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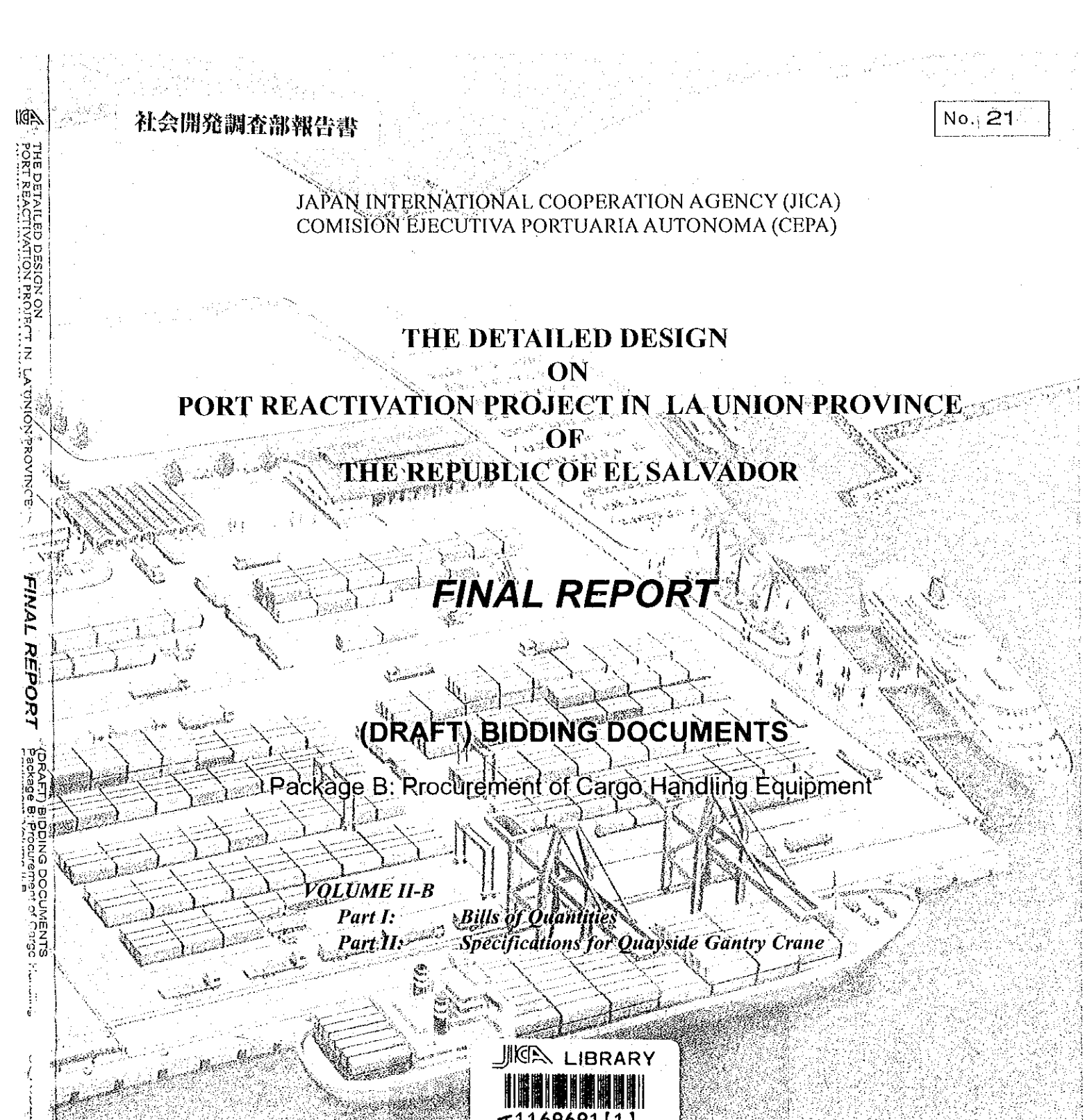
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
COMISION EJECUTIVA PORTUARIA AUTONOMA (CEPA)

THE DETAILED DESIGN ON PORT REACTIVATION PROJECT IN LA UNION PROVINCE OF THE REPUBLIC OF EL SALVADOR



FINAL REPORT

(DRAFT) BIDDING DOCUMENTS

Package B: Procurement of Cargo Handling Equipment

VOLUME II-B
Part I: Bills of Quantities
Part II: Specifications for Quayside Gantry Crane

OCTOBER 2002

NIPPON KOEI CO., LTD.

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Part I: *Bills of Quantities*
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NIPPON KOEI CO., LTD.

LA UNION PORT DEVELOPMENT PROJECT

Bidding Documents
for
Package B: Procurement of Cargo Handling Equipment

Volume II-B

Part I: Bill of Quantities

CONTENTS

PART I: BILL OF QUANTITIES

A. Preamble

1. General

1.1 The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, Conditions of Contract (Part-I: General Conditions of Contract, and Part-II: Special Conditions of Contract), and Specifications.

1.2 The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works.

1.3 General descriptions of the Plant are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract Documents shall be made before entering prices against each item in the priced Bill of Quantities.

1.4 The Bidder shall sign all the pages of Part I: "Bill of Quantities" and this forms an integral part of the Bid and Contract Documents.

2. Rates and Sums

2.1 The unit rates and prices of the Plant as entered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract, include all manufacturing plant, labor, supervision, materials, sea/land transportation, erection, testing, commissioning, insurance, foreign taxes and duties, profit and overhead, together with all general risks, liabilities, and obligations set out or implied in the Contract.

The prices of the Purchaser's and Engineer's attendance to tests and inspection and the prices of training of the Purchaser's personnel shall be entered separately from the prices of the Plant.

2.2 A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Supplier has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

2.3 All prices shall be stated in the currencies stipulated in Clause 15 of the Instructions to Bidders.

2.4 All prices quoted by the Bidder shall remain fixed a nd valid until completion of the Contract execution. Price adjustment will not be applicable, except in the cases of any change in price resulting from variation orders.

3. Provisional Item

3.1 The cost of optional spare parts proposed by the Bidder for the Plant to be supplied under the Contract, as prescribed in the Specifications, shall be filled in Item 04 of the Bill of Quantities. This is a Provisional Item and its use in whole or in part will be decided by the Purchaser at his own discretion.

4. Taxes and Duties

4.1 The unit rates and prices entered on the Bill of Quantities shall be deemed as inclusive of all foreign taxes and duties but exclusive of local taxes and duties. The amounts of taxes and duties payable in the Republic of El Salvador, including but not limited to IVA (Impuesto al Valor Agregado), goods and services tax, withholding tax, municipal tax, business tax, income tax, customs duty, import duty and others, shall be indicated in the appropriate columns in B.(1) Summary of Bid Price and B.(4) Breakdown of Taxes and Duties in the Bill of Quantities.

4.2 Exemption of some tax and duty categories may be granted as mentioned in Sub-Clause 53.2 of the Special Conditions of Contract. However, it remains the sole responsibility of the Bidder to make sure of all local taxes and duties imposable on him under the Contract so as to calculate the amounts of such taxes and duties properly in his Bid.

5. Insurance

5.1 The unit rates and prices entered in the Bill of Quantities shall be deemed as inclusive of the cost of all kinds of insurance, including third party liability insurance, as prescribed in Clause 43 of the Conditions of Contract.

6. Errors

6.1 Any arithmetic errors in computation or summation will be corrected by the Purchaser as follows:

(a) where there is a discrepancy between amounts in figures and in words, the amount in words will govern;

(b) where there is a discrepancy between the unit rate and the total amount derived from the multiplication of the unit price and the quantity, the unit rate as quoted will govern, unless in the opinion of the Purchaser, there is an obviously gross misplacement of the decimal point in the unit price, in which event the total amount as quoted will govern and the unit rate will be corrected; and

(c) where there is a discrepancy between the total amount and the sum of the total price per item, the sum of total price per item will govern and the total amount will be corrected.

Bill of Quantities

LA UNION PORT DEVELOPMENT PROJECT

PACKAGE B: PROCUREMENT OF CARGO HANDLING EQUIPMENT

VOLUME II-B - PART I: BILL OF QUANTITIES
B.(1) SUMMARY OF BID PRICE

No.	Description	Foreign Currency (US$)	Local Currency (US$)	Total (US$)
01	Design, manufacture, delivery to site, erection, test and commissioning of two (2) units of quayside gantry crane for Panamax type container vessels, including all equipment, compulsory parts for 2-year operation, tools, and ancillaries			
02	Cost of Purchaser and Engineer's attendance to tests and inspection as specified in Section 10007 of the Specifications			
03	Cost of training of the Purchaser's personnel on operation and maintenance of the cranes as specified in Section 10008 of the Specifications			
04	TOTAL COST OF PLANT, INSPECTION AND TRAINING (01+02+03)			
05	Provisional item: Supply of optional spare parts as specified in Section 10006 of the Specifications			
06	LOCAL TAXES AND DUTIES			
07	TOTAL BID PRICE (04+05+06)			

Signature of Bidder: _____

PART I: BILL OF QUANTITIES

B.(2) BREAKDOWN OF BID PRICE

No.	Description	Quantity	Foreign Currency (US$)			Local Currency (US$)			Total (US$)
			Unit Price CIF Port of Entry	Total CIF Cost	Miscellaneous Costs *	Unit Price Ex-factory	Total Ex-factory Cost	Miscellaneous Costs *	
01	a) Design, manufacture of quayside gantry cranes for Panamax type container vessels, including all equipment, tools and ancillaries as specified in Section 10009.a) of the Specifications b) Compulsory spare parts for the cranes as specified in Sub-Section 10006.1 of the Specifications c) Sea/land transportation of the cranes d) Erection, test and commissioning of the cranes	2 units							
								Total of Item 01	

Note:

* Miscellaneous costs include inland transportation, insurance, erection, commissioning, etc.

Signature of Bidder: _____

No.	Description	Quantity	Foreign Currency (US$)		Local Currency (US$)		Total (US$)
			Unit Price	Amount	Unit Price	Amount	
02	Cost of Purchaser and Engineer's attendance to tests and inspection as specified in Section 10007 of the Specifications a) Transportation cost ... ... b) Accommodation cost ... ... c) Communication and other costs						
						Total of Item 02	

Signature of Bidder: ____________________

No.	Description	Quantity	Foreign Currency (US$)		Local Currency (US$)		Total (US$)
			Unit Price	Amount	Unit Price	Amount	
03	Cost of training of the Purchaser's personnel on operation and maintenance of the cranes as specified in Section 10008 of the Specifications a) Manufacturer's training - Crane operation ... ... - Crane maintenance ... ... b) First site training - Crane operation ... ... - Crane maintenance ... ... c) Second site training - Crane operation ... ... - Crane maintenance						
						Total of Item 03	

Signature of Bidder: ____________________

PART I: BILL OF QUANTITIES

B.(3) BREAKDOWN OF OPTIONAL SPARE PARTS

No.	Spare Parts	Part Code No. (if applicable)	Description	Quantity	Cost F.C. (US$)	Cost L.C. (US$)
04	Supply of optional spare parts as specified in Section 10006 of the Specifications: - Main hoist wire ropes - Trolley drive wire ropes - Boom hoist wire ropes - Wheel for trolley traverse - Rope guide roller for trolley traverse - Brake unit complete for trolley traverse - Trolley festoon cable for trolley traverse - Brake lining for main hoist - Brake unit complete for gantry travel - ... ... -					
					Total of Item 04	

Signature of Bidder: ____________________

PART I: BILL OF QUANTITIES

B.(4) BREAKDOWN OF TAXES AND DUTIES PAYABLE IN EL SALVADOR

No.	Description	Amount of Taxes and Duties (US$)						
		IVA	Municipal Tax	Customs Duty	Business Income Tax	... ... */	... ... */	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)=(3+4+5+....)
01	Quayside gantry cranes							
02	Inspection by Purchaser and Engineer							
03	Training of Purchaser's personnel							
05	Optional spare parts							
	TOTAL							

Note: */ Add other taxes, duties or levies, if any, to those mentioned in columns (3) to (6) above

Signature of Bidder: ______________________

LA UNION PORT DEVELOPMENT PROJECT

Bidding Documents
for
Package B: Procurement of Cargo Handling Equipment

Volume II-B

Part II:
Specifications for Quayside Gantry Crane

CONTENTS

LIST OF TABLES

ABBREVIATIONS

m	meter
mm	millimeter
t	ton
min	minute
s	second
° C	degree Celsius (Centigrade)
kg	kilogram
%	per cent
Hz	hertz
CO_2	carbon dioxide
lb	pound
ft	feet
W	watt
kW	kilowatt
HB	Hardness Brinell Number
Fi	Filler
IWRC	Independent Wire Rope Core
MoS_2	Molybdenum disulfide
L-10	Symbol of basic rated service life
AC	Alternate Current
DC	Direct Current
V	volt
A	ampere
kV	kilovolt
IP Code	Classification of degrees of protection provided by enclosures of rotating electrical machines
IP22	IP Code Protected Drip Proof Type
IP55	IP Code Dust Proof Water Jet Proof Type
PVC	Polyvinyl chloride
CV	JIS Symbol of Cross linked polyethylene insulate cables
Type HIV	JIS Symbol of heat-resistance polyvinyl choride insulated wires
PNCT	JIS Symbol of ethylene propylene rubber insulated and polychloroprene sheathed cable
SCR	Silicon Controlled Rectifier
CPU	Central Processing Unit
I/O	Input/Output
PLC	Programmable Logic Controller
SA 2 1/2 (SIS 055900)	JIS Symbol for primary surface preparation
LWL	Low Water Level
HWL	High Water level
Breadth (MLD)	Breadth Moulded

SECTION 10000 GENERAL CONDITIONS

10001 General

The container crane shall be of the rail-mounted type and shall have a hinged boom on the waterside and a fixed girder on the landside. The traversing trolley of the rope operated type shall be provided on the girders. The main hoist and trolley drives as well as the gantry and trolley drives shall be simultaneously fully operational. The cranes shall load and unload not only containers but also hatch covers, lashing gear and non-containerized cargo.

10002 Drawings and Documents to be Submitted

10002.1 Drawings and Documents for Approval

Six (6) copies of the drawings and documents listed below shall be submitted to the Engineer for approval within one hundred and twenty (120) calendar days from the date of the notice to proceed. In addition, six (6) copies of the schedule of submission of those drawings and documents shall be submitted to the Engineer within thirty (30) calendar days from the date of the notice to proceed.

One copy shall be sent back to the Supplier signifying the Engineer's approval, or comment, if any, within twenty-one (21) days of the Engineer's receipt of drawings.

No fabrication or manufacture of equipment shall commence until the Supplier gets approval of the Engineer for the relevant drawingsand documents.

The drawings and documents to be submitted for approval are listed below:

a) General arrangement of container crane

b) Main hoist arrangement

c) Trolley drive arrangement

d Boom hoist arrangement

e) Gantry drive arrangement

f) Trolley arrangement

g) Rope reeving diagram

h) Power cable reel device arrangement

i) Layout of machinery house and operator's cab

j) Lifting equipment

(Spreader and common head block)

k) Anti- sway system arrangement

l) Assembly of rail clamp and anchoring

m) Assembly of latching mechanism for boom

n) Arrangement of ladders and walkways

o) Statement of motor output

p) Electrical connection diagram

q) Arrangement of electrical equipment and devices

r) Painting scheme

s) Motor power calculation sheets

t) Wire rope design (selection) sheets

u) Crane wheel load and stability calculation sheets

v) Crane structure calculation sheets consisting of all loading conditions and respective loads, load combinations, section drawings and properties of all members, calculated stresses, calculated deflection and natural frequency of structure frame.

w) Vendor's list

x) Other drawings that the Engineer may require

10002.2 Final Drawings and Documents

The Supplier shall, prior to the time of Provisional Acceptance, submit to the Engineer five (5) copies of the final drawings and documents listed below.

a) All the drawings and documents listed in Sub-Section 10002.1

b) Electrical circuit diagram

c) Photographs taken during construction

d) List of maker's names for buy-out components and products

(i.e motors, electrical equipment, etc)

e) Other drawings that the Engineer may require.

10002.3 "As-built" Drawings for Wearing and Consumable Parts

The Supplier shall, prior to the time of Provisional Acceptance, submit to the Engineer five (5) copies of the "As-built" drawing's as listed below:

a) List of wire ropes with detail specifications

b) Brake drums

c) Brake shoes (including linings)

d) Wheels

e) List of ball and roller bearings with detailed specifications

f) List of bushes with detailed specifications

g) List of oil seals, o-ring and packing with detailed specifications

h) List of controllers with detailed specifications

i) List of main contact pieces for electromagnetic contactors with detailed specifications

j) List of coils for electromagnetic contactors with detailed specifications

k) List of fuses with detailed specifications

l) List of the elements for the inverter

m) Painting scheme for each portion

10002.4 Documents and Drawings Required by Government and/or Regulatory Bodies

Documents and drawings required by the Government of El Salvador or regulatory bodies shall be prepared by the Supplier and submitted to the Engineer.

10002.5 Manuals

The Supplier shall, prior to the time of Provisional Acceptance, submit to the Engineer five (5) copies of the following manuals:

a) Instruction manual for operation

b) Instruction manual for maintenance

10002.6 Inspection and Test Reports

The Supplier shall, at appropriate stages during manufacturing, submit to the Engineer five (5) copies of the following:

a) Mill sheets

b) Test reports for major equipment

c) Test certificates for wire rope

10002.7 Size and Scale of Drawings and Documents

a) The size shall conform to JIS and in the following sizes:

A-1 594 mm × 841 mm

A-2 420 mm × 594 mm

A-3 297 mm × 420 mm

A-4 210 mm × 297 mm

b) Scale of the Drawings

The scale of the drawings shall be clearly shown on the drawings. Wherever possible, the scale of drawings shall be as follows:

1:1 1:2 1:3 1:4 1:5

1:10 1:20 1:30 1:40 1:50

1:100 1:150 1:200 1:500

10002.8 Measurements and Language

a) Measurement

All designs, drawings, technical specifications and other technical data to be submitted to the Engineer shall be prepared in the metric system of measurement.

b) Language

All notices, communications, documents, instructions, drawings, data, manuals and other writings to be submitted to the Engineer shall be in English.

10003 Applicable Standards and Regulations

The crane shall be designed and manufactured in accordance with the internationally recognized standards and regulations approved by the Engineer.

The following standards are acceptable:

BSI	British Standard Institute
DIN	Dutch Industries Normen
FEM	Fédération Européene de la Manutention
ISO	International Standards Organization
JIS	Japan Industrial Standard
NEC	National Electric Code
SSPC	Steel Structures Painting Council

If a conflict exists, the order of precedence shall be as follows:

a) These specifications.

b) The standards listed above.

c) The bid submitted by the Supplier.

10004 Design Criteria

10004.1 Principal Functions and Dimensions

- Basic Dimensions

a)	Hoist capacity including spreader	minimum	50 t
	Under spreader	minimum	40.6 t
	Under heavy lift hook beam	minimum	45 t
(b)	Outreach from seaside rail center	minimum	37.5 m
(c)	Span (gauge of rail)		25 m
(d)	Back reach from landside rail center	minimum	11 m
(e)	Lift total	minimum	46.0 m
	Lift (above sea side rail surface)		32.8 m
	Lift (below sea side rail surface)		13.2 m
(f)	Width (buffer to buffer)	maximum	28.0 m
(g)	Portal clearance (under horizontal stays)	minimum	14.0 m
(h)	Portal clearance (between two seaside legs)	minimum	17.0 m
i)	Height of crossbeam (between seaside legs)	maximum	4 m
j)	Travelling distance		430 m
k)	Power supply	Cable reel system	

- Type of Crane

a) Type:

Rope trolley type, rail mounted, single lifting, gantry, travelling, quayside container crane

b) Control : Inverter control system

- Operating Speed

a)	Main hoist	
	With empty spreader	not less than 150 m/min
	With 45% load (under spreader 18 t)	not less than 90 m/min
	With full load (under spreader 40.6 t)	not less than 65 m/min
b)	Trolley	not less than 150 m/min
c)	Gantry	not less than 45 m/min
d)	Boom hoist	not more than 8 min to raise or to lower
e)	Sondary movement requirements	
	Trim	not less than 3 degrees
	List	not less than 3 degrees
	Skew	not less than 3 degrees
f)	Spreader	Telescopic type for ISO 20, 40 and 45 feet containers
g)	Rail clamp	Electro-hydraulic or electro- mechanical

- Acceleration and Deceleration for Main Hoist and Trolley Travel

- Main hoist

With rated load

a)	Hoisting	
	- Acceleration	not less than 0.6 m/s^2
	- Deceleration	not less than 1.0 m/s^2
b)	Lowering	
	- Acceleration	not less than 1.0 m/s^2
	- Deceleration	not less than 0.6 m/s^2

Without load under spreader (mean number)

c)	Hoisting	
	- Acceleration	not less than 0.8 m/s^2
	- Deceleration	not less than 1.2 m/s^2
d)	Lowering	
	- Acceleration	not less than 1.0 m/s^2

- Deceleration not less than 1.0 m/s²

- Trolley travel

With full load and against the maximum operation wind

a) Acceleration and deceleration not less than 0.5 m/s²

b) Acceleration and deceleration time not more than 5 s

The acceleration and deceleration rate shall be constant regardless of the amount of loads.

- Motors, Control Systems and Brakes

The quantities and power of motors are be shown in Table-1 below and Table-1 of Sub-Section 40006. 2

Table-1 Quantities and Power of Motors

Drive	Motor	Brake	Control System
Main Hoist	AC squirrel cage motor	AC thruster disk brake	Inverter with field control
Trolley Travel	AC squirrel cage motor	AC thruster disk brake	Inverter
Gantry Travel	AC squirrel cage motor	DC magnetic disk brake	Inverter
Boom Hoist	AC squirrel cage motor	Hydraulic disk brake. AC thruster disk brake.	Inverter

10004.2 Measurement

The Metric System shall be used in all designs, drawings and technical data.

10004.3 Ships Loaded/Unloaded

a) Breadth, (mld) 32.2 m

b) Number of container rows on deck 13 rows

10004.4 Main Dimensions of Berth

a) Quay level 5 m

b) Depth -14 m

b) Depth -14 m

c) High water level (HWL) +3.37 m

d) Thickness of fender About 1.25 m

10004.5 Ambient Temperature and Wind Load

a) Temperature

Maximum 45° C

Minimum 10° C

b) Humidity

Maximum 99%

c) Wind Pressure

Maximum wind velocity during operation 16 m/s

Maximum velocity of storm wind 60 m/s

d) Seismic Coefficient Kh = 0.2

The seismic energy transmitted to the system shall be absorbed by device in order to quickly stop the moment of crane eliminate the remaining sway. Pressure is to vary as a function of height (h) in meters above the quay deck level as shown in the table below:

Condition	Pressure kg/m^2		Wind speed m/s
	H16	H16	
Service	17	$8.5\sqrt[4]{h}$	16
Stowed	240	$160\sqrt[4]{h}$	60

10004.6 Wheel Load and Rail Conditions of Gantry Rail

Allowable wheel load

At service conditions (maximum)

Seaside 38.5 t/wheel Landside 31 t/wheel

At stowed conditions (maximum)

Seaside 50 t/wheel Landside 58 t/wheel

- Wheel pitch not less than 0.9 m.

Rail conditions

Construction standards for the traveling rails are as follows:

a) Rail 73 kg/m

Tolerances

b)	Horizontal alignment	not more than	±5 mm for every 10 m
c)	Gauge	not more than	±10 mm
d)	Level	not more than	±5 mm for every 10 m
e)	Relative level between seaside and landside rails	not more than	25 mm
f)	Rail alignment at rail joint	not more than	0.5 mm

- Rail position and height

a) Position

Seaside rail — 3.0 m (from face of berth)

Landside rail — 28.0 m (from face of berth)

(b) Height

Seaside rail + 4.97 m.

Landside rail + 4.72 m.

Clearance on seaside

(See Drawing DWB-01)

When the boom is stowed, no part of the crane must lie forward of the border plane defined by:

A vertical plane 1 m behind the berth face, from the quay deck level to a height of 32 m above it.

At the 32 m level, the plane inclining forwards over 1 m behind the berth edge at 75° to the horizontal.

10004.7 Crane Power Source

The Crane must operate under the following conditions:

a)	Voltage	4,160 volt
b)	Phase	3
c)	Frequency	60 Hz
d)	Deviation	

- Voltage (at rated frequency)	not more than	± 5 %
- Frequency (at rated voltage)	not more than	± 5 %
- Total deviation (at the same time)	not more than	± 5 %

10004.8 Design Criteria of Major Components and Parts

- Diameter of drums and sheaves

The diameter of drums and sheaves shall be at least thirty five point five (35.5) times the rope diameter for the main hoist drum and main hoist sheave. The diameter of drums and sheaves for the boom hoist drum and boom hoist equalizer sheave shall be at least twenty-eight (28) times the rope diameter.

- Brake torque

The brake torque of each brake on motors shall be at least:

a) Main hoist and Boom hoist: 150% of the sum of the torque at the brake shaft produced by the maximum load, when only one brake is provided on the system.

Or 100% of the sum of the torque at the brake shaft produced by the maximum load, when two brakes are provided on the system.

b) Trolley and Gantry: 100% of the motor rated torque

- Safety factor for wire rope

The safety factor for wire ropes shall be not less than five (5) for the main hoist and boom hoist including sheave efficiency.

- Dead turns on rope drum

For safety margin purposes, three (3) dead turns are required for the main hoist and boom hoist.

- Gantry travel device

	Seaside	Landside
Number of wheels per corner	8	8
Number of motors per corner	2 or 4	2 or 4
Number of driving wheels per corner	4	4

- Buffer

End buffer resistance: 100% speed for trolley travel and 70% speed for gantry travel

- Fleet angle

The fleet angle shall not be more than 2.5° for drums and shall not be more than 3.5° for sheaves

-Overload and Stability Test

Each test shall be carried out with the following loads. The load shall be slowly hoisted up to about 0.5 m above ground and no more hoisting up will not be required. In the case of overload test, the trolley shall run on full travel range with the above load under slow speed.

Stability test shall be carried out only at the most severe trolley position.

a) Overload test 125% rated load

b) Stability test 127% rated load

- Materials

The materials used for major parts of the crane shall be of the high quality and free from any kind of defects, and also of recent manufacture. The materials of main components and parts of the crane shall basically be selected according to the following JIS standards or equivalent to those.

Table-2 Materials

Portion and Parts	Material	JIS No
Steel structural parts	SS400 SM400, SM490, SM520, SM570 STK400	G3101-1995 G3106-1999 G3444-1994
Bolts and nuts	SS400 S35C, S45C SNC436 SCM435 SUS304	Same as above G4051-1979 G4102-1979 G4105-1979 G4303-1998
Drum	SS400, SM400, SM490, SM520	Same as above
Rope sheave	SS400, S35C, S45C S25C SC450 FCD450, FCD500	Same as above G4051 G5101-1991 G5502-2001
Shaft and pin	S35C, S45C SCM430, SCM440 SNCM625	Same as above G4105 G4103-1997
Brake wheel	FC250 SS400, SM400, FCD450, FCD550 Approved special material for brake wheel.	G5501-1995 Same as above G5502-1995
Brake shoe	SS400 FC200	Same as above G5501
Pinion	S45C, SCM435, SCM440, SNC631	Same as above G4102
Gear	S40C, S45C, SCM430, SCM435, SCM440	Same as above
Wheel	S45C SCMn2 SSW-Q	Same as above G5111-1991 E5402
Bearing housing	SS400, SM400, SC450	Same as above
Gear box	SS400, SM400, SC450, FC250	Same as above

10004.9 Crane Stability

The crane shall be so designed as to have sufficient stability under any of following loading conditions. The stability factor calculated from following loading modes shall not be smaller than 1.0.

Table-3 Crane Stability

Mode	Hoisting Load	Impact	Inertia	Wind load	Anchoring and/or Tie down	Boom
1	1.3 P	0.1 P	0.1 W	Operating wind	Released	Lowered
2	1.7 P	0	0	0	Released	Lowered
3	0	0	0	Stowed wind	Applied	Raised
4	- 0.3 P	0	0	0	Released	Lowered

From: JIS B8821 "Technical Specification for Design of Crane Structure"
Note : 1. "P" is "Rated container load + Lifting attachment"
2. "W" is " Crane total weight exclusive of the load "P" above".

10005 Tools and Accesories

The following tools and accessories shall be provided on the crane.

a) Maintenance tools with steel box 1 set per crane
(the list is shown below)

b) Fire extinguisher

* for machinery house	: CO_2 10 lb type	1 pc per crane
* for electric house	: CO_2 10 lb type	ditto
* for operator's cab	: CO_2 5 lb type	ditto

c) Portable programming panel — 1 pc per crane

d) Megger — ditto

e) Tester — ditto

f) Hand lamp: 100 W with bulb guard and 30 m code — ditto

g) Retractable ladder — ditto

h) Air compressor — 1 set per crane

i) Work bench with vice — ditto

List of Maintenance Tools

- Double ended wrench
- Flat file
- Single ended wrench
- Round file
- Monkey wrench
- Half-round file
- Pipe wrench
- Square file
- Hexagon wrench key set
- Chain block (5 t)
- Handle for hexagon wrench key
- Oil feeder
- Screw-driver set
- Cutting nipper
- Side cutting pliers
- Hand hammer
- Test hammer
- Chisel
- Grease gun

10006 Spare Parts

10006.1 Compulsory Spare Parts

The quayside container crane shall be supplied with spare parts for two (2) year operation. At least the following spare parts shall be supplied with each crane:

- Bearing	2 for each type
- Grease nipple	50% working numbers
- Flexible hose for hydraulic	1 pc for each type
- Oil seals and O-ring	100% working numbers
- Oil strainers	ditto
- Air filters	ditto
- Rollers of festoon cable carrier	ditto
- Twist lock pins	4 for each spreader
- Flipper frame of spreader	ditto
- Hydraulic and electric actuator	100% of working numbers
- Brake lining	ditto
- Festoon cable for trolley	ditto

- Umbilical cable for spreader	ditto
- Auxiliary relays and timers	50% of working numbers
- Fuses	100% of working numbers
- Limit switches	1 pc for each type
- Control switches	ditto
- Control chips	50% of working numbers
- Magnetic contactors	ditto
- Print boards	1 for each type
- Transistor for main drive	50% of working numbers
- Modules for PLC	1 for each type
- Bulbs for lighting lamps	10% of working numbers
- Pilot lamps	2 for each type
- Bulb for Pilot lamps	100% of working numbers
- Indication lamps	200% of working numbers
- Main hoist wire ropes	100% of working numbers
- Trolley drive wire ropes	200% of working number
- 20/40/45 ft telescopic spreader	1 set for two cranes

10006.2 Optional Spare Parts

In case the Bidder recommends spare parts in addition to the compulsory spare parts list mentioned above, he shall indicate these items in the optional spare parts list which may be similar to or different from the tentative list given hereafter. A price quotation for the optional spare parts shall be included in the Bill of Quantities. The Purchaser will decide whether the proposed spare parts will be included in the Contract or not.

The optional spare parts may include the following items:

- Main hoist wire ropes	100% of working numbers
- Trolley drive wire ropes	200% of working numbers
- Boom hoist wire ropes	100% of working numbers
- Wheel for trolley traverse	50% of working numbers
- Rope guide roller for trolley traverse	100% of working numbers
- Brake unit complete for trolley traverse	2
- Trolley festoon cable for trolley traverse	100% of working numbers
- Brake lining for main hoist	100% of working numbers
- Brake unit complete for gantry travel	2

10007 Test and Inspection

10007.1 General

To ensure the function and performance specified in the Specifications, all materials, shop-works and operations of the crane shall be carefully inspected and tested in the presence of the Engineer's and/or the Purchaser's representatives.

All labor, materials and equipment required for inspection and test at shop or on site, except a barge for crane stability test on site, shall be provided by the Supplier.

All cost including air travel (C class), local transportation, communication and accommodation of the representatives of the Purchaser and the Engineer shall be borne by the Supplier.

Any inspection or test results verified by the Engineer shall not waive the Supplier's duties and obligation to achieve satisfactory performance of the crane in actual operation.

The Supplier shall take all actions necessary to obtain certifications required by the Regulatory Bodies in order to place the crane in service.

The crane shall be certified in accordance with regulations of the local governing agency. It shall be the responsibility of the Supplier to have the certifications made by the accredited individuals or organizations. The test and inspection made by the accredited individual or organization shall be combined with the above test and it shall be the responsibility of the Supplier to furnish to the accredited individual or organization a copy of the test procedure at least two (2) weeks prior to the test. All results of the tests and inspections shall be recorded in the final report and submitted to the Engineer in five (5) copies.

The Engineer will reserve the right for himself or any party authorized by him to inspect the cranes at any time during the fabrication and delivery.

10007.2 Factory Test and Inspection

The Supplier shall give 14 days notice of the date he expects to be ready to perform these tests. The tests and inspection will be carried out in the presence of the Purchaser's representatives (2 persons) and the Engineer's representative (1 person). The tests and inspection will be carried out in but not limited to three (3) times as described below:

- Shop Inspection

The following inspections shall be made:

a) For main loading members, mill sheet with the steel maker's certification shall be submitted to the Engineer

b) For wire ropes, test record showing the results of the test at the rope maker's plant shall be submitted to the Engineer

c) Visual and dimensional inspection for structures

d) Inspections for partially assembled and temporality assembled parts

e) Non destructive test for welds

f) Buy-out components and equipment to be installed shall be tested and inspected at the respective manufacturer's shop

- Shop Assembly and Test

a) Steel structures, trolley, hoist, boom hoist and gantry travel equipment shall be partially assembled prior to erection to assure fitness and smooth operation of

all mating parts and connections.

b) Machinery parts shall be checked for vibration, chatter, static and dynamic balance under loaded operation condition.

c) All electrical equipment including switchgear, motors, control equipment, cable, etc. shall be tested al the manufacturer's works in accordance with appropiate National Standars.

- Field Inspections and Test at the Manufacturer's Premises

a) The inspection and test procedures which include all items to be measured, shall be submitted to the Engineer for approval.

b) After completion of the erection and final adjustment, the crane shall be tested. However the test for full gantry travelling will not be carried out at this test and inspection of the crane. The test shall include but not be limited to the following items:

Visual and dimensional inspections

No load test run

100 % rated load operation tests

125 % overload operation test

10007.3 Test and Inspection on Completion at Site

a) The inspection and test procedures which include all items to be measured, shall be submitted to the Engineer for approval.

b) After completion of the erection and final adjustment, the crane shall be tested. The tests shall include but no be limited to the following items:

Visual and dimensional inspections

No load test run

100 % rated load operation tests

125 % overload operation test

- Stability Test

Test shall be done under 127 % of the rated hoisting load in the maximum outreach or backreach position.

- Performance Test

The test shall be conducted with ISO 40 ft container rated load (30.5 t).

The procedure shall be repeated on the designated cycle path with load and no load, disconnection on seaside. The test will consist of the following steps: pick up a container on the dock and, through hoist and trolley travel, lower it to near the water level, then hoist the container and, through the same motion, place and disconnect the container on the dock. The next operation shall be performed on the same path with no load. This test shall be held trouble free for a period of not less than four (4) hours continuously.

During the test period, the temperature of motors, gears and brakes shall be checked. Motor current shall also be read. Protective devices shall be tested, and observations of performance for all systems and components shall be

made. All brakes shall be adjusted, all limit switches shall be verified to be functioning. The test shall include simulated power failure, measurements and record of cycle times. The test records shall be submitted to the Engineer for approval.

- Trial Operation

During trial operation the due performance of the cranes will be tested during actual loading and unloading of containers. The trial operation test shall include:

a) A duration test under at least 12 hour continuous operation, simulating the performance of the crane as realistically as possible, and handling different types of containers.

b) Any other test that may be requested by Engineer to test the due performance of the crane.

The Engineer will issue a Provisional Acceptance when:

- All equipment shall have been delivered to the site, and
- Test on completion has been successful.

10008 Training

10008.1 General

The Supplier shall, at his own cost, provide an English-Spanish interpreter for training of the Purchaser's personnel at the Manufacturer's shop training and the First Site Training.

A detailed training program shall be submitted for approval of the Engineer.

All expenses, including air travel (C class), local transportation, communications and accommodations shall be borne by the Supplier .

10008.2 Manufacturer's Shop Training

This training will be provided prior to the factory no load test in the manufacturer's country and as detailed below:

Table-4 Manufacturer´s Shop Training

Kind of training	Number of trainees	Training period (including travel day)
Crane operation	3 (Including team leader)	3 weeks
Crane maintenance	4 (Mech. 2, Elect. 2)	3 weeks
Total	7 persons	

10008.3 First Site Training

This training will be provided prior to the Provisional Acceptance of the crane at the site as detailed below:

Table-5 First Site Training

Kind of training	Number of trainees	Training period
Crane operation	1	2 weeks
Crane maintenance	2 (Mech. 1, Elect. 1)	2 weeks
Total	3 persons	

10008.4 Second Site Training

This training will be provided after the Provisional Acceptance the crane as detailed are as below:

Table-6 Second Site Training

Kind of Training	Number of trainees	Training period
Crane operation	1	2 weeks
Crane maintenance	2 (Mech. 1, Elect. 1)	2 months
Total	3 persons	

10008.5 Taking-Over Certificate

The Engineer will issue a Taking Over Certificate when the training has been conducted successfully.

10009 Scope of Work

10009.1 Scope of Manufaturer's Work

The Manufacturer shall supply the following products, equipment, materials and service in compliance with the Contract specifications and schedule.

a) Design, supply of materials, fabrication, delivery to site, erection, test, commissioning of and training on:

- Quayside container crane including all equipment, parts and materials specified in the specifications, except for items (b) to (j) below. — 2 units
- ISO 20/40/45 feet telescopic spreader — 2 sets
- 45 metric ts heavy cargo lifting beam — 2 sets
- Trailing electric cable for crane power supply — 2 sets
- Tools and accessories — 2 sets
- Runway end stopper frame with bumper and anchor bolts — 4 sets
- Jack-up base block with anchor bolts — 8 sets
- Crane anchoring frame — 8 sets
- Socket block for crane stowage pin with anchor bolts — 4 sets
- Cable suring block and cable guide frame for crane power supply pit. — 1 set
- Earth plate with bonding conductor — 4 sets

b) Inspection and test at the Manufaturer's and vendor's workshops — for 2 cranes

c) Painting and coating including material — ditto

d) Packing and transportation from workshop to site — ditto

e)	Crane erection at workshop and partial erection at site, or total erection at site including labor,materials, heavy lifting equipment and site office	ditto
f)	Adjustment of control and drive, turn-up and trial operation at site	ditto
g)	No load and load test on crane including test load	for 2 cranes
h)	All drawings and documents required in the specification	for 2 cranes
i)	Spare parts	2 sets
j)	Training of the Purchaser's personnel	1 set

10009.2 Out of Manufacturer's Work

The following work, service, facilities and materials shall be excluded from the Manufacturer's Work

a) All civil and construction works.

b) Gantry rail with fish plates and bolts/nuts, rail clips and bolts/nuts, and rail pads.

c) Moving to the locations, unpacking, and installation and/or embedding of runway end stopper frames, jack-up base blocks, crane anchoring frames, socket block for crane stowage pins, cable suring block and cable guide frame, earth plates and bonding conductors.

d) Installation of the crane main power supply line and the auxiliary shore power supply line respectively up to the junction box in the power supply pit and to the receptacle box, both of them placed aside the seaside gantry rail, including supply of the junction box, receptacle box and all electric cables.

e) Supply of space at site for installation of the Supplier's site office.

f) Preparation of utilities for the Supplier's site office and the crane erection site. However, the charge of usage shall be paid by the Supplier.

g) Supply of power for adjusting, turn-up and test running of the crane at site.

h) Supply of a barge for carrying the test load for crane stability test under the crane outreach.

SECTION 20000 STRUCTURAL PARTS

20001 General

The main steel structures shall consist of legs, sill beams, girder support beams, portal tie beams, leg diagonals, top horizontal lattice beams (if necessary), upper posts, top crossbeam, upper post stays, girder, boom, fore stays, back stays (if necessary) and machinery house platform. The boom shall be hinged at its heel by means of pins. So as to allow free passage of berthing vessels, the boom shall be raised around the boom hinge pins by wire ropes and secured to the upper post by the boom locking device. On loading operation the boom and girder shall be horizontally connected, and the trolley with cab runs between the boom and girder ends along the rails installed on the boom and girder. The portal frame consisting of legs and portal tie beams shall have enough space and height to allow vehicles and straddle carriers to pass through between the crane rails. In the other direction, the leg-construction will be so arranged that sufficient space can be obtained for container passage while loading and unloading. The main structure shall be rigidly constructed, and have sufficient strength and rigidity for efficient container handling work. Each load carrying member shall be so designed as to prevent the vibration due to Karman vortex by the wind. The crane structure in total shall have the stiffness specified below and be testified by strain analysis by computer program:

The horizontal deflection of the boom end and the girder support beam to the gantry travel direction due to the acceleration and deceleration of the gantry motion shall be not more than 200 mm and 80 mm respectively.

The horizontal deflection of the boom level of the crane structure to the trolley travel direction due to the acceleration and deceleration of the trolley motion shall be not more than 15 mm. All of the above deflections shall be calculated for the trolley at the most severe position with a rated load.

The natural frequency of the gantry structure to the trolley travel direction shall be less than 0.5 Hz.

Pin connections between the main structures will not be allowed except for tension bars and boom hinge pins.

The minimum thickness of the structural parts of the crane shall be as follows :

Plates, bars and rolled sections

7 mm for load carrying members

6 mm for the secondary member of the load carrying member

2.8 mm for handrail

All joints of load carrying members shall be connected by high friction bolts, or pin, or welding at workshop. However, the use of high friction bolts will not necessarily be required for the jointing of auxiliary members, machinery house enclosure, stairs, ladders, walkways, and covers.

The interior of all members, large enough to crawl through, shall be accessible for periodic structure inspection. Members that cannot be internally inspected because of the size or other practical reasons shall be sealed by welding. Sealed members shall be pressure tested at 0.1 kgf/cm^2 gage pressure using soap film to demonstrate air tightness

20002 Gantry Frame

Legs, sill beams, girder support beams, top crossbeam and upper posts shall be of the welded box type construction. Meanwhile, leg diagonals, top horizontal lattice beams (if any) and post stays may be any of the I-section shape, or pipe, or welded box type construction. Flange joints using high friction bolts shall be applied for rigid

frame connections. In addition, splice joints by high friction bolts will be permitted as far as reliable measures are taken to prevent invasion of rainwater into any of the load carrying members. The frames must have enough clearance for container carrier and straddle carrier passage under the crane portal frame and also shall have enough clearance between legs for passage of the suspended container from the trolley.

20003 Boom and Girder

The boom and girder shall be either a double I-section plate mono-girder with lateral bracing or two welded box-sections or welded mono-box section girders. The boom shall be hinged at the heel end and shall be raised by boom hoisting wire ropes to clear ship's superstructure and rigging. To enable the crane to handle a 20 ft container stacked in front of the superstructure, the lateral distance of the most outside point of the boom or the trolley, whichever is larger, from the longitudinal center of the boom shall not be more than 4.7 m on either side. When the boom is in the horizontal position, it shall be supported by two or four forestays at its front side in order to limit its deflection to a practicable extent, and its heel end shall be connected securely to the girder by two lubricated hinge pins which shall have sufficient strength for all design loads. Two lines of trolley traversing rails shall be installed on the boom and girder from end to end, and an elastic pad shall be provided between the rail and rail bed to eliminate vibration and noise due to trolley traversing. Rail shall be fixed to the rail bed by bolted rail clips, not by direct welding.

Rail joints shall be connected by full penetration welding and the tread surface shall be finished perfectly flat so as to form a continuous rail surface throughout the boom or girder. The connection part of rail between the boom and the girder shall be cut diagonally, designed to lessen the shock when the trolley runs over it. On the waterside end of the boom, equipment for spreader tilting device shall be provided. A walkway shall be equipped on the boom and girder over the whole lengths, and the operator shall be able to escape from the trolley through the walkway in case of emergency.

20004 Machinery and Electrical House

Main and boom hoist and trolley drive machinery bases and electrical power distribution equipment shall be mounted on a machinery platform which is enclosed in the weatherproof machinery house. The machinery platform shall have sufficient rigidity and provide safe access and working space around all machinery components and electrical equipment.

Machinery houses shall have, at least, two (2) sliding doors furnished with a fixed glass window, and a locking device. Drip shields shall be provided over the doors. At the ceiling of machinery houses, an overhead traveling crane shall be furnished for handling of repair equipment and parts of the biggest size and weight, and lowering them to the ground.

The traveling crane shall have the following:

- Hoisting capacity 5 t
- Hoist Motor driven
- Trolley travel Motor driven
- Travel Motor driven

An access hatch shall be provided in the floor, sized to permit lowering of the largest mechanical or electrical parts in the machinery house by the above mentioned overhead traveling crane. Usually, the hatch shall be securely closed by the removable covers which shall be used as the floor. A small hatch with a hinged manually-open cover shall be provided to allow raising and lowering of small tools and supplies from and to the ground. If necessary, additional hatches shall be provided for servicing the trolley machinery by the machinery house service crane.

Location of all the hatches shall consider the ropes that will obstruct access to the trolley and ground. Removable pipe stanchions with safety chain guards shall be provided around the hatch opening. The roof shall have sufficient slope, not less than 8/100, from the center ridge to prevent standing water. Ventilation fans with dust filter, with adequate capacity for cooling the equipment shall be provided at the appropriate location in the machinery house. As a minimum, it shall have the capacity to change the air in the machinery house in ten minutes. The access slot in the machinery house for passage of the boom hoist ropes shall be through the front wall of the house and shall be baffled to prevent entry of driving rain. One set of motor-driven rereeving device shall be provided in the machinery house, and arranged for convenient rereeving of the wire ropes during routine ropes replacement. A work bench with 10 cm vise, an air compressor, 3 storage cabinets, a table for work master, and a lube oil rack shall be provided in the machinery house. Hook plates for maintenance purposes shall be provided at proper locations outside of the wall and under the machinery platform.

An electric incinerating type toilet shall be provided in the machinery house. The toilet shall be surrounded by a fence with suitable height to prevent the sight form outside. The incinerating capacity of the toilet shall be sufficient for two persons for every hour. The toilet shall be equipped with a deodorizing device and the air inside the toilet shall be exhausted to outside of the machinery house.

Inside the machinery house, an enclosed electric room shall be provided to accommodate the electric control panels and associated equipment which may be badly affected by excessive temperature, moisture, dust and harmful gases. The electric room shall be adequately sized to house and service the equipment. The floor's walking surface shall be covered by an electrically insulating rubber matting with non-skid walking surface. The electric room shall be insulated with flameproof heat protection panels and be air conditioned. Air conditioning systems shall be automatic and thermostatically controlled to maintain the temperature in the electric room between 20° C and 30° C and the relative humidity less than 50%. The wall facing the machinery house shall be provided with a hinged door with a fixed glass window, and a window with safety glass to allow maximum sight of mechanical equipment from the electric room to facilitate maintenance operation. An emergency personnel exit to the outside shall be provided. Material dust and other airborne particulates shall be excluded from the electric room. The room shall be reasonably sealed and maintained at an overpressure. Intake air shall be adequately filtered to remove material dust and other particulates.

20005 Operator´s Cab

The operator's cab, which is constructed with steel section and plate and be totally enclosed, will be suspended from the trolley. The floor shall be a double layer construction and the space between the upper and lower floors shall be used for electric wiring.

The arrangement of the cab shall be such as to give the operator a good view for the crane operations. The ladder and platform installed on the landside leg shall provide the access to the operator's cab. Further, due consideration should be made to enable the operator to escape from the operator's cab through the trolley to the girder and boom in case of emergency. The front and both sides shall be provided with windows with wide view, and provision shall be made for easy cleaning of windows. They shall be open for ventilation. The floor window which will give clear downwards view, shall be of tempered safety glass and protected on the inside by steel bars which do not unduly limit the operator's visibility. On the lower front window, a window wiper with washer shall be provided. Tinted glass absorbing ultraviolet rays shall be used for the windows through which the operator would be exposed directly to the sun. Two convex rear view mirrors, adjustable from the open

cab window, shall be positioned outside on each front corner of the cab.

An air conditioner shall be provided in the operator's cab. An anemometer with alarm shall be installed on the crane, whose indication shall be fitted in the operator's cab. Controllers, switches and indicator lamps inside the cab shall be clearly marked and arranged for easy operation and viewing. An upholstered, rotating, and pro-aft and height adjustable chair shall be provided.

20006 Boom Control Station

The boom control station shall be located on the seaside girder supporting beam. The station shall be suitably enclosed. All controls necessary for operation of the boom hoist and boom latching shall be provided. The station shall be lighted and equipped with an intercom station. Station and window location shall provide visibility of the boom traveling from the operating to the stowed position, wire rope entering the machinery house, boom latch device and the upper boom hoist sheaves.

20007 Check Man´s Cab

The check man's cab shall be installed under the seaside sill beam for the convenience of the personnel who check the container number, etc. The cab shall be suitably enclosed by using a sliding, glassed door and sliding, glassed windows. One chair, one shelf for writing, one 20 W x 2 fluorescent light and one receptacle shall be provided in the cab.

20008 Stairs, Ladders, Platforms and Walkways

Stairs, ladders, platforms and walkways shall be provided on the crane to make readily accessible all parts and areas to which access is required for crane operation, lubrication, service, maintenance or inspection. Stairs shall be provided for access to the operator's cab , machinery house and boom latch device. Stairway and ladder access to the crane shall be from the landside leg opposite the elevator. The stairways shall be arranged and installed from the ground level to the portal tie beam so as to provided the required clearance. Access above the portal tie shall be by stairs. Stairway access shall be provided to the machinery house and operator's cab. Main horizontal beams used for access shall be equipped with handrail on both sides. Ladder or stairway access shall be provided to both portal tie beams. An access walkway shall be furnished for the full length of the boom and trolley girder for direct access to the operator's cab at any position of trolley travel. Access shall be provided around and through the machinery house. Where normal access for operation or maintenance uses the horizontal surface of any beam, the surface shall be covered with a non-skid surface. The stairways, ladders, platforms and walkways shall satisfy the following specifications.

-Stairways

a) Width
   main stairway : 600 mm
   sub-stairway : 500 mm

b) Footstep distance : Max. 240 mm

c) Angle of inclination from the horizontal : 30°~50°

d) Handrail shall be provided.

e) Footstep shall be made of stair tread.

- Ladders

a) Width : 410 mm

b) Footstep distance : 300 mm

c) Footstep shall be made of round steel.

d) If a ladder is installed vertically or at an the angle of inclination larger than 70 degrees from the horizontal level, and if the ladder is longer than 2.5 m, arc-shaped enclosures shall be attached to the ladder.

- Handrails

a) Height of handrails : 1100 mm

b) Height of toe board : 100 mm

c) The handrail shall be made of steel pipe, and its stanchion shall be made of angle shaped steel.

20009 Structural Design

The structures shall be designed in accordance with JIS B 8821 "Technical Specifications for the Design of Crane Structure" or an equivalent internationally recognized standard as approved by the Engineer.