission and agreement of transportation, construction and procurement for the Project	
12. Burden cost of tax exemption for construction and procurement of the Project	Put into the Budget in 2008

(3) Port of Namibe Enterprise

The obligations of Port of Namibe Enterprise have been indicated in Table 2-3 (2).

Concerning with scale of organization, staffs and budget, it seems not to be found serious difficulties to execute the obligations.

Table 2-3 (3) Obligations of Port of Namibe Enterprise

Items	Cost Estimation
1. To secure enough land being necessary for the construction of the Project and to clear the site	1 million Japanese Yen to be expected（works in 1 weeks）
2. To secure an appropriate dumping site which has leveling land, good access and near from the project site	1 million Japanese Yen to be expected（works in 1 week）
3. To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities	4 million Japanese Yen to be expected（works in 1 week）
4. To maintain and use properly and effectively the facilities contracted and equipment provided under the Grant	
5. To remove existing quay cranes in the project site	2 million Japanese Yen to be expected（works in 2 weeks）

Items	Cost Estimation
6. To remove existing rails in the project site	2 million Japanese Yen to be expected（works in 2 weeks）
7. To remove existing objects and obstacles in the project site	2 million Japanese Yen to be expected（works in 2 weeks）
8. To remove existing utilities such as water and electricity supplying facilities and drainages in the project site	2 million Japanese Yen to be expected（works in 2 weeks）
9. To secure the borrow pit and quarries	
10. To prepare the permission and agreement of transportation, construction and procurement for the Project	
11. Burden cost of tax exemption for construction and procurement of the Project	Put into the Budget in 2008

2-4 Project Operation Plan

(1) Organizations of Operation, Maintenance and Management

1) Port of Lobito

Port of Lobito Enterprise has responsibilities for operation, maintenance and management of Port of Lobito. The number of staffs reaches 1,106 persons in 2006. Facilities and equipment provided by the project will be operated, maintained and managed by Department of Operation and Maintenance controlled by deputy port director. Number of staffs in the department in charge of operation is 327 persons. And the same of maintenance is 330 persons. Significant shortage of capabilities of them can not be reported according to the results of site survey of the Basic Design Study.

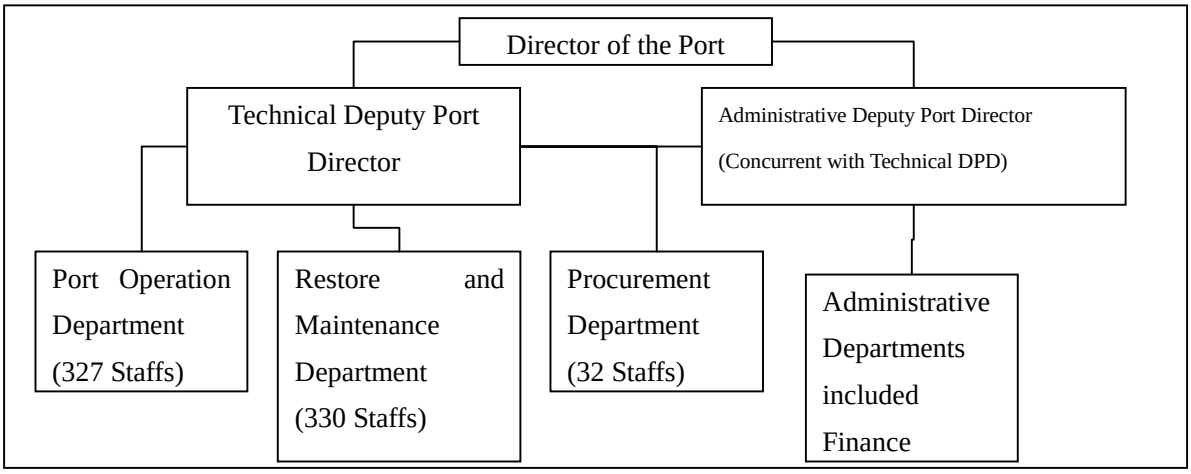


Figure 2-4(1) Organization Chart of Operation, Maintenance and Management (Port of Lobito)

2) Port of Namibe

Port of Namibe Enterprise has responsibilities for operation, maintenance and management of Port of Namibe. The number of staffs reaches 631 persons in 2006. Facilities and equipment provided

by the project will be operated, maintained and managed by Department of Production. Number of staffs in the department in charge of production is 391 persons in 2004. Significant shortage of capabilities of them can not be reported according to the results of site survey of the Basic Design Study.

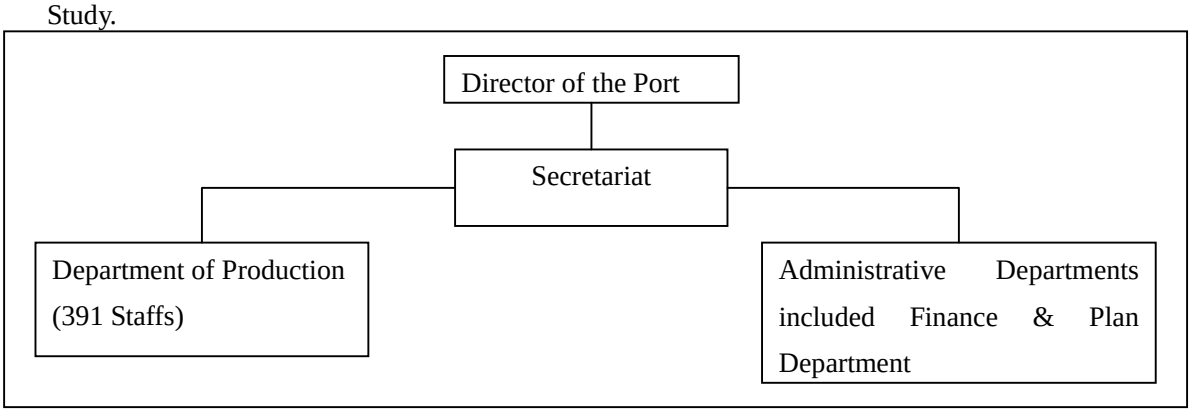


Figure 2-4(2) Organization Chart of Operation, Maintenance and Management (Port of Namibe)

(2) Budget State

1) Ministry of Transport, Institute of Maritime and Ports in Angola

Institute of Maritime and Ports in Angola is the implementation agency of the project. The institute is an administrative organization covering all of commercial ports in Angola; hence it does not have the function of actual operation. Expenses of the institute are borne by Ministry of Transport in Angola. Budget for operation, maintenance and management shall be bore by each Port Enterprise as describing in following clauses.

Table 2-4.(1) Budget State (Institute of Maritime and Ports in Angola)

Items	2006
1.Office Expenses	
Fuels	1,350,000.00
Meals	1,150,000.00
Other ordinal expenses	1,124,574.40
Other purchases of products	1505495.20
Communications	1,570,948.00
Health	1,678,565.00
Maintenance and restore	279,840.47
Water and electricity	154,901.00
Transportation	694,259.40
Business trip allowance	2,159,132.00
Other office expenses	1,621,728.75
1.Sub-total	13,289,444.22
2.Investment and others	
Capital assets and others	2,625,648.60
2.Sub-total	2,625,648.60
3.Total (1+2)	15,915,092.82

(Note: Unit in Kz (=1.5Japan Yen /Kz))

2) Port of Lobito

Although implementation agency of the project is Ministry of Transport in Angola, facilities and equipment in Port of Lobito included items provided by the project are operated, maintained and managed by Port of Lobito Enterprise. As described below, balance sheet of Port of Lobito Enterprise indicates annual benefit with the amount of 50 million Kz to 60 million Kz. Budget state of Port of Lobito Enterprise is sound.

Table 2-4.(2) Budget State (Port of Lobito)

Items		2002	2003	2004	2005
Revenue	Port Charge	503,843,313.83	668,903,361.00	843,544,880.00	1,291,906,267.72
	Tugboat Service	54,678,022.69	29,454,037.00	17,429,307.00	74,047,590.21
	Overtime Works	401,327.96	5,981,318.00		675,774.26
	Container Storage	38,457,790.15	56,117,322.00	104,609,826.00	212,111,487.76
	Land and Tenant Lease	1,172,363.40	572,482.35	54,979,200.00	69,710,983.12
	Others	86,252,556.86	668,167,901.72	564,866,951.07	105,001,180.70
	Total	684,805,374.89	1,429,196,422.07	1,585,430,164.07	1,753,453,283.77
Expense	Salaries	155,301,604.46	225,886,244.40	276,271,174.14	329,336,327.78
	Overtime	36,939,323.00	64,331,911.00	72,705,398.00	83,283,803.00
	Fuels	5,203,753.42	214,305,905.83	11,893,343.70	32,450,785.90
	Office	4,013,345.32	7,118,760.47	8,535,889.70	7,391,685.07
	Travel	12,711,125.58	5,113,883.50	9,406,577.50	31,695,420.52
	Insurance	36,282.00	52,807.00		412,797.00
	Others	417,968,273.29	862,079,920.40	1,160,963,589.24	1,210,138,999.84
	Total	632,173,707.07	1,378,889,432.60	1,539,775,972.28	1,694,709,819.11
Balance		52,631,667.82	50,306,989.47	45,654,191.79	58,743,464.66

(Note: Unit in Kz (=1.5Japan Yen /Kz))

3) Port of Namibe

Although implementation agency of the project is Ministry of Transport in Angola, facilities and equipment in Port of Namibe included items provided by the project are operated, maintained and managed by Port of Namibe Enterprise. As described below, balance sheet of Port of Namibe Enterprise indicates annual benefit with the amount of 35 million Kz to 173 million Kz. Budget state of Port of Namibe Enterprise is sound.

Table 2-4.(3) Budget State (Port of Namibe)

Items		2002	2003	2004	2005
Revenue	Total	214,085,964.58	385,213,485.19	702,751,391.5 1	852,041,606.59
Expense	Salaries	61,400,795.20	114,937,143.10	206,772,976.50	265,425,839.50
	Overtime	38,798,094.42	71,181,232.49	127,753,226.93	145,382,833.03
	Fuels	3,788,519.74	4,030,314.55	11,407,070.00	19,586,539.00
	Insurance	380,108.70	132,695.80	100,366.20	N/A
	Others	74,638,687.89	155,620,827.69	183,548,707.88	306,448,867.06
	Total	179,006,205.95	345,902,213.63	529,582,347.51	736,844,078.59
Balance		35,079,758.63	39,311,271.56	173,169,044.00	115,197,528.00

(Note: Unit in Kz (=1.5Japan Yen /Kz), Insurance in 2005 did not pay due to changing the insurance firms.)

(3) Estimation of Operation and Maintenance Cost

1) Port of Lobito

Operation and maintenance cost of new facilities and equipment provided by the project is tried to estimate in the following table. Estimation of annual operation and maintenance cost will be reached to 6 million Kz, approximately. Therefore, according to examinations with clauses (1), (2) and (3), operation and maintenance of new facilities and equipment by Port of Lobito are not found any serious difficulties.

Table 2-4.(4) Estimation of Operation and Maintenance Cost (Port of Lobito)

Facilities and Equipment	Content	Amount（Kz）
Pavement	Repairing cost（Partial break and re-pavement of concrete pavement）	2,891,566
Cargo Handling Equipment	Yearly consumption parts	2,141,901
	Yearly operation cost	
	Fuel consumption of reach-stacker	1,259,438
	(Salary of operator：already hired)	(1,737,115)
Total		6,292,905

2) Port of Namibe

Operation and maintenance cost of new facilities and equipment provided by the project is tried to estimate in the following table. Estimation of annual operation and maintenance cost will be reached to 11 million Kz, approximately. Therefore, according to examinations with clauses (1), (2) and (3), operation and maintenance of new facilities and equipment by Port of Namibe are not found any serious difficulties.

Table 2-4.(5) Estimation of Operation and Maintenance Cost (Port of Namibe)

Facilities and Equipment	Content	Amount（Kz）
Pavement	Repairing cost（Partial break and re-pavement of concrete pavement）	1,445,783
Cargo Handling Equipment	Yearly consumption parts	6,024,096
	Yearly operation cost	
	Fuel consumption of reach-stacker	1,259,438
	Fuel consumption of forklift	1,259,438
	Fuel consumption of mobile crane	1,070,522
	(Salary of operator：already hired)	(5,211,345)
Total		11,059,277

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

When the project will be implemented by Grant Aid Cooperation of the Government of Japan, project cost as obligation of Angola will be 20 million Japanese Yen (US$167,550).

(1) Cost borne by Angola

Details of the cost borne by Angola are described in Table 2-5-1.(1). Amount of cost is estimated approximately US$ 167, 550 except the cost for tax exemption. The amount is nearly 7.7% of the total annual balance in both ports. These cost burdens will not be difficult for both ports.

Table 2-5-1.(1) Amount of Cost borne by Angola

Items of Cost Burden	Amount (US$)	Remarks
Institute of Maritime and Ports		
Guarantee of cargo unloading, Custom clearance and domestic transport		
Tax and levy exemption to Japanese		
Burden of the fees for banking arrangement, authorization to pay and certificate issuance of each payment	US$29,000	Count into the Budget of Angola in 2008
Total	US$29,000	
Port of Lobito		
Preparation of temporary yard and its clearance	US$17,000	
Preparation of dumping site	US$8,350	
Preparation of main water pipe and electricity line to project site	US$33,500	
Removal of quay cranes	US$0	
Removal of oil tank and its pipe line	US$0	
Removal of existing rails	US$17,000	
Clearance project site	US$17,000	Balance in 2005
Total	US$62,700	Kz58,743,464
		(US$731,550)
Port of Namibe		
Preparation of temporary yard and its clearance	US$8,350	
Preparation of dumping site	US$0	
Preparation of main water pipe and electricity line to project site	US$33,500	
Removal of existing rails	US$17,000	
Clearance of project site	US$17,000	Balance in 2005
Total	US$75,850	Kz115,197,528
		(US$1,434,589)
Grand Total	US$167,550 (*This is 7.7% of total amount of the balance in Port of Lobito and Namibe.) (Approximately 20 million Japanese Yen)	Total amount of the Balance in Port of Lobito and Namibe in 2005 US$2,166,139* (Approximately 259 million Japanese Yen)

(2) Conditions of Cost Estimation

1) The cost estimation is calculated based on cost information in the end of March 2007 when field survey of the basic design study was completed.
2) Exchange Rate:1US$=119.59 Japanese Yen, 1 Kz=1.494 Japanese Yen, 1US$=80.3 Kz
3) Project Period: Period of detailed design, construction and procurement are shown in the table of

implementation schedule of the project.

4) The project should be implemented following the procedure of Grant Aid Cooperation of the Government of Japan.

2-5-2 Operation and Maintenance Cost

(1) Port of Lobito

As described in Clause 2-4(3), balance of budget in Port of Lobito shows 58,743,464 Kz as the benefit. Beside, cost of operation, maintenance and management for new facilities and equipment was estimated to 6,292,905 Kz. Therefore, operation, maintenance and management for new facilities and equipment by Port of Lobito are not expected serious difficulty in budget.

(2) Port of Namibe

As described in Clause 2-4(3), balance of budget in Port of Namibe shows 115,197,528 Kz as the benefit. Beside, cost of operation, maintenance and management for new facilities and equipment was estimated to 11,059,277 Kz. Therefore, operation, maintenance and management for new facilities and equipment by Port of Namibe are not expected serious difficulty in budget.

2-6 Other Relevant Issues

Special issues for smooth implementation of the project are emphasized below. The project should be joint work between Japan and Angola. Therefore, relevant persons in both sides should have certain responsibilities for smooth implementation of the Project.

Following issues should be important remarks for Ministry of Transport in Angola as the Responsible Agency, Ports of Lobito and Namibe as the Implementation Organization and relevant parties in Japan.

(1) For Angolan Side

1) To issue necessary permissions for construction and procurement. And to make necessary decision to any building permissions such as environmental impact assessment and others.
2) To maintain tight communications with Embassy of Japan, JICA South Africa Office, Consultant, Contractor and others.
3) To carry out suitable and quick responses to Embassy of Japan, JICA South Africa Office, Consultant, Contractor and others.
4) The construction will possibly cause the troubles with current cargo handling activities and common traffic in and out of the Ports. Accordingly, it will be necessary to execute the traffic control such as tentative limitation of cargo handling activities and common traffic at neighboring and influential areas of the Project.
5) Some damages on road and other infrastructures in and out of the Ports may be generated by construction vehicles. Such damages should be repaired and suitable maintenance should be carried out.

(2) For Japan Side

1) To respect the custom and climate in Angola and to avoid the conflict with local societies.
2) To maintain tight communications with IMPA in Ministry of Transport, Port of Lobito and Port of Namibe and other parties in Angola.
3) To ensure protection of environment of the Project to providing the suitable planning such as temporary yards and facilities.