3.3 The Third Mission

1. Program for the next fiscal year

At the end of January last, the Mexican Government made an application to the Japanese Embassy in Mexico, for experts to be sent, to provide the same sort of technical services as this fiscal year.

The Japanese Embassy notified the Japanese Government of this, and has received the following reply.

The Japanese Government will cooperate in every possible way.

2. Application for technical cooperation to the Japanese Government for the port project of Salina Cruze and other ports

As a result of several discussions with the Mexican authorities, the possibility became evident of presenting the following request for the commencement of a development project for the commercial zone of the new industrial port of Salina Cruz, which will be carried out as from the fiscal year of 1981.

As far as the time of commencement and details of the studies, these will be taken up for study by the Mexican side.

The Request from the 'C.P.D.' consists of the terms of reference, as follows;

a) Technical cooperation for working out the master plan for the port of Salina Cruz;

a-1) Study of the policy for the construction of Salina Cruz port, and also the other three ports. The construction policy for the port is being studied from the standpoint of social improvement, forecast of regional development and the policy of physical distribution of goods.

a-2) Working out of the master plan for Salina Cruz port. Determining the size of Salina Cruz port (in both the short and the long term), and study of the general layout of the port, in accordance with the study specified in (a-1).

b) Technical cooperation for the project and planning of the construction of the 4 industrial ports that are in the process of development. (The same as for fiscal 1980).

3. **Sister port relationship between the ports of Lázaro Cárdenas and Kashima.**

Before the departure of Mr. Takeuchi from Japan, the intention of the Governor of Michoacan State, Mexico, in whose region Lazaro Cárdenas port is situated – and the intention of the Governor of Ibaraki Prefecture, Japan, who is responsible for the administration of Kashima port – have been confirmed in the matter of establishing a sister port relationship between these two ports.

In order to consolidate the procedure, Mr. Takeuchi met with Dr. Fernando Rosenzweig and Lic. Aguilar of the 'C.P.D', and visited the city of Morelia, Capital of Michoacan State, where he had the opportunity of talking with Messrs. Vaca, Governor's Secretary, and Flores, Director of Industrial Development for the State Government.

At this meeting, those persons in charge of the Government of Michoacan State, promised to send a letter to the Governor of Ibaraki Prefecture, extending an invitation for a Japanese Mission to come to Mexico, and asking for a Mexican Mission to be accepted to Japan.

The despatch of booklets from Michoacan State to the Governor of Ibaraki Prefecture, and the despatch of information on the port of Kashima and Ibaraki Prefecture to Mexico, was also agreed on.

4. **Supply of information to the 'C.P.D'.**

a) On their last visit, the Japanese side promised the preparation of a works schedule for the Luguna de Ostión port project, if they were supplied with data on the subsoil of the zone. However, at the present time, the Mexican side (PEMEX and Proyecto Marinos) is studying the alternative of moving the construction site of the port further to the south of the original site. For the purpose of comparing the two alternatives, the Mexican side made a decision to carry out a study of the subsoil of that zone in Mexico. (Item 3-2, 7 of the last report).

In the light of such circumstances, the promised study that was to have been done in Japan was cancelled.

b) With regard to the project for the industrial port of Altamira, carrying out a study in Japan was agreed on, if the Mexican side would send on the data on earth conditions in that zone, so as to weigh up the possibilities of utilizing the very loose ground, situated to the east of the projected port, and to consider what work techniques would have to be employed in those areas.

c) The despatch from Japan of similar examples concerning the safety of the construction of breakwaters on the rocks in the port of Laguna del Ostión was agreed on. (Please refer to the C.P.D. plan).

– Signed –

Dr. Fernand Rosenzweig
C.P.D., GMM/sve

– Signed –

Yoshio Takeuchi
Leader
Study Team for the Development
Plan of Industrial Ports in Mexico
President OCDI

Chapter 4

Working Papers

4-1 Cargo Handling System of "Multi-Purpose Terminal" in Altamira Port, Mexico, (July. 1980)

4-1-1 Outline of "Multi-Purpose Terminal"

We define "Multi-Purpose Terminal" as a wharf which is planned to be used by various kinds of vessels when the volume of cargos loaded and unloaded is still not so big at the time a port is under developped.

In other words, this is a pier prepared with reasonable layout of it's facilities, which will be able to be utilized for handling a variety of cargos as much as possible after a small extention of it's length in the future.

The object of this report is to study:

(1) the selection and the layout of various facilities and

(2) the flow of data and information in this terminal

in order to realize an efficient flow of cargos at the "Multi-Purpose Terminal" in the commercial area of Altamira port.

The following vessels and cargos are considered to utilize this commercial area of Altamira port.

Vessels:

Full container vessel (including RO/RO vessel)

Bulky cargo vessels

Conventional freight vessels

Automobile carrier

Cargos:

General merchandise

Grain

Steel products

Equipments for plant

4-1-2 Precondition

As we have no information or knowledge regarding to the cargos which would be handled in this port, we would like to proceed this report assuming the following conditions.

(1) Qty. of berth: 2 berths

(2) Depth of water: −12 and −13 meters

(3) Length of berth: 250 meters and 300 meters

(4) Variety of vessels: Full container vessel 50,000 G.T.
Conventional freight vessel 10,000 – 20,000 D.W.T.
Grain carrier 65,000 D.W.T.
Ferryboat 10,000 – 20,000 D.W.T.

It will be possible to handle approx. 1,400,000 tons of cargos per year if these facilities are utilized with the maximum possible efficiency. Calculations are as follows:

Precondition	:	1.5 Vessels/1 berth/1 week
Container	:	1,000 TEU X 50(times) X 1.5 vessel = 75,000 pcs (750,000t.)
General merchandise	:	2,000t. X 50 = 100,000t.
Grain	:	60,000t. X 12 X 1/2 = 360,000t.
		30,000t. X 12 X 1/2 = 180,000t. (utilizing 2 ports)
Others	:	1,000t. X 12 = 12,000t.
Total	:	approx. 1,400,000tons

4-1-3 Cargo Handling System

(1) Handling System of Container

Total quantity of containers per one vessel (including loaded containers also vacant containers) is supposed to be 1,000 TEU.

Then, handling quantity is to be 667pcs. if there are 40ft. containers and 20ft. containers with the share of 50%/50%.

In the case of LO/LO vessel, it takes about 33 hours for unloading/loading if we use one Gantry Crane of the capacity 20pcs./hour (3 minutes/cycle).

In other words, it takes 2-3 days supposing that the working hours per day is 11-16 hours.

In the case of LO/LO-RO/RO vessel, running hours of crane to be 23 hours (or 1.5−2 days) on the condition that the handling quantity through RO/RO Ramp is 100pcs. per day.

In the case of RO/RO vessel and automobile carrier, all the cargos will be loaded/unloaded through the Ramp.

For example, in the case of the vessel with 1,000 containers, it takes only 6 hours and 40 minutes for unloading/loading when the capacity of the Ramp is 5pcs./min..

A Straddle Carrier is generally used supported by Chassis to transport containers in the Marsharing Yard.

Four sets of 40ft.X 3 Straddle Carriers, with 10−12 minutes of running cycle between the yard and the pier, are required to be operated together with one Gantry Crane, with the cycle of 3 minutes, in order to avoid any idle time of each machines.

It is recommended to provide one more Straddle Carrier for the CFS operation, and one more for emergent use. (then 6 Straddle Carriers in total)

Chassis are generally prepared to the terminal by the transporting agents in each time they are required, however it is recommended to provide at least 10 Chassis (each 5 sets of 40ft. and 20ft.) for emergent use.

3 Trailer Heads would be sufficient to handle those Chassis. One 30t. Forklift is required for the handling of RO/RO cargos, it could be used also for unloading/loading of freight trains. 30,000 m^2 of Marsharing Yard is to be located in the Berth "A", and another 18,000 m^2 is to be in the Berth "B".

Straddle Carriers are used in the yard "A", then the capacity of containers in this yard is to be 2,000 TEU according to the following calculation:

$30{,}000m^2 \times 0.4$ (utilization rate of the area) $\div 15m^2$/TEU $\times 2.5$ (piles) = 2,000TEU

Chassis are used in the Yard "B", then the capacity of this yard to be 562 TEU according to the following calculation:

$18{,}000\text{m}^2 \times 0.5 \div 16 = 562$ TEU

Unloading/loading quantity per week is 1,500pcs.. So the space for 1,500 containers shall be provided regularly assuming that the containers are remain kept in the yard for 7 days on an average.

The remaining space for 1,000 containers could be utilized for storing vacant containers and for the inspection area.

Handling quantity of the Refrigerator Containers is uncertain. However we assume to place 150 Refrigerator Containers in one line at the edge of the yard taking into account of the electric distribution. The CFS should be provided for the handling of the LCL cargos. 10,000 m^2 is recommendable as the space for the CFS with 250 m of one side and 40 m of another side.

Those lengths of both sides are determined in consideration of layout of cargos and space for offices.

10,000 m^2 is calculated as follows:

a) volume of the LCL cargos to be 40% of all cargos. $750{,}000\text{t} \times 0.4 = 300{,}000\text{t}$

b) cycle of the CFS: 24/year

c) utilization rate of the area: 0.7

d) volume addmitted per m^2 : $2\text{t.}/\text{m}^2$

e) then:

$300{,}000 \div 24 \div 2 \div 0.7 = 8{,}930\ \text{m}^2$ (approx. $10{,}000\ \text{m}^2$)

2 sets of 2t. Forklift should be provided for the handling in the CFS. One maintenance shop (30×40m) and one washing yard (30×30m) for the cargo handling machines and containers are to be provided. Water treatment facilities and a parking lot (30×70m) are also required around the area.

(2) Handling system of grain

We presume that the imported grain would be handled because of current food situation in Mexico.

Although there are large Grain Carriers weighing over 100,000 DWT, PANAMAX Type is still very popular all over the world.

In the case of this port, we would like to assume a condition that the two Grain Carriers with 65,000DWT and 30,000DWT would call at the unload once a week, each.

We estimate that the volume of 30,000t. (just the half volume of the maximum workable cargo, 60,000t., in this port) would be unloaded in 4 days.

$30{,}000\text{t.} \div 4\ \text{days} \div 15\ \text{hours} \div 0.8 = 625\text{t.}/\text{hour}$

Pneumatic Unloader is to be used for unloading with capacity of 600t./hour. (It is recommendable to use 2 sets of 300t./hour machine for the safety purpose.).

Tire mounted traveling type could be useful in order not to disturb other unloading/loading when it is not servised. (Eventhough it's cost is higher than the fixed type).

Silos are to be provided for the storage of Grain behind the yard. It is possible to spare the area of $21{,}000\text{m}^2$ for Silos considering the layout of other facilities.

It is required to have Silos with capacity 60,000t. according to the following calculation:

a) handling volume per year

$(30,000 + 15,000) \times 12 = 540,000t.$

b) cycle: 9/ year

c) then:

$540,000t. \div 9 = 60,000t.$

However, we opine that the Silos with capacity 30,000t. could be good enough for the time being.

Piers and Silos are connected by the Belt Conveyer (600t./hour) installed underground.

Backet Elevator (200t./hour X 3 sets) will lift Grain into Silos from Belt Conveyor.

Two Bulldozers (2t. each) are required for the works in the Grain Carriers.

Forklifts used for general merchandize could be utilized to move Pneumatic Unloader, Hopper and Belt Conveyor as occasion demands. Railways and Tracks would be used to transport Grain to outside of the port.

(3) Handling System of General Cargo

Cargos transported by conventional freight vessels such as general merchandise, steel products, equipments for plants are principally loaded and unloaded by the derricks equipped with the vessels. Transportation between the aprons and the warehouses or the outdoor storages would be made by Forklifts.

Heavy cargos such as the Equipments for plants are generally transported by special vessels equipped with heavy crane. However, one Mobile Crane is needed to receive such heavy cargos transported by conventional freight carriers not equipped with heavy cranes.

This Mobile Crane could be utilized for handling containers when the Gantry Crane is being maintained.

Conventional freight vessels generally displace 10,000–20,000t., then, assuming that 1,000 t. cargo is loaded per one vessel on the average, total handling volume is to be 100,000 t. per year on the condition that they would call at this port once every week. Supposing that 50% of those cargos are to be stored in the warehouses and remaining 50% are to be stored in the open storage, space needed for the warehouses is:

$50,000t. \div 12\ (\text{times}) \div 1.5\ (t./m^2) \div 0.6\ (\text{utilization rate}) = 4,630m^2$

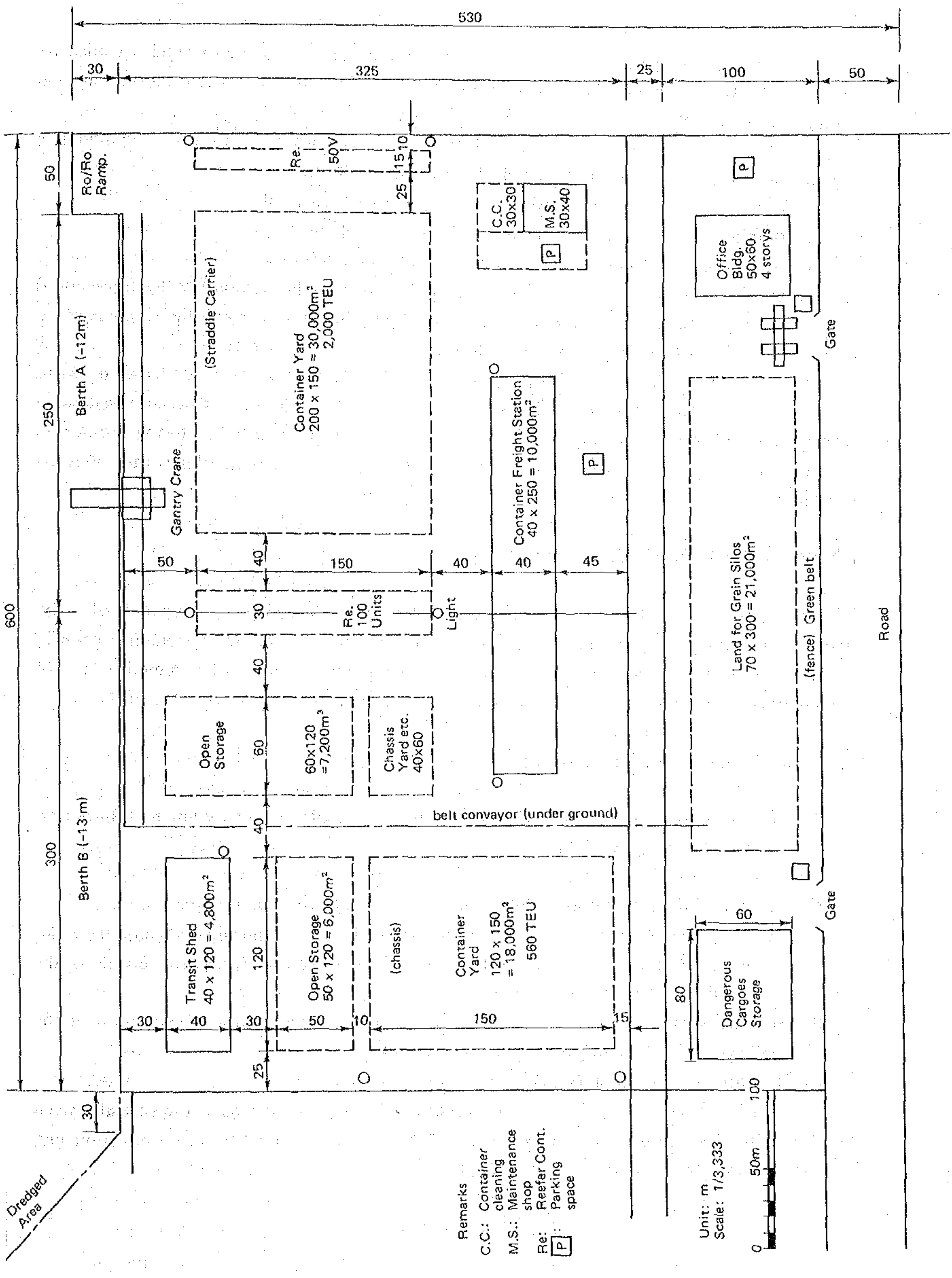
and space needed for the open storage is:

$50,000 \div 8 \div 1 \div 0.5 = 12,500m^2$

2 sets of 2t. Forklifts are required for the works in the warehouse and 3 sets of 6t.–10t. Forklifts are required for the works at the aprones and the open storage.

An illustration of the layout plan of "Multi-Purpose Terminal" is shown in the next page.

Fig. 4-1-1 Layout Plan of Multi-Purpose Terminal



4-1-4 Data and Information Flow in the Terminal

In order to make transportation of cargos in the terminal smooth and to avoid any mistakes in handling cargos, it is essential to have a system well organized to administrate various data and information of cargos.

Documents, which flow in parallel with the flow of the cargos, will transmit the required data and information in the terminal. Required documents are as follows:

1) for apprication and correspondence to the government authorities.
2) for communication with the steamship companies, the shippers etc.
3) for plannings, instructions and records of works in the terminal.

Regular forms provided by the government authorities would be used for the appricatipns and correspondences to the government. Also the steamship companies and the shippers could provide their regular forms to be used for our purpose.

However, the documents which will be used for plannings, instructions and records of works in the terminal should be designed individually. Unfortunately, we can not design the definite forms of those documents at this moment because the information regarding to this terminal in our hand is too poor to make such a important decision. Generally speaking, the following information is required to be incorporated into the documents.

(1) Information about the Features of Cargos

Every lots of cargos (every B/L), name of vessel, name of steamship company, date of entry, date of departure, shipper, consignee, place of departure, shipper, destination, no. of B/L, packages, quantity of packages, mark, name of commodity, quantity of commodity, no. of container, type of container, information about customs clearance, etc.

(2) Information required for the Works

Date of entry, date of departure, location of storage, shipping company, inland transporter, results of external inspection of container, etc.

There are following works in the yard.

a) Decision of the order of loading and the location of the cargos in the space of vessels.

Based on the data about cargos and vessels provided by the steamship company, the order of loading and the location in the space of the vessel should be decided taking into account of the destined port and the center of vessel's gravity.

Special cargos should be loaded at the location specified respectively. Instruction of the location and the order of loading to be given to the workers.

b) Decision of the location of storage

Instruction should be given to the workers to place special cargos at the specially given place, and general cargos at each places classified in accordance with their steamship company, their sea routes, destined port and description.

c) Various procedures to the government authorities

Entry into port: notice of entry, arrangement of pilot, tugboat, water, fuel, food, telephone, automobile, accommodation, etc.

Customs clearance, quarantine and prevention of epidemics: notice, application for inspection, inspection, disposition of rejected goods. communication with shippers, steamship companies etc.: information of vessel and cargo, notice of cargo entry, delivery order, claim of payment for various expences regarding to unloading, storage etc.

d) To make record of data and information

Data tables, which is designed convenient for reviewing at any time, should be prepared for each lot of cargos in the terminal.

e) Instruction of works

Notice of daily working plan, reports of works, records, works carried over to the next day, rearrangement, calculation of expenses should be done in each unit of works.

It is essential to provide well examined forms of documents in order to transmit and preserve those data and information correctly and quickly.

It is required to design simple forms of documents so that they can fill up every necessary subject without fail.

Also it is needless to say that the regulation and the business custom in this country have to be studied and incorporated in those forms of documents.

Attached sample of forms are one which is currently used at M.O. Berth in Ooi Pier, Tokyo. (abbreviated here)

Please be noted that the volume of those documents is not so big because the system of works is computerized to a certain extent in M.O. Berth.

4-1-5 Works in the Terminal

In this report, unloading/loading works at this "Multi-Purpose Terminal" in Altamira port are mapped out to be modernized and mechanized for a great deal.

The fundamental specifications of each machines are shown in this report which have been figured out based on the calculation of estimated handling volume in this terminal.

Machinery adopted in this plan is obtainable easily in the Japanese market, however, we believe, there is no difficulties in fabricating those machines to order if completed machines are not available in your market.

Please kindly be noted that we dare not to mention names of existing manufacturers of those machines in this report.

Eventhough the works in the terminal are well mechanized, it is needless to say that the workers have to be talented and well trained to perform the mapping out of the working plan, operation of cargo handling machines, supplimental works and documental works in the office in order to manage a successful administration of the terminal.

Education and training for the workers have to be done before the operation of the terminal.

Please kindly be advised that at least full one year of training is required for a non-experienced worker.

We are pleased to attach some materials for study of "Training College at Yokohama Port" for your reference.

4-1-6 Cost and Schedule for Construction of "Multi-Purpose Terminal" in Altamira Port

Facilities	Specification	Unit	Q'ty	Unit Price (1000 yen)	Amount (million yen)	Schedule (months)
1. Pier and Breakwater					3,516	
(1) -12.0m Pier	Sheel sheet pile with Tie-rod	m	250	4,000	1,000	12
(2) -13.0m Pier	〃	m	300	4,500	1,350	12
(3) Revetment	Average -7.5m	m	530	2,200	1,166	8
2. Pavement		m^2	233,600	7	1,635	
3. Facilities for container handling					1,500	
(1) Container Crane	30.5 t	Set	1	660,000	600	16
(2) Straddle Carrier	40' Container 3 piles	Set	6	70,000	420	12
(3) Trailer Head		Set	3	6,000	18	6
(4) Chassis	for 40'	Set	5	2,000	10	6
	for 20'	Set	5	1,400	7	6
(5) Forklift	30t Model	Set	1	40,000	40	7
	2t Model	Set	2	3,500	7	6
(6) Track Scale	50t	Set	2	9,000	18	9
(7) Ro/Ro Ramp	50m x 30m	Set	1	320,000	320	8
4. Facilities for Grain Handling					1,853	
(1) Preumatic Unloader	300 k/h x 2	Set	2	450,000	900	16
(2) Beltconveyor	600 t/h, 1,050 m/m x 140 m/min. (Pier 250m, underground 300m, silo 250m)	m	800	800	640	14
(3) Backet Elevator	200 t/h x 3	m	90	500	45	14
(4) Tripper		Set	3	70,000	210	14
(5) Conveyor Scale	600 t/hr	Set	1	6,000	6	9
(6) Truck Scale	20t	Set	2	6,000	12	9
(7) Bulldozer	2t	Set	2	3,500	7	6
(8) Packer	900 t/day, 400 bags/hr x 3	Set	3	11,000	33	9

Facilities	Specification	Unit	Q'ty	Unit Price (1000 yen)	Amount (million yen)	Schedule (months)
5. Facilities for general cargo handling					222	
(1) Mobile Crane	120 t lift	Set	1	170,000	170	12
(2) Forklift	10 t	Set	3	15,000	45	6
	2 t	Set	2	3,500	7	6
6. Facilities on the ground					4,326	
(1) CFS	40 m x 250 m	m^2	10,000	80	800	10
(2) Container Cleaning Yard	30 m x 30 m	m^2	900	20	18	
(3) Maintenance Shop	40 m x 30 m	m^2	1,200	50	60	
(4) Warehouse	40 m x 120 m	m^2	4,800	80	384	12
(5) Warehouse for Dangerous Article	60 m x 80 m	m^2	4,800	80	384	
(6) Silo	ϕ10mxH30m, V=1200t	Set	25	36,000	900	18
(7) Office, Addministration Office	*50m x 60m x 4*	*m^2*	12,000	120	1,440	12
(8) Erectric Facilities		Set	1		340	10
Total					11,480	

4-1-7 Schedule

	Facilities	Q'ty	1st, year						2nd, year						3rd, year					
			2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12
Preparation and Temporary Works		1 set																		
Public Works	-12 m Pier	250 m																		
	-13 m Pier	300 m																		
	Revetment	530 m																		
	Ro/Ro Ramp	50 m x 30 m																		
	Pavement	233,600 m^2																		
Machinery	for Container Handling	Container Crane 1 set																		
	for Grain Handling	Straddle Carrier 6 set; Pneumatic Un-loader 2 set; Belt Conveyor 800 m etc.																		
Housing	C.F.S etc.	10,000 m^2, Other C.C, M.S																		
	Silo	1,200 t x 25 set																		
	Warehouse, warehouse for dangerous article	4,800 m^2 x 2 bldgs.																		
	Office, addministration Office	12,000 m^2																		
Electric Facility		1 set																		

4-2 Brief Explanation of Yokohama Harbour Training College (Y.H.T.C.), (July, 1980)

4-2-1 The Purport of Establishment

Japan is a nation of islands, completely surrounded by the sea. Its area is 372,000km^2 of which 70% is covered by forest and woods, leaving only 115,000 km^2 as land to be used for cities or for agriculture and from this small amount of land, the country gets very few basic resources. For survival, this nation of more than a hundred million people must import most of its materials from overseas, then after processing, export as many product as possible. In other words, in the major categories of human needs, "food, clothing and shelter" Japan depends on foreign trade.

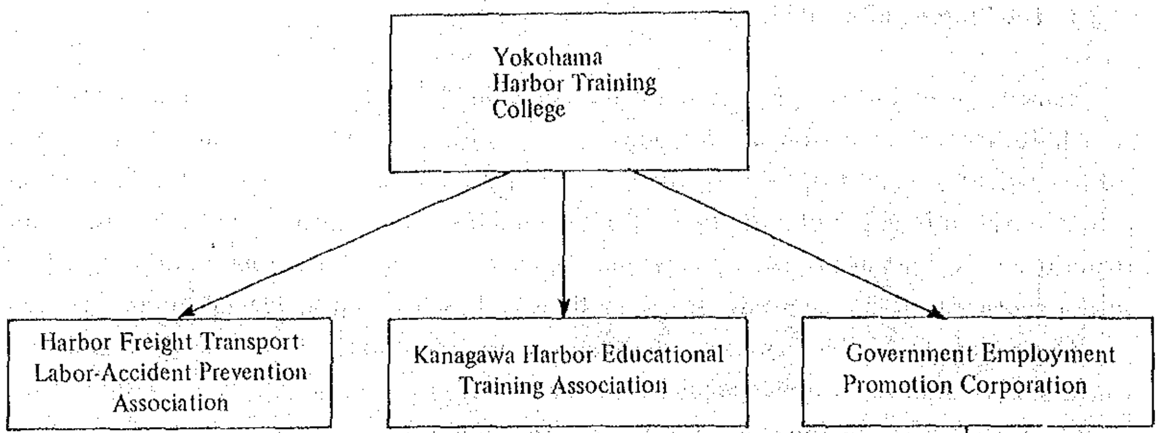
In foreign trade, the harbors achieve the most important role as the major point of the cargo's and commercial flow. Furthermore, the quantitative expansion and qualitative improvement of physical distribution of the goods request now urgently harbor activity to be modernized, rationalized, and mechanized, having a high regard to the human beings, following the national economic and social development.

Thus, we need earnestly as more people as possible, who hold the high degree of skill and ability with a good character, for supporting and developing harbor activity.

For this purport, Y.H.T.C. (Yokohama Harbor Training College) was established April, 1972 by the combined desire of the government, the local government, the cities of Yokohama, Kawasaki and Yokosuka, the corporations of harbor transportation business, the unions of port and harbor and the client organizations.

The mission of Y.H.T.C. is to exert themselves for making the people who now is engaging in or will be engaged in port business to improve or obtain the high technical skill and ability, as well as to build up their character by the high thought.

4-2-2 Management and Organization of Y.H.T.C.



Harbor Freight Transport Labor-Accident Prevention Association

Association was established June, 1964 in accordance with the law for preventing the workers from the disasters by the organization of the business corporation. The members of the association consist of nearly 400 companies in Port-Business under Kanagawa Prefecture.

The works of the association are as follows:

1) Making up the regulation for preventing the workers from disasters and enforcing the members to follow it.

2) Technical guidance and assistance to the members regarding the prevention from disasters.

3) The researches and informations into the activities of the prevention.

4) Enforcement of the exercises or the short course of lecture to the workers and staffs due to the regulations or law.

5) Inspection and guidance by the means of the patrol on the actual spot in Port-Business Operations.

Kanagawa Harbor Educational Training Association

Association was established June, 1970 by the members of about 180 companies, engaging in Port-Business under Kanagawa Prefecture and authorized as the juridical person for the public benefit March, 1972.

The work of Association is applicable to any persons, engaging now in Port-Business.

The educational trainings are mainly as follows:

1) The short course of lecture for the newcomers in the companies of Port-Business.

2) The course of lecture for the backbones of the companies.

3) The seminar for the directors or executives.

4) The cultural lecture for the people engaging in Port-Business.

5) Training to the workers for acquiring the driver's licence of the specific large-sized vehicle or the ship's winch.

6) Publication of the periodicals for the information and communication.

7) Assisting the students of Y.H.T.C. with the scholarship and Promoting them to the employment.

Government Employment Promotion Corporation

Purpose of the Corporation is to promote the worker's welfare and to improve their vocational skill. Established July, 1961.

Kanagawa High Advanced Vocational Center

11 courses of the vocational training.

Branch of Kanagawa High Advanced Vocational Center

1 course of the vocational training. (Cargo-Handling and Transportation in Port-Business)
Established April, 1972.

Study and Practice are applicable to the young men less than 20 years old, who have finished the course of the senior high school.

Purpose of the education and training is to make the students to grow up the skilled technician or staff with a good character in the field of Port-Business.

4-2-3 The Students

(1) An applicant for entrance to Yokohama Harbor Training College is restricted to a person, who is a healthy male, less than aged twenty and a graduate from a senior high school.

(2) The full number of the students is limited to thirty persons at the first year.

(3) The entrance examination to Y.H.T.C. is conducted by the achievement test of four subjects (mathematics, English, national language and composition) and the personal interview.

Admission to the college is decided by the whole evaluation of the examination, thinking much of an applicant's personality.

(4) After an applicant is admitted to enter Y.H.T.C., he has to live in the students' dormitory equipped inside the campus, following "The Student Regulation."

(5) The daily routine of the students.

(as of April, 1977)

Flow of Time	Details of Activity
07:30	Rising in the morning
07:35 – 07:40	The roll call & health inspection
07:45 – 08:00	Gymnastics & running
08:00 – 08:30	Breakfast
08:30 – 08:45	Cleaning inside dormitory
08:45 – 08:50	The morning meeting
09:00 – 10:30	Taking a lesson
10:30 – 10:40	Intermission
10:40 – 12:10	Taking a lesson
12:10 – 13:00	Lunch & Rest
13:00 – 14:30	Working exercise
14:30 – 14:40	Intermission
14:40 – 16:10	Working exercise
16:10 – 16:25	Cleaning the class rooms & training-place
16:25 – 16:30	The evening meeting
16:30 – 17:30	Voluntary activity
17:30 – 18:00	Dinner
18:00 – 22:00	Free hand (include to take a bath)
22:00	The gate closed & the roll call
22:00 – 23:00	Free hand
23:00	Lights out & bed time

4-2-4. Expenses

(as of April, 1977)

The monthly expense	Tuition fee	¥ 500
	P.T.A. 〃	500
	Boarding 〃	10,500
	Utility 〃	1,000
	Student self-administration fee	500
	Total	¥13,000
The lump sum in case of the entrance	Text & reference books Note books, Stationery The various wears Uniform, working & gymnastic clothes, safety helmet, shoes, etc.	¥20,000
	Total	¥50,000

Benefits

(1) A student, if he wishes, is qualified to borrow the scholarship from Kanagawa Harbor Educational Training Association to the amount of ¥12,000 per month through the two years. But this scholarship has to repay half of the amount within two years, after he will be employed.

(2) A student, if he wishes, is qualified to obtain to the amount ¥9,600 per month from Government Employment Promotion Corporation through the two years.
This scholarship is exempted from repaying, but it is applicable to a student whose protector gains less than the amount of ¥3,200,000 per year.

4-2-5 Advantage

When the students graduate Yokohama Harbor Training College, they acquire a lot of licences and qualifications as follows:

(1) Driver's licence of the specific large-sized vehicles.
(2) Operator's licence of the movable crane over 5 tons capacity.
(3) Operator's licence of the over-head crane over 5 tons capacity.
(4) Driver's licence of any type of the ship's winches over 5 tons capacity.
(5) Driver's licence for handling and carriage of the cargo over 1 ton weight itself by a fork lift truck.
(6) Qualification of assistant engineer for handling and carriage the cargoes in the business of port operation.
(7) Qualification of the good treatment as the one of the leading members in the company, when he is employed by the port transportation business companies.

4-2-6 The Goal of Education and Training

(1) A graduate is very proficient in technic of driving and operation with regard to any type of the conveyable machines and apparatuses.

(2) He is highly skilled in technic of inspection, conservation and maintenance to the above machines and apparatuses.

(3) He has high technical skill in the works of handling or carriage of the cargoes, such as technic for hoisting the cargo up, signal communication, stowage of the cargoes and the proper use of any kinds of the implements.

(4) He has also high technical skill in regard to any kinds of the cargo transportations and good knowledge to the various cargoes.

(5) He is capable for arranging or drawing many type of the documents, which are necessary in the trade business, both export and import.

(6) He is so proficient in English that he may work well in the port transportation business of the international trade.

(7) He has a good knowledge of the Port Industry, for instance, how its structure or system was organized and how its supervision or management has been done.

(8) He has also a good knowledge of the foreign trade and the transportation in the province of marine, port, and land.

(9) He keeps the foundational ability and the good character in himself to be a supervisor or manager in future, in the business world of the Port Industry.

4-2-7 *Curriculum*

(1) Curriculum is divided into the study and the practice, then the study consists of fundamental and professional subject. The practice is enforced, in response to professional subject.

(2) In one year, the school work is done during forty weeks. First year is divided the first semester and the second one, second year is also divided the third semester and the fourth one. Consequently, each semester has twenty weeks.
In one week the lesson is enforced during forty hours in standard and the same subject of study or practice is carried through two hours.

(3) Calculation of one credit is made of enforcing the same subject of lesson for one hour through eighteen weeks, then acquirement of the credits is decided by the result of examination, treatise and report, which are executed in the last week of each semester.

(4) A student is not able to get the examination, unless the rate of his attendance is more than 80% in each lesson.

(5) Graduation is given only to a student, who acquired the whole credits (178 credits) both the study and practice within two years.

4-2-8 Curriculum in Detail

(1) Subject of Study

Division			Subject	Details	Credit 1st year	Credit 2nd year	Credit Total
Fundamental Subject	Fundamental Cultural Subject	Cultural Science	Literature	A human being and Literature Literary thought	2	–	2
			History	History of marine and harbor's transportation	2	–	2
		Social Science	Law	The outline of law	2	–	2
			Economics	Economic principle & structure	–	2	2
		Natural Science	Mathematics	Basic mathematics of mechanical engineering	2	–	2
			Chemistry	The outline of chemistry, knowledge of dangerous & poisonous substance	–	2	2
	Foreign language		English	Daily English conversation, Basic knowledge of English	4	4	8
	Preservation of health & Physical training		Physical education	Gymnastics, Ball game, Swimming physical examination, etc.	4	2	6
Sub Total					16	10	26
Professional Subject	Professional foreign language		English	Professional English conversation, English of trade and transportation	4	4	8
	Learning of Port Transportation		Learning of Port Transportation I	Knowledge of supervision, management, project, rationalization, modernization in port	6	2	8
			II	Trade and marine transportation	–	2	2
			III	Business of Port & warehouse, System of the rates	–	2	2
			IV	Labor of Port, Personnel management	–	2	2
	Professional Law		Law I	Law and regulation of traffic and vehicle	2	–	2
			II	Law of employee and employer in port business	2	–	2
			III	Custom formalities, law and regulation in province of port business	–	2	2
	Engineering of the conveyable machines		Dynamics	Practical dynamics of cargo handling and carriage	2	–	2
			Electrical engineering	Electrical theory, apparatus and attachment to the conveyable vehicles	2	–	2
			Motor's engineering	Theory & structure of the various engines, oil hydraulic system, cycle of refrigerator	4	–	4
			Engineering I	Mechanical engineering	4	–	4
			II	Vehicle's engineering	2	–	2
			III	Engineering to the apparatuses of cargo handling	–	2	2
	Technics of cargo handling		Treatise on the cargoes I	Classification and quality of the cargoes, Treatise on packaging and the hazardous cargoes	2	–	2
			II	Treatise on Unit Load System, Application of the electrical computer to the cargo operation in port	2	–	2
			Technics of cargo handling I	Technics of hoisting cargo up by the implements and of stowage, besides signal operation	4	–	4
			II	Ship's structure & stowage of the various cargoes	–	2	2
			III	Practical business & technics of cargo handling	–	4	4
	Productive engineering		Productive engineering I	Flow of the cargoes and documents in port & supervision and management of the operations in Port	2	–	2
			II	Maintenance & supervision of the conveyable vehicles and apparatuses	–	2	2
Sub Total					38	24	62
Grand Total					54	34	88

(2) Working Practice

Division		Subject		Details	Credit 1st year	Credit 2nd year	Credit To-tal
Professional Subject	Engineering of the conveyable machines	Basic training for machine		How to use the tools & apparatuses Hand working in all round	2	–	2
		Basic training of welding		Work of electric welding and gaseous welding	2	–	2
		Basic training of driving for the specific large sized vehicles		Training for acquiring the driver's licence of the specific large-sized vehicles	4	–	4
		Basic operation of the weight-lifting apparatuses		Basic driving exercise for Fork lift truck, Movable crane, ship's winch, etc.	16	–	16
		Practice of driving & operation with wide application		Work of the various conveyable machines with loads	–	8	8
		Operation of the Gantry crane & specific vehicles		Operation of Gantry crane, Overhead crane, Straddle carrier, specific vehicle, etc.	–	2	2
	Technics of cargo handling	Technics of cargo handling	I	How to use the implements for handling cargo. Standard behavior for handling cargo	2	–	2
			II	Work for hoisting the various cargoes, using the proper implements with the signal work for stowing cargo up over 2m high and breaking it down	2	2	4
			III	Flooring the various dunnage properly Securing work to the various cargo How to make knot or hitch, using the ropes	–	2	2
		Applied practice for handling cargo	I	Various kind of "stand by" jobs for the cargo works	–	2	2
			II	Exercise of the tally work	–	2	2
			III	Work of various kinds of the dangerous, poisonous and particular cargoes	–	2	2
		Typewriting Draw Drawing up the document		Typewriting of English words Drawing up the documents and the plans	2	–	2
	Exercises of actual business outside the school	Exercises of the living business inside the companies of Port		Study and exercise the living business, regarding Longshoring, Stevedoring, Consolidator, Cargo-checking and Forwarder	–	28	28
		Final exercise through the trip for educational purposes		Visit the other major harbors for study aboard a ship	–	2	2
	Exercise to be completed & Function	Centralization of exercises		The all-inclusive exercises to the various kinds of applied working Maintenance, Overhaul, Drawing up treatise, treatise, etc.	3	3	6
		Annual function		Ceremony of entrance & graduation, health examination and recreation, etc.	2	2	4
Actual Practice Total					35	55	90
Subject of Study Total					54	34	83
Grand Total					89	89	178

4-3 Planning Method of New Grain Terminals, (July, 1980)

4-3-1 General Methodology of Grain Terminal Planning

A grain terminal generally is based on the Flow Chart shown in Fig. 4-3-1.

(1) The volume of grain annually handled is assumed by taking other factors into account. For a grain reserves terminal, the annual handling volume is computed from the target of reserve volume as follows:

Annual handling volume = Reserve volume x Turnover rate

A turnover rate of four times per year is usually employed.

(2), (3) Silo capacity is computed as follows:

$$\text{Silo capacity} = \frac{\text{Volume annually handed}}{\text{Turnover rate}} \div \text{Utilization coefficient}$$

The turnover rate is 7~9 times a year (4 times in the case of a grain reserve terminal) and the utilization coefficient is around 0.63 in Japan.

Both the turnover rate and the utilization coefficient are dependent upon the circumstances of a country, such as the management principles of a grain terminal, the quality of labour and the maintenance technology of the facilities.

(4), (5) The entire terminal area, including berths, silos, roads, green area and related facilities, is calculated as follows:

Area of a grain terminal = Silo capacity x Basic unit area

The basic unit area employed in Japan is aprox. 0.18 m^2/ton, but the chosen value should include an area for future expansion and similar supplemental space.

(6), (7) Annual handling capacity per berth (throughout) is given as follows:

$$A = a \times b \times c$$

Where A : Throughput (tons/year per berth)

a : Daily handling capacity per berth (tons/day/berth)

b : Annual work-days (approx. 300 days/year)

c : Handling coefficient (handling hours/berthing hours), in Japan approx. 0.79 is used

The number of berths(B) necessary for handling the annual grain volume (d tons/year) is given as follows:

$$B = d/A$$

(8), (9) The design size of grain carriers is determined in view of the handling capacity of the ports of call, the transport distance, and the grain volume annually handled etc. 50,000~60,000 DWT class carriers will be most commonly used in the present world shipping fleet, however in some circumstances the fleet will be significantly different. Typical grain carriers serving Japan are shown in Table 4-3-1.

(10), (11) The capacity pneumatic unloaders is determined by unloaded volume and handling days per ship, frequency of call and the number of unloaders.

The high capacity pneumatic unloaders used in Japan are shown in Table 4-3-2. The muximum capacity of these unloaders is 400 t/h, but higher capacity machines have recently come into service.

The necessary capacity of unloaders is calculated in two examples below:

Example 1. Assume that the daily volume is 15,000 tons under the condition of eight-hour daily operation with a handling coefficient of 0.8.

The hourly handling capacity is calculated below:

15,000 ÷ 8 ÷ 0.8 = 2,344 tons/berth hour

If four unloaders operates to four cargo holds at the same time, each unloader must handle around 600 tons of grain per hour, that is, four pneumatic unloaders with the capacity of 600 tons/hour each are required.

Example 2. At the Port of Hakata, a grain terminal was planned based on the following conditions:

Annual volume handled : 190,000 tons (wheat)

Ships calling at the port annually : 14 (15,000 DWT class)

Average capacity : 13,500 tons/ship

Working days per ship : 5 days/ship

Operating hours per day : 7 h ours

In this case, of a total unloading volume of 13,500 tons, 10,000 tons are handled by two unloaders, resulting in

10,000 tons ÷ (5 days x 7 hours x 2 unloders) = 142.7 tons/hour

≒ 150 tons/hour

The remaining 3,500 tons are handled by an air conveyor.

A case study on the required capacity of the unloaders is in the next section.

(12) The transfer flow of unloaded grain in the terminal, and the layout of the facilities in the grain reserve terminal are shown in Fig. 4-3-2 and 4-3-3.

4-3-2 Case Study on the Required Capacity of Unloaders

(1) Calculation Method.

There are several methods available for choosing the number and capacity of unloaders required; three analysis methods are summarized below:

a) Experience or analysis of existing facilities

b) Combined study of mathematical analysis and economic comparison

c) Simulation test by computer

Of these three methods, method (3) is effetive if analyzed data is sufficient and at least several cases are compared. If the study is in an early stage, and the data is limited, method (1) or (2) often is employed.

Our case study is based on method (2), with emphasis on minimizing costs for the required capacity.

(2) Conditions of Study

a)	Annual unloading volume	: 1,000,000 tons (grain)
b)	Size of Carrier	: Case 1 ; 30,000 DWT
		: Case 2 ; 50,000 DWT
c)	Annual work-days	: 220 days/year
d)	Operation hours	: 8 hours/day
e)	Handling coefficient	: 0.7
f)	Amortization	: Handling Equipment, etc.
		10-year amortization, 10% interest
		Quay construction
		15-year amortization, 10% interest

(3) Process of Analysis

Process of analysis for determining the optimum capacity of unloaders is summarized below:

a) Optimum capacity of unloaders is decided by the minimized demurrage, equipment and quay construction costs (total unloading costs).
b) Since, total unloading costs in relation to several unloading capacity was calculated to choose the optimum size.
c) As for the computation of ship's waiting time for berthing, the mathematical analysis based on queuing theory was employed.

(4) Results of Analysis

The results of analysis are shown in Fig. 4-3-4, but the point of minimized costs cannot be seen clearly. In this case, it may be appropriate to choose the point A, where the gradient of cost curve declines remarkably, as the optimum capacity.

Table 4-3-1 Grain Carriers

Name of Ship	Gross Tonnage	DWT	Overall Length	Breadth	Depth	Draft
Mito	36,553	65,350	224.0 m	32.2 m	18.7 m	13.1 m
Hohkokusan	34,064	55,168	223.0	32.2	17.9	11.9
Zenkohren No. 3	31,854	49,046	208.0	32.2	17.8	11.3

Table 4-3-2 Pneumatic Unloaders Installed on Wharves for Large-sized Ships

Name of Port	Depth of Quay (m)	Nominal Capacity (t/h)	Volume Handle (1,000t/year)	Number of Work-days (days/year)	Annual Work-hour (h/year)
Shimizu	−11	300	176	226	1,383
〃	〃	〃	134		
Nagoya	−10	150	64	94	464
〃	〃	100	21	44	250
Yokkaichi	−10	300	518	255	2,872
〃	〃	〃			
Osaka	−11	150	1	2	16
〃	〃	〃	16	28	216
〃	〃	400	175	150	1,250
Kobe	−12	150	493	250	1,884
〃	〃	400			1,708
Tomakomai	−12		255	198	1,508
Otaru	−12	300	27	32	360
Hakata	−11	400	322	252	2,293
〃	〃	〃	194	205	1,386
〃	〃	210	133	170	902
〃	〃	〃	130	179	907

Table 4-3-3 Unloading Cost Study

		Case 1					Case 2				
1	Annual handling volume A(t/d)	←		1,000,000		→	←		1,000,000		→
2	Unloading capacity x No. of unloaders Qn(t/h)	300x3	400x3	500x3	600x3	600x4	300x3	400x3	500x3	600x3	600x4
3	*Average size of ship* (DWT)	←		30,000		→	←		50,000		→
4	Average handling volume per ship Ws(t/ship)	←		27,000		→	←		45,000		→
5	Daily handling capacity S(t/d)	5,040	6,720	8,400	10,080	13,440	5,040	6,720	8,400	10,080	13,440
6	No. of calling ships Ns(No/y)	←		37.1		→	←		22.3		→
7	Arrival rate (No/d)	←		0.102		→	←		0.061		→
8	Average Laying up time at berth Tn(d/ship)	8.89	6.67	5.33	4.44	3.33	14.8	11.11	8.89	7.41	5.55
9	Service rate μ(No/d)	0.112	0.150	0.188	0.225	0.300	0.067	0.090	0.112	0.134	0.180
10	Traffic density ρ	0.91	0.68	0.54	0.45	0.34	0.90	0.68	0.54	0.45	0.34
11	Average wait for service TM(d/ship)	54.2	8.5	3.75	2.18	1.03	80.6	14.2	6.29	3.66	1.72
12	Average days at port per ship TM(d/ship)	63.1	15.2	9.08	6.62	4.36	95.4	25.3	15.2	11.1	7.3
13	Demurrage Cs (10 ¥/d)	←		2,000		→	←		2,500		→
14	Ship cost per ton C1 (10 ¥/d)	4.67	1.13	0.67	0.49	0.32	5.30	1.41	0.84	0.62	0.41
15	Equipment cost 10^6¥	990	1,155	1,485	1,980	2,640	1,155	1,320	1,650	2,145	2,860
16	Annual equipment cost (10^6¥)	161	188	242	322	430	188	215	269	349	465
17	Annual equipment cost per ton C_2 (10^3¥ c/t)	0.16	0.19	0.24	0.32	0.43	0.19	0.22	0.27	0.35	0.47
18	Quay construction cost (10^6¥)	←		1,500		→	←		2,030		→
19	Annual quay construction cost (10^6¥)	←		197.2		→	←		266.9		→
20	Annual quay construction cost per ton C_3(10^3¥/t)	←		0.197		→	←		0.267		→
21	Total cost per ton (10^3¥/t)	5.0	1.5	1.1	1.0	0.9	5.8	1.9	1.4	1.2	1.1
	%	500	150	110	100	90	580	190	140	120	110

Fig. 4-3-1 Flow for Planning of Grain Terminal

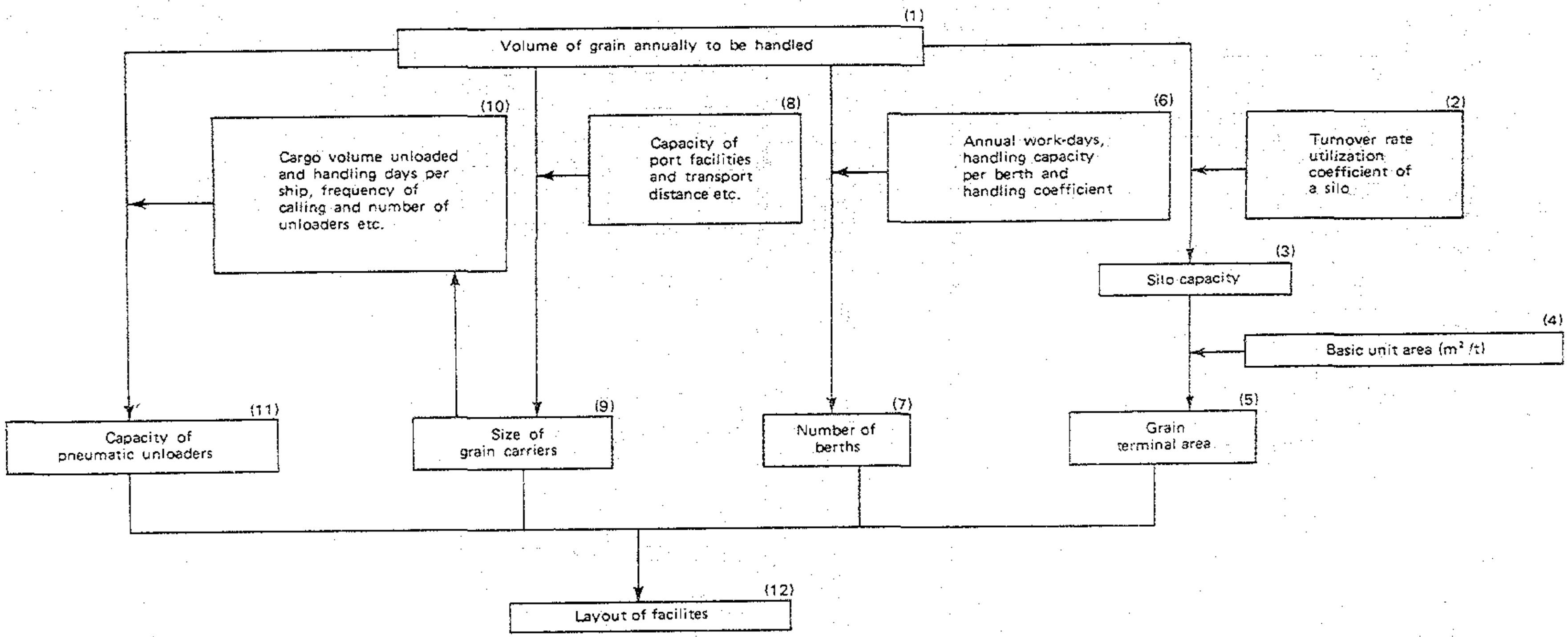


Fig. 4-3-2 Flow of Grain in Terminal

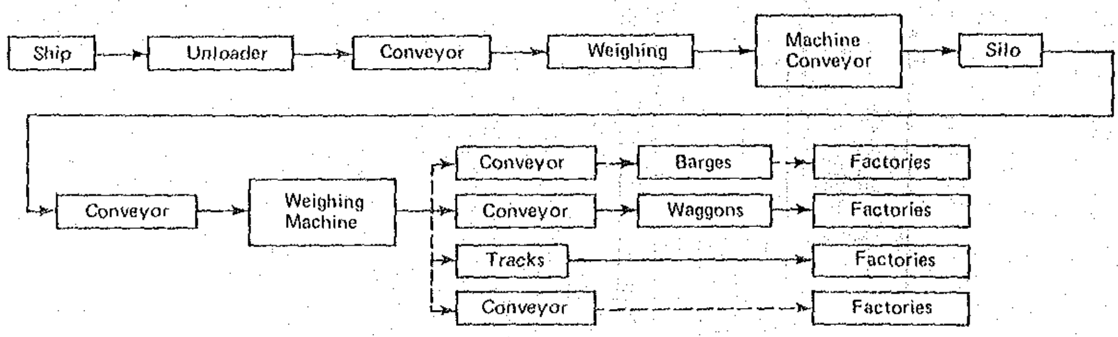


Fig. 4-3-3 Layout of Facilities in a Grain Reserves Terminal

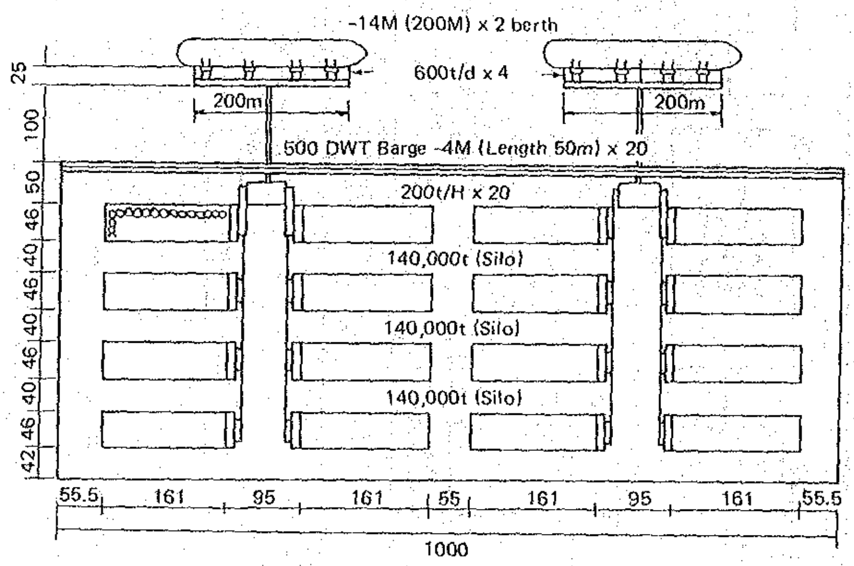
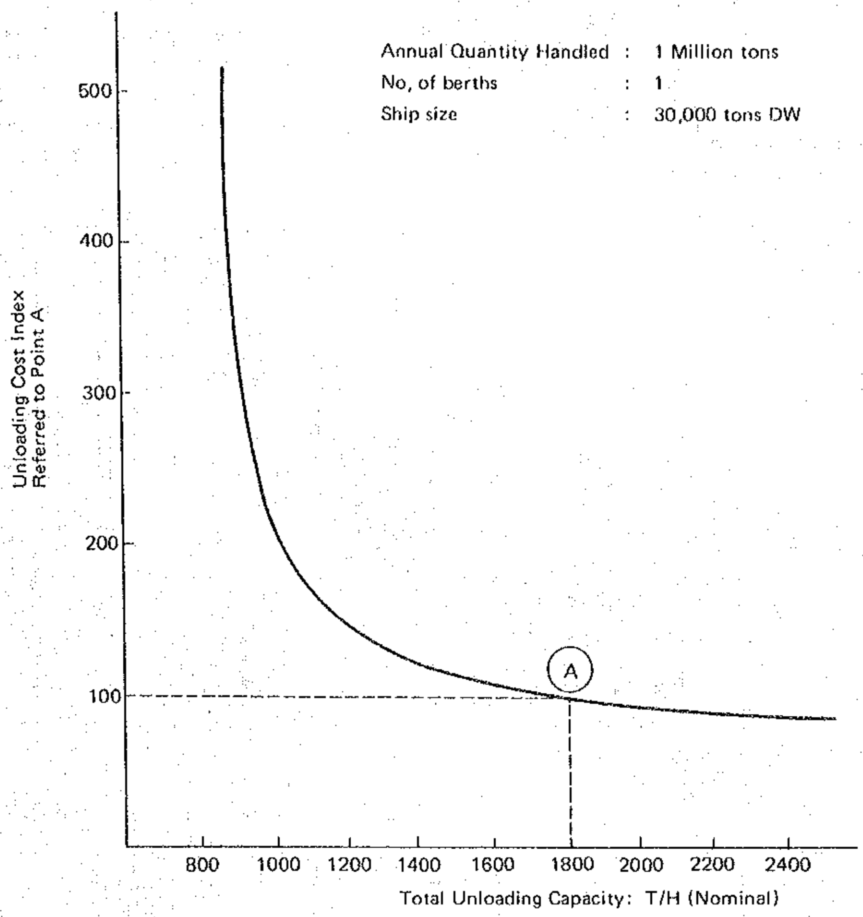


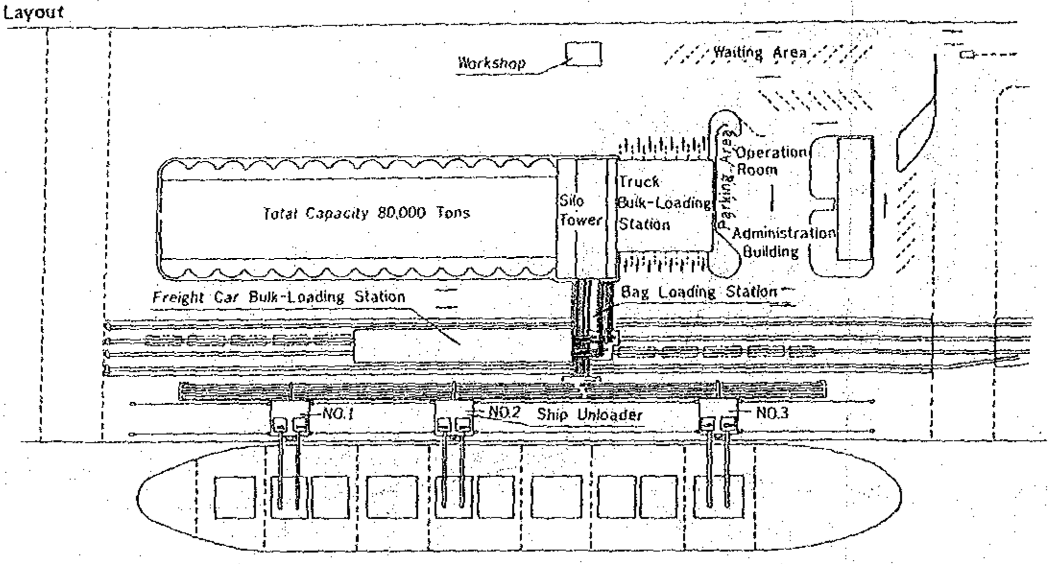
Fig. 4-3-4 Unloading Cost in Relation to Unloading Capacity



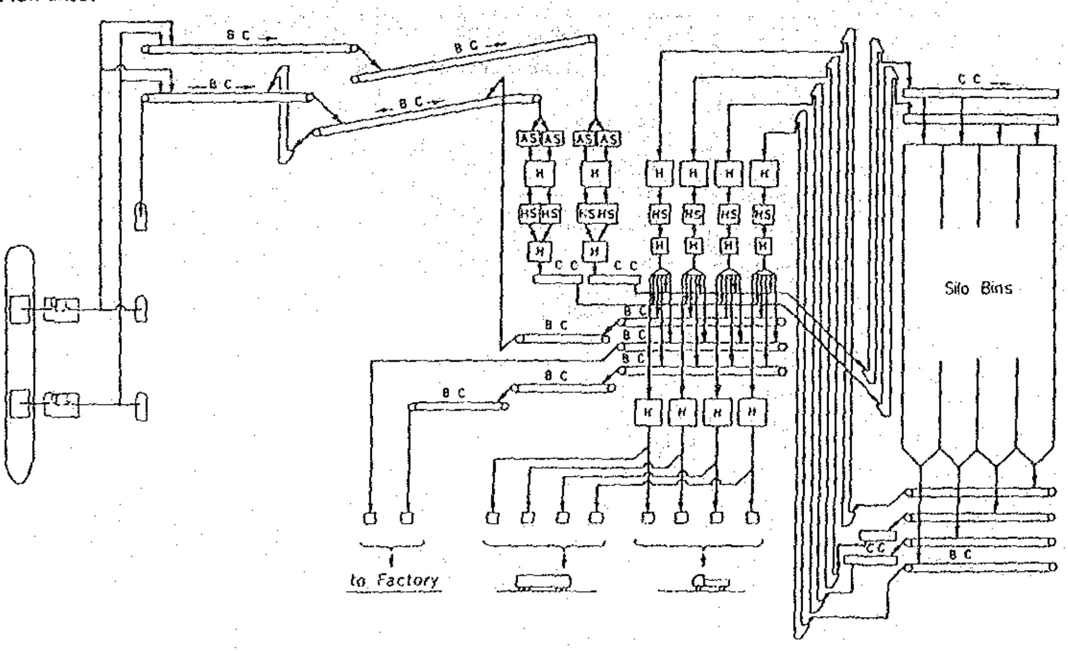
GRAIN TERMINAL

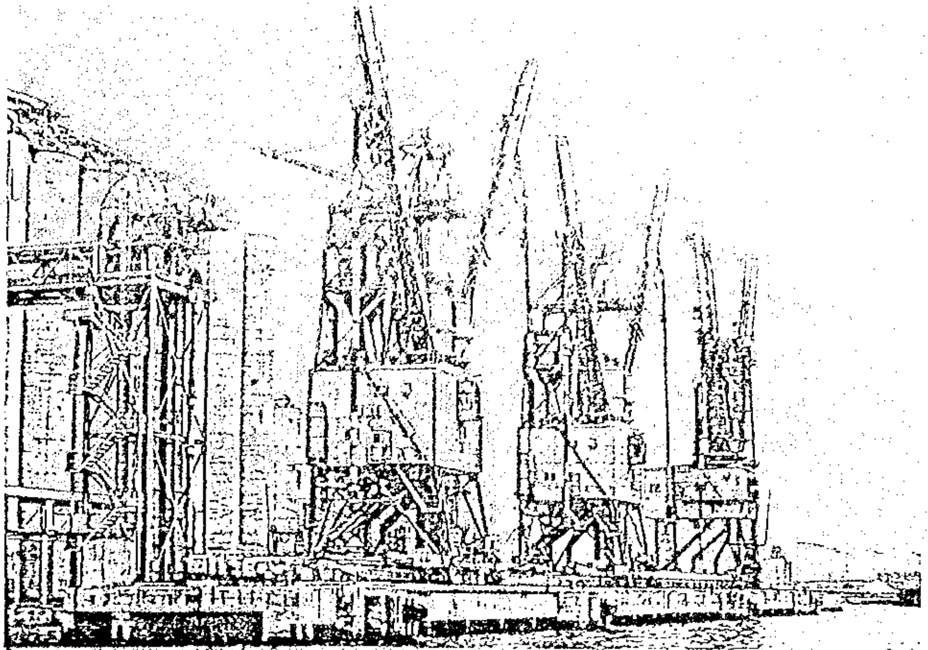
Grain storage terminals are usually built in the hinterland and coastal areas close to large consumer market. The terminals which import grain for distribution to consumer places unload the imported grain from oceangoing vessels, store it and then transfer it to small coastal boats such as barges for delivery to small consumer market.
On the other hand, the terminals which export grain transfer it from freight trains or trucks to silos for temporary storage and then load it on board oceangoing vessels as the occasion demands.
With the recent increase in the volume of grain handled by terminals, conveyors and unloaders that are used there are becoming larger and are of higher speed.

Layout



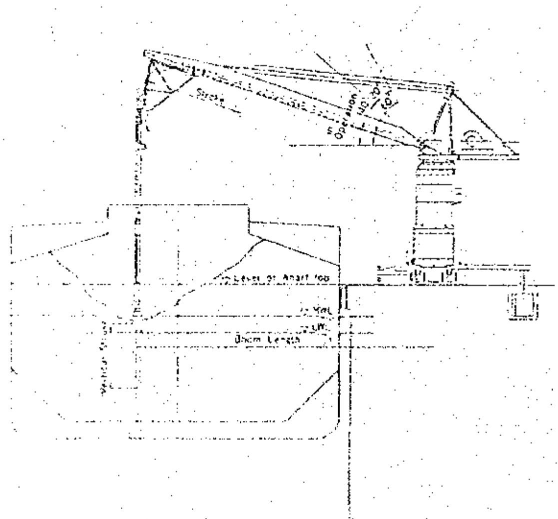
Flow Sheet

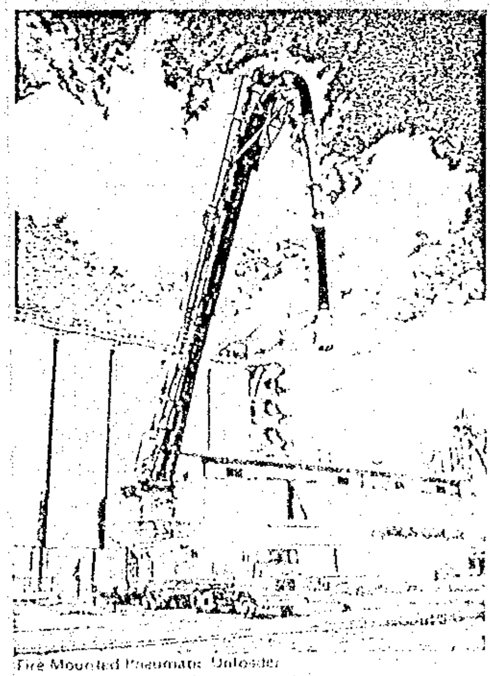




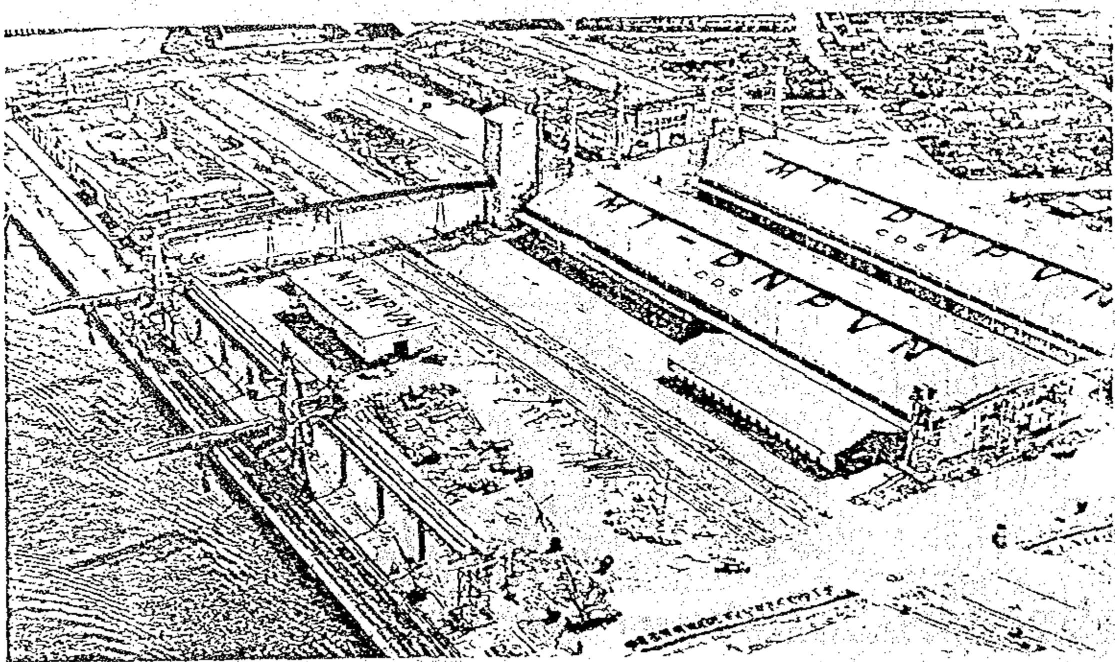
Pneumatic Unloaders and Silo for Grain

Tire Mounted Pneumatic Unloader

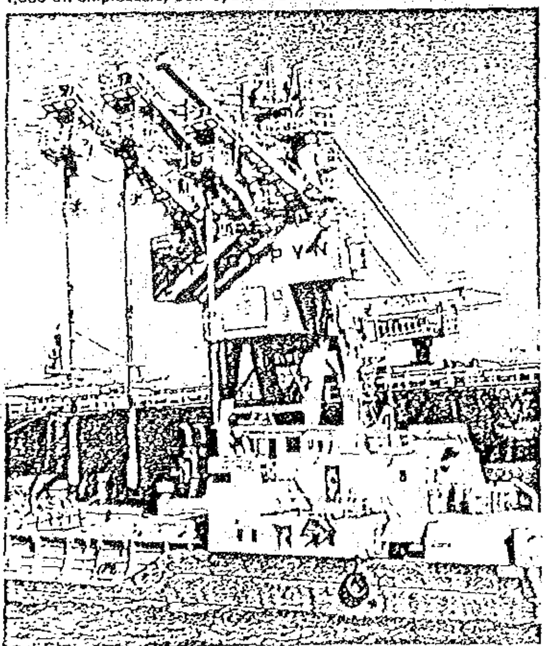




Tire Mounted Pneumatic Unloader

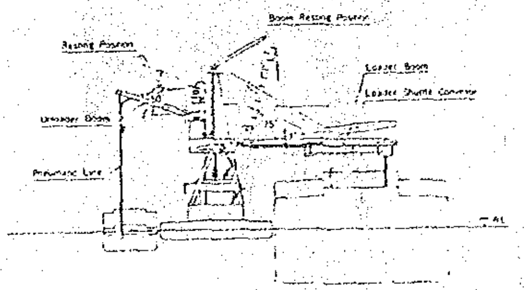


1,500 t/h Shiploaders, Conveyors and Ware Houses for Grain

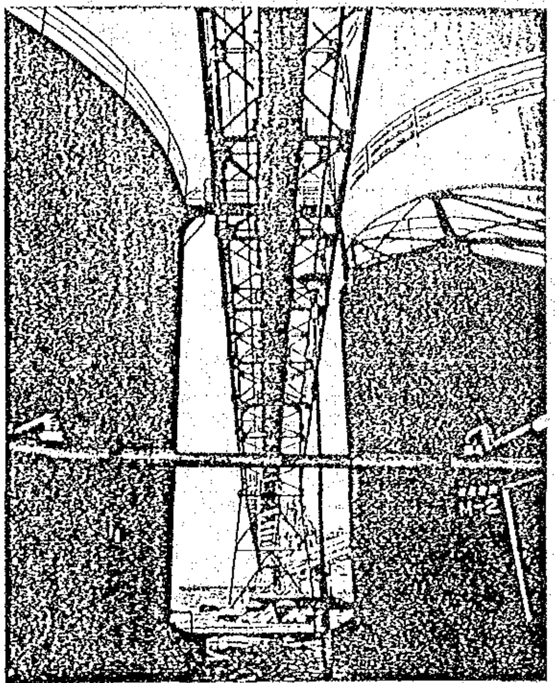


Floating Type Pneumatic Unloader/Loader

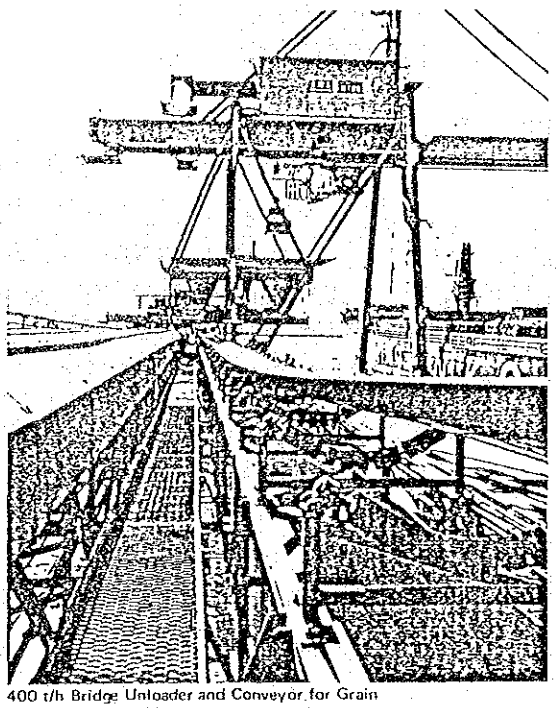
Floating Type Pneumatic Unloader/Loader



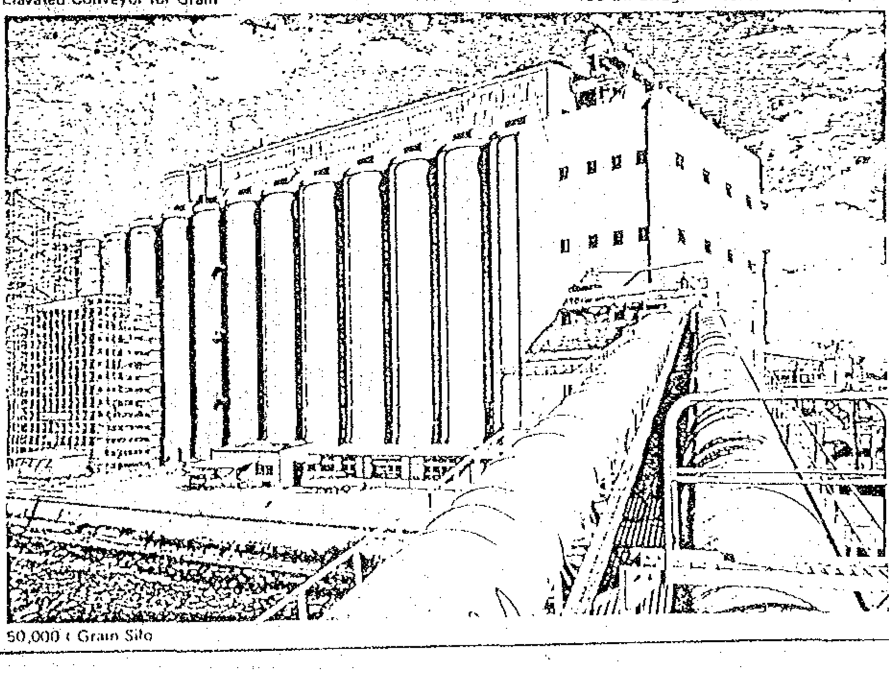
GRAIN TERMINAL



Elavated Conveyor for Grain



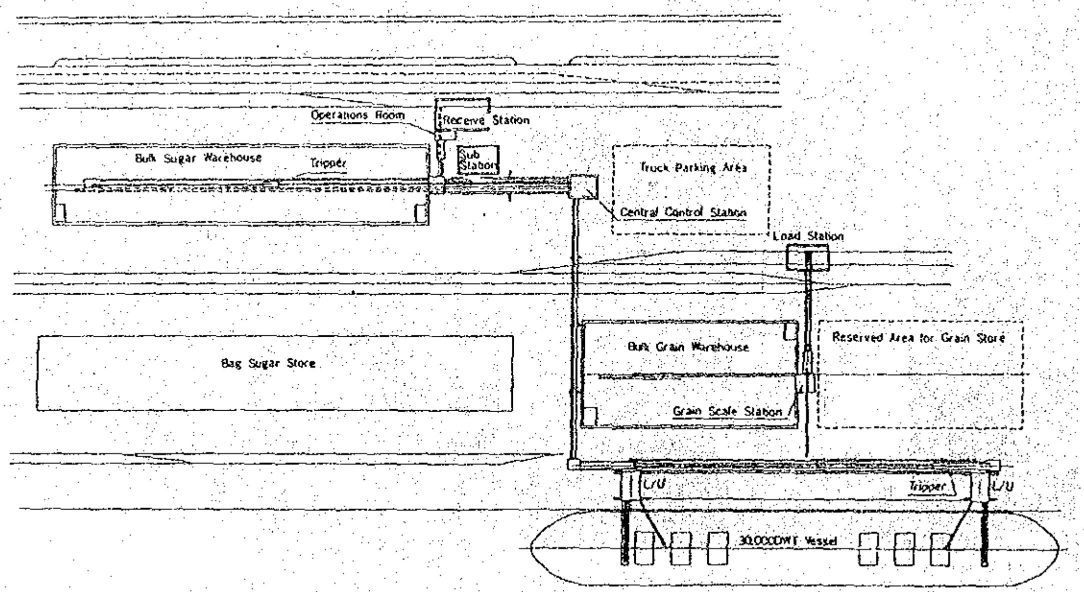
400 t/h Bridge Unloader and Conveyor for Grain



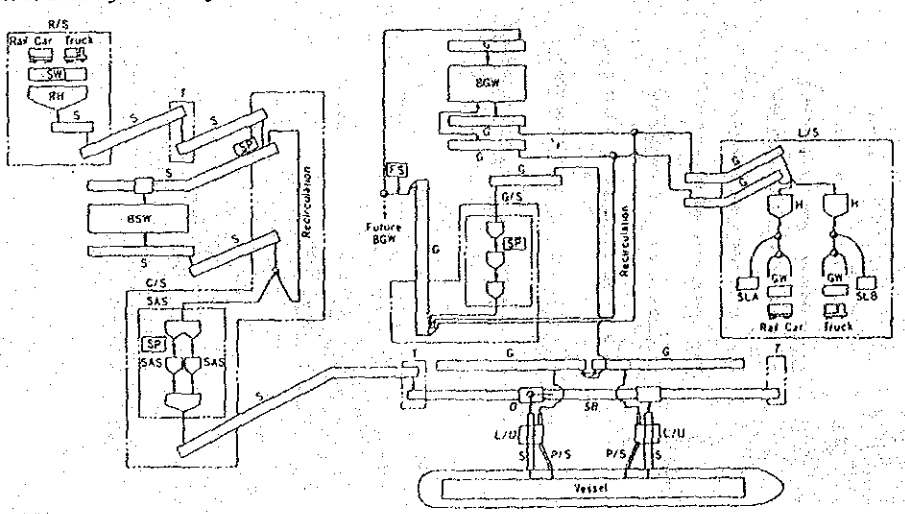
50,000 t Grain Silo

LOADING / UNLOADING TERMINAL (GRAIN·SUGAR)

Layout of Loading/Unloading Terminal



Flow Sheet of Loading/Unloading Terminal



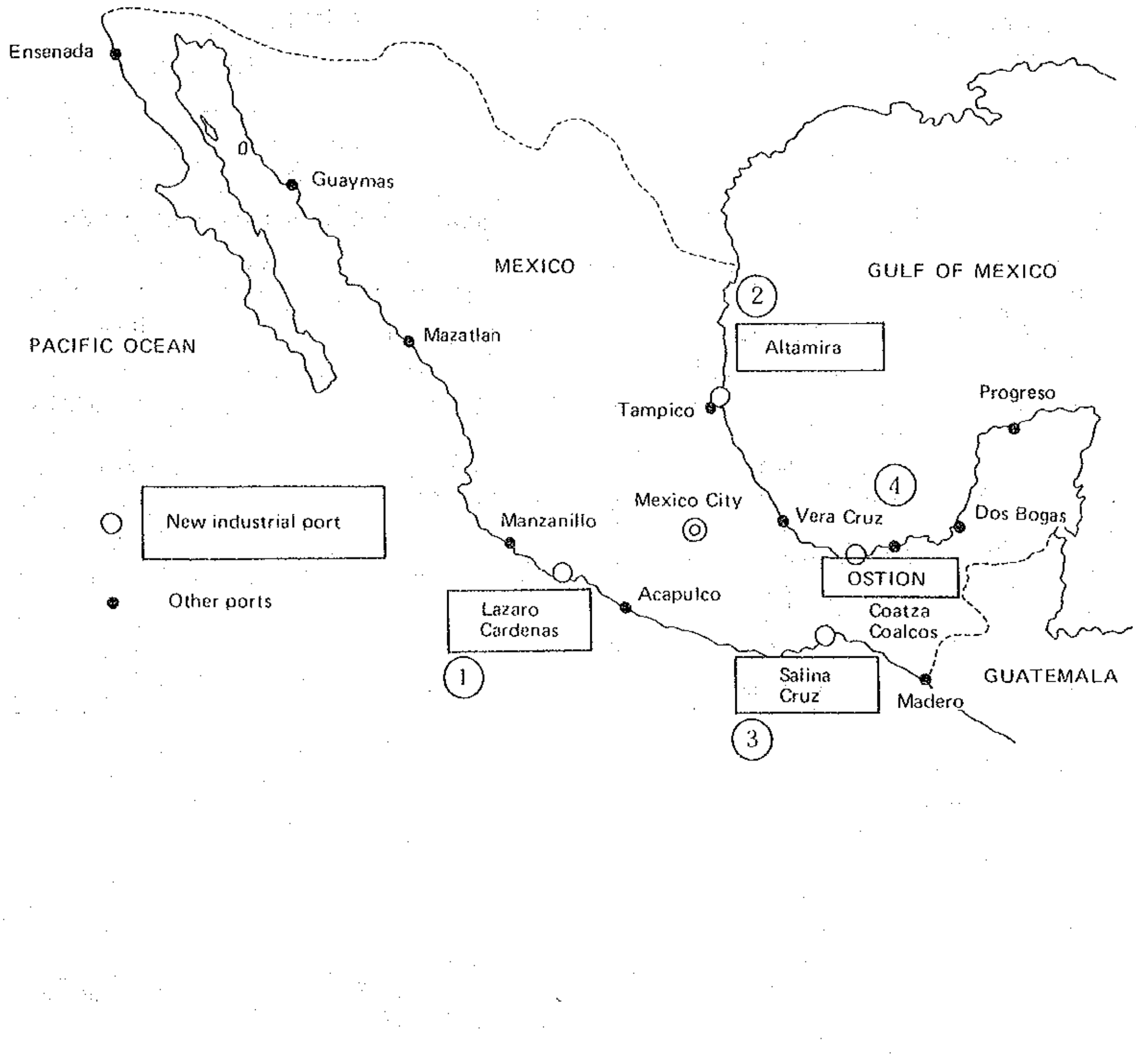
4-4 Master Plan for the Altamira Industrial Port Development, (July, 1980)

4-4-1 Introduction

As mentioned in the main report dated 8 August 1980, the study team for Mexico promised to prepare one or two examples of a Master plan for the Altamira industrial port development.

Although the first-step-tender was made on 2nd September and the works will start nearly one month later, the team believes that a master plan has to be elaborated urgently for the development of industrial port project at Altamira. The plans were drawn after many discussions by the planning experts of the OCDI, and finally chosen among several alternatives, which have been ammended again after getting the latest plan of the port for tender.

Fig. 4-4-1 The location of new industrial ports in Mexico



4-4-2 The Altamira Industrial Port Project

The Port is going to be built in a wide sandy area by dredging the main channel into it. The both sides of the dredged channel will be occupyed by many kinds of industries, such as iron and steel, oil refinery and petrochemical, aluminum, food complex and some parts for the commercial port functions.

The work is accelarated aiming the opening of its service at the year of 1983.

4-4-3 Industrial Development Planning

While the details of planning are unknown currently, we can assume the size of industries judging from the allocated areas for industries. These areas for industries could be compared with Tomakomai and Kashima industrial areas in Japan, as in the table below.

Table 4-4-1 A comperison of industrial areas of Altamira, Tomakomai and Kashima Port

Ports / Industries	Altamira	Tomakomai	Kashima
Iron and steel	555 + 545 + 100 + 47 = 1247 ha	1,700 ha	660 + 170 = 830 ha
Oil refinery	600 ha	300 + 60 (Power) + 400 (Tank yards) = 760 ha	165 ha
Petro chemical	891 ha	800 ha	330 ha
Alminum	745 ha	700 ha	—
Food processing	119 ha		
Others	1,200 ha		
Total	4,800 ha	6,670 ha	3,300 ha

4-4-4 Mexican Plans Examined and OCDIs sugestions

Terms	Problems	Improvements
Breakwaters	Wave, especially long period swell can come into the port easily from the direction of East.	To plan the layout of two breakwaters to shelter N and E directions.
Position of central channel	Situating at relatively south side of planned areas, so the inside channel has to be extended long toward north	It is ideal to plan the entrance channel at the middle of whole industrial port area.
Outside basin surrounded by breakwaters	Total length of breakwaters is minimum, but there are no space for mooring.	It had better widen the basin so as to accomodate the vessels at outside basin.
Width of the entrance channel	350m for vessels 100,000DWT 250m for vessels below 60,000DWT 100,000DWT Ore Carrier L = 275m, B = 42m D = 16.1m 60,000 DWT Grain Tanker L = 224m, B = 32.2m D = 13.1m 50,000DWT Container Vessels L = 250m, B = 32.2m D = 11.0m 8,000G.T Ferry Boat L = 155m, B = 21.8m, D = 6.1m Ll= ship length D = draught B = width	In case of not one way navigation, the width = W is 1.5 times of shiplength = L: W = 1.5L 400m for vessels 100,000DWT 350m for vessels 60,000DWT
Depth of the channel	100,000DWT Vessels need -18m, but at the 1st stage -16m 60,000DWT Vessels -14m Commercial port -12m	It is not confirmed, but we assume allowances for = rolling of ship 2.5m wave action 1.0m others 1.0m Adding allowances and taking-off the mean tidal hight -1.0m 16.1 + 2.5 + 1.0 + 1.0 - 1.0 = 19.6m for entrance area. In port, adding 1 ~ 2m of allowance to the fully loaded draught. Ore carrier -18m Grain carrier -14m Container vessle -12m Ferry boats -7.5m
Turning Basin	Not indicated	Using Tug-boats with together, diameter should be more than 2L (ship length)

Terms	Problems	Improvements
Iron & steel factory	Transportation of materials in the yard is difficult, judging from the shape of the land	Planning the yard as rectaugular as possible.
Water front length of Iron & steel factories	850m + 900m = 1,750m it seems too short.	Necessary length of waterfront for the factories [Iron ore importing berth] amount imported 26 million ton unloader 2 x 1,500t/hr 26 million ÷ 1,500 ÷ 2 ÷ 12hr/day ÷ 200day = 3.61 berth ∴ 330m berth x 4 = 1,320m
	The products are considered to be carried out whole by trucks through road. (40,000t/day and more)	[Steel products for carrying out] The posibility of export is not deneyed, maybe, many part of products will be carried by sea to the domestic market. if 50% is carried by sea; 13 million t/year ÷ 2 = 6.5 million ton Export 15,000DWT Vessels are used Domestic 5,000DWT Vessels are used 12,000t x 78 Vessels = 936,000t/berth 4,000t x 78 Vessels = 312,000t/berth 936,000t x 3 berth + 312,000t x 12 berth = 6,552,000t 3 berths x 185m = 555m 12 berths x 130m = 1,560m Total = 2,115m
Food processing complex berth	It is not understood why the berth is planned as a detouched type pier.	Conventional wharf could be planned here. The products can be handled at public wharves including MPT. Import wharves 2 berths length 600m
Oil refinery	Crude oil will be transported by pipe line land is 600ha wide.	When the crude oil is exported, the loading berth should be at the outside port area (surrounded by breakwaters) and the berth can accomodate for 200,000DWT Tankers. Petroleum products will be carried.out using 40,000DWT tankers and 5000DWT tankers. For example, I show here the case of Tomakomai east industrial port; which seems to be almost same amount as Altamira.

Terms	Problems	Improvements
		For example, Tomakomai port is; 1 million barrel/day production (is equl 50,000,000t/year). 9 million ton → petro-chemical material 9 million ton → power station fuel 1 million to → miscellaneous Carrying out to other places 31,000,000t/year. If the 50% is carried by sea 15,000,000t/year 5,000,000t/30,000t × 100 vessels 10,000,000t/4,000t × 100 vessels = 40,000,000DWT Berth × 2 berths = 5,000DWT Berth × 25 berths
Petro chemical industries	Production level unknown, area 891ha wide.	For example; Tomakomai east port is 800ha for petro-chemical factories. Producing 1,600,000t/year (product equivelent to ETHYLEN.) Material is NAPHTHA 9 million tons. Transport of products: Consumption in the port-area 20% Road-transportation 50% Sea-transportation 30% = 480,000t/year (less important for the port plan)
Aluminum factory	Production level unknown, material is Bauxite from Jamaica and space 745ha.	For example: Tomakomai east port is 700ha wide for Aluminum plant. Production 1 million t/year Importing Bauxite 4,000,000t/year NAOH 70,000t/year Fuel-oil 270,000t/year In case of Altamira, assume the import vessel as 40,000DWT. 2 berths needed for importing.
Commercial port zone	Handling amount is not yet estimated. Foreign and domestic trade amount are not separated. Water from for multipurpose Terminal is too long	Domestic and Foreign trade areas have to be separated. First berth could be MPT. but in the course of development, the container wharves will be planned independently. Domestic ferrey service will require their berths

Terms	Problems	Improvements
Power supply stations	No power plant is seen in the industrial port project of Altamira.	In case of Tomakomai East port 6,000,000KVA plants need 300ha in total. Fuel 9,000,000t/year will be supplied by pipeline.
On phase I step, planning of the port	Breakwaters and dredging of central channel have already ordered to be built. We can guess that a part of iron & steel mill 430ha, CONASUPO wharf MPT are expected to complete in the phase I plan.	A part of iron & steel mill, Food processing complex, Multi-purpose terminal, Power station, Ferry boat berth and some others are included in the plan of Phase I
Others	*Basin for small service boats is missing.*	A basin is planned in the outside area of the port which will be used for the working vessel's schelter at the first stage of dredging.
	Port administration will need some space in the middle.	Port administration offices are planned with some water front length.
		Control tower is recommended to be situated at the middle of symbol zone of industrial area.
		These waterfront lengths and the depths of the mooring facilities area adopted to draw up the master plan attached to this report.

4-4-5 A consideration on the direction of entrance channel to the port

Table 4-4-2 Recorded Wave Direction off Tampico Port at 22°22'N, 97°64'W, water depth –25m

(table in %)

	N	NE	E	SE	S	SW	W	NW	TOTAL
JAN	47.5	7.1	9.4	22.0	13.3	0.2	0.2	0.3	100%
FEB	40.6	8.8	13.0	25.0	11.9	0.2	0.2	0.3	100
MAR	30.6	12.7	17.7	29.5	8.8	0.2	0.2	0.3	100
APR	15.7	17.2	24.7	35.3	6.5	0.2	0.2	0.2	100
MAY	12.0	15.9	30.4	35.0	6.1	0.2	0.2	0.2	100
JUN	11.2	11.4	33.2	33.4	10.2	0.2	0.2	0.2	100
JLY	11.0	8.7	33.5	31.1	15.1	0.2	0.2	0.2	100
AUG	17.1	11.8	29.5	27.9	13.1	0.2	0.2	0.2	100
SEP	39.4	14.0	16.8	18.1	11.0	0.2	0.2	0.3	100
OCT	42.7	14.6	15.7	15.5	10.8	0.2	0.2	0.3	100
NOV	45.0	10.0	12.7	18.3	13.3	0.2	0.2	0.3	100
DEC	49.4	6.7	8.9	19.3	15.0	0.2	0.2	0.3	100
TOTAL	30.2	11.6	20.4	25.9	11.2	0.2	0.2	0.3	100
	41.8% (N+NE)		57.9% (NE+E+SE)		37.1% (SE+S)				

Wave records show us the most frequent wave direction is from North, followed by South-East and East. North waves are found in Winter season, and East is in Summer. Wave from South East attacks most frequently in Spring time, and can not neglect during Summer and Winter season.

Table 4-4-3 Distribution of Wave Height in Direction, off Tanpico (throughout year)

Wave height	N	NE	E	SE	S	SW	W	NW	Total
(ft)									
0 ~ 1.9	4.0	1.9	3.8	4.4	1.8	0.2	0.2	0.3	16.6
2 ~ 3.9	10.7	4.5	8.3	10.0	4.3	0.0			37.8
4 ~ 5.9	7.6	2.8	4.6	6.1	2.6	0.0			23.7
6 ~ 7.9	4.5	1.	2.3	3.2	1.4	0.0			12.
8 ~ 9.9	2.1	0.6	0.9	1.4	0.7	0.0			5.7
10 ~ 15	1.2	0.3	0.5	0.7	0.4	0.0			3.1
15 ~	0.1	0.0	0.0	0.1	0.0	0.0			0.2
Total	30.2	11.6	20.4	25.9	11.2	0.2	0.2	0.3	100.0

High waves are found most frequently at North direction, followed by South East and East directions

Table 4-4-4 Distribution of Wave Period in Relation with Wave Heights (throughout year)

ft \ sec	0~4.4	4.5 ~ 6.4	6.5~ 8.4	8.5~ 10.4	10.5~ 12.4	12.5~ 14.4	14.5~ 16.4	16.5~	Total
0 ~ 1.9	38.3	41.1	11.5	3.5	2.6	1.8	0.9	0.3	100%
2 ~ 3.9	24.8	44.4	19.2	4.9	3.2	2.0	1.1	0.4	100
4 ~ 5.9	11.2	44.7	29.6	6.6	3.8	2.2	1.3	0.6	100
6 ~ 7.9	4.1	38.4	39.1	9.0	4.5	2.5	1.5	0.9	100
8 ~ 9.9	0.8	27.7	45.0	15.3	5.3	2.9	1.7	1.3	100
10 ~ 15	0.0	15.4	44.7	26.6	6.3	3.3	1.9	1.8	100
15 ~	0.0	4.8	42.0	37.4	7.4	3.8	2.2	2.4	100

Table 4-4-5 Distribution of Wave Period and Wave Height (throughout year)

ft \ sec	0~4.4	4.5~ 6.4	6.5~ 8.4	8.5~ 10.4	10.5~ 12.4	12.5~ 14.4	14.5~ 16.4	16.5~	Total (%)
0 ~ 1.9	6.358	6.823	1.909	0.581	0.432	0.299	0.149	0.050	16.1
2 ~ 3.9	9.374	16.783	7.258	1.852	1.210	0.756	0.416	0.151	37.8
4 ~ 5.9	2.654	10.594	7.015	1.564	0.901	0.521	0.308	0.213	23.7
6 ~ 7.9	0.529	4.954	5.044	1.161	0.581	0.323	0.194	0.116	12.9
8 ~ 9.9	0.046	1.579	2.571	0.872	0.302	0.165	0.097	0.074	5.7
10 ~ 15	0	0.477	1.386	0.825	0.195	0.102	0.059	0.056	3.1
15 ~	0	0.010	0.084	0.075	0.015	0.008	0.004	0.005	0.2
Total	18.961	41.220	25.267	6.930	3.636	2.174	1.227	0.665	100%

The relation between the wave height and the wave period can be understood from two tables above. High wave heights are observed for the wave from 6.5 sec. to 10.4 sec. of period, that are supposed as caused by halicanes. On the other hand, longer period waves are also recorded as its period from 10.5 sec to 16 sec and more, these wave are called swell which may disturb the calmness of the port basin more frequently than the storm waves.

Taking into considerations of wind direction distribution and Fetch lengthes, we can guess that the swell may come from East direction, the storm wave may attack the harbour from North to Northeast. South East waves may hit the area with less powered due to the shorter length of the Fetch and the shallowness of the Bay. North wind in winter season has to be considered to protect the port from the waves.

Fig. 4-4-2 Wind Rose at Tompico (by wind strength)

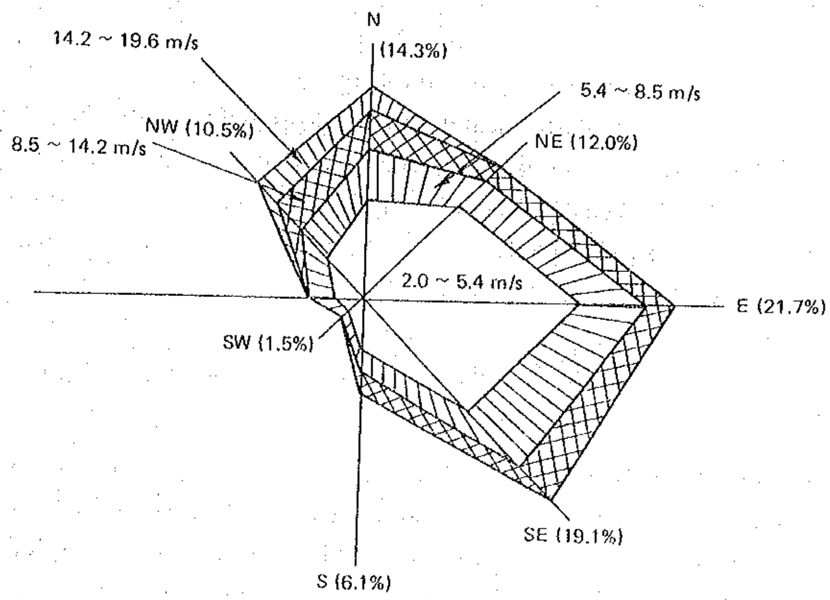


Fig. 4-4-3 Location of Altamira and the Fetch Lengths

The sand drift phenomena is not well known for us yet, but judging from the shape of sand beaches around the breakwaters of Tampico Port, we can say the drifted-sand is moving from North to South as the result of long ranged movement.

The wave deflection starts, from about the depth of the 0.5 × L (wave length) and usually wave direction is reaching nearer and nearer to the perpendicular to the beach. We have to draw wave reflection diagrams for several waves (directions and periods) in case for the detailed studies. but we can hereby consider that the North direction wave will change its direction by approaching near the beach to North East and the South East direction wave will be to ESE.

As a conclusion;

It might be roughly analysed for a decision of breakwater layout for the Altamira port, but we dear say, after the considerations done above, that we recommend the South East direction for the entrance channel to the new industrial port. Since the East direction is opened as original Mexican plan, swell might agitate even into the North South inner channels. Wave absorbing means are still less effective for a longer perioded waves. Therefore, we have chosen SE direction for the entrance channel in our master plan of Altamira industrial port.

Of course, wave observation has to be carried out at the site and a hydraulic model study is also recommended to decide this direction for the port. Thinking of other directions, for example, North East ward directed channel will effected by sand drift at the most, farthermore, navigating vessels are exposed to the side wind blow. The SE direction, we conclude, seems to have the least problem.

At the moment, the dredging and breakwater works will carried out in an accelerated tempo, which we understand well, so our proposal might be examined in the course of execution.

As we have heard the SCT is studying it by construction hydraulic model in their laboratory, our proposal could be tested in the same model, if our proposal is accepted for the authorities to add to the study list of model experiments.

Hereby we recommend again that the study to decide the direction of the entrance channel and the layout of breakwaters have to be terminate as soon as possible, and if the conclusion is reached, the procedure to approve a master plan is as described in the main report (submitted 8th August in Spanish, revised in English as 2-1-1).

4-4-6 On the JICA plans for the Altamira Industrial Port

(1) Alternative A PLAN proposed by the team (Fig. 4-4-4)

a) Entrance channel
- Direction to South East
- Depth −19.5m
- Direction changes to East inside the sheltered area by breakwaters

b) Outer port area
- Two main breakwaters are planned about 1,400m apart so that to give an allowance to build a unloading/loading pier in the future in outer port basin.
- Mooring basin for small service boats are planned at the south end, which will be served for a safety shelter basin during the construction of main breakwaters,

c) Main entrance basin
- From the existing coast line to the planned symbol zone the area will be dredged until 18m deep
- To the south, a 1,200m long channel is planned for the domestic/foreign export of steel products. The lengths are just as long as mentioned at the Table in 3. of this report.
- To the North, a 12m deep channel is drawn about 1,500m backward from the coast line.

d) Deployment of two steel mills
- Steel mills are planned at the South ward of the central channel. This layout is the closest to the original proposal by SCT/CPD.
- Smaller factories of steel producers can find their places among the 600 and 680 ha steel mill areas.

e) Symbol zone
- at the end of the main channel

f) Grain terminal
- 120 ha of land for CONASUPO is taken at the offshore side, that is the north side of the main channel with a waterfront of 14m deep and 600m long.

g) Ferry terminal
- Planned at the corner for use of domestic ferry services, thinking of the best access to the highway.

h) Multi-purpose terminal
- The first two berths are planned as the MPT with 600m waterfront and the −12m of depth.

i) Container terminal
- In future, the exclusive container wharves will be constructed in this area, planning depth will be −12m.

j) Domestic trade wharves

- They will be planned at the 2nd stage next to the Grain-terminal at the opposit side of container wharf. Designing depth will be −7.5m, the wharf will take over some congested wharves of existing Tampico port.

k) Aluminum factory

- An Aluminum factory is planned at the North end, as proposed currently by Mexican plan.

l) Power Plant

- We adds a site of Power Plant
- A intake and a outlet of cooling water should be taken into consideration at the deployment.

m) Petrolium and Petro-chemical plants

- Planned as same as the original layout.

(2) Alternative B PLAN proposed by OCDI (Fig. 4-4-5)

a) Entrance channel

Same as alternative A.

b) Outer port area

Same as alternative A.

- A turning basin for larger ships is planned at the middle of outer port basin.

c) Main entrance basin

Same as Alternative A at −18m deep area

- But −18m depth area is smaller than plan A, that will reduce the dredging amount.
- Main turning basin at the end of the area could be designed smaller than the Alternative A, due the depth is −14m.
- To the North and South, perpendicular to the main entrance channel, sub-channels are planned.

d) Deployment of two steel mills

- Steel mills are planned at the both sides of the central channel to minimize the deep water dredging.
- Smaller factories of steel producers can find their spaces among the 550 and 600 ha steel mill areas.

e) Symbol zone

- At the end of the main channel

f) Grain terminal

- 120 ha of land for CONASUPO is taken to the next of symbol zone, where the food processing factory will have a easyer access to inland areas.
- Waterfront is 14m deep and 600m long, but 1,000m of it will be left unutilized.

g) Ferry terminal

- 300m long, −7.5m in depth

h) Multi-purpose terminal

- Planned same as Alternative A.

i) Container terminal

– As Alternative A.

j) Domestic trade wharves

– Domestic wharves are planned at the Alternative B at the south end of secondary channel, where the domestic trade cargo will find a better access to the existing Tampico port by a highway.

k) Aluminum factory

– The plan is located at the south end, 700 ha wide and with some waterfront to unload Bauxite.

l) Power Plant

– We addes a site of Power Plant

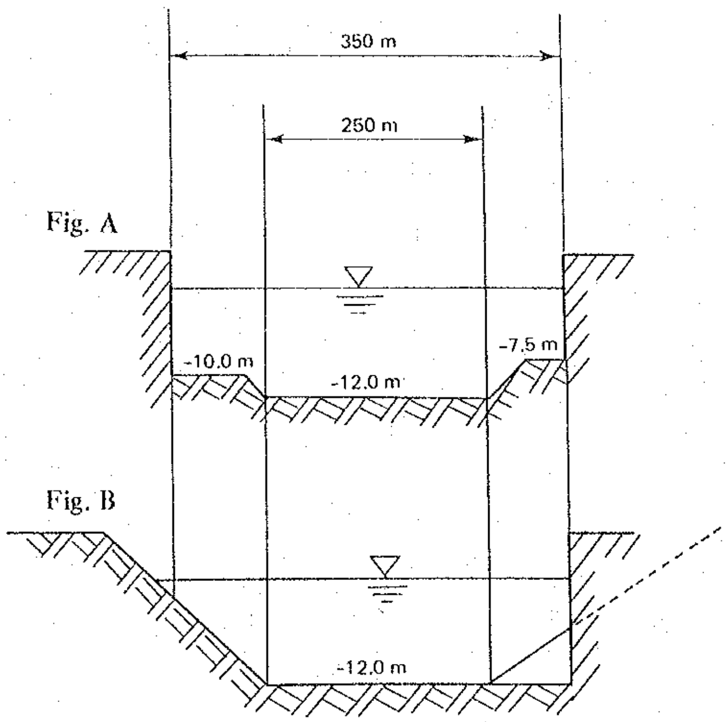
m) Petrolium and Petro-chemical plants

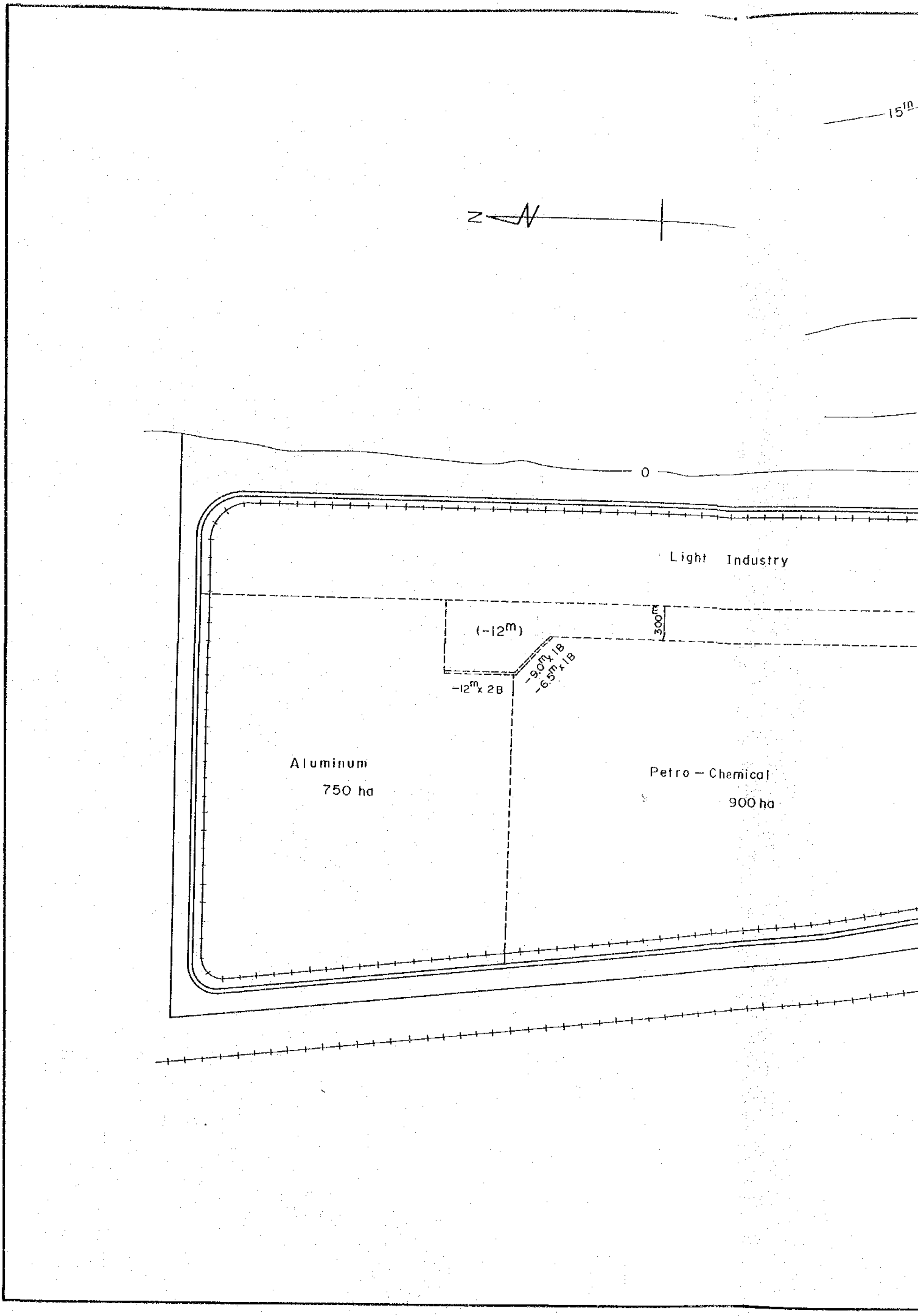
– The area is enough wide to plan two sets of refineries in this area, so we devided the plants at the both side of the North channel.

(3) North South Channel

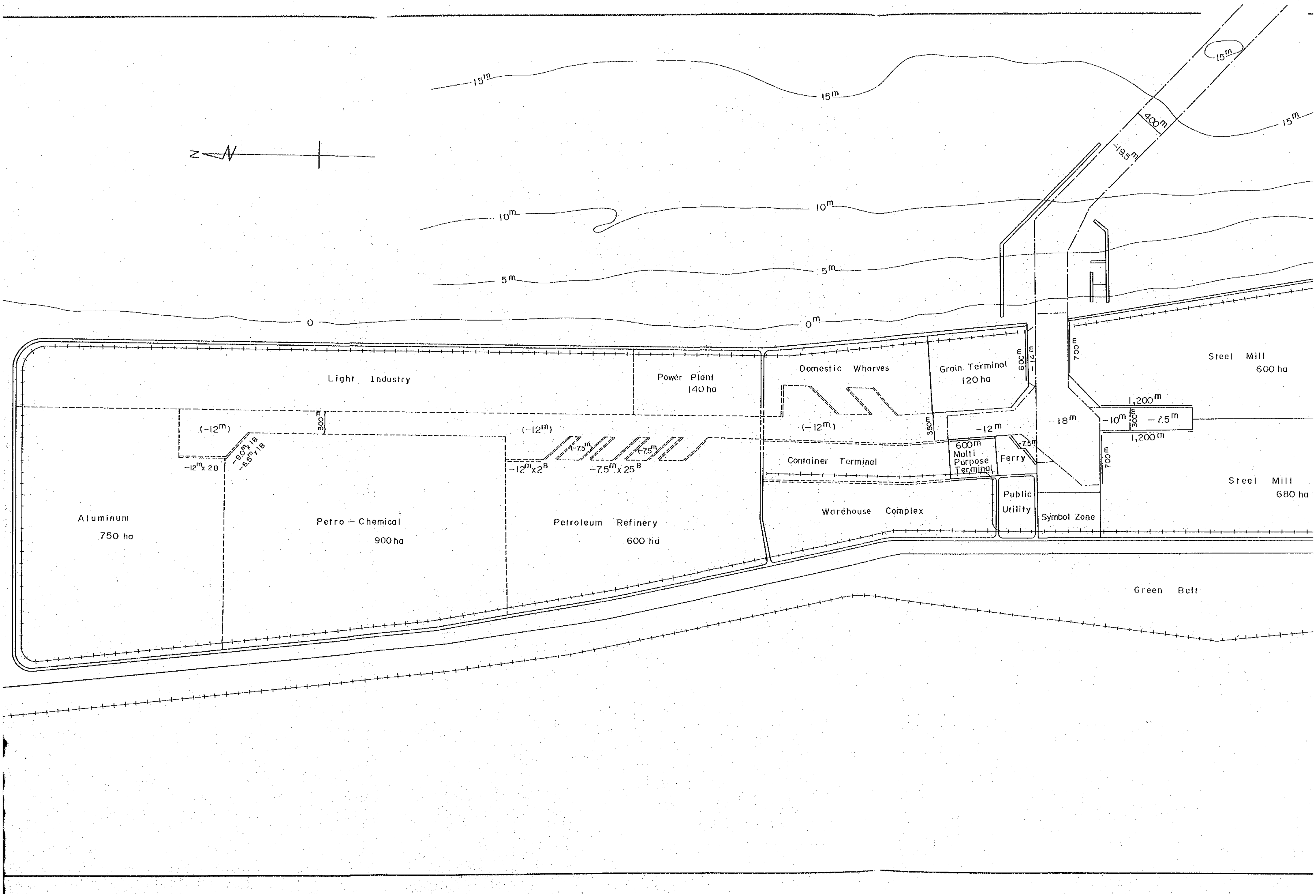
The width of navigation channel is drawn as wide as 350m, the width for 12m deep navigation channel is 250m at its botton. In case the waterfront utilized as a quaywall, the channel will be shaped as Fig. A, and the case when the waterfront is not utilized as a quay the width of the channel will be a little bid wider than Fig. A just as shown in Fig. B.

Fig. 4-4-6 Width of North South Channel





15m
N
0
Light Industry
(-12m)
300m
-9.0m x 1B
-6.5m x 1B
-12m x 2B
Aluminum
750 ha
Petro - Chemical
900 ha



15m
15m
15m
15m
400m
-19.5m
10m
10m
5m
5m
0
0m
N
Light Industry
Power Plant
140 ha
Domestic Wharves
Grain Terminal
120 ha
600m
-14m
700m
Steel Mill
600 ha
1,200m
-18m
-10m
300m
-7.5m
1,200m
(-12m)
300m
(-12m)
(-12m)
350m
-12m
-12m x 2B
-9.0m x 1B
-6.5m x 1B
(-7.5m)
(-7.5m)
-12m x 2B
-7.5m x 25B
600m
Multi
Purpose
Terminal
-7.5m
Ferry
700m
Container Terminal
Steel Mill
680 ha
Public
Utility
Symbol Zone
Warehouse Complex
Aluminum
750 ha
Petro-Chemical
900 ha
Petroleum Refinery
600 ha
Green Belt

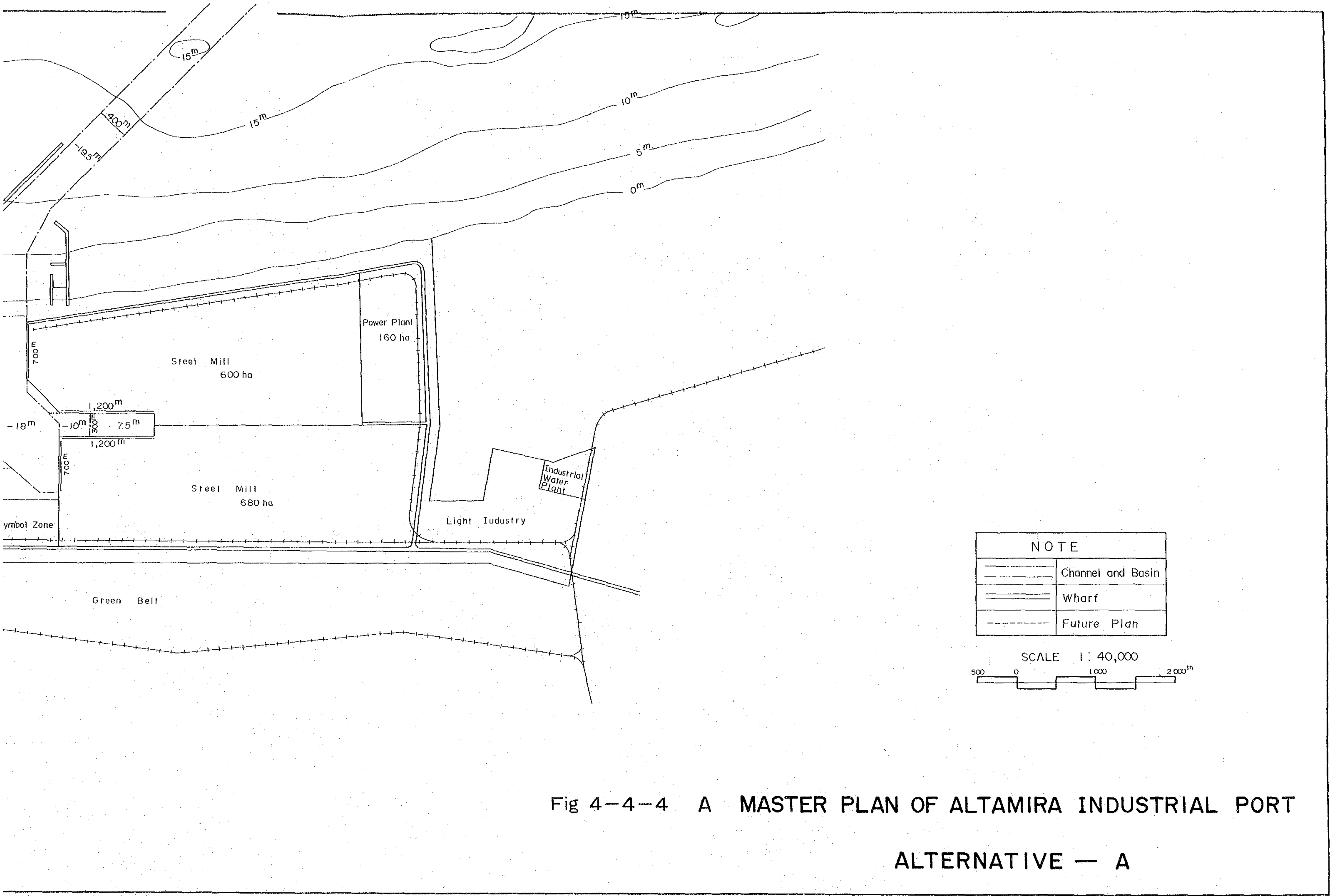


Fig 4-4-4 A MASTER PLAN OF ALTAMIRA INDUSTRIAL PORT

ALTERNATIVE — A

4-5 The Outline of Japanese Standard for Physical Studies on Port and Harbour Engineering

1980 October

This paper was prepared by the team for the C.P.D. Mexican Government to introduce the Japanese standardized technique for the natural condition surveys of port and harbour engineering, authorized and published by the Ministry of transport, according to the record of discussion dated on 8 August made between the C.P.C. and the first mission of JICA headed by Mr. Takeuchi.

The paper summerizes the standard by the Index, which we believe showing the whole structure of physical studies. In the case of the application of the study structure to the in-situ survey, the chief of the engineering study has to select and examine the study items case by case considering the condition of the planning site of the new port.

We hope this paper will be usefull, and please ask us, if you would like to have further informations on the matter.

For your reference I attached a copy of original Japanese which might be translated by Japanese Experts in SCT in case to study a detail.

Yoshio Takeuchi

INDEX

4-6 Multi-Purpose Terminal, (November, 1980)

– An example of its layout –

4-6-1 General introduction

At the earlier stages of a commercial port development, a multi-pourpose terminal is usually planned to handle relatively many types of cargo which will be carried by various types of vessels.

It is better to plan a fully containerized wharf where the cargo is expected in near future enough to exceed the capacity of a full containerized wharf which is roughly said to be one million tons annually. A multi-purpose terminal is a conception introduced by UNCTAD secretaries to apply to a relatively small developing port.

It is simply introduced here how to plan and draw out a concept of a multi-purpose terminal, taking Altamira port in mind where two or three berths of multi-purpose terminals are going to be planned among the industrial port terminals.

This paper is prepared in Mexico by the team to complement the former report "Altamira Port, Mexico Cargo Handling System of Multi-pourpose Terminal".

4-6-2 Wharf

The terminal will be planned as a foreign trade terminal principally, but some part of cargo will be passed to the domestic vessels which ashore the terminal. The foreign trade zone will be surrounded by fences and be separated from other part of the port by custom authority.

A domestic ferry service terminal is recommended to be built in some other part of the port where the passengers on car could access easily from the highways.

The multi-pourpose terminal will facilitate the accommodation for the vessels such as full-container vessels, semi-container vessels, conventional cargo boats, vessels with RO/RO ramps on their own deck, mineral ore carriers, some heavy cargo carriers and some domestic traders which distribute the cargo locally.

4-6-3 Precondition

Assumptions for the multi-pourpose terminal planning are as follows:

1.	a set of the berth	2 berths
2.	depth of the berth	–12m
3.	length of the berth	$2 \times 300^{m} = 600^{m}$

4-6-4 Vessels expected

full containerized vessel	50,000 DWT
ordinary cargo vessel	10,000 – 20,000 DWT
mineral ore carrier	30,000 DWT
ferry service vessels (International trade RO/RO vessels)	10,000 – 20,000 DWT

Condition of operation;

Supposing 1.5 vessels utilize the berth every week in average and the annual cargo handling amount will be calculated =

containers	1,000 TEU x 50 weeks x 1.5 vessels/week = 75,000 TEU
containerized cargo will be	75,000 TEU x 10^t = $750,000^t$/year
general cargo	$2,000^t$ in 50 weeks = $100,000^t$/year
mineral ore	$50,000^t$ x 12 times = $600,000^t$/year
others	$15,000^t$/year
TOTAL (approx.)	$1,465,000^t$/year

A comparison of annual throughput

a) ordinary wharf	$100,000^t$ – $150,000^t$
b) containerized wharf	up to $1,000,000^t$
c) multipurpose terminal proposed here	$730,000^t$

4-6-5 Cargo handling system

(1) Handling system of containers

Assumption:	a) 1,000 TEU for a vessel
	b) 40 footers and 20 footers are same number
	c) then, handling containers are 667. per vessel
handling 1 =	a) using a gantry crane (for LO/LO vessels)
	b) 3 minutes cycle 20 containers handled per hour
	c) 667 containers need 33 hours approx.
handling 2 =	a) RO/RO ramp is used
	b) 5 containers per minute can pass the ramp
	c) then the handling can be done in shorter hours.
handling 3 =	a) LO/LO and RO/RO combined case
	b) RO/RO containers assumed 100 units
	c) 567 containers will be handled 28 hours

Marshaling Yard

Marshaling yard is planned behind the crane rail, the area will be required depending on the operating system. Principle of the designing is to utilize the rather expensive gantry crane as much as possible. A crane load/unloads a container in every 3 minutes at average operation.

The marshaling yard has to feed and store the containers at every 3 minutes intervals. If a berth has 2 or 3 gantry cranes. The yard will be neccessary two or three times more. In case RO/RO vessels, a special consideration will be added to meet the handling velocity.

A marshaling yard will be clearly marked for each booth of container so as to store the individual container which has its own destination. The storage plan of a container in the yard has to be well considered and planned in order to make no confusion at the ship loading operations.

Yard will be devided for;

a) loading containers and unloaded containers
b) for each vessel, shipping agent, etc.
c) for destinations
d) for contents (in case of special cargo)
    dangerous good
    living animals
    reefer containers
    fresh vegitables
    etc.

The function is just like the pigeon box in a post office. It is believed that a yard could be operated without appling a electronic computor when the handling number reach less than 1,000 units per month.

The yard capacity will be increased several times if a computor is introduced for the operation.

Operation of the marshaling yard =

a) chassis system	one level storage
b) straddle carrier system	2 – 3 level storage
c) transtainer system	3 – 4 level storage

The system c) is considered almost same as system a) just adding transtainers for the multi-story storage to the chassis transportation system between the crane and the yard.

The straddle carriers and transtainers require a heavy pavement for their pass.

The number of tractors for chassis and straddle carriers are planned not to give a idle time for the crane.

The area for the marshaling yard when 2,000 TEU containers are stored.

chassis system	64,000m^2
straddle carrier system	30,000m^2

The handling number of containers per vessel (1,000 TEU) 667 units, the average storage days in the yard is assumed as 7 days then. 1,500 TEU storage space will be reserved for the ship handling operations. Adding the area for open-van-pool and inspection. The total storage space is nearly 2,000 units (TEU). 100 or 150 TEU space will be needed separately for the reefer containers.

C.F.S. (container freight station) will be planned for the vanning/devanning of LCL (less than container load) cargo, in the terminal area. If the percentage of LCL cargo is 40% of total handling amount, the expected amount which will be handled through the CFS will be;

$750{,}000^t \times 0.4 = 300{,}000$ (annually)

The size of C.F.S.,

assuming: the rotation rate 24 times/year utilization rate of the floor 0.7 unit load per m^2 of floor area 2^t

40m x 250 = 10,000m^2

Allocating near the entrance of the terminal.

Supplemental facilities for the terminal;

maintenance shop 30m x 40m

container clearning space 30m x 30m

water treatment basin

parking space for workers, and for the maintenance shop

light system for night operation

reffer container electric supply

Fig. 4-6-1 (a) Layout of container yard (Chassis system)

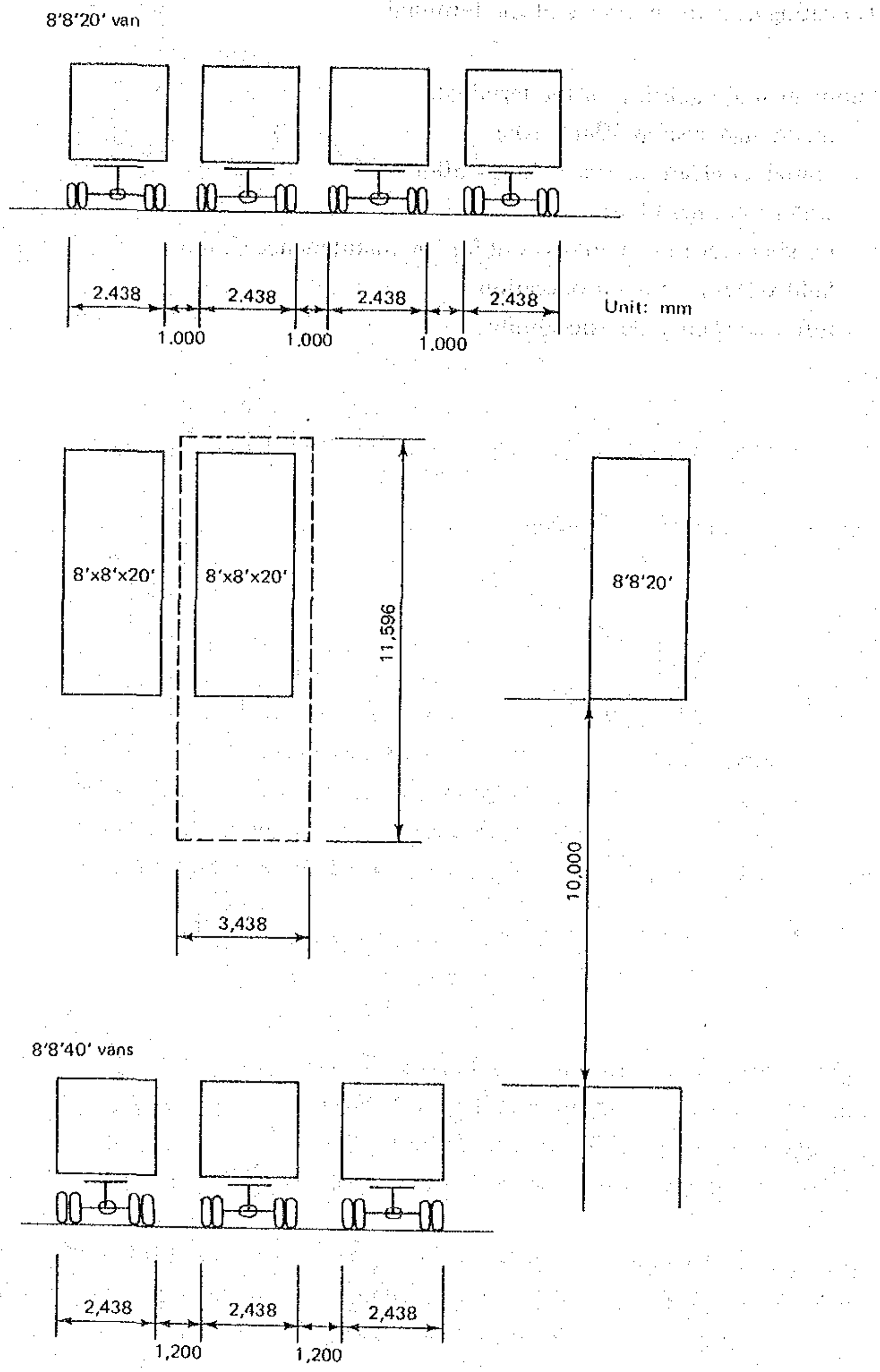


Fig. 4-6-1 (b) Layout of container yard (Stradlle carrier system)

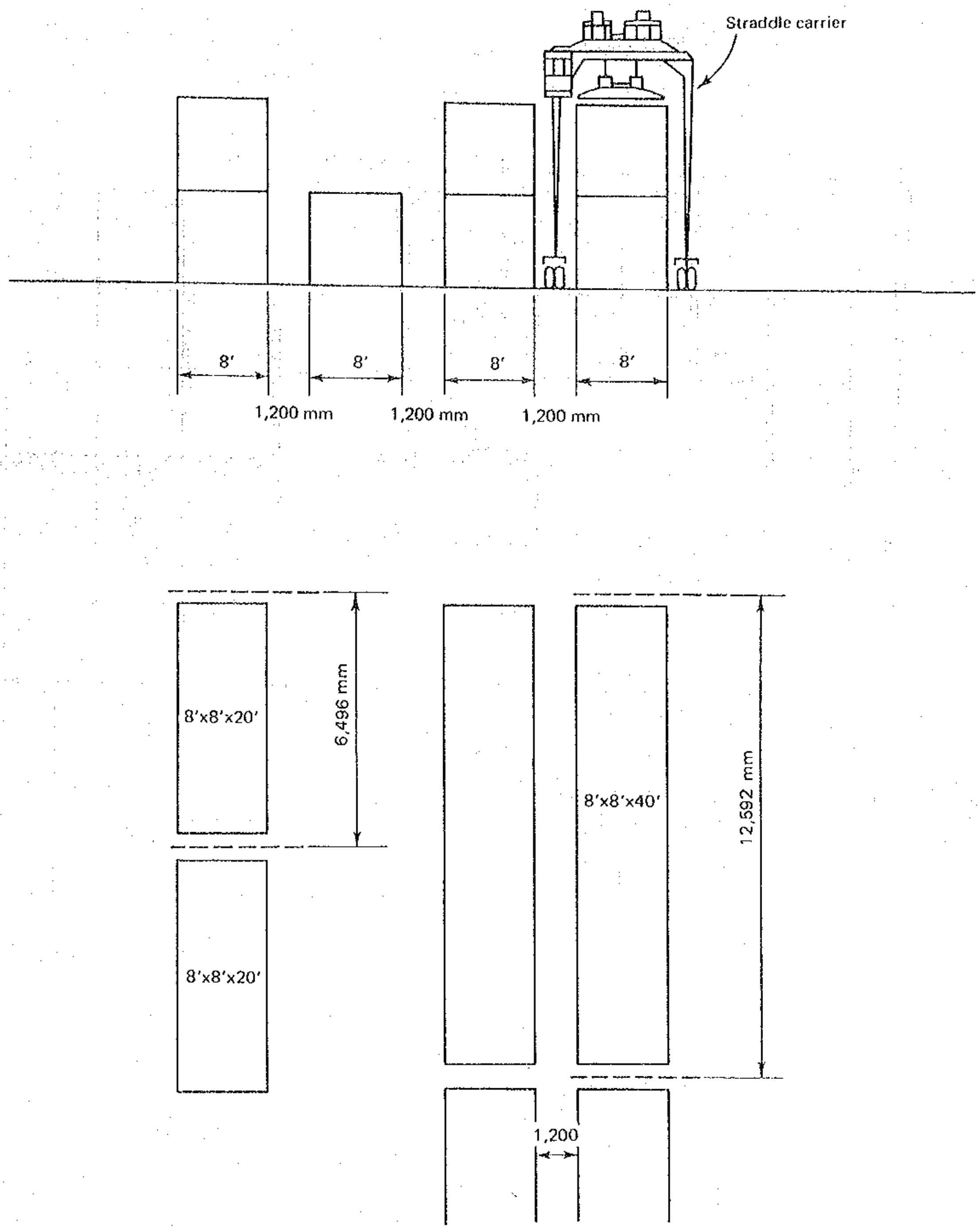


Fig. 4-6-1 (c) Layout of container yard (Transtainer system)

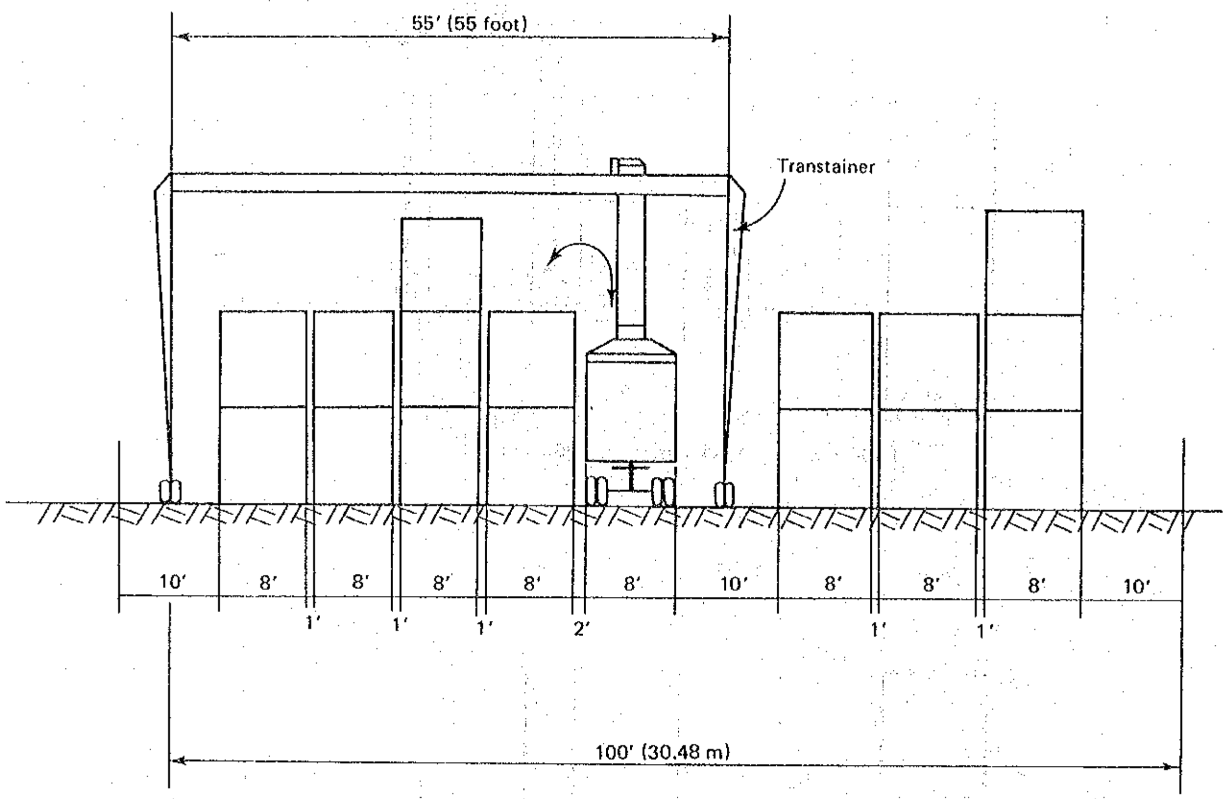


Fig. 4-6-2 (a) An example of layout for Multi-Purpose Terminal
(Straddle Carries System)

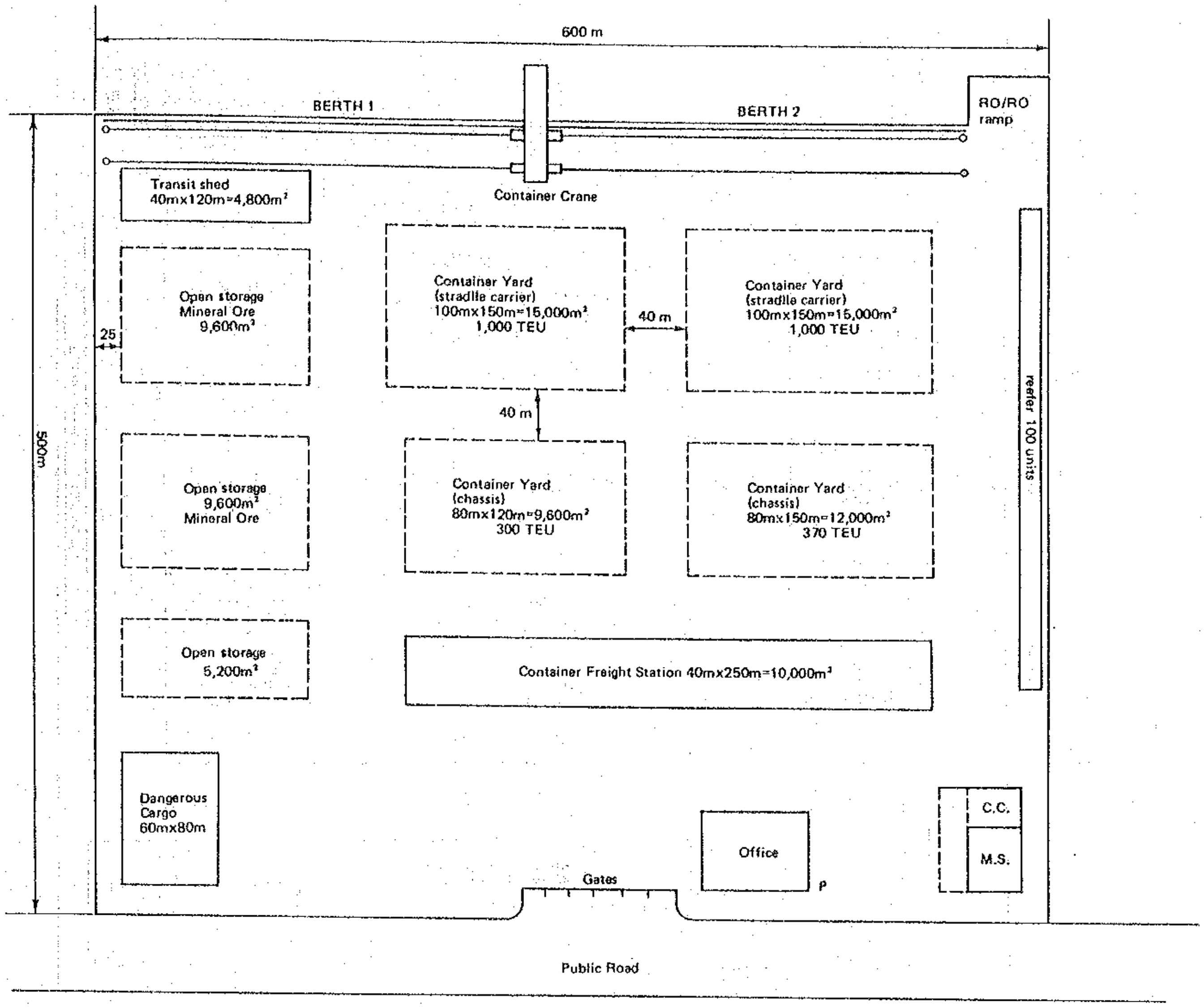
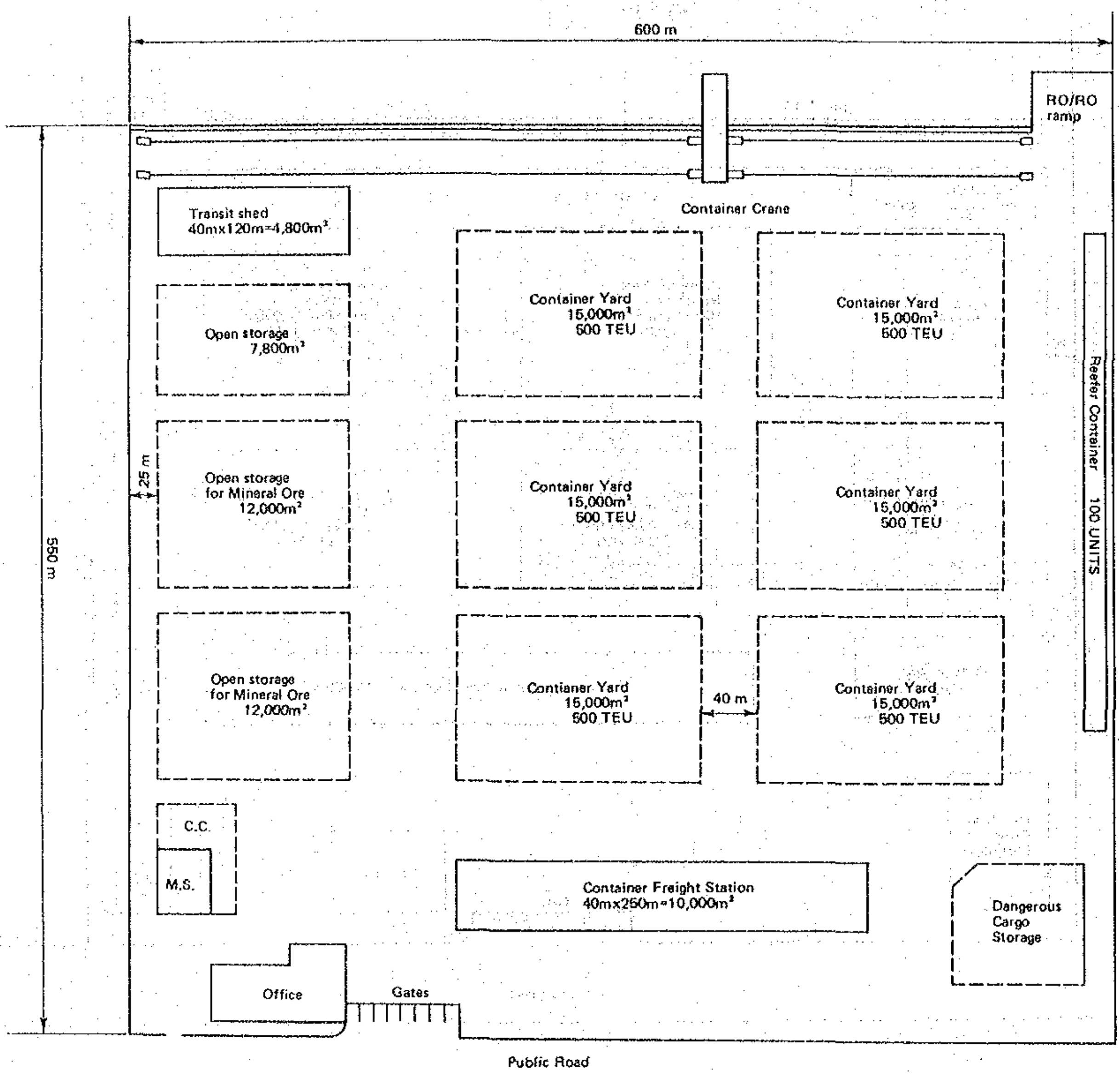


Fig. 4-6-2 (b) An example of layout for Multi-Purpose Terminal (Chassis System)



4-7 A consideration on the planning of crude oil loading port of Salina Cruz Oaxaca, Mexico. (January, 1981)

4-7-1 Background of the study

In a meeting at the second mission to Mexico, a discussion was held on the layout of Salina Cruz oil exporting port facilities with CPD, SCT, CIFSA and JICA. At the meeting I suggested that the plan has to be consulted with experienced captains of very large tankers. Then I took this project to Japan to have some discussions with ship maneuvering experts. Hence a consideration is added on the configuration of the oil loading port, especially on the relation between width of the water area and ship maneuverability for the very large tankers (VLCC) as large as 250,000 DWT.

VLCC operation is fur difficult comparing with ordinary vessels and contains high probability of danger where the water area is limited, since the VLCCs have fur larger inertia of movement. Then a pilot has to maneuve it with a completely new kind of technique.

The port layout, breakwater alignment and entrance channel dredging, has to be elaborated carefully taking into consideration of the ship maneuvering skill at the planning site. A perfect plan will be configurated taking into the worst natural conditions for such as; the wind velocity and directions, swell and the tidal current. I had to say that these natural conditions were unfortunately not sufficient at the time of discussion and also in our study in Japan. Therefore the final plan should be decided after getting the result of further surveys on wind and current and so on.

I would like to introduce here the summary of a short consideration on the planning idea for the layout of port facilities in Salina cruz oil loading port.

4-7-2 Salina Cruz Oil Loading Port

(1) Operation in General

- Several kind of different sized tankers will be accommodated in the same basin, including VLCCs of 250,000 DWT class.
- For the port planning, we think of VLCC maneuvering which will decide the port dimensions.
- 250,000 DWT tankers will arrive at the port in a ballast loaded condition, the draught of which is approximately 13.0 meter.
- VLCC in ballast condition will enter the port by the aid of tug-boats and turn it head in the turning basin. This operation will be effected by the wind and current.
- VLCC will be moored to the loading pier, filled with the crude oil.
- Fully loaded VLCC will leave the pier by the aid of tug-boats and start to go out the port by its engine. The draught is then 20.6 meter approximately. The attension should be taken for the effect of swell and current, at the entrance channel. Of course strong North East wind should be considered.

(2) **Basic information for the natural condition**

Wind; Wind roses are given in the following figure by season and intensity.

Current; Not yet known.
We are informed the current is not strong so far.

4-7-3 A sugestion to the planning of Salina Cruz oil loading port

(1) A consideration on the maneuvering of VLCCs (250,000DWT)

It is desirable to moor a VLCC to the loading pier by the aid of tug-boats which attend after the VLCC entered completely into the sheltered area. However this ideal condition will be obtained with a very long breakwater, since a VLCC needs a long distance to stop, which will cause a very difficult and expensive execution for the breakwater construction work at this site.

For the port operation in Salina Cruz, I recommend that a VLCC should stop the movement once in front of the port entrance, then the attended tug-boats take the vessel into the port not using the VLCC's engine. The procedure is shown in a figure of maneuvering.

(2) Configuration of the oil port

I prepared a few plans considering the following points;

a) Deployment of berths
Basically, I followed the original plan which is attached here as presented by Mexican authorities. Two berths for 50,000 DWT tankers were moved to the new site along the coast line in order to create a wider water area in the basin.

b) Width of the entrance channel
I recommend the width of the entrance channel to be extended as wide as 420 meter at least which is 1.2 times of ship length (L) against the original proposal of 330 meter (1.0 L).

c) Turnning basin
I recommend to widen the turnning basin until 700 meter of diameter circle which means 2.0 times of ship length against the original proposal of 450 meter (1.3 L).

According to the considerations mentioned above, I drew up two plans for the oil loading port as attached as the Alternative A and B. Supplemented Alternative B' is a variation of B and the end of west breakwater is bended in the middle. In case of B and B', the west break water should be built up to the duplicated place at the earlier stages, the rest, streight extension or bended direction, will be extended after watching the operational or wave sheltering conditions.

VLCC: abb. Very Large Crude Oil Carrier

(3) Tug-boats

When a VLCC is coming in or going out, four or five tug-boats should be attended to carry out the operation safely, their capacities should be 2,500 to 3,000 HP.

(4) A consideration on the bad wheather operation

It is recommended to study further. Generally speaking, in our country the operation is not carried out when the wind is observed more than 15 M/SEC.

Fig. 4-7-1 Wind Rose at Salina Cruz

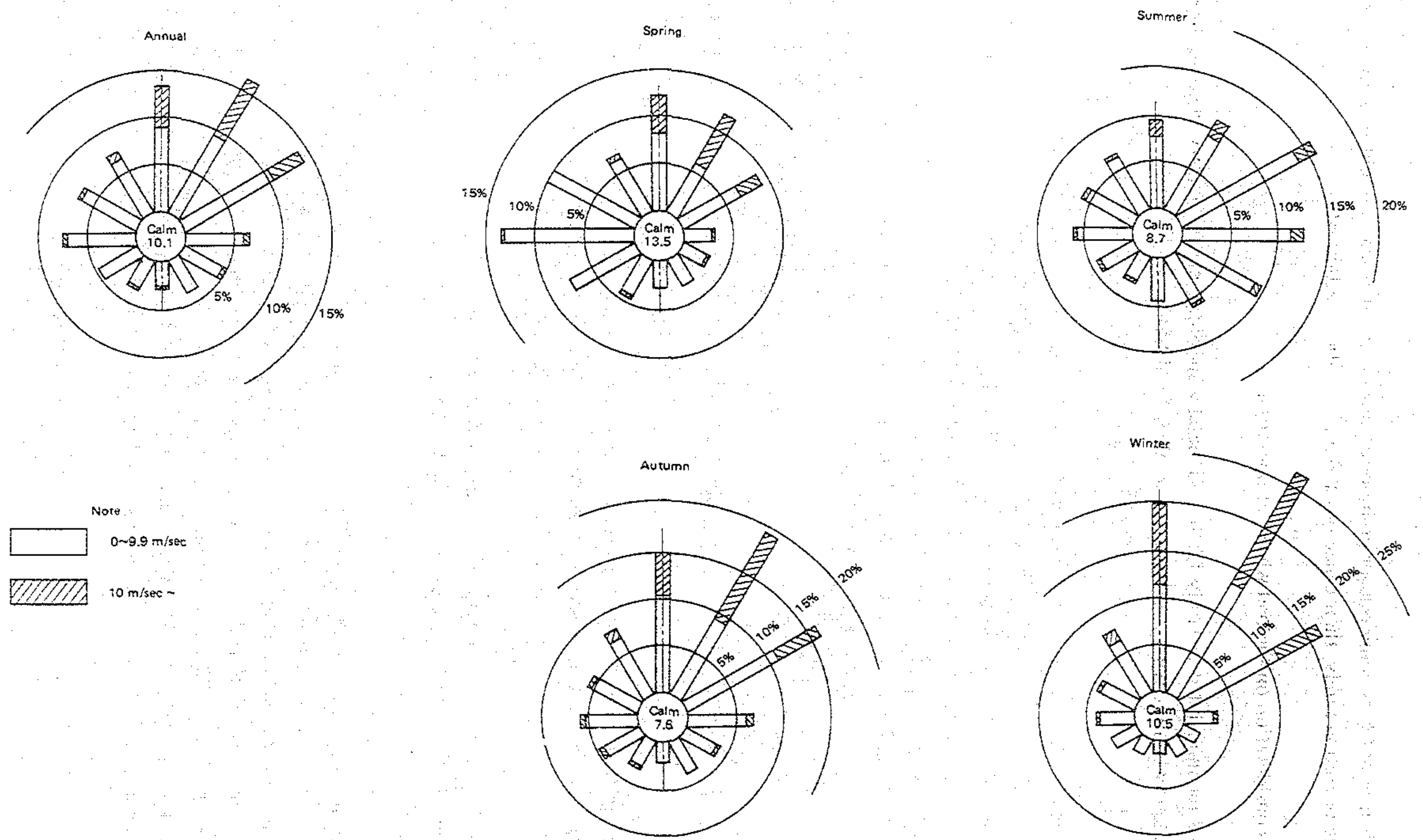


Fig. 4-7-2 Recommended Maneuvering of 250,000 DWT Oil Tanker

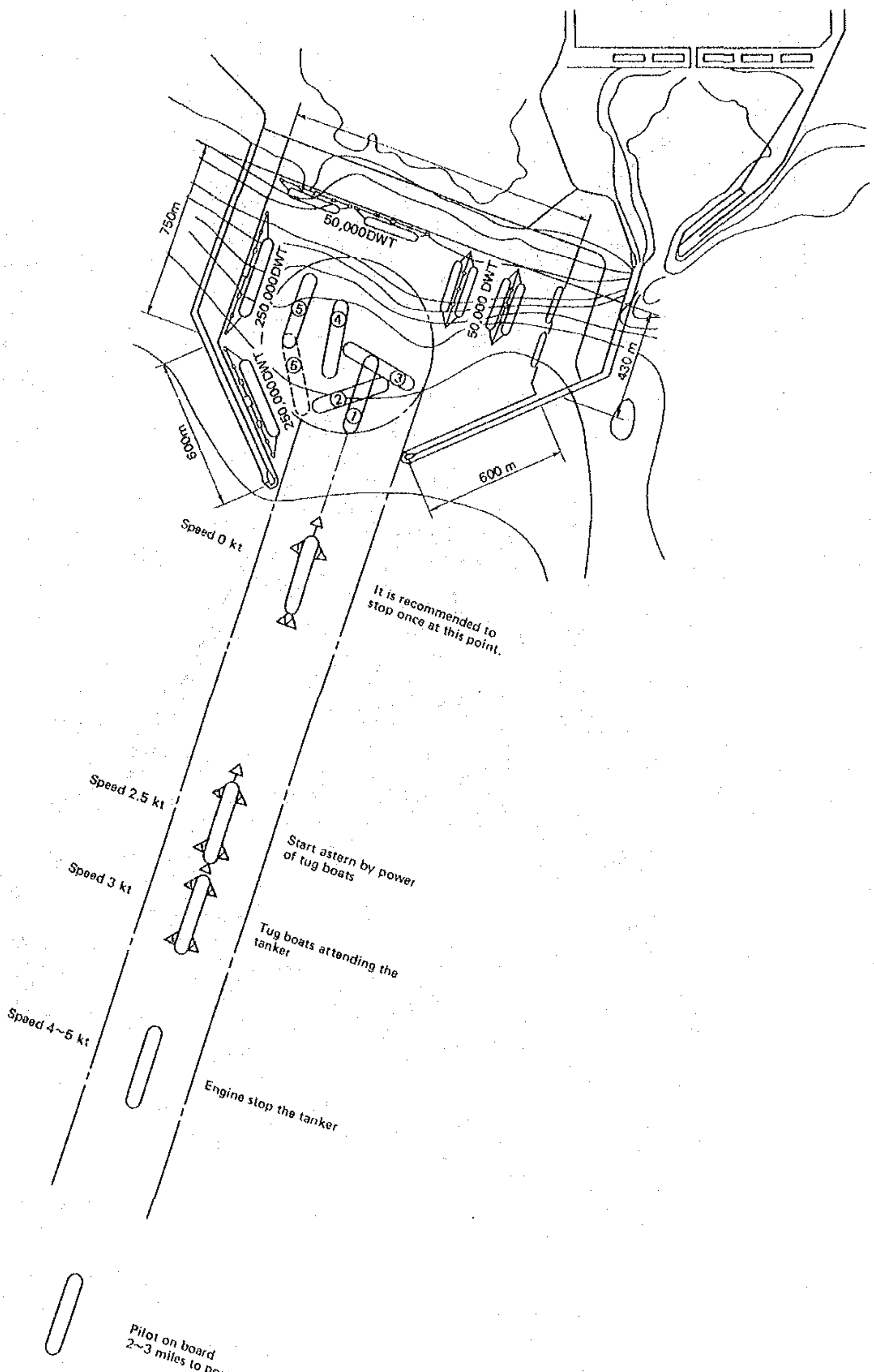


Fig. 4-7-3 A Plan of Salina Cruz Port Oil Loading Harbour
Original Plan prepared by S.C.T.

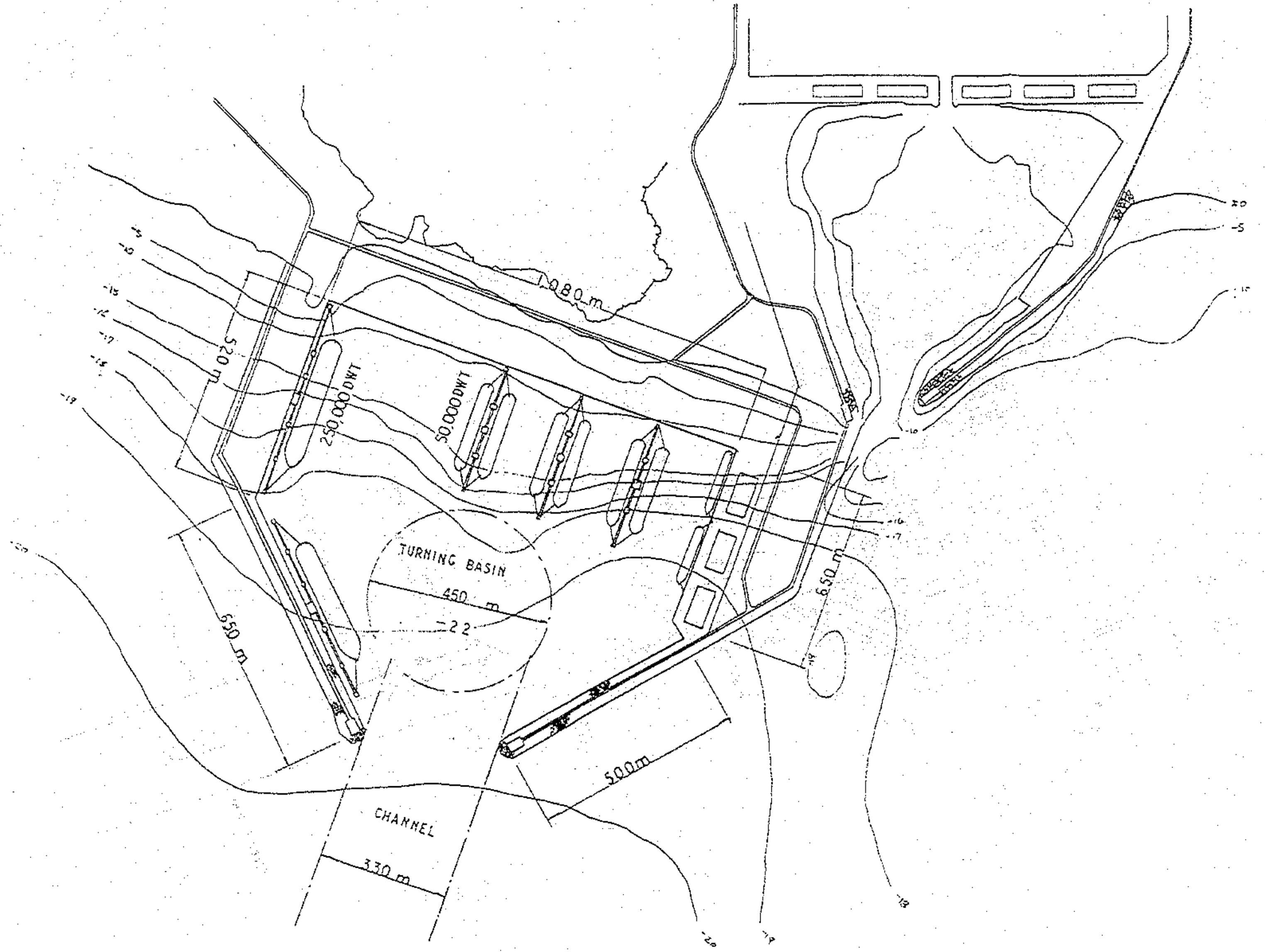


Fig. 4-7-4 SALINA CRUZ OIL HARBOUR
JICA/OCDI recommendation
Alternative (A)

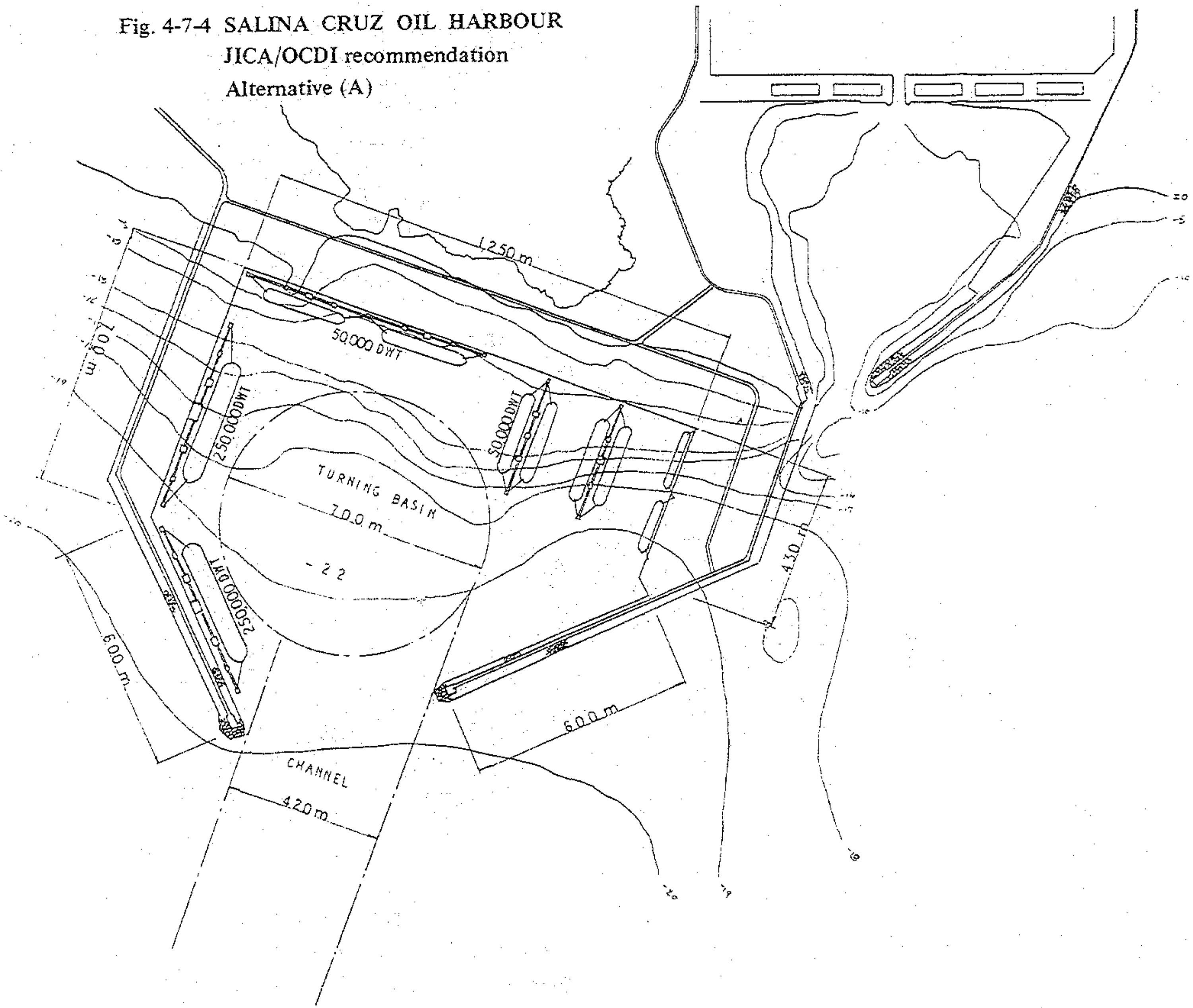


Fig. 4-7-5 SALINA CRUZ OIL HARBOUR
JICA/OCDI recommendation
Alternative (B)

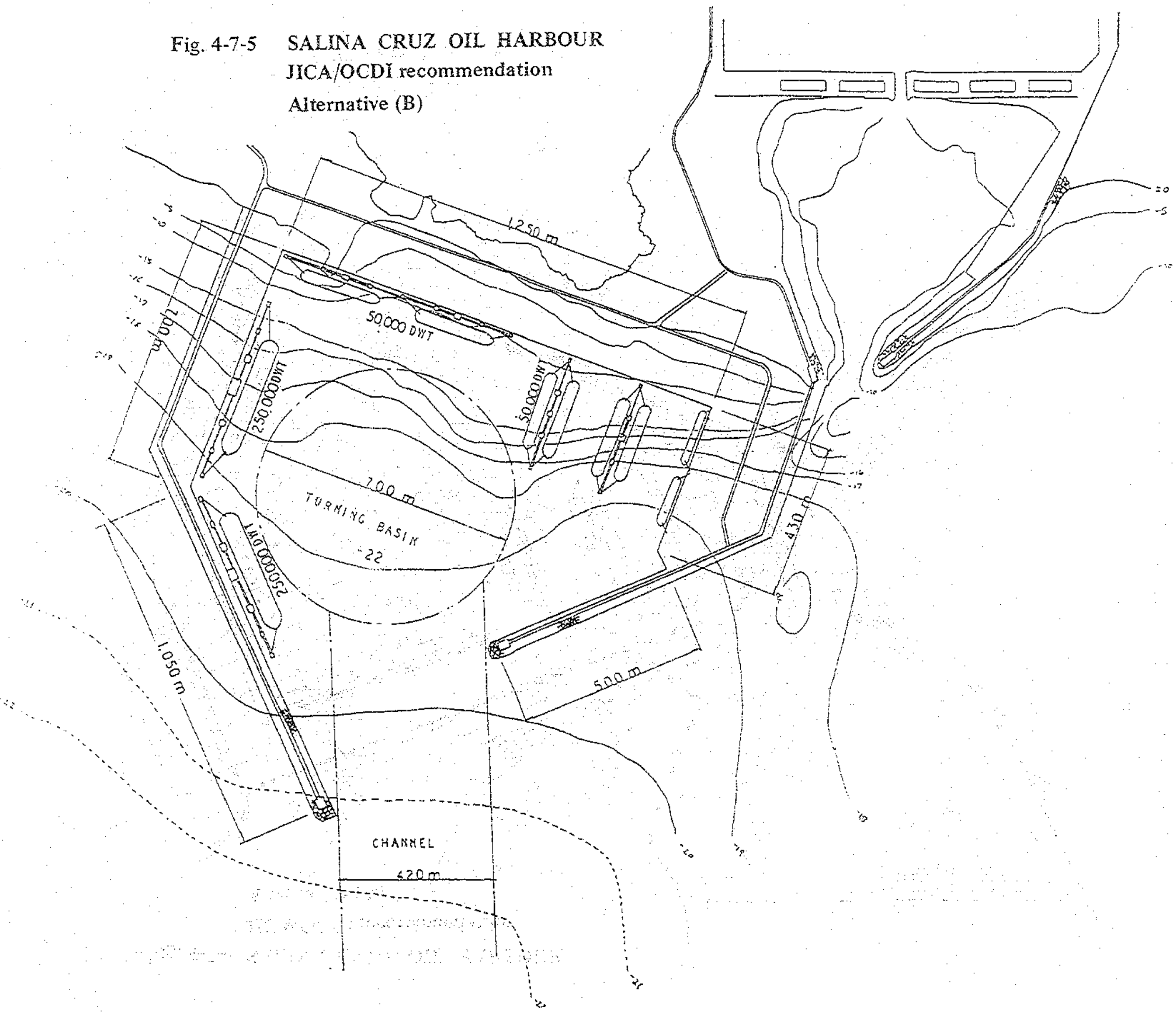


Fig. 4-7-6 SALINA CRUZ OIL HARBOUR
JICA/OCDI recommendation
Alternative (B')

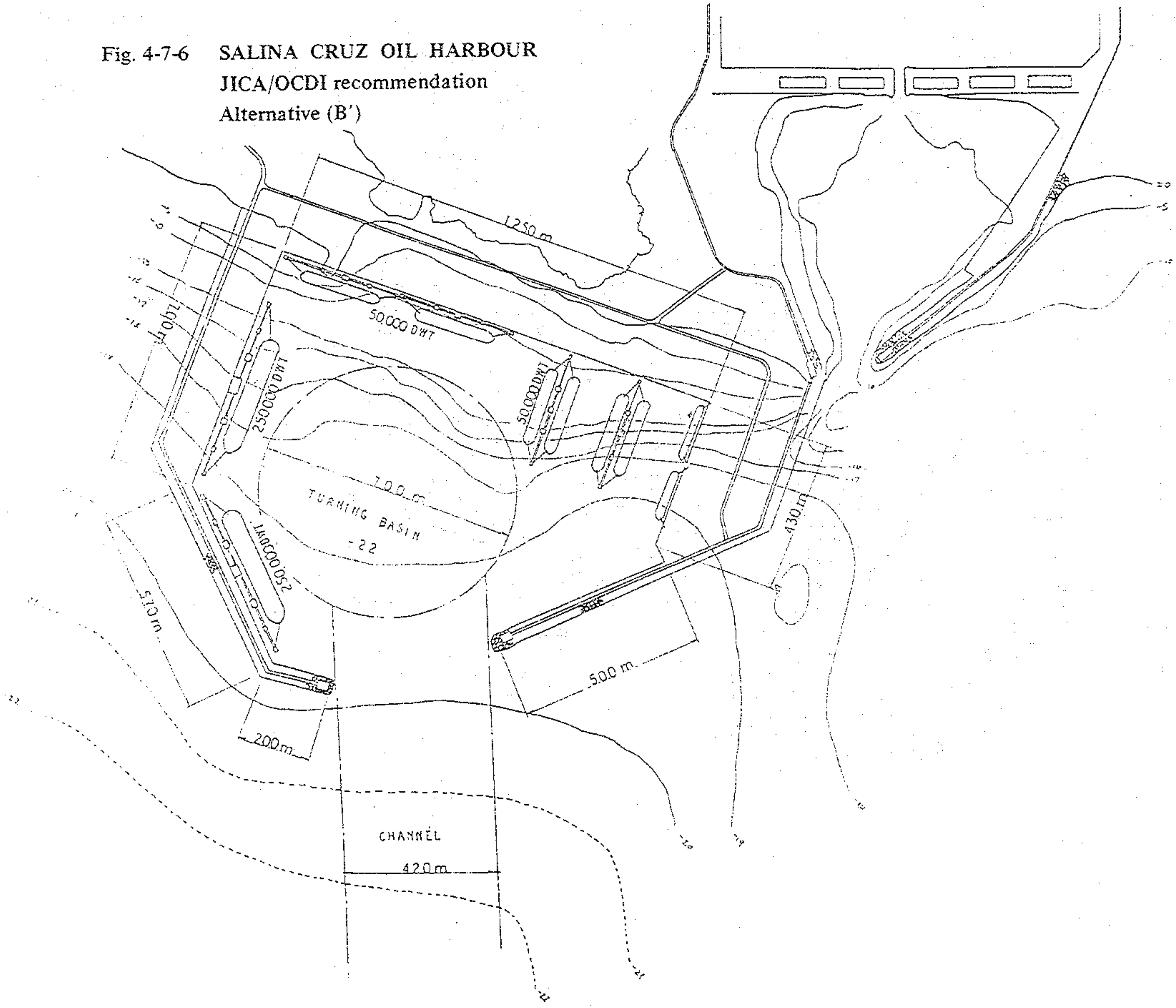
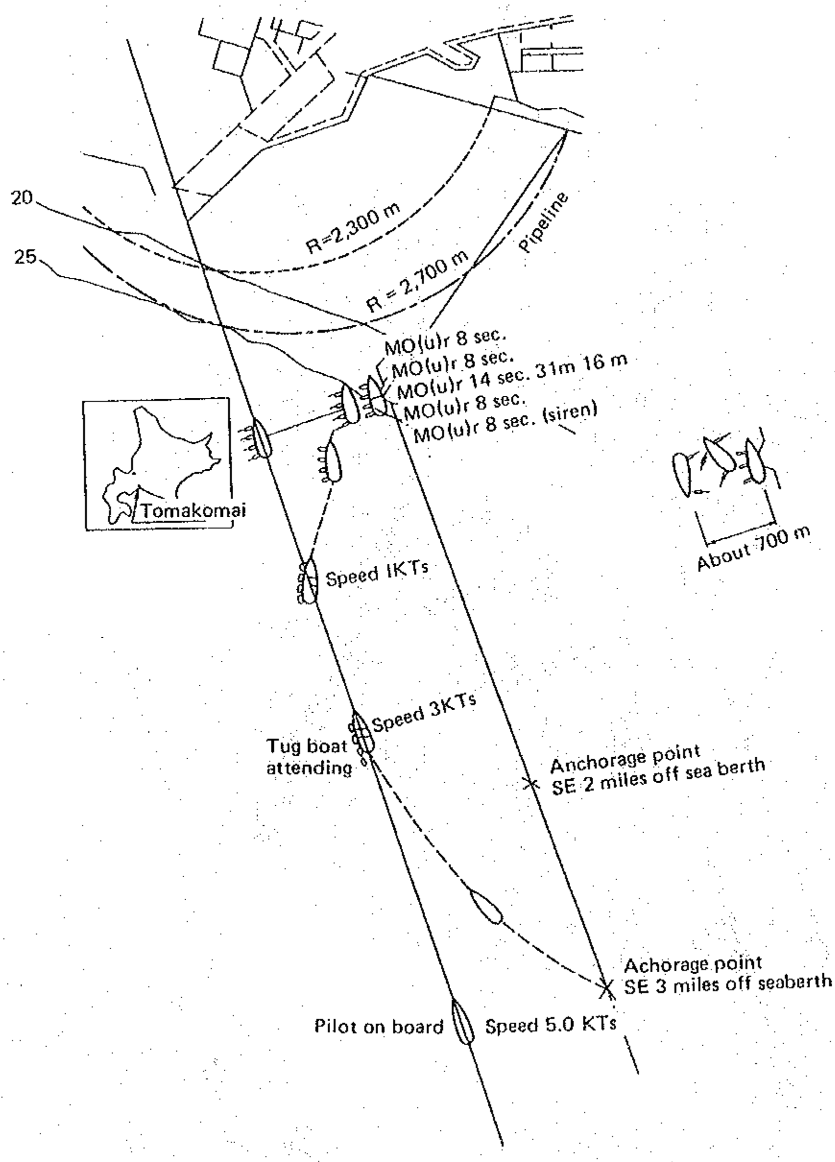
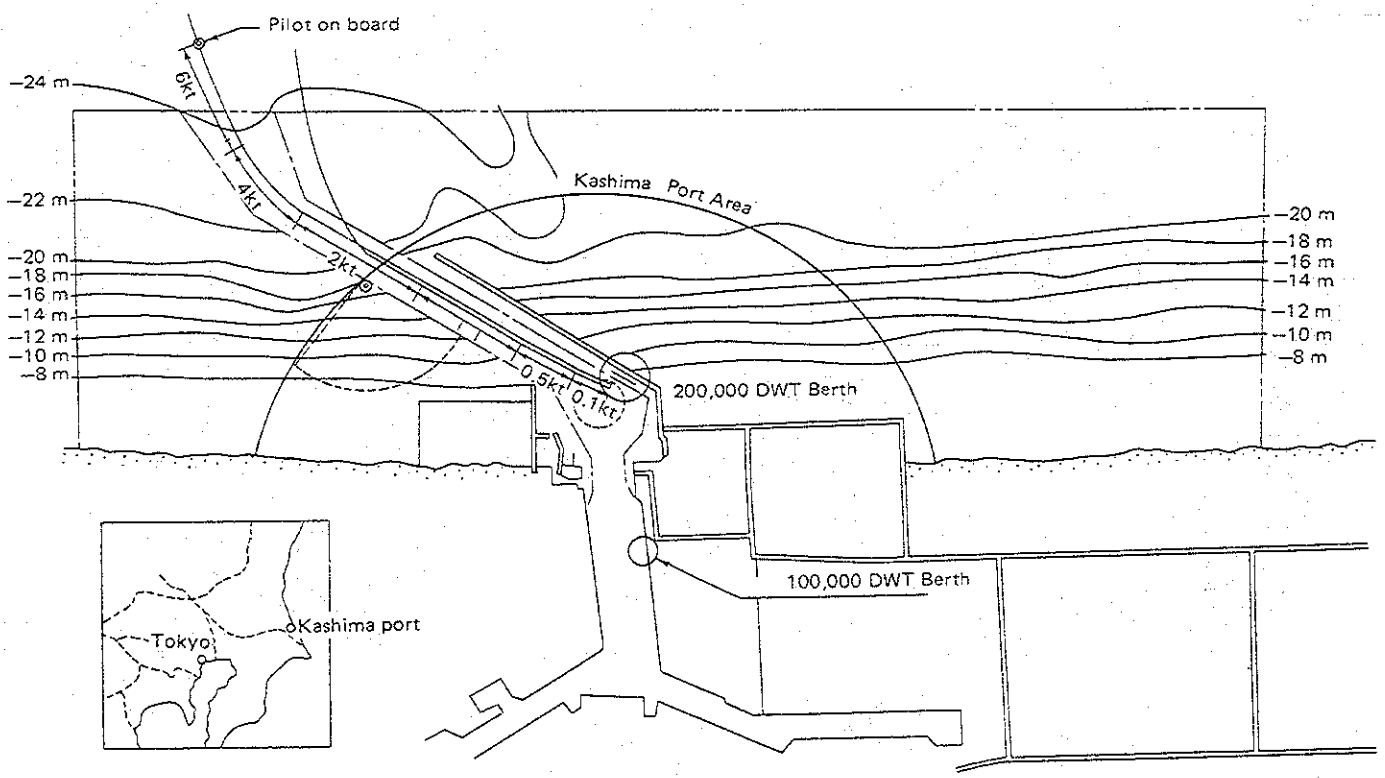


Fig. 4-7-7 Manuevering Examples of Crude Oil Unloading Harbour

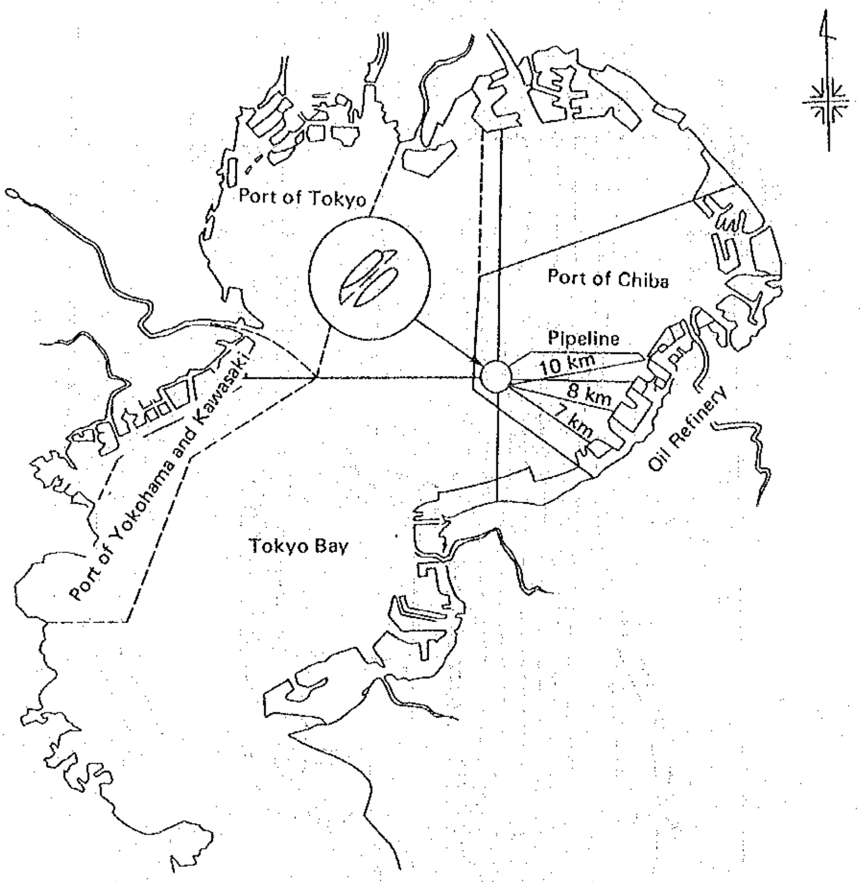
(1) Port of West Tomakomai (280,000 DWT)

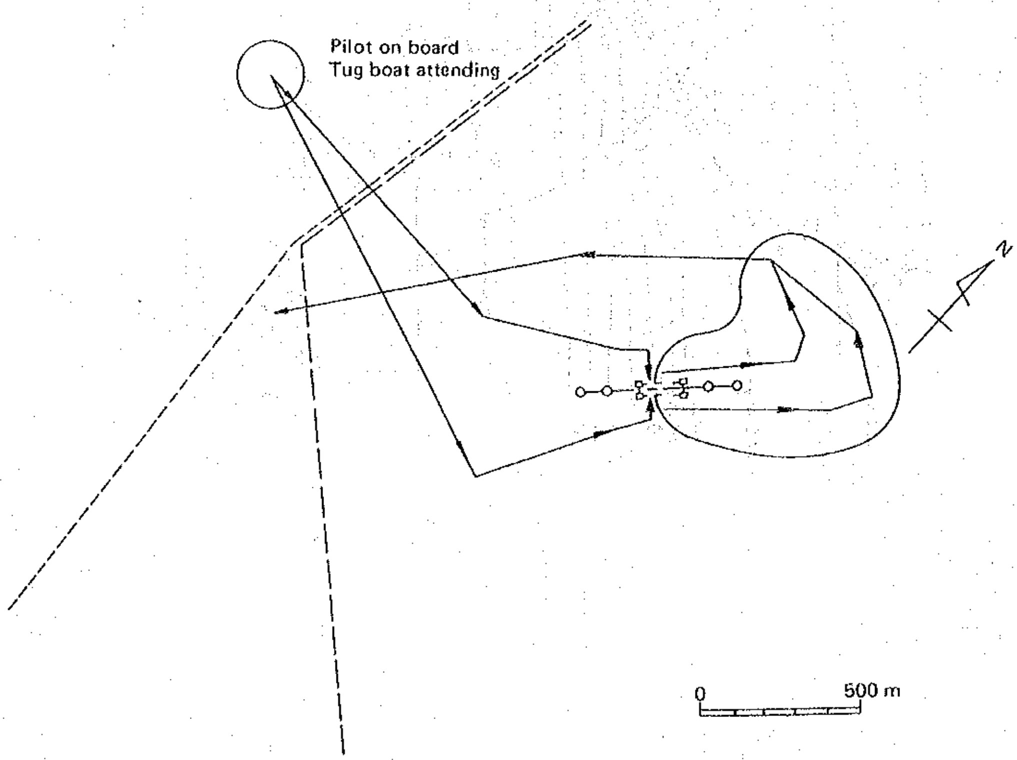


(2) Port of Kashima (200,000 DWT)

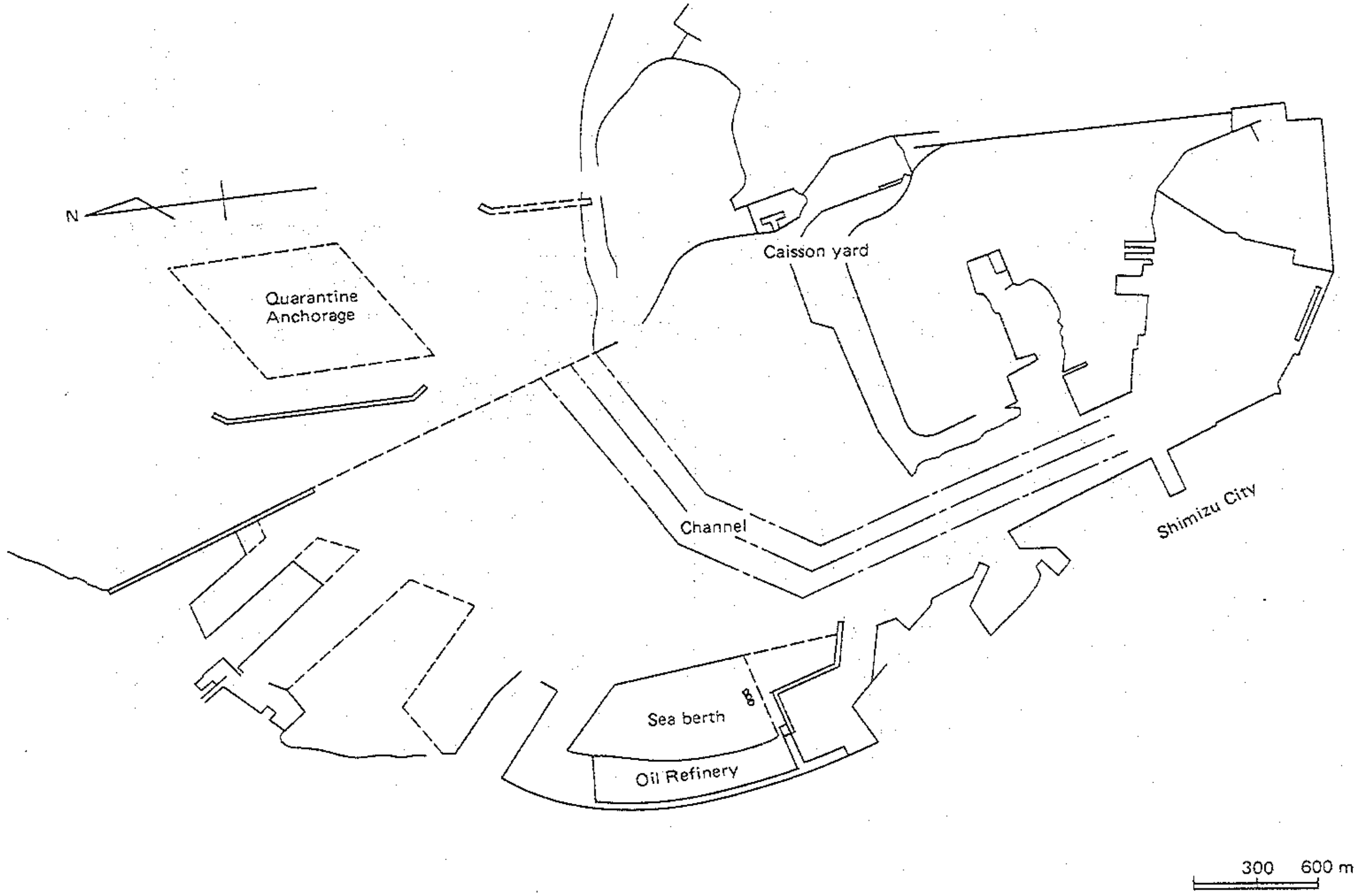


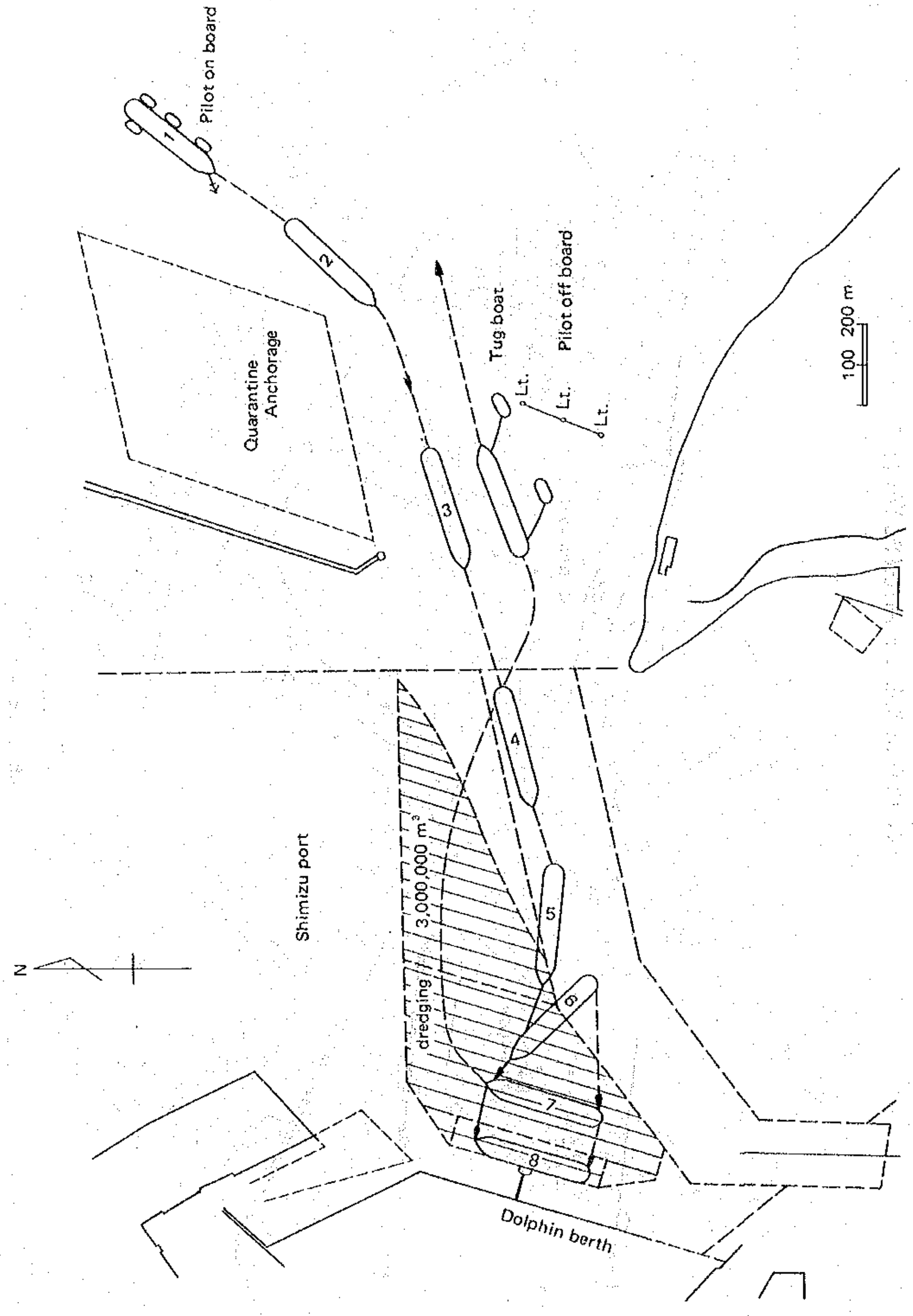
(3) Port of Chiba (260,000 DWT)





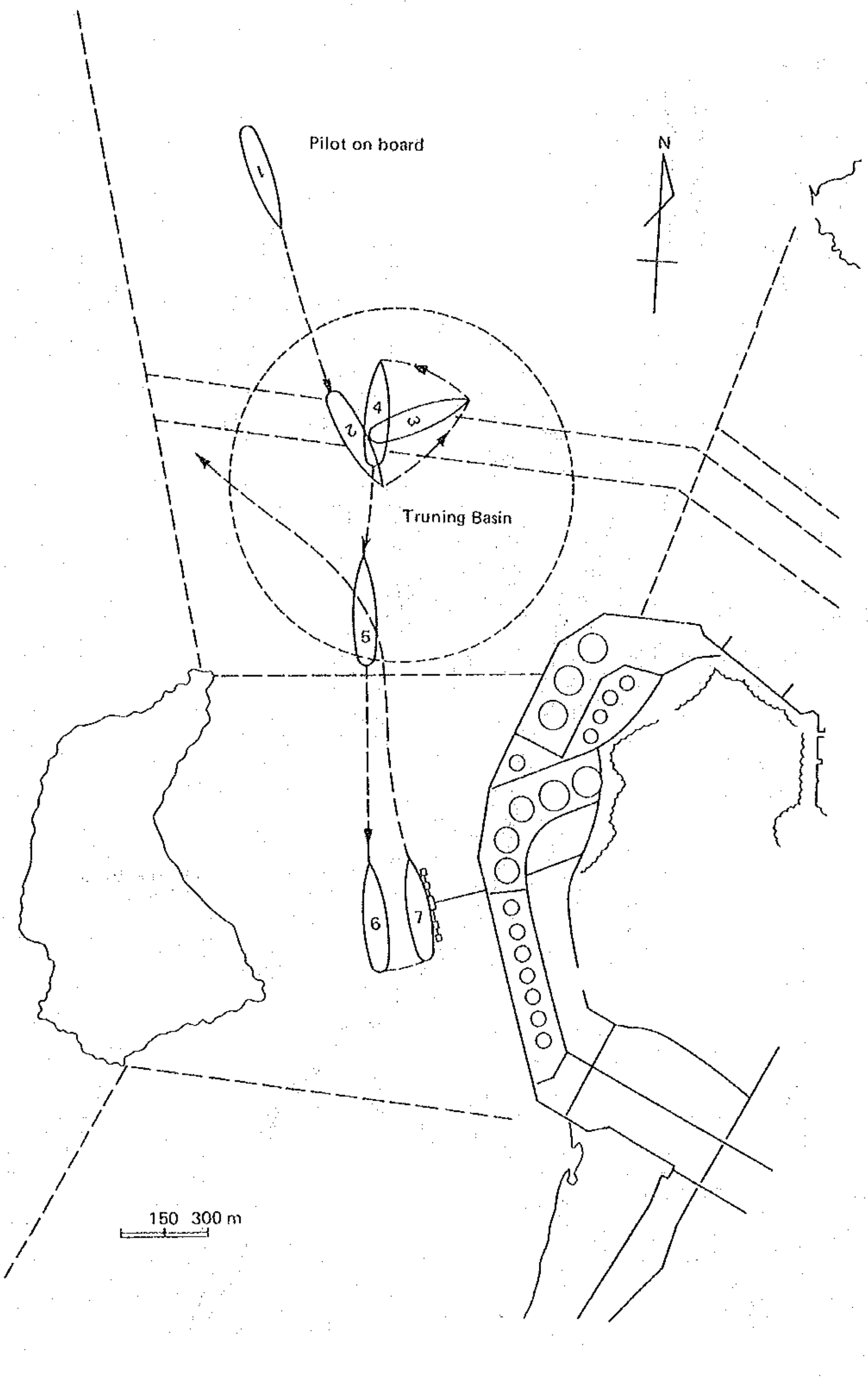
(4) Port of Shimizu (250,000 DWT)



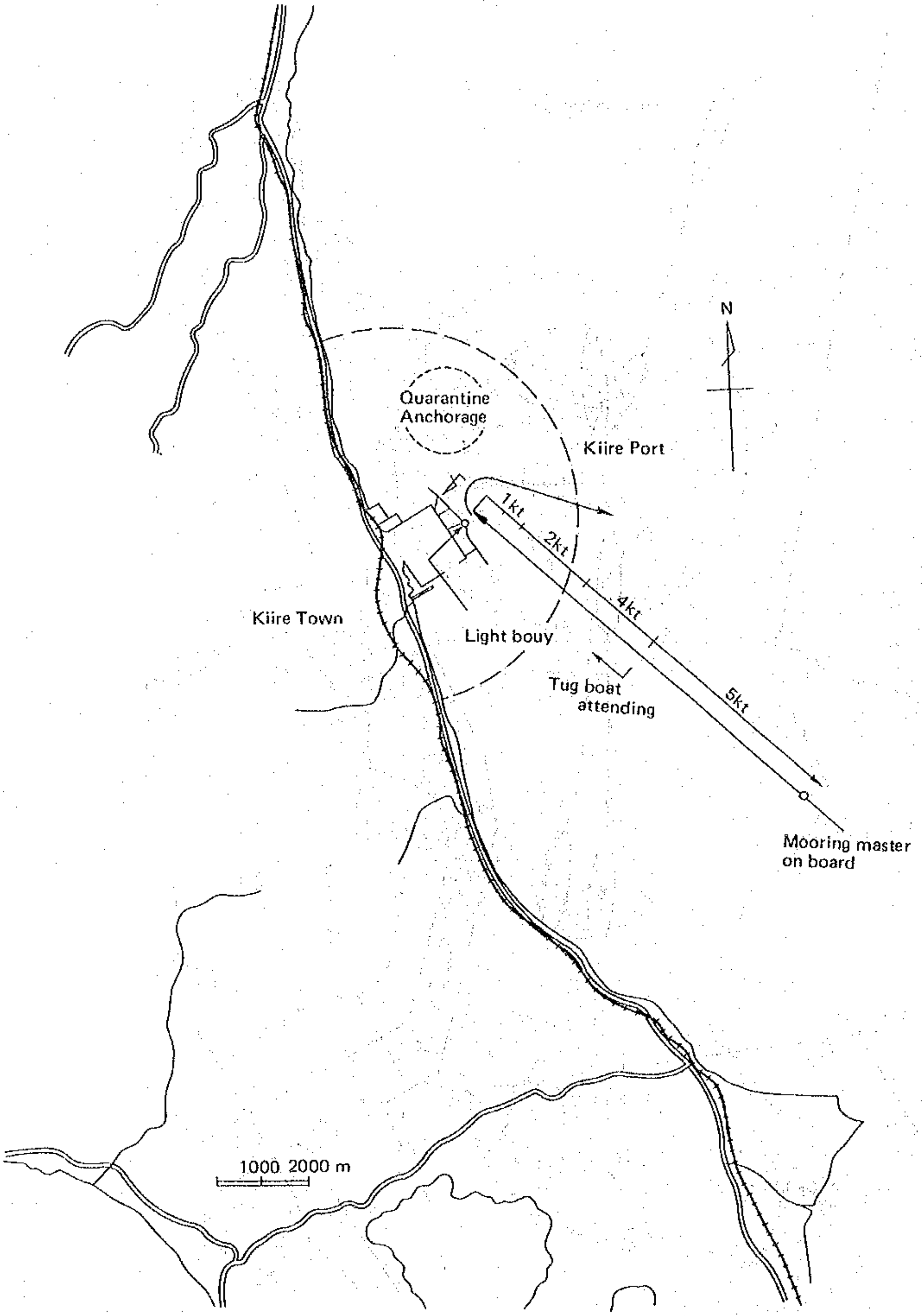


Pilot on board
Quarantine Anchorage
Tug boat
Pilot off board
Lt.
Lt.
Lt.
100 200 m
Port of Shimizu
Shimizu port
dredging
3,000,000 m³
Dolphin berth
N
1
2
3
4
5
6
7
8

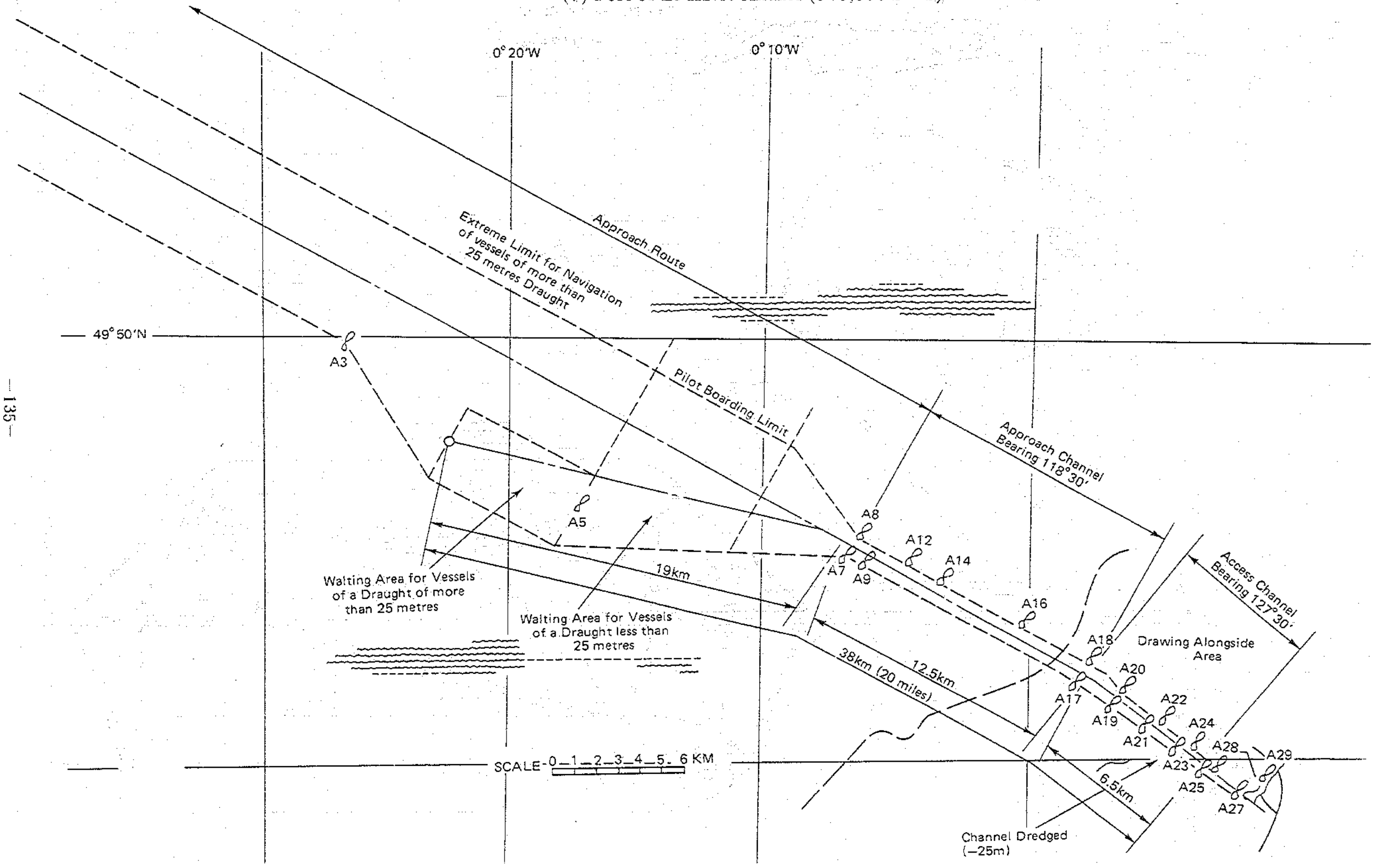
(5) Port of Wakayama (240,000 DWT)

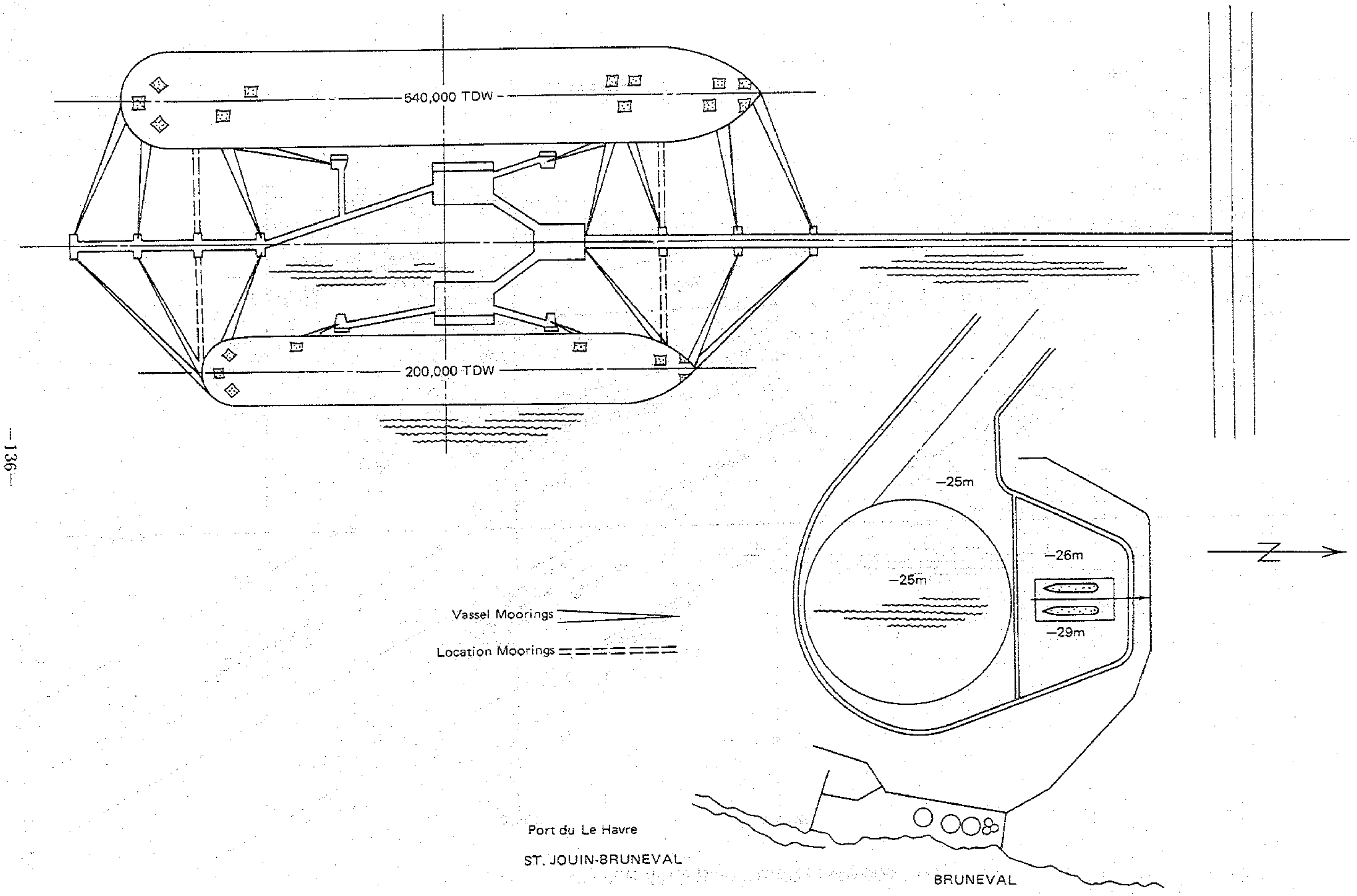


(6) Port of Kiire (540,000 DWT)



(7) Port of Le Havre Antifer (540,000 DWT)





540,000 TDW
200,000 TDW
Vassel Moorings
Location Moorings
-25m
-25m
-26m
-29m
N
Port du Le Havre
ST. JOUIN-BRUNEVAL
BRUNEVAL