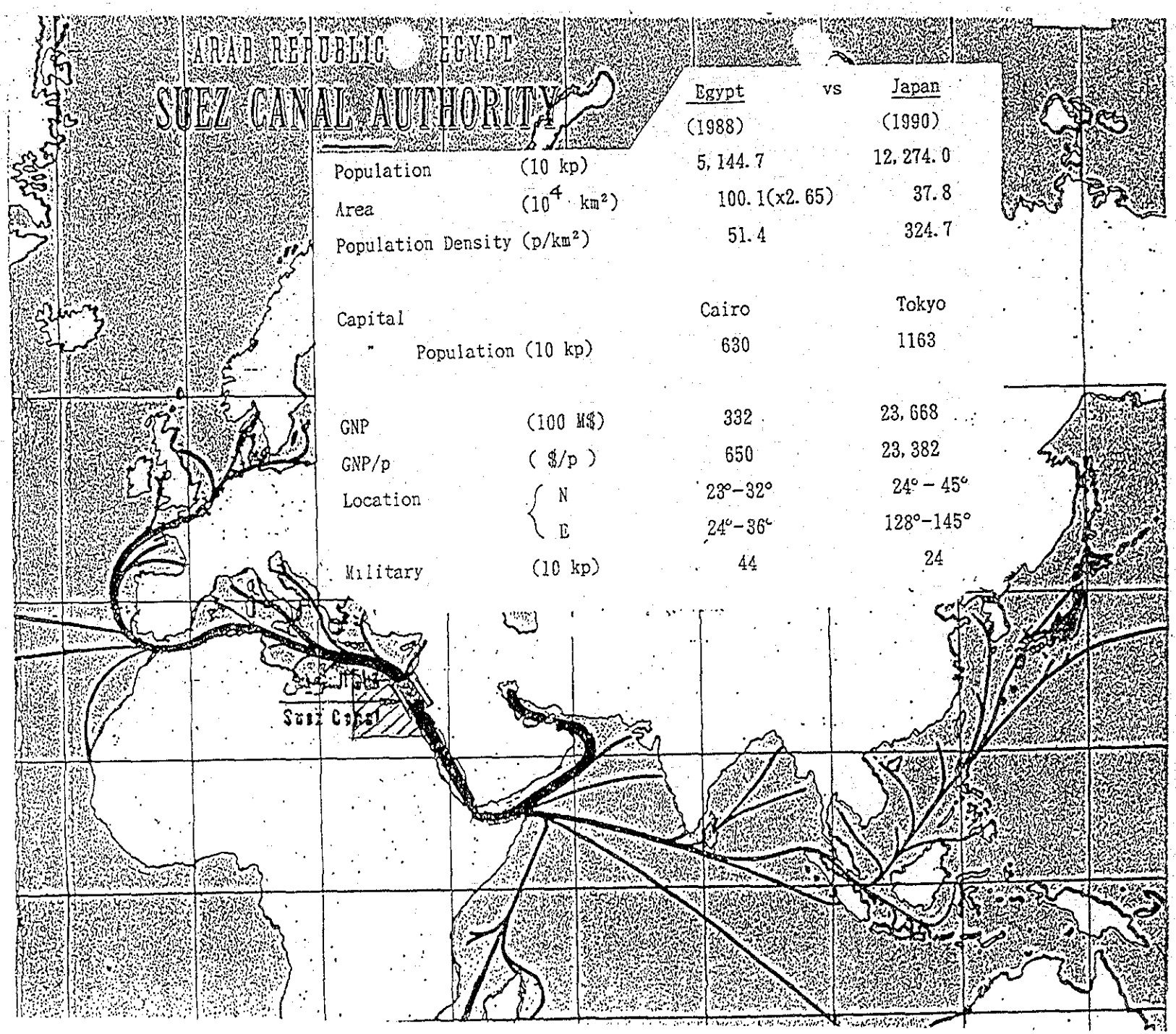
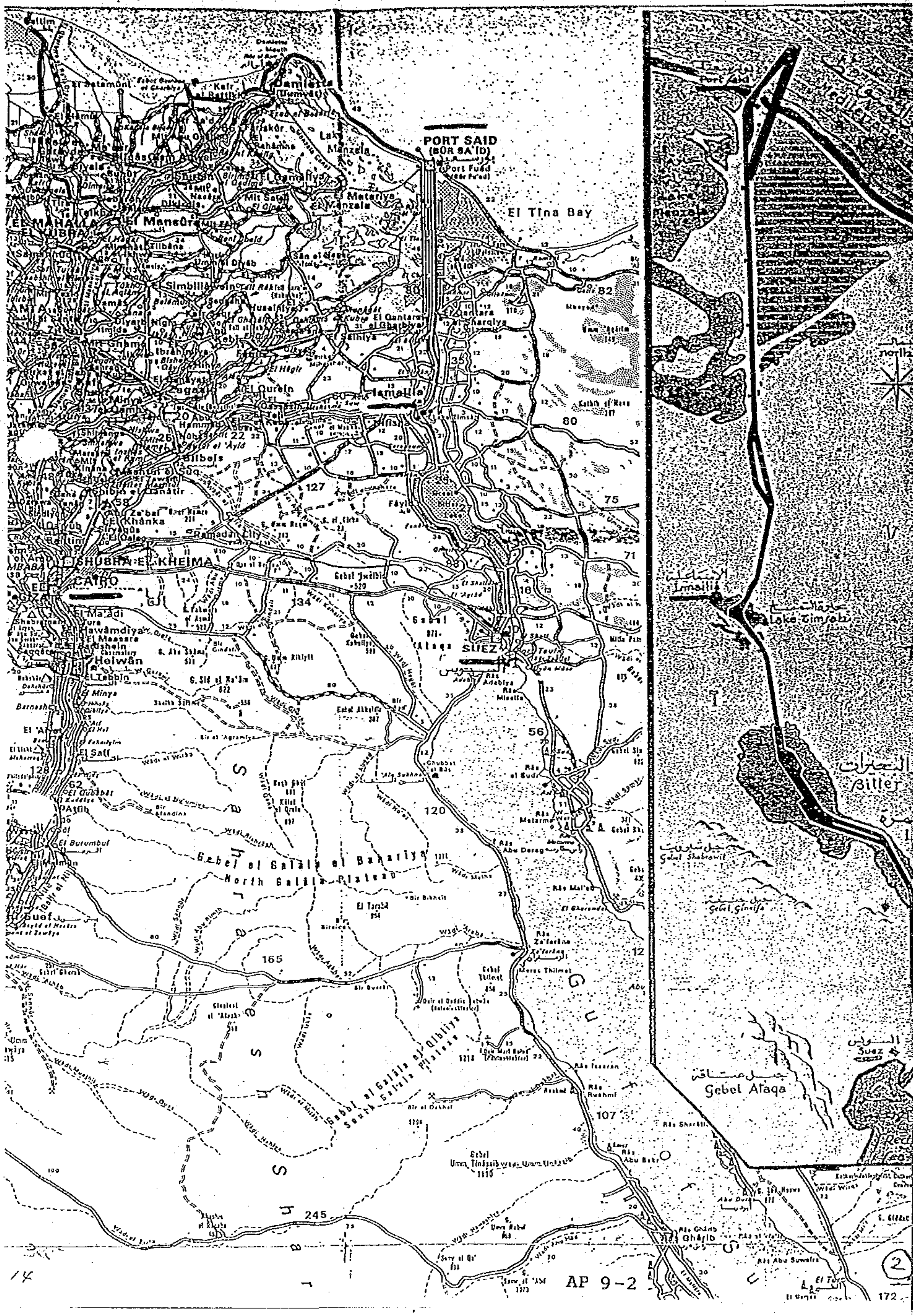
Appendix-9

Traffic Condition of Suez Canal

ARAB REPUBLIC OF EGYPT
SUEZ CANAL AUTHORITY

		Egypt (1988)	vs	Japan (1990)
Population	(10 kp)	5,144.7		12,274.0
Area	(10^4 km²)	100.1(x2.65)		37.8
Population Density	(p/km²)	51.4		324.7
Capital		Cairo		Tokyo
" Population	(10 kp)	630		1163
GNP	(100 M$)	332		23,668
GNP/p	($/p)	650		23,382
Location	N	23°-32°		24° - 45°
	E	24°-36°		128°-145°
Military	(10 kp)	44		24





PORT SAID
(BŪR SA'ĪD)
Port Fuad
El Tina Bay
Damietta
(Dumyât)
Lake Manzala
El Manzala
El Mansûra
EL MAHALLA EL KUBRA
El Qantara
Ismailia
Zagazig
Bilbeis
El Khânka
Ramadan City
SHUBRA EL KHEIMA
CAIRO
El Ma'adi
Hawâmdiya
Helwân
El Tebbin
El Saff
Suez
SUEZ
Gebel 'Atâqa
Gebel el Galâla el Bahariya
North Galâla Plateau
Gebel el Galâla el Qibliya
South Galâla Plateau
Râs Abu Darag
Râs Zafarâna
Râs Gharib
Râs Ruahmi
El Tina
Lake Timsah
Bitter
Gebel Shabrawit
Gebel Ginelfa
Gebel Ataqa
Sahara
Gulf of Suez

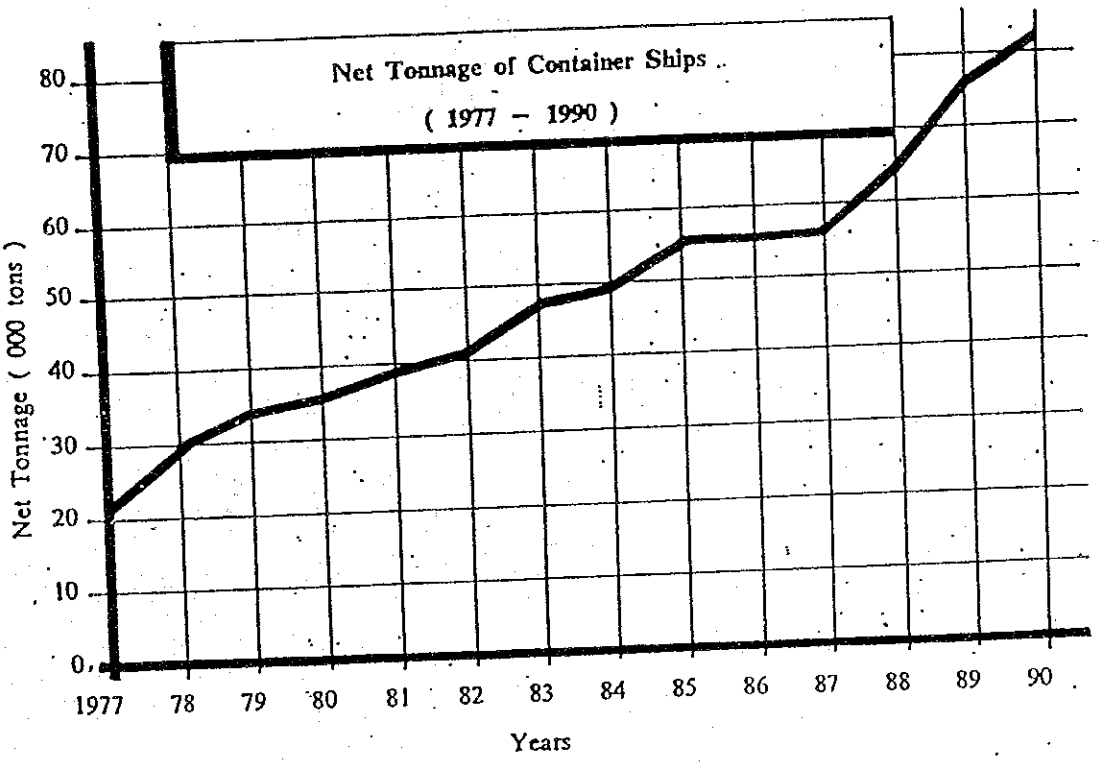
AP 9-2

14

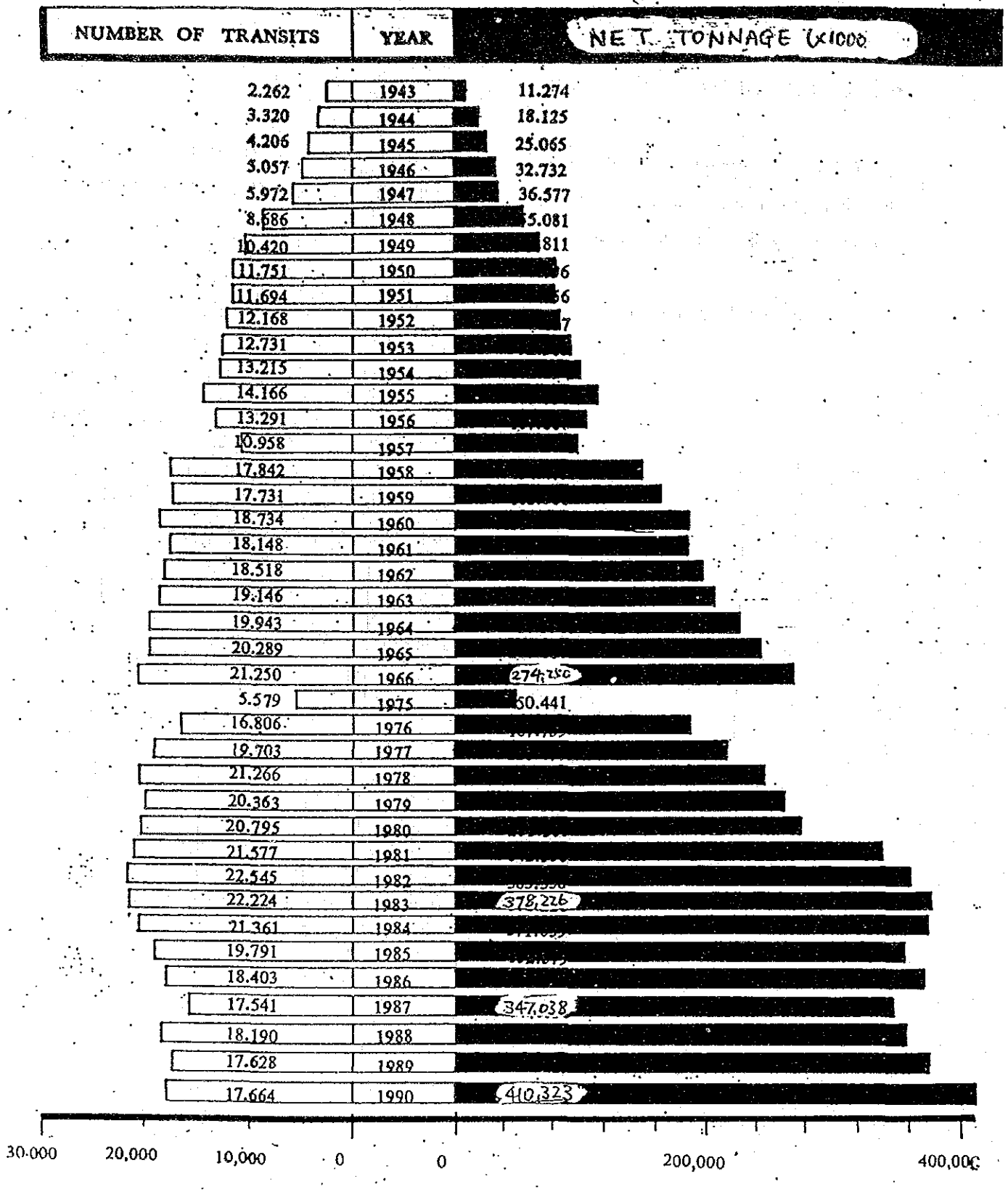
CONTAINER SHIPS :

This category occupies a remarkable position in the Canal traffic, as it represents the modern development in maritime transportation. The number and the net tonnage of these vessels have been increasing since the Canal was reopened in 1975.

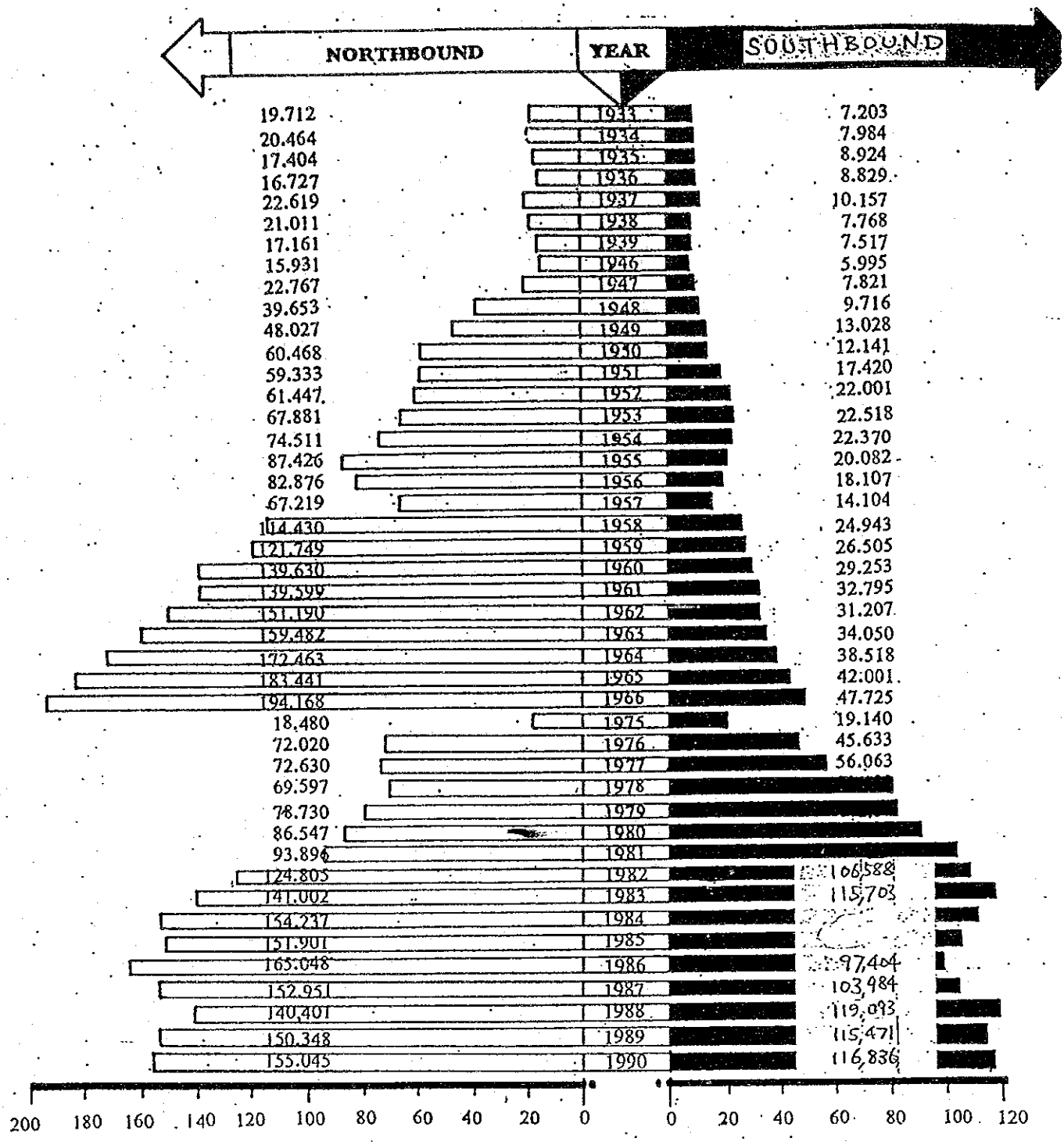
The following diagram shows the net tonnage of this category (1977 – 1990) :



NUMBER OF TRANSITS & NET TONNAGE



GOODS TRAFFIC (Thousand Tons)



Appendix-10

Traffic Condition of Transportation Crossing Suez Canal (from S.C.A.)

ARAB REPUBLIC OF EGYPT
SUEZ CANAL AUTHORITY
Ismailia, August 4, 1991
Dept : of Works
No :
Re :
Telephone : 064-220030/9 Ismailia
Fax. 064 / 220784 220785

جمهورية مصر العربية
هيئة قناة السويس
إدارة
رقم القيد
رقم الملف
عدد المرفقات

Comparison between different means of Connecting the two banks of S.C. (Delta & Nile Valley / By Sinai)

A historical outline; -

First : The time before nationalisation the Canal two banks were connected by the following :-

1 - The northern region : -

A ferryboat line known by the French ferry, connecting Port-Fouad City east of the canal with Port-Said and two ferries were operating between the two cities, each could accomodate 6 cars.

2 - Kantara region : -

2 - 1 : A ferry operating by a steel chain connecting Kantara east to Kantara west, carrying cars and another one for animals known as Camels ferry.

2 - 2 : The railway ferry and this one transported the train carriages one by one from and to the two railway stations of Kantara East and West.

3 - Ismailia region : -

3 - 1 : A double swing bridge used for road transportation and railway area and it was opened and closed according to traffic in the Canal and was used by those heading to or from El Areesh/Gaza (Palestine).

3 - 2 : A chain ferry boat line for transporting cars at area No. 6 (Km 76).

4 - The Southern region : -

There was a chain ferryboat at km 149 for transporting cars.

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/1

Second : The period between Canal nationalisation and development

While being under the management of the Egyptian administration following year 1956, a widening and deepening project of the canal known by the second modified programme was carried out, and it was followed by the widening operations which aimed at developing the transit services, the following operations were carried out : -

1 - The northern region : - (km 46)

A 45 T ferry boat line has been set up capable of carrying 12 cars at a time, besides the other line known as the French ferries.

2 - Kantara region : -

Due to the slow speed of the chain ferry, it has been replaced by 45 ton self-propelled ferries to shorten the crossing time and to upraise their manoeuvrin efficiency.

3 - Ismailia region : -

3 - 1 : A new bridge has been constructed at El-Ferdan (km 66) area to replace the old one. The new bridge was automatically operated, opened and closed in not more than 7 minutes, against more than 30 minutes that were needed to open or close the old bridge manually.

3 - 2 : The chain ferry working at area no. 6/km 76 was replaced.

4 - The Southern region : -

The ferry of this area was replaced by a self-propelled one.

Third : The period after canal development

After resumption of navigation following October war, The SCA embarkedon carrying out the development project for widening the Suez Canal to the width of 320 m. with an increase of 120 to 130 meters, to allow the transit of tankers up to half million tons in ballast instead of 100 000 ton tankers before development. In the meantime, Sinai liberation

./...

was followed by its reconstruction and rehabilitation and connecting it to the mother land, the matter that entailed the development of the means of liking the canal two banks, and in this domain, the following operations were carried out : -

The northern area (Port-Fouad/Port-Said)

Two additional ferry lines have been set up, known as temporary line 3 at Port-Said harbour including 5 ferries , each of 150 tons capacity capable of carrying 22 cars. later these ferries have been developed to accomodate 52 cars.

- A ferryboat line was constructed at El-Raswa area including 2 ferryboats, each of 150 tons.
- The French ferryboat constructed before the nationalization of the Canal was replaced by two double floor ferryboats to carry people and cars.

El-Kantara area

- A ferryboat line of 45 tons, 2 km. south El-Kantara was constructed, including 2 ferryboats working day and night. This area allows the construction of trucks and cars entries and waiting areas.
- A ferryboat line was constructed at the old ferryboat area for carrying people including 2 boats, each of 84 passengers.
- A ferryboat line of 150 tons is being constructed. It is scheduled to finish at the first half of 1992.

Ismailia area : -

- A ferryboat line of 45 tons was constructed at Sarabyoum, south of Ismailia. Km 91
- The ferryboat line at no. 6 area/ Km 76 was developed including ferryboats, each of 45 tons.
- A ferryboat line of 150 tons was constructed at El-Ferdan for carrying trucks. Km 66

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Southern area :

- The construction of Ahmed Hamdy Tunnel by Ministry of Construction at (km. 142).
- A ferryboat line of 150 tons is being constructed at El-Shat area (km. 148). (will be in work at April 1992)

This is a historical outline about the development of ferry-boats accross the Suez Canal since the Nationalization of the Suez Canal till now as for number and means of transport to cope with the development in the Canal waterway and the reconstruction of Sinai .

The crossing capacity between the canal two banks : -

This capacity is outlined as follows individuals and cars represented in the following : -

Diagram No. 1 : shows the total annual transits of ferries.
" No. 2 : shows the monthly average of transits.
" No. 3 : shows the daily average of transits "comparatively"
" No. 4 : The total transits for previous years and the expected transits.
" No. 5 : ferries transits curve during a year"comparatively"

Fourth: - The preference between the different means of transit , ferries, tunnel and bridge : -

1 - Ferries : -

1 : Ferries advantages, the capability of upraising the transit capacity in any ferry line through carrying out the following either being separated or put together.

* Increasing number of ferries operating in the line.
* Increasing tonnage capacity of the ferry operating in the line.
* Adding new line-axis for the vertical line (existing line) and this takes a record time not exceeding a year. opart from the less costs of construction (15 million for the 150 ton ferry line) if compared to other crossing means.

- The ferry lines cannot restrict canal widening projects or it doubling future.

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- Their operation costs are less than their other means.
- Maintenance cannot hinder transit of ships (as an additional ferry is working on more than one line during maintenance time as regards the berths, they are maintened on long intervals (from 4 - 5 years)

1 - 2 - The ferries disavantages : -

1 - Transit capacity/hour is less than other means.

2 - They dont work except between convoys. Even this is allowed at present during convoys passage but the crossing is cautiously done and God is our Guardian.

2 - Tunnels : -

2/1 : Advantages of tunnels : -

- Crossing capacity per hour is high in comparison with ferryboats. Crossing goes on all the time without being effected by navigation in the Suez Canal.
- Tunnels are not obstacles against development projects of the Canal.
- They are not obstacles against the passage of giant ships or oil rigs up to 160 meters high.
- The tunnel allows the Authority to double the Canal - if it is taken into consideration while planning - as it is in the case of Ahmed Hamdy Tunnel.

2/2 : Disavantages of tunnels : -

1 - operating costs are high since they need ventilation system and artificial lighting working all the time, in addition to observation and warning costs.

2 - The rising of maintenance expenses which include maintenance of the whole body of the tunnel, maintenance of ventilation system, lighting, warning and observation equipment that should work effeciently all the time.

3 - There are kinds of cars and chars that are restricted from passing through the tunnel.

4 - The passage of cars through the tunnel should be stopped in case of making serious overhauls in one of the above mentioned items of maintenance.

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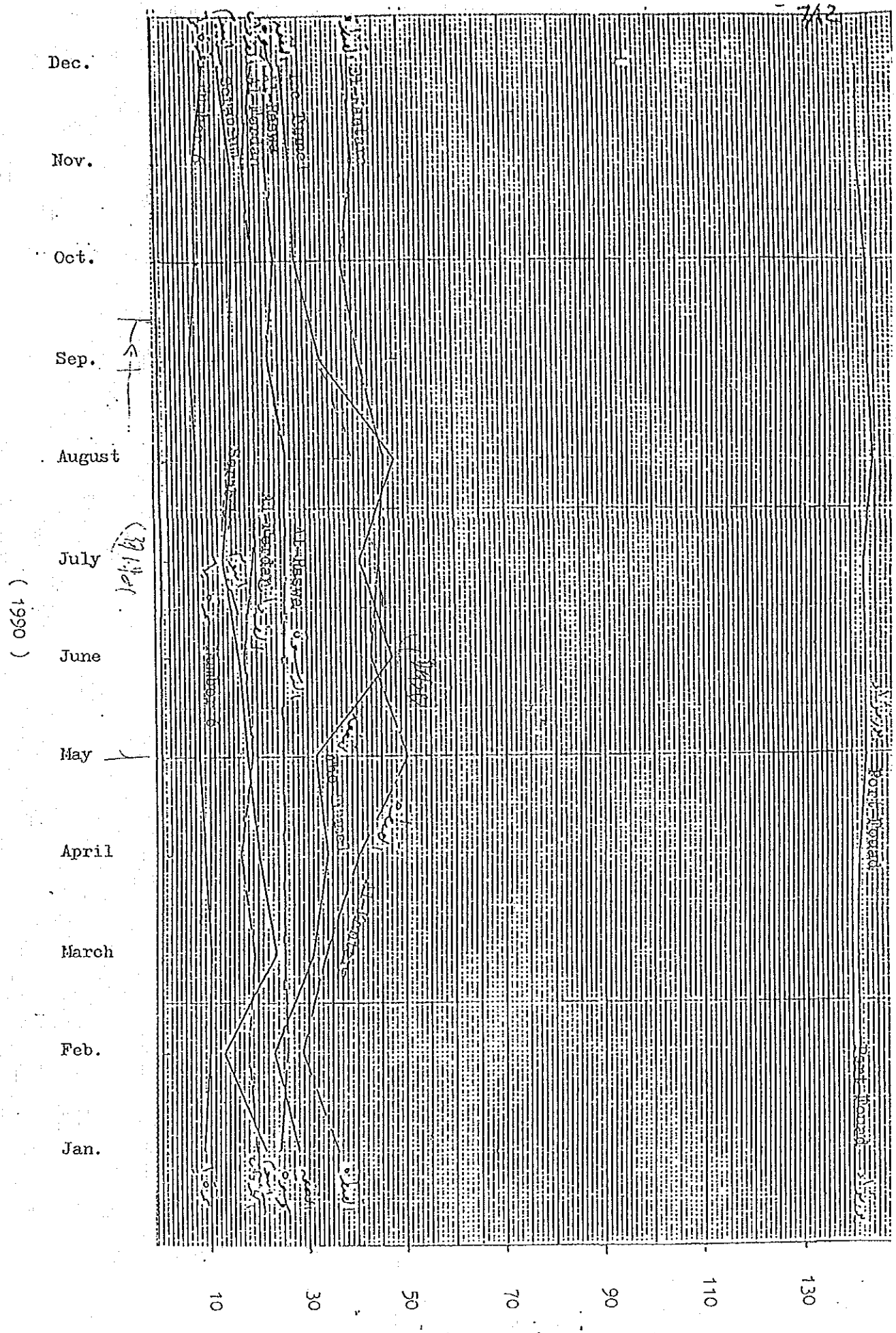
3 - Bridges : -

3/1 - Advantages of bridges : -

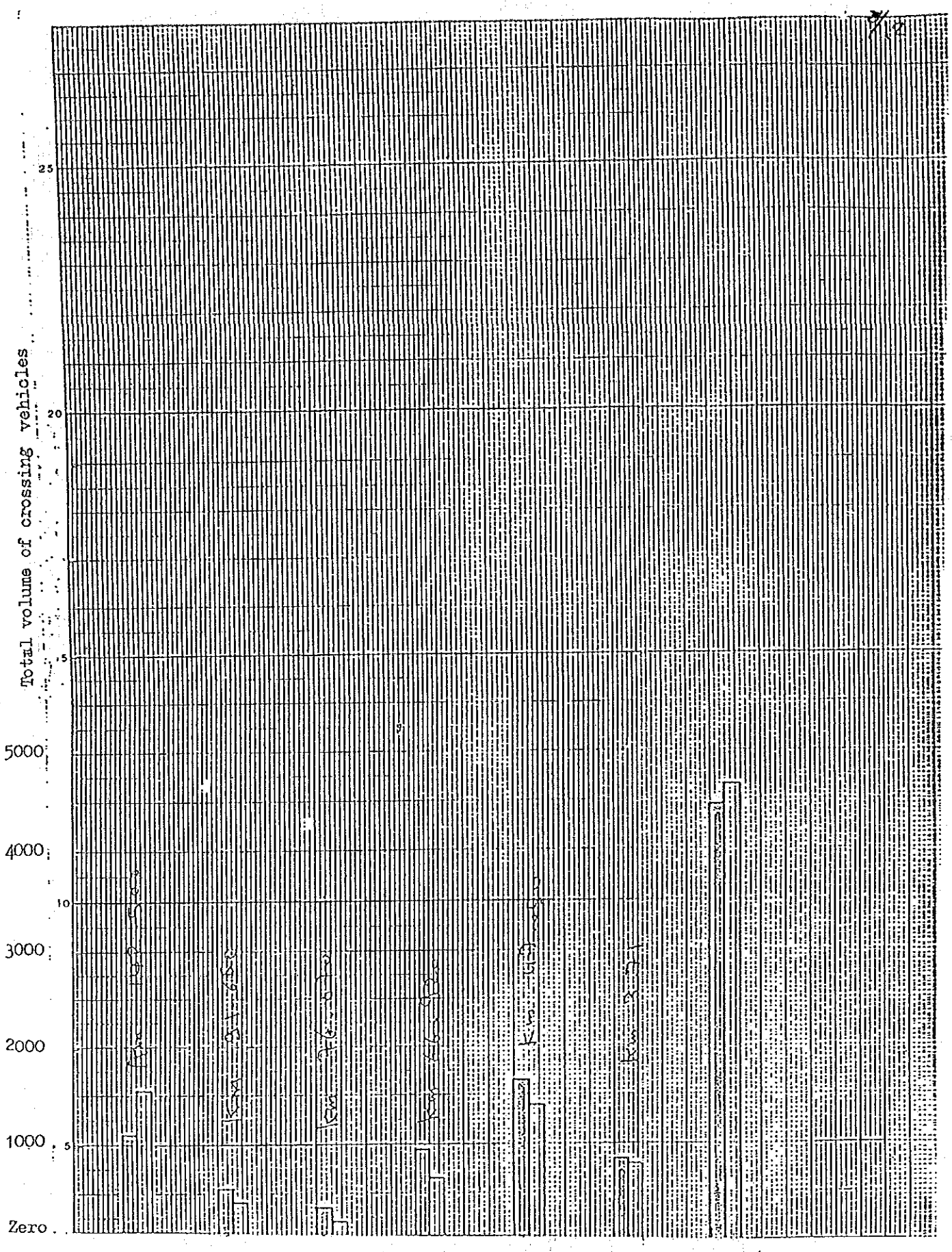
- Crossing capacity per hour is very high if it is compared with other means, and the passage goes on all the time without being affected by navigation.
- Operating costs are very low.
- Maintenance expenses are greatly less than maintenance expenses of tunnels.

3/2 - Disavantages of bridges : -

- The rising of construction costs in comparison with tunnels, since the bridge should not be less than 65 meters high to allow giant ships to transit the Canal, consequently it requires extension of the entries of the bridge up to 2 km. on both sides.
- The cost of construction is approximately doubled in case of constructing the bridge to allow future plans of doubling the Canal.
- The bridge will be an obstacle against oil rigs, and the enclosed table shows an outlineof oil rigs that recently transited the Suez Canal.
- Due to the transit of oil tankers and liquified gas carriers, there should be a kind of protection against the fall of inflammable liquids from the bridge on these types of ships and this will be an additional cost.


Dec.
Nov.
Oct.
Sep.
August
July
June
May
April
March
Feb.
Jan.
(1990)
10
30
50
70
90
110
130
Number (1000 unit)

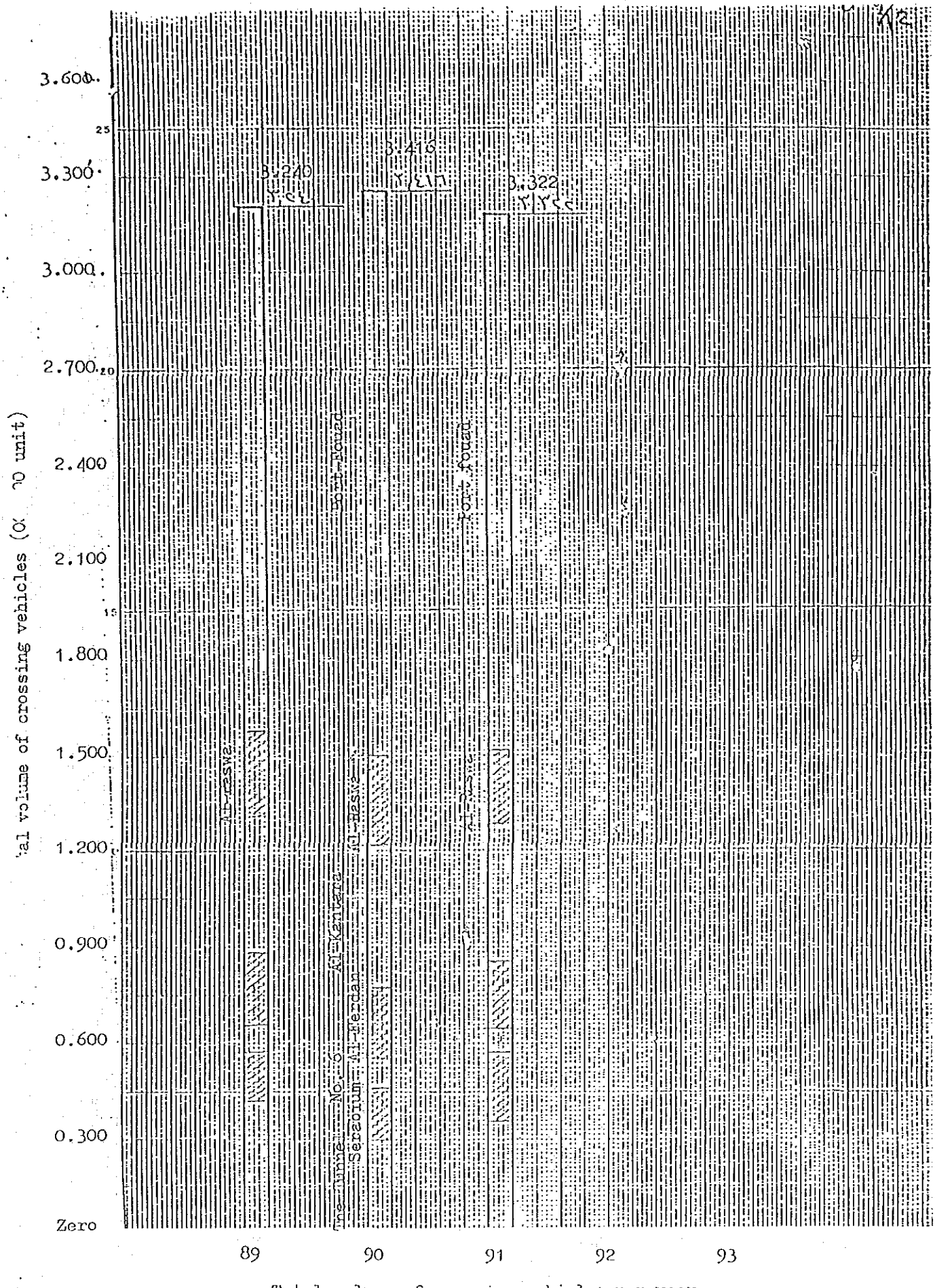
AP10-7



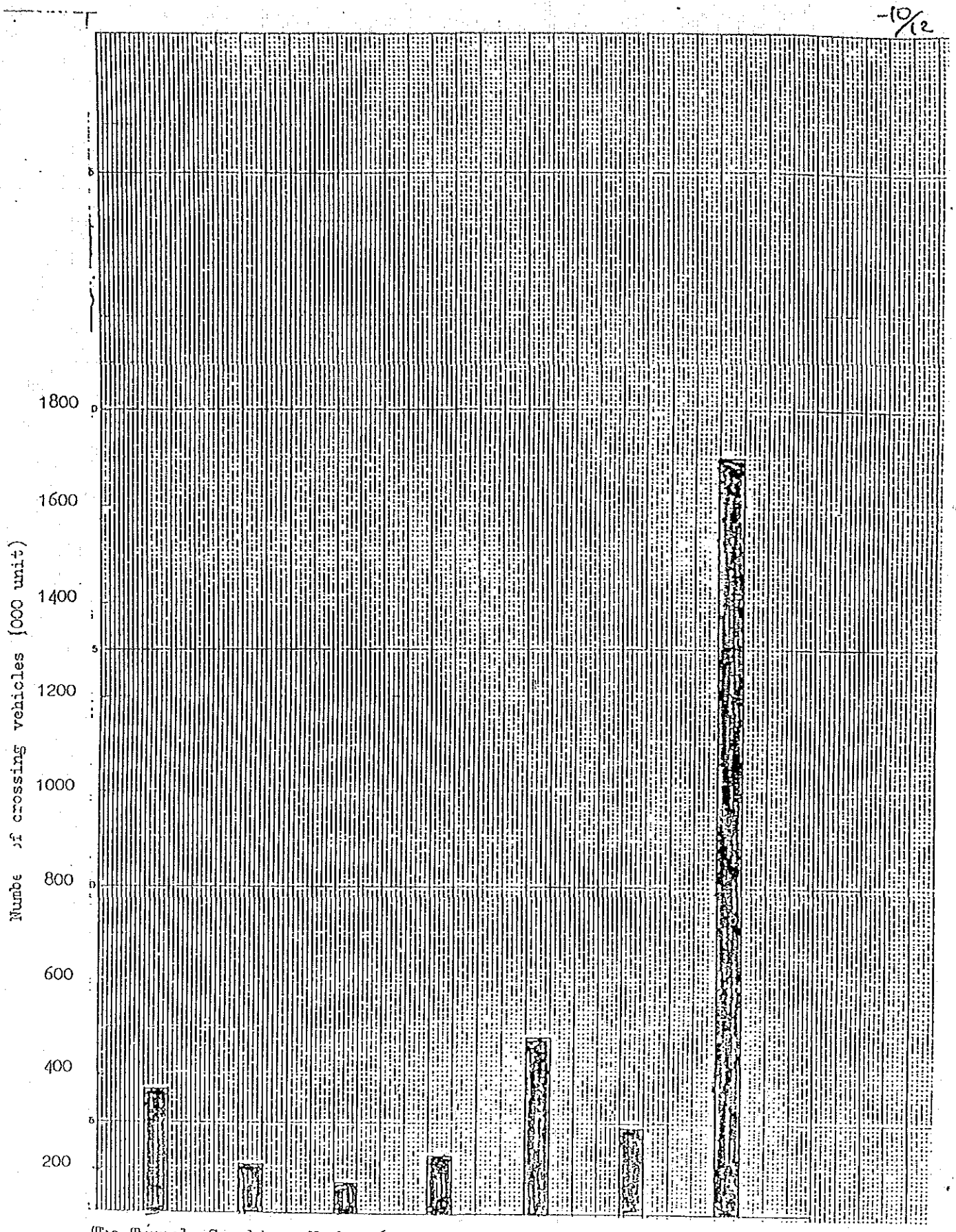
The Tunnel Serabium Number 6 Al-Ferdan Al-Kantara Al-Raswa (Port-Fouad city)

Daily average of crossing vehicles

August 1990 May 1994


3.600
3.300
3.000
2.700
2.400
2.100
1.800
1.500
1.200
0.900
0.600
0.300
Zero
89
90
91
92
93
Total volume of crossing vehicles per year

AP10-9



The Tunnel Sarabium Number 6 Al-Ferdan Al-Kantara Al-Rasua Port-Fouad

Total volume of crossing vehicles (1990)

Table (3) Number and Net Tonnage by Classes of Vessels (January 1 December 31)

	NUMBER			NET TONNAGE		
	North South	South North	TOTAL	North South	South North	TOTAL
Laden Vessels:				(In thousand tons		
Tankers	818	1 396	2 214	12 204	41 411	53 615
Bulk Carriers	1 575	1 213	2 788	28 815	26 523	55 338
Combined Carr.	66	125	191	2 879	6 562	9 441
General Cargo	2 316	1 737	4 053	18 410	14 536	32 946
Container Ships	1 535	1 469	3 004	41 062	39 666	80 728
Lash Ships	69	62	131	2 210	2 041	4 251
Ro-on / Ro-off	423	259	682	7 375	5 220	12 595
Car Carriers	229	422	651	9 684	17 786	27 470
Passenger Ships	10	20	30	93	312	405
Warships	270	114	384	4 091	1 264	5 355
Others	498	362	860	1 732	980	2 712
TOTAL	7 809	7 179	14 988	128 555	156 301	284 856
In Ballast Vessels:						
Tankers	1 184	284	1 468	101 093	3 947	105 040
Bulk Carriers	57	114	171	2 543	2 155	4 698
Combined Carr.	52	11	63	3 025	489	3 514
General Cargo	47	344	391	231	2 088	2 319
Container Ships	14	59	73	156	822	978
Lash Ships	2	12	14	41	253	294
Ro-on / Ro-off	3	128	131	26	1 960	1 986
Car Carriers	101	8	109	3 949	177	4 126
Passenger Ships	14	12	26	87	77	164
War Ship	-	57	57	-	1 639	1 639
Others	47	126	173	154	554	708
TOTAL	1 521	1 155	2 676	111 305	14 161	125 466
TOTAL	9 330	8 334	17 664	239 860	170 462	410 322

Table (4) Distribution of Vessels by Size (S. C. N. T.) & Type (Jan. 1 - December 31) 1990

TYPE / SIZE	Tankers	Bulk C.	Comb. C.	General C.	Cont.	Lash	Ro / Ro	Car C.	Passenger	War Ships	Others	TOTAL
Up to 5	1 072	22	-	3 093	134	-	217	-	63	377	1 629	6 607
5 - 10	2 530	1 534	-	18 500	2 287	45	1 927	210	126	538	1 644	29 341
10 - 15	6 998	12 020	-	11 387	5 274	10	1 086	55	126	437	94	37 487
15 - 20	9 327	14 015	-	1 895	12 206	586	1 289	323	103	201	-	39 945
20 - 25	3 554	10 039	188	339	6 431	-	1 973	649	42	338	-	23 553
25 - 30	3 576	3 957	827	51	4 865	54	2 528	1 442	-	1 114	53	18 467
30 - 40	6 427	12 662	1 133	-	15 868	2 278	3 741	5 749	109	1 368	-	49 335
40 - 50	15 804	574	3 038	-	20 789	1 508	1 601	18 641		1 721	-	63 676
50 - 60	6 524	745	2 806	-	13 852	-	158	4 527	-	54	-	28 666
60 - 70	12 844	2 146	1 655	-	-	64	61	-	-	683	-	17 453
70 - 80	13 543	1 480	1 706	-	-	-	-	-	-	163	-	16 892
80 - 90	4 232	842	1 157	-	-	-	-	-	-	-	-	6 231
90 - 100	97	-	93	-	-	-	-	-		-	-	190
100 - 120	11 308	-	230	-	-	-	-	-	-	-	-	11 538
Over 120	60 819	-	122	-	-	-	-	-	-	-	-	60 941
TOTAL	158.655	60 036	12 955	35 265	81 706	4 545	14.581	31.596	569	6 994	3 420	410.322

ARAB REPUBLIC OF EGYPT
SUEZ CANAL AUTHORITY
Ismailia, September 4, 1991
Dept : —of Works—
No :
Re :
Telephone : 064-220030/9 Ismailia
Fax. 064 / 220784 / 220785

جمهورية مصر العربية
هيئة قناة السويس
I.K./S.R.
إدارة :
رقم الفسخ :
رقم الملف :
عدد المرفقات :

FAX 719076 .. JICA - Cairo

Sent to : Mr. OHTSUKA

From : Dr. Eng. Isis A. Kamel

Total number of pages : 1 (one)

Date : - September 4, 1991

Dear Sir,

With reference to the projeot for rehabilitation Work of Ahmed Hamdy Tunnel, you find herein the information you have asked oonoerning the El-Shat Ferry-boat under oonstruotion.

El-Shat Ferry-Boat

Date of begining of implementation	:	Oct. 1990
Date of handover	:	April 1991
Costs		
* Civil work		5×10^6 L.E.
* Ferry boats (150 T)		9×10^6 L.E.
TOTAL		14×10^6 L.E.
others		1×10^6 L.E.
Total cost		15×10^6 L.E.

Whilst thanking you for your kind cooperation,
Please accept my best regards.

Dr. Eng.
9/1991
(Isis A. Kamel)

FROM SCA ISMA64220785 9 4 1991 17:46

ARAB REPUBLIC OF EGYPT
SUEZ CANAL AUTHORITY
Ismailia, September 4, 1991
Dept : of Works
No :
Re :
Telephone : 064-220030/9 Ismailia
Fax. 064 / 220784 220785

جمهورية مصر العربية
هيئة قناة السويس
I.K./S.R.
إدارة :
رقم الفرع :
رقم الملف :
عدد المرفقات :

FAX 719076 .. JICA - Cairo

Sent to : Mr. OHTSUKA

From : Dr. Eng. Isis A. Kamel

Total number of pages : 1 (one)

Date : - September 4, 1991

Dear Sir,

With reference to the project for rehabilitation Work of Ahmed Hamdy Tunnel, you find herein the information you have asked concerning the El-Shat Ferry-boat under construction.

El-Shat Ferry-Boat

Date of begining of implementation : Oct. 1990
Date of handover : April 1991

Costs

* Civil work	5×10^6 L.E.
* Ferry boats (150 T)	9×10^6 L.E.
TOTAL	14×10^6 L.E.
others	1×10^6 L.E.
Total cost	15×10^6 L.E.

Whilst thanking you for your kind cooperation,
Please accept my best regards.

Dr. Eng.
4/9/1991
(Isis A. Kamel)

Appendix-11

Data of Water Supply Pipeline
(from S.C.A. and JSE.NK)

Appendix-11 Data of Water Supply Pipeline

(1) Minutes of Meeting dated Monday August 12,1991

(2) Water Reservoirs in Sainai

(3) S.C.A. Ductile Iron Pipes

(4) Route Study, Solution (1) & (2)

(1) MINUTES OF MEETING

Re : Present Conditions of the Water Supply Pipes through the Tunnel

Date : Monday August 12, 1991
Place : Office of Suez Canal Authority in the Tunnel site

At Monday August 12, 1991 there were a field visit to the treatment plant (west of the Tunnel) and the two 500mm ductile cast iron mains inside the Tunnel by :

Eng. Naim M. Ramadan	Suez Canal Authority	Naim Ramadan
Eng. Emad Abdel Wahab	Suez Canal Authority	Emad Abdel Wahab
Eng. Mona Badawy	Suez Canal Authority	Mona Badawy
Eng. Mohamed Nashat	Suez Canal Authority	Mohamed Nashat

And Eng. Fekry Ahmed Shaheen manager of the water treatment plant (west of the Tunnel) from Ministry of Housing and Reconstruction.

Eng. Takayosi Ohtsuka	Basic Design Study Team	T. Ohtsuka
Eng. Iwao Tsunashima	Basic Design Study Team	Iwao
Eng. Yusuke Doi	Basic Design Study Team	

We found the following :

1- There is a water treatment plant under erection with a design capacity of 400 lit./sec. - west of the tunnel - owned by Ministry of Housing and Reconstruction. At the same site there is a compact unit under operation with a design capacity of 150 lit./sec. (5 units with a capacity of 30 lit./sec. for each unit) owned by Ministry of Housing and Reconstruction too. The treatment plant compact unit pumps its water to the East of the Canal through two mains crossing in the Tunnel.

2- From the operation documents of the treatment plant we found :

a- During Summer the operation start at 6 A.M. and step at 11 P.M. by other way, there are 17 working hours a day during Summer.

b- There are 4 units under operation (4 x 100 = 400 m^3/h)

c- The treated water are pumped by one pump with a design capacity of 324 m^3/h and a delivery head of 8 bar, there are no way to measure the discharge of the treatment plant. The only way is by estimating the discharge of the pump and the working hours.

d- During Winter the operation start at 6 A.M. and stop at 4 P.M. by other way, there are 10 working hours a day during Winter with the same discharge and the head (Q = 324 m^3/h, H = 8 bar).

e- Engineer Fekry (Manager of the treatment plant) informed that this treatment plant pump its water to Raas Cidre, Mesalla and Malab in Sinai, and he informed too that there are water reservoirs in Sinai to feed the served areas during the unworking hours of the treatment plant.

3- During our field visit to the delivery mains inside the Tunnel, we found that there are two main pipes from Ductile Cast Iron 500mm diameter Spigot-Socket push-on type with rubber gaskets, but elbows and special parts are flanged-type Connected together by bolts. The pipes are in a very good case and new. We believe that the removal of the push-on pipes are not easy because of the unwide place and they need special tools and big forces for removal, and may be some of the pipes will be damaged during the removal. All the gaskets must be changed by new ones from the same kind which were used with the pipes during re-erection. But the elbows and special parts it is easy to remove them safely, just we may use new flat gaskets during re-erection and it is easy to find them, may be need new bolts.

4- After the field visit we had a meeting with the Japanese Consultants at Engineer Refaat's office (the chief of tunnel) and we gave the Consultants all the informations above. The Consultants requested to have an analysis for the treated water from the treatment plant (west of the tunnel) and a quantity of treated water as a specimen. We gave them the specimen which were taken by the chemist of Suez Canal treatment plant of Suez and we had a quantity of treated water to

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make the chemical analysis of it in Suez treatment plant.
They requested also to have a specimen of treated water and a chemical analysis from Suez treatment plant.
Engineer Emad (the chief of water sector in Suez) promised to prepare the specimen and chemical analysis through two days.

5- Engineer Refaat informed that Suez Canal Authority are responsible of the maintenance of the two main pipes inside the Tunnel from the valves room 500 ms west of the Tunnel to valves room 250 ms east of the Tunnel. And he informed also that it can be put one of the two pipes in operation and the second out of operation by controlling the valves at the west and at the east, and make any maneuvering without problems.

6- The Japanese Consultants asked about the estimated consumption of treated water during the coming four years in the areas which are served with water from these two mains. Engineer Fekry informed that this information is at the Sinai Reconstruction Organization. From my own opinion I made a quick estimation to find the capacity of one main line 500mm in diameter, supposing that the velocity of the water inside the pipe line is 1.2 m/sec. Then the discharge in the main pipe will be about 848 m^3/h. And if we increase the working hours of the treatment plant to 24 hours a day instead of 17 hours a day during Summer. Therefore if the future consumption increased four times, then one pipe line 500mm in diameter is adequate.
They also asked about the name of pipe manufacturer and his citizen Engineer Fekry informed that this information is at the Sinai Reconstruction Organization.

7- The Japanese Consultants informed that the first study will be finished at the end of this month, and another engineers will join the study until the middle of September in Egypt. The total study including in Japan will be finished at the end of this November. And they expect to start the rehabilitation work October 1992 (not a fixed time).

Draft by Eng. Naim Ramadan

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96

(2) Water Reservoirs in Sinai

Aug 28, 44 (1/2)
TSC
(END Report)

NAME	DISTANCE	CAPACITY	REMARKS
SHAT	Km 17.600	500 m^3	High
Moussa	Km 26.800	500 m^3	High
Massala	Km 36.100	5000 m^3	Land
Sadr	Km 62.	1000 m^3	High
Sadat	Km 64.100	500 m^3	High
Sawera	Km 67	500 m^3	High
El-Gelbs	Km 106	500 m^3	High
Malaab	Km 114	5000 m^3	Land
Kemma	Km 134	500 m^3	Land
Kaser	Km 137	2500 m^3	Land
Zenema	Km 145	1000 m^3	High
Abo-Reidels	Km 168	1000 m^3	High

(2/2) Aug 28 91 Stanley Read

Pipe Line TUNNEL – SINAI

Diameter	Distance (Length)
600 mm Diam.	63 Km
500 mm Diam	20 km /8
450 mm Diam	53 km /13
350 mm Diam	35 km /17

147

(3) S.C.A Ductile Iron Pipes

Sep.17,1991

JSE I.TUSNASHIMA

1) Purpose

Survey of (1) Existing Pipes in the Tunnel and (2) Stock Pipes which will be supplied from S.C.A. both for the on land pipelines.

-(1) was visited on Aug.18,1991
-(2) was visited on Sep. 2,1991

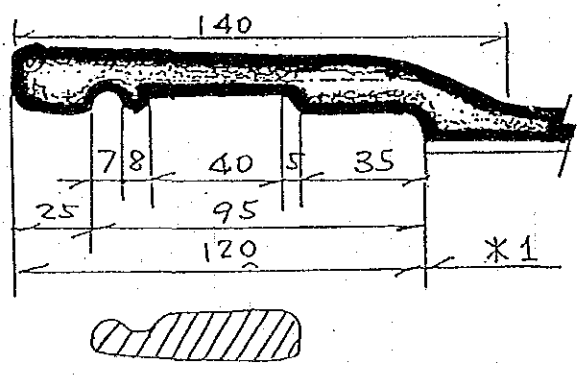
2) Dimension

The dimension detail of S.C.A. supply pipes is as follows:

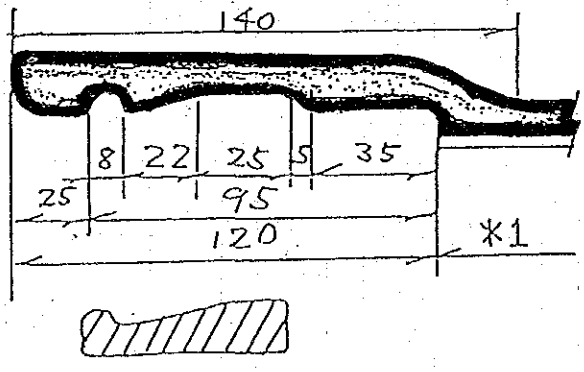
Ductile Iron Pipes available from SCA

		from A.H.Tunnel	from Ataka Yard	Remarks
Size (Dia × Length *1)㎜		500 ^{NID} × 5,500	500 ^{NID} × (5,500)	
Standard		BS4772 Class K9 25 bar PN	AWWA C1 *2	*2 C1-A-82
Quantity (pcs/㎞)		580/3,190	(91)/500	
Joints		Tyton(*3)	Tyton(*4)	Spigot/Socket spun with Neoprene rubber
Others	(1) Stock	A.H.Tunnel	in SCA Ataka(Suez) (ref. Eng. Said Dawed)	
	(2) Others	P.O.1276/9006 of 12th Feb., 1980	Presented by USA	

*3, BS4772 K9(㎜)



*4, AWWA C1(㎜)



*1:Effective Length

Appendix-11

Fresh Water Supply Pipeline

(4) Route Study,

Solution (1) & (2)

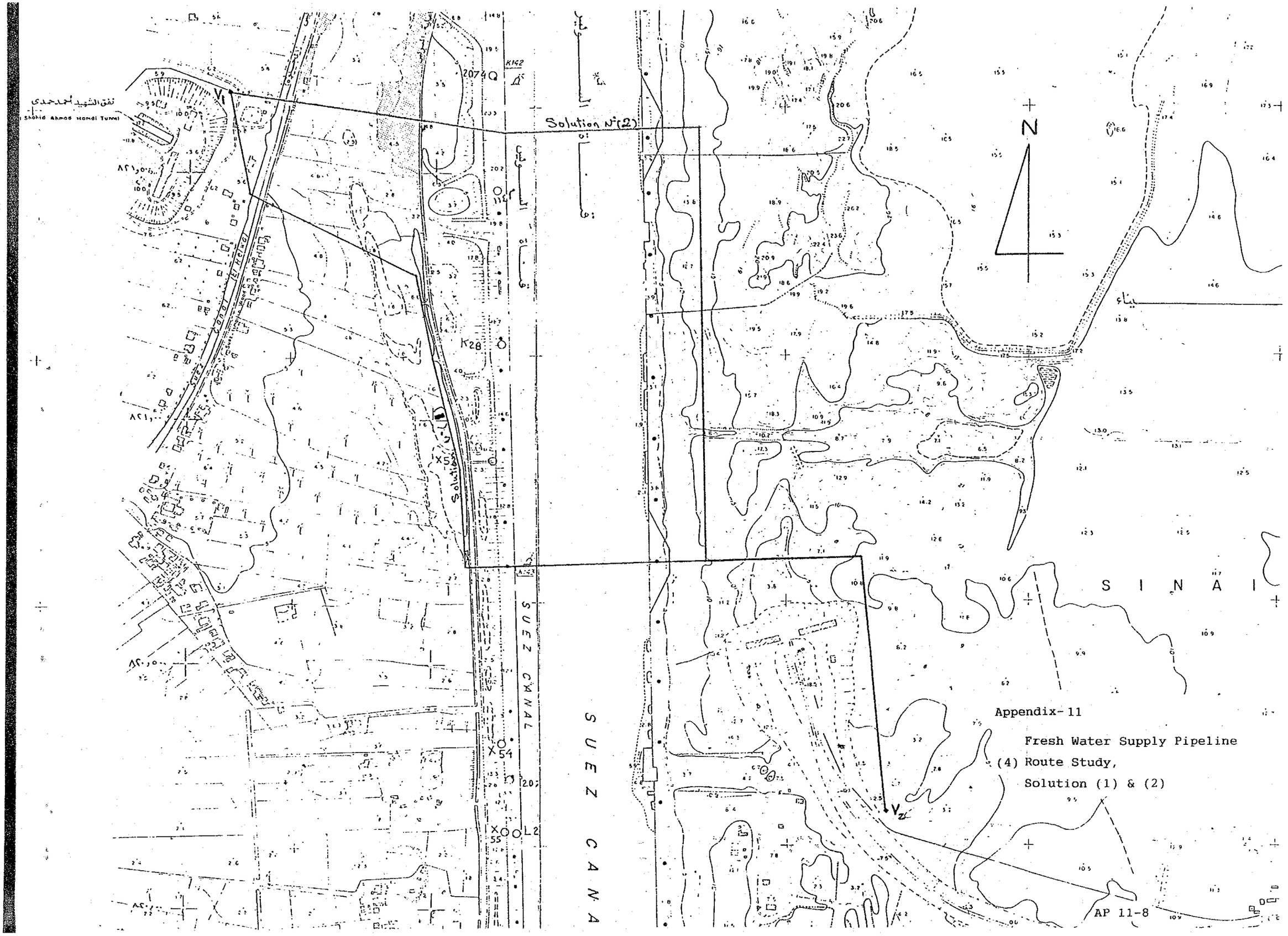
/ 2A/8

THE REQUIRED WORKS FOR LAYING OF SYPHON
AT KM. 102.130/143.00 AND OBSTRUCTIONS (SOLUTION (1) ,(2))

SERIAL	KIND OF WORK	UNIT	SOLUTION (1) S.C.A proposal QUANTITIES			Jica Team SOLUTIONS (2) proposal QUANTITIES			REMARKS
			WEST SIDE	EAST SIDE	TOTAL	WEST SIDE	EAST SIDE	TOTAL	
1	Length of pipe line	m'	1248+(498) (canal) +	972	2718	595+(486) (Canal) +	1835	2916	
2	Dry Exicavation	m^3	8000	65000	73000	50000	82000	132000	
3	Dredging of Trench	m^3	25000		250000	250000		250000	
4	Cut & fill for laying pipes		8000	6000	14000	3000	24000	27000	
5	Removal of Revetment	m'	20	210	230	20	210	230	
6	New Revetment		20	230	250	20	230	250	The shown volumes is roughly calculated
7	Obstructions :								
	* Sweet water Canal		26 m	–	26	26 m	–	26	
	* Planted Land		164 m (This land is owned to S.C.A.)		164	272 (This land is not owned to S.C.A.)		272	
	* Drain		22 m'	–	22	–	–	–	
	* Small Lake (v. shallow)		33 m'	–	33	–	–	–	

Dr. Eng. Ibr. KAMEL

AP 11-7



Appendix- 11

Fresh Water Supply Pipeline

(4) Route Study,

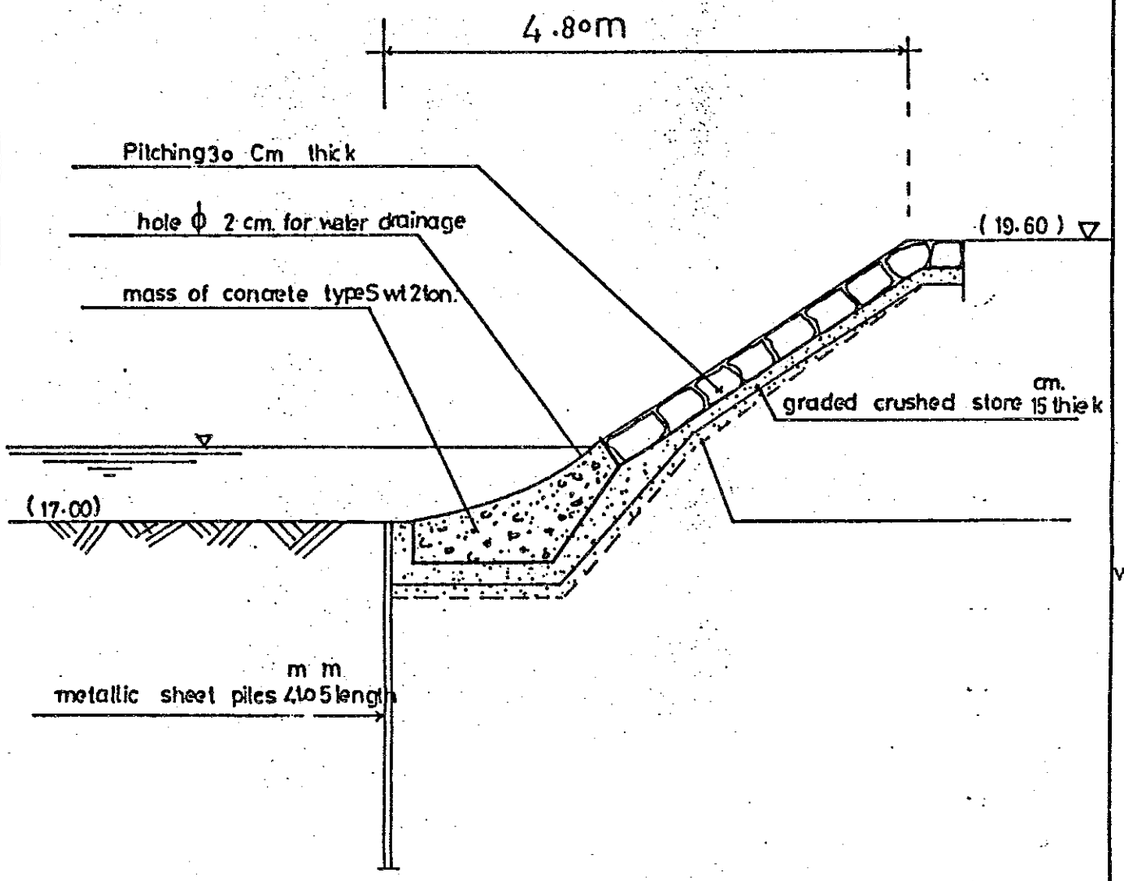
Solution (1) & (2)

Appendix-12

Data of Suez Canal Banks (from S.C.A.)

TYPE Of Revetment at East Bank k·m 142~143

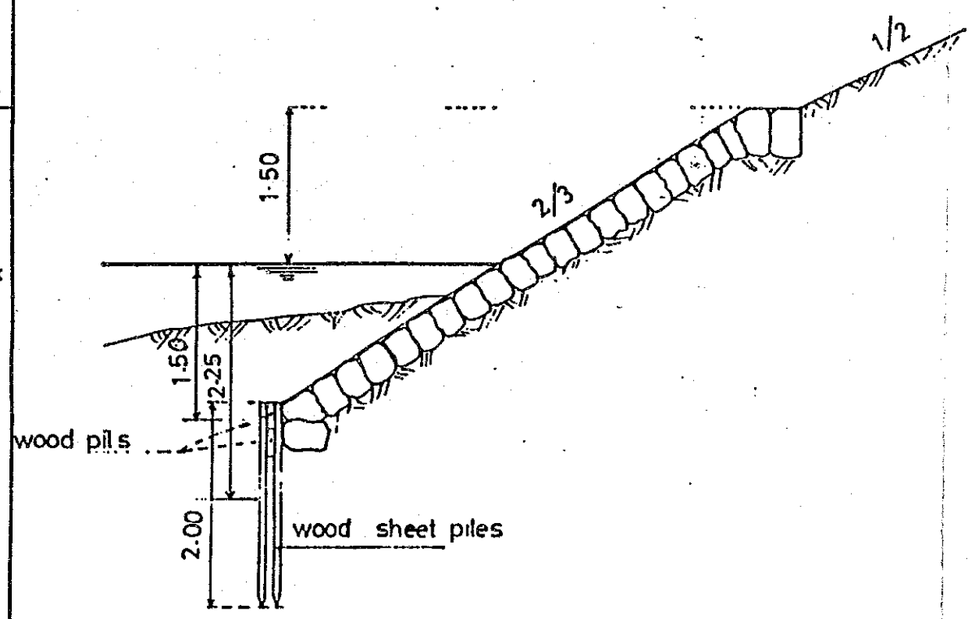
MOdified S



SCale 1:50

TYPE Of REVETMENT aT WEST BaNK K·M 142739 ~143

TYPE D



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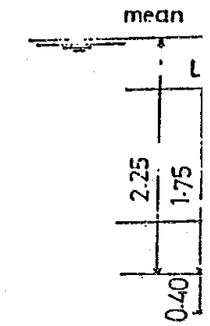
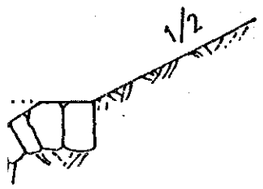


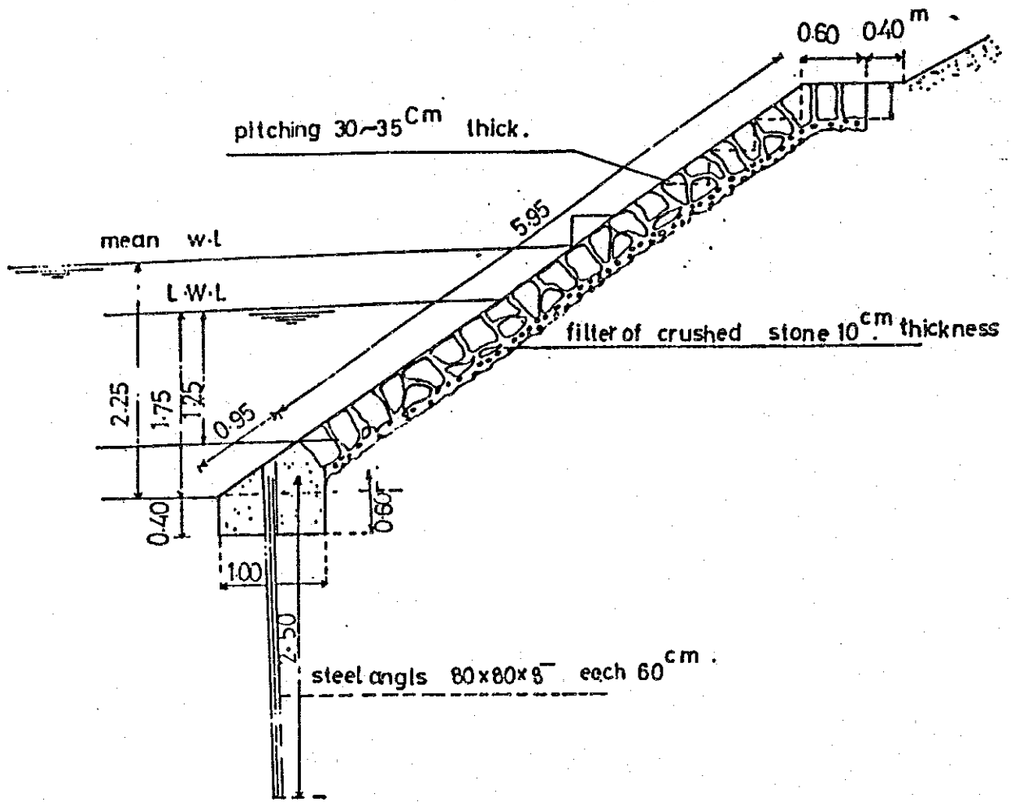
379

aNK K·M 142739 ~143



TYPE Of REVETMENT aT WEST BaNK K·M 142 ~142·739

TYPE D_1



SCale 1 : 50

Data of Suez Canal Banks (from S.C.A)

Aug, 1991

East Bank 142-143 Km (type S)

West Bank 142-142,739 Km (type D_1)

142,739-142 Km (Type D)

AP12-1

Appendix-13

Tide Tables of Red Sea-Suez (from S.C.A.)

(Zero = +16.90)

A-14

RED SEA - SUEZ

LAT 29°56'N LONG 32°33'E

TIME ZONE -0200

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

YEAR 1990

	JANUARY				FEBRUARY				MARCH				APRIL			
	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M
1	0141	1.8	0310	1.8	0255	1.9	0349	1.7	0148	2.0	0220	1.8	0326	1.9	0303	1.7
	0801	0.6	0905	0.7	0912	0.6	0940	0.9	0804	0.5	0818	0.8	0943	0.6	0921	0.8
M	1401	1.9	1520	1.8	1510	1.9	1543	1.6	1403	2.0	1420	1.7	1550	1.8	1513	1.6
	2027	0.6	2129	0.7	2137	0.5	2200	0.8	2026	0.4	2034	0.8	2218	0.6	2149	0.8
2	0226	1.8	0359	1.7	0350	1.8	0439	1.6	0238	2.0	0256	1.7	0437	1.8	0358	1.6
	0846	0.6	0949	0.8	1007	0.6	1031	1.0	0854	0.5	0859	0.9	1055	0.6	1018	0.8
T	1445	1.9	1604	1.7	1604	1.8	1627	1.6	1454	2.0	1454	1.7	1707	1.7	1613	1.6
	2113	0.6	2212	0.8	2234	0.6	2254	0.9	2119	0.5	2119	0.8	2337	0.6	2253	0.8
3	0315	1.8	0453	1.7	0454	1.8	0544	1.6	0335	1.9	0341	1.6	0557	1.8	0503	1.6
	0936	0.7	1039	0.9	1113	0.7	1134	1.0	0952	0.6	0949	0.9	1216	0.7	1122	0.8
A	1533	1.9	1652	1.6	1709	1.7	1732	1.5	1552	1.8	1538	1.6	1833	1.7	1725	1.5
	3203	0.6	2300	0.9	2344	0.6			2222	0.6	2214	0.9				
4	0412	1.8	0553	1.6	0609	1.7	0001	0.9	0443	1.8	0440	1.6	0059	0.6	0000	0.8
	1025	0.7	1133	1.0	1230	0.7	0702	1.5	1101	0.7	1050	0.9	0717	1.7	0610	1.6
	1611	1.8	1748	1.6	1827	1.7	1247	1.0	1703	1.7	1640	1.5	1337	0.7	1225	0.8
	2330	0.6	2356	0.9			1902	1.4	2337	0.6	2322	0.9	1954	1.7	1836	1.6
5	0516	1.8	0700	1.6	0103	0.6	0115	0.9	0602	1.7	0556	1.5	0213	0.6	0103	0.8
	1117	0.7	1237	1.0	0730	1.7	0812	1.6	1222	0.7	1200	0.9	0827	1.8	0711	1.6
T	1718	1.8	1855	1.5	1350	0.7	1358	0.9	1829	1.6	1804	1.5	1446	0.6	1324	0.7
					1952	1.6	2023	1.5					2100	1.7	1937	1.6
6	0611	1.8	0050	0.9	0221	0.6	0221	0.8	0102	0.6	0036	0.9	0314	0.6	0158	0.7
	1213	0.7	0805	1.6	0845	1.8	0906	1.6	0726	1.7	0712	1.5	0926	1.8	0803	1.7
SA	1247	0.7	1344	1.0	1504	0.6	1457	0.9	1347	0.7	1311	0.9	1543	0.6	1417	0.7
	1842	1.7	2006	1.5	2109	1.7	2119	1.5	1957	1.6	1929	1.5	2155	1.8	2028	1.7
7	0115	0.6	0201	0.9	0328	0.5	0315	0.7	0221	0.6	0143	0.8	0404	0.6	0248	0.6
	0740	1.8	0900	1.6	0948	1.9	0947	1.7	0841	1.8	0812	1.6	1015	1.8	0850	1.8
SU	1359	0.7	1444	1.0	1606	0.6	1545	0.8	1501	0.6	1413	0.8	1628	0.6	1505	0.6
	1956	1.7	2106	1.5	2213	1.8	2200	1.6	2111	1.7	2030	1.6	2240	1.8	2115	1.8
8	0224	0.6	0256	0.9	0426	0.5	0400	0.7	0327	0.5	0239	0.7	0445	0.6	0334	0.5
	0848	1.9	0945	1.7	1042	2.0	1021	1.8	0942	1.8	0858	1.7	1056	1.8	0934	1.9
M	1506	0.6	1534	0.9	1658	0.5	1625	0.6	1600	0.6	1503	0.7	1703	0.7	1551	0.5
	2105	1.8	2153	1.5	2306	1.8	2235	1.7	2210	1.8	2116	1.7	2318	1.8	2200	1.9
9	0328	0.5	0344	0.8	0515	0.4	0441	0.6	0420	0.5	0326	0.6	0518	0.6	0419	0.4
	0943	2.0	1022	1.7	1129	2.0	1053	1.9	1032	1.9	0937	1.8	1130	1.8	1019	2.0
TU	1606	0.6	1616	0.8	1744	0.5	1703	0.6	1648	0.5	1547	0.6	1732	0.7	1636	0.4
	2209	1.8	2231	1.6	2353	1.9	2309	1.8	2258	1.8	2156	1.8	2351	1.8	2246	2.0
10	0426	0.5	0426	0.7	0558	0.5	0519	0.5	0504	0.5	0409	0.5	0545	0.7	0504	0.
	1045	2.0	1054	1.8	1211	2.0	1125	2.0	1116	1.9	1014	1.9	1200	1.8	1105	2.
W	1701	0.5	1655	0.7	1824	0.5	1740	0.5	1728	0.5	1628	0.5	1756	0.7	1723	0.4
	2306	1.9	2304	1.7			2344	1.9	2340	1.9	2235	1.9			2333	2.1
11	0519	0.4	0505	0.6	0036	1.9	0557	0.4	0542	0.5	0449	0.5	0019	1.8	0552	0.3
	1136	2.1	1124	1.9	0637	0.5	1200	2.0	1153	1.9	1052	2.0	0611	0.7	1154	2.1
TH	1751	0.4	1732	0.6	1251	2.0	1818	0.4	1802	0.6	1708	0.4	1225	1.8	1812	0.4
	2359	1.8	2336	1.7	1900	0.5			O		2314	2.0	1820	0.8		
12	0608	0.4	0543	0.6	0116	1.9	0022	2.0	0016	1.9	0530	0.4	0045	1.8	0023	2.1
	1224	2.1	1154	1.9	0713	0.6	0637	0.4	0614	0.6	1132	2.1	0638	0.8	0641	0.3
F	1838	0.4	1808	0.5	1327	2.0	1238	2.1	1227	1.9	1750	0.4	1249	1.8	1245	2.1
					1933	0.6	1858	0.4	1830	0.6	2357	2.1	1849	0.8	1904	0.4
13	0048	1.9	0009	1.8	0153	1.9	0103	2.0	0049	1.9	0613	0.4	0112	1.8	0117	2.1
	0654	0.4	0621	0.5	0747	0.6	0719	0.3	0643	0.6	1214	2.1	0710	0.8	0734	0.4
SA	1310	2.1	1226	2.0	1401	1.9	1316	2.1	1256	1.9	1833	0.4	1315	1.8	1341	2.0
	1923	0.5	1844	0.5	2004	0.6	1940	0.2	1857	0.7			1924	0.8	2001	0.4
14	0136	1.9	0045	1.9	0230	1.8			0120	1.8	0042	2.1	0142	1.8	0215	2.0
	0739	0.5	0700	0.5	0822	0.7			0711	0.7	0658	0.4	0747	0.8	0832	0.4
SU	1354	2.0	1301	2.0	1434	1.8			1324	1.9	1300	2.1	1347	1.7	1442	1.9
	2044	0.5	1923	0.5	2039	0.7			1925	0.7	1920	0.4	2005	0.8	2104	0.2
15	0223	1.9	0124	1.9	0308	1.7			0149	1.8	0131	2.1	0218	1.7	0318	1.
	0822	0.6	0740	0.5	0858	0.8			0742	0.7	0747	0.4	0831	0.8	0936	0.
M	1459	1.9	1340	2.0	1507	1.7			1351	1.8	1350	2.1	1425	1.7	1551	1.
	2147	0.6	2003	0.4	2116	0.8			1957	0.7	2011	0.4	2052	0.8	2213	0.
31			0207	1.9												
			0824	0.5												
W			1422	2.0												
			2047	0.5												
31											0225	2.0				
											0841	0.5				
SA											1445	2.0				
											2110	0.5				

15-3/6

RED SEA - SUEZ

LAT 29°56'N LONG 32°33'E

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

YEAR 1990

TIME -0200

	MAY				JUNE				JULY				AUGUST			
	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M
1	0000	1.6	0325	1.6	0015	0.6	0434	1.5	0037	0.6	0456	1.4	0144	0.6	0114	0.4
	0544	0.6	0950	0.7	0624	1.6	1101	0.5	0646	1.4	1123	0.4	0808	1.2	0713	1.3
TU	1206	1.6	1551	1.6	1238	0.6	1714	1.6	1248	0.6	1745	1.6	1347	0.6	1336	0.3
	2328	0.6	2224	0.7	1906	1.7	2344	0.6	1928	1.5			2037	1.4	1957	1.5
2	0542	1.8	0420	1.6	0120	0.6	0531	1.5	0136	0.6	0015	0.4	0237	0.6	0224	0.3
	1201	0.6	1045	0.7	0728	1.6	1157	0.5	0747	1.4	0603	1.4	0905	1.2	0831	1.4
W	1823	1.7	1651	1.6	1339	0.6	1013	1.6	1343	0.6	1229	0.4	1440	0.6	1446	0.3
			2324	0.7	2006	1.7			2023	1.5	1852	1.6	2121	1.4	2102	1.6
3	0643	1.8	0618	1.6	0218	0.6	0042	0.5	0230	0.7	0121	0.4	0320	0.5	0326	0.2
	1301	0.7	1143	0.7	0027	1.6	0631	1.5	0854	1.3	0714	1.4	0949	1.2	0936	1.5
TH	1913	1.6	1752	1.6	1432	0.7	1255	0.5	1431	0.7	1338	0.3	1525	0.6	1546	0.2
	1939	1.7			2058	1.7	1913	1.7	2111	1.5	2000	1.6	2159	1.4	2158	1.7
4	0736	1.6	0022	0.7	0308	0.7	0141	0.5	0314	0.6	0226	0.3	0358	0.5	0420	0.1
	1351	0.7	0816	1.6	0918	1.6	0733	1.6	0933	1.3	0826	1.5	1057	1.4	1032	1.6
F	1958	1.6	1238	0.6	1516	0.7	1355	0.4	1513	0.7	1444	0.3	1606	0.5	1640	0.2
	2013	1.8	1850	1.7	2143	1.7	2013	1.7	2152	1.5	2103	1.7	2231	1.5	2249	1.7
5	0821	0.6	0118	0.6	0348	0.7	0239	0.4	0350	0.6	0327	0.2	0434	0.4	0507	0.1
	1400	1.7	0712	1.8	1002	1.6	0835	1.6	1014	1.3	0932	1.5	1057	1.4	1122	1.6
SA	1613	0.6	1332	0.6	1551	0.7	1434	0.4	1551	0.7	1547	0.2	1645	0.4	1728	0.2
	2138	1.8	1946	1.7	2221	1.6	2111	1.8	2227	1.5	2202	1.7	2300	1.5	2335	1.7
6	0904	0.6	0211	0.5	0420	0.7	0335	0.3	0424	0.6	0424	0.1	0509	0.3	0551	0.1
	1447	1.7	0806	1.7	1038	1.5	0938	1.7	1048	1.4	1033	1.6	1126	1.4	1208	1.7
SU	1656	0.7	1425	0.5	1621	0.8	1553	0.3	1628	0.6	1644	0.2	1723	0.4	1812	0.2
	2213	1.8	2039	1.8	2254	1.6	2208	1.9	2258	1.5	2256	1.8	2329	1.6		
7	0946	0.7	0302	0.5	0448	0.7	0430	0.2	0457	0.5	0517	0.1	0543	0.3	0019	1.7
	1530	1.6	0859	1.8	1108	1.5	1035	1.7	1119	1.4	1129	1.7	1156	1.5	0632	0.1
M	1737	0.7	1517	0.4	1651	0.7	1650	0.3	1706	0.6	1738	0.2	1801	0.3	1252	1.7
	2301	1.8	2131	1.9	2322	1.6	2304	1.9	2327	1.5	2348	1.8			1854	0.3
8	1026	0.8	0351	0.4	0518	0.7	0524	0.2	0532	0.5	0606	0.1	0000	1.6	0100	1.7
	1613	1.5	0957	1.9	1136	1.5	1133	1.8	1149	1.4	1222	1.7	0619	0.2	0710	0.2
TU	1818	0.8	1609	0.4	1724	0.7	1746	0.2	1744	0.5	1829	0.2	1228	1.6	1335	1.7
	2345	1.8	2225	2.0	2349	1.6	2359	1.9	2356	1.6			1839	0.3	1934	0.3
9	1106	0.7	0443	0.3	0551	0.6	0618	0.2	0608	0.4	0038	1.8	0033	1.6	0140	1.6
	1654	1.5	1045	1.9	1206	1.5	1230	1.8	1220	1.5	0654	0.1	0655	0.2	0747	0.3
W	1900	0.8	1702	0.4	1801	0.7	1843	0.2	1824	0.5	1313	1.7	1303	1.6	1417	1.5
	2348	1.7	2311	2.0							1919	0.2	1919	0.3	2014	0.4
10	1145	0.8	0535	0.3	0018	1.6	0054	1.9	0027	1.6	0127	1.7	0110	1.6	0220	1.5
	1735	1.7	1140	1.9	0627	0.6	0712	0.2	0645	0.4	0741	0.1	0734	0.2	0824	0.4
TH			1757	0.3	1236	1.6	1327	1.8	1253	1.5	1403	1.7	1343	1.6	1501	1.6
					1842	0.6	1939	0.3	1905	0.4	2008	0.3	2002	0.3	2056	0.5
11	0001	0.9	0009	2.0	0051	1.6	0149	1.8	0102	1.6	0215	1.7	0151	1.6	0301	1.4
	0611	1.6	0629	0.3	0707	0.6	0805	0.2	0724	0.3	0827	0.2	0815	0.2	0903	0.5
F	2219	1.6	1236	1.9	1312	1.6	1425	1.8	1330	1.5	1454	1.6	1428	1.6	1548	1.5
			1853	0.3	1926	0.6	2036	0.3	1947	0.4	2057	0.4	2049	0.4	2143	0.6
12	0048	1.0	0106	2.0	0130	1.6	0244	1.8	0139	1.6	0304	1.6	0237	1.6	0346	1.3
	0654	1.7	0724	0.3	0749	0.5	0900	0.3	0804	0.3	0913	0.3	0902	0.2	0948	0.6
SA	1251	1.7	1335	1.9	1352	1.6	1524	1.7	1411	1.6	1546	1.6	1519	1.6	1643	1.4
	1903	0.7	1952	0.4	2012	0.6	2134	0.4	2032	0.4	2148	0.5	2143	0.4	2238	0.7
13	0133	1.1	0204	2.0	0208	1.6	0342	1.7	0220	1.6	0355	1.5	0330	1.5	0444	1.2
	0737	1.7	0822	0.3	0833	0.5	0955	0.3	0847	0.3	1000	0.4	0957	0.3	1044	0.6
SU	1336	1.7	1438	1.9	1437	1.6	1624	1.7	1456	1.6	1642	1.5	1618	1.5	1748	1.3
	1945	0.7	2054	0.4	2101	0.6	2233	0.5	2120	0.4	2242	0.6	2246	0.4	2343	0.7
14	0218	1.2	0306	1.9	0253	1.6	0441	1.6	0306	1.5	0450	1.3	0433	1.4	0604	1.2
	0819	1.7	0923	0.4	0919	0.5	1052	0.4	0933	0.3	1050	0.5	1102	0.3	1152	0.7
M	1420	1.6	1543	1.8	1525	1.6	1726	1.6	1546	1.6	1741	1.4	1728	1.5	1857	1.3
	2031	0.7	2159	0.5	2153	0.6	2335	0.5	2212	0.5	2341	0.6	2358	0.4		
15	0303	1.3	0410	1.8	0341	1.6	0542	1.6	0358	1.5	0552	1.3	0550	1.3	0054	0.7
	0900	1.7	1027	0.4	1000	0.5	1150	0.5	1025	0.3	1146	0.6	1218	0.4	0728	1.2
TU	1504	1.6	1652	1.7	1617	1.6	1820	1.6	1642	1.6	1843	1.4	1844	1.6	1304	0.7
	2116	0.7	2307	0.5	2247	0.6			2311	0.5					1957	1.4
16	0346	1.4	0517	1.7												
	0941	1.7	1133	0.5												
W	1548	1.6	1730	1.7												
	2202	0.7	2350	1.7												
17	0431	1.5									0043	0.7			0156	0.6
	1022	1.7									0701	1.2			0832	1.2
TH	1633	1.6									1247	0.6			1407	0.6
	2249	0.7									1943	1.4			2046	1.4

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RED SEA - SUEZ

LAT 29°56'N LONG 32°33'E

TIME ZONE -0200

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

YEAR 1990

	SEPTEMBER				OCTOBER				NOVEMBER				DECEMBER			
	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M	TIME	M
1	0325	0.4	16 0937	0.4	1 0249	0.5	16 0950	0.4	1 0332	0.4	16 0450	0.7	1 0348	0.5	16 0455	0.8
	1045	1.5	SU 1543	0.3	M 1500	0.5	TU 1619	0.5	TH 1559	0.5	F 1712	0.8	SA 1622	0.5	SU 1721	0.9
	1705	1.5	2152	1.7	2118	1.6	2224	1.8	2153	1.9	2318	1.7	2216	2.0	2333	1.7
2	0412	0.2	17 0412	0.2	2 0329	0.4	17 0438	0.4	2 0413	0.4	17 0515	0.7	2 0438	0.4	17 0521	0.8
	1027	1.7			0949	1.6			1027	2.0	1146	1.9	1054	2.1	1155	1.8
	1632	0.3	M		TU 1549	0.5	W 1658	0.5	F 1642	0.4	SA 1738	0.8	SU 1711	0.4	M 1748	0.8
	2238	1.8			2161	1.7	2302	1.8	O 2235	2.0	● 2345	1.7	O 2309	2.0	● 2358	1.7
3	0405	0.2	18 0454	0.2	3 0407	0.3	18 0511	0.5	3 0456	0.3	18 0539	0.7	3 0526	0.4	18 0551	0.8
	1111	1.7			1021	1.7	1133	1.8	1110	2.1	1213	1.9	1144	2.2	1220	1.9
M	1714	0.3	TU		W 1628	0.4	TH 1731	0.6	SA 1726	0.4	SU 1804	0.8	M 1802	0.4	TU 1819	0.8
	2319	1.8			2225	1.8	● 2336	1.8	2321	2.0						
4	0448	0.3	19 0532	0.2	4 0443	0.3	19 0539	0.5	4 0541	0.3	19 0010	1.7	4 0002	2.0	19 0025	1.7
	1151	1.8			1055	1.8	1206	1.8	1156	2.1	0606	0.7	0620	0.3	0625	0.7
	1752	0.3	W		TH 1706	0.4	F 1800	0.6	SU 1613	0.4	M 1238	1.8	TU 1236	2.2	W 1246	1.9
	2357	1.7	●		O 2301	1.9					1835	0.8	1854	0.4	1853	0.7
5	0514	0.2	20 0605	0.3	5 0521	0.2	20 0005	1.7	5 0009	2.0	20 0036	1.7	5 0058	2.0	20 0054	1.7
	1226	1.8			1132	1.9	0604	0.6	0629	0.3	0639	0.7	0714	0.4	0703	0.7
A	1834	0.3	TH		F 1747	0.3	SA 1235	1.8	M 1245	2.1	TU 1306	1.8	W 1330	2.2	TH 1316	1.9
O	2330	1.7			2340	1.9	1827	0.7	1903	0.4	1910	0.8	1949	0.4	1931	0.7
6	0559	0.2	21 0032	1.7	6 0601	0.2	21 0032	1.7	6 0101	2.0	21 0106	1.7	6 0156	2.0	21 0129	1.7
	1249	1.7	0636	0.4	1213	2.0	0631	0.6	0721	0.3	0718	0.7	0811	0.4	0743	0.7
	1914	0.3	F 1304	1.7	SA 1829	0.3	SU 1304	1.8	TU 1339	2.1	W 1338	1.8	TH 1427	2.1	F 1349	1.9
			1859	0.5			1858	0.7	1958	0.4	1951	0.8	2047	0.4	2011	0.7
7	0004	1.8	22 0700	0.4	7 0023	1.9	22 0702	0.7	7 0200	1.9	22 0144	1.7	7 0259	1.9	22 0208	1.7
	0644	0.4			0644	0.2			0920	0.4	0802	0.8	0913	0.5	0826	0.7
	1338	1.7	M		SU 1258	2.0	M 1335	1.7	W 1435	2.0	TH 1415	1.8	F 1528	2.0	SA 1427	1.8
	1932	0.6			1916	0.3	1933	0.7	2100	0.5	2036	0.8	2149	0.5	2054	0.7
8	0135	1.6	23 0737	0.5	8 0110	1.8	23 0739	0.7	8 0306	1.8	23 0228	1.6	8 0407	1.9	23 0251	1.7
	0737	0.5			0732	0.3			0925	0.5	0851	0.8	1019	0.6	0913	0.8
	1413	1.6	SU		M 1349	1.9	TU 1407	1.7	TH 1544	1.9	F 1459	1.7	SA 1633	1.9	SU 1508	1.8
	2008	0.6			2009	0.4	2015	0.8	2209	0.5	2127	0.8	2256	0.6	2140	0.7
9	0207	1.5	24 0814	0.6	9 0204	1.8	24 0824	0.7	9 0422	1.7	24 0321	1.6	9 0520	1.8	24 0340	1.7
	0827	0.6			0827	0.4			1040	0.6	0947	0.8	1129	0.7	1004	0.8
	1452	1.5	M		TU 1447	1.8	W 1540	1.6	F 1657	1.8	SA 1550	1.7	SU 1741	1.8	M 1555	1.8
	2051	0.7			2109	0.6	2105	0.8	2325	0.6	2222	0.8			2230	0.7
10	0215	1.6	25 0244	1.4	10 0307	1.6	25 0252	1.5	10 0545	1.7	25 0423	1.6	10 0007	0.6	25 0435	1.7
	0940	0.3	0858	0.7	0932	0.4	0918	0.8	1159	0.6	1048	0.8	0634	1.8	1101	0.8
	1539	1.7	TU		W 1555	1.7	TH 1541	1.6	SA 1813	1.8	SU 1646	1.7	M 1242	0.7	TU 1648	1.7
	2144	0.8			2221	0.5	2204	0.8			2320	0.8	1851	1.8	2326	0.7
11	0335	1.3	26 0954	0.7	11 0425	1.5	26 0358	1.4	11 0041	0.6	26 0530	1.6	11 0116	0.7	26 0538	1.7
	1041	1.4			1050	0.5	1023	0.8	0704	1.7	1151	0.8	0744	1.8	1203	0.8
	1713	1.7	W		TH 1713	1.7	F 1646	1.5	SU 1314	0.6	M 1745	1.7	TU 1352	0.8	W 1749	1.7
	2348	0.8			2342	0.5	2309	0.8	1924	1.8			1958	1.7		
12	0505	1.5	27 1215	0.5	12 0555	1.5	27 0522	1.4	12 0151	0.6	27 0019	0.7	12 0220	0.7	27 0027	0.7
	1215	0.5			1215	0.5	1135	0.8	0812	1.8	0635	1.6	0846	1.8	0645	1.7
	1834	1.7	SA		F 1834	1.7	SU 1754	1.5	M 1421	0.6	TU 1252	0.8	W 1455	0.8	TH 1308	0.8
									2027	1.8	1844	1.7	2058	1.7	1855	1.7
13	0033	1.2	28 0721	0.5	13 0133	1.5	28 0041	1.4	13 0250	0.6	28 0115	0.7	13 0314	0.7	28 0130	0.7
	0721	1.6			0721	1.6	0641	1.4	0910	1.8	0734	1.7	0939	1.8	0751	1.8
SA	1333	0.5	SU		SA 1333	0.5	1242	0.8	TU 1517	0.6	W 1349	0.8	TH 1540	0.8	F 1412	0.7
	1904	1.7			1946	1.7	1855	1.6	2131	1.8	1940	1.7	2149	1.7	2002	1.8
14	0113	1.1	29 0751	1.6	14 0213	1.4	29 0141	1.3	14 0339	0.6	29 0200	0.6	14 0356	0.8	29 0232	0.8
	0751	1.6			0751	1.6	0751	1.4	0959	1.9	0827	1.8	1020	1.8	0853	1.9
SU	1405	0.6	M		SU 1405	0.6	M 1343	0.9	W 1604	0.7	TH 1442	0.7	F 1628	0.9	SA 1511	0.6
	1947	1.7			1947	1.7	1944	1.6	2207	1.8	2003	1.8	2231	1.7	2106	1.8
15	0150	1.0	30 0827	1.7	15 0310	1.4	30 0241	1.3	15 0418	0.6	30 0259	0.5	15 0429	0.8	30 0331	0.5
	0827	1.7			0828	1.7	0827	1.6	1040	1.9	0916	1.9	1059	1.8	0950	2.0
M	1534	0.4	TU		M 1534	0.4	TU 1430	0.7	TH 1642	0.7	F 1532	0.6	SA 1656	0.9	SU 1608	0.5
	2139	1.8			2139	1.8	2039	1.7	2246	1.8	2125	1.9	2305	1.7	2206	1.9
			31 0908	1.8			31 0250	0.5							31 0427	0.4
			W				0908	1.8							1044	2.1
			1515	0.6			1515	0.6							M 1701	0.4
			2112	1.8			2112	1.8							O 2303	2.0

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RED SEA - SUEZ

LAT 29°56'N LONG 32°33'E

TIME ZONE -0200 — TIMES AND HEIGHTS OF HIGH AND LOW WATERS — YEAR 1991

JANUARY

	TIME	M		TIME	M
1	0520	0.4	16	0537	0.7
TU	1136	2.2	W	1200	1.9
	1754	0.4		1801	0.7
	2358	2.0			
2	0614	0.3	17	0011	1.7
W	1228	2.2	TH	0610	0.7
	1846	0.3		1226	1.9
				1834	0.6
3	0053	2.0	18	0040	1.8
TH	0706	0.3	F	0645	0.6
	1320	2.2		1254	1.9
	1937	0.3		1909	0.6
4	0149	2.0	19	0110	1.8
F	0759	0.4	SA	0722	0.6
	1412	2.1		1324	1.9
	2030	0.4		1945	0.6
5	0246	2.0	20	0145	1.8
SA	0853	0.5	SU	0801	0.6
	1506	2.0		1358	1.9
	2124	0.5		2023	0.6
6	0345	1.9	21	0223	1.8
SU	0951	0.6	M	0842	0.7
	1603	1.9		1436	1.9
	2222	0.6		2104	0.6
7	0449	1.8	22	0307	1.8
M	1052	0.7	TU	0928	0.7
	1705	1.8		1519	1.8
	2324	0.7		2150	0.6
8	0558	1.8	23	0358	1.8
TU	1200	0.8	W	1020	0.8
	1812	1.7		1609	1.8
				2244	0.7
9	0032	0.8	24	0458	1.7
W	0709	1.7	TH	1123	0.8
	1314	0.9		1710	1.7
	1923	1.6		2349	0.7
10	0141	0.8	25	0610	1.7
TH	0816	1.7	F	1234	0.8
	1424	0.9		1823	1.7
	2031	1.6			
11	0242	0.8	26	0103	0.7
F	0914	1.7	SA	0726	1.7
	1522	0.9		1350	0.7
	2129	1.6		1942	1.7
12	0330	0.8	27	0216	0.6
SA	1001	1.8	SU	0838	1.8
	1605	0.9		1459	0.6
	2214	1.6		2057	1.7
13	0406	0.8	28	0322	0.5
SU	1039	1.8	M	0941	1.9
	1636	0.9		1600	0.5
	2250	1.6		2202	1.8
14	0436	0.8	29	0421	0.4
M	1109	1.8	TU	1036	2.0
	1703	0.8		1654	0.4
	2320	1.6		2300	1.9
15	0505	0.7	30	0514	0.3
TU	1136	1.8	W	1128	2.1
	1731	0.8		1745	0.3
●	2346	1.7	O	2353	2.0
			31	0605	0.3
			TH	1217	2.2
				1833	0.3

FEBRUARY

	TIME	M		TIME	M
1	0043	2.0	16	0015	1.8
F	0652	0.3	SA	0623	0.6
	1305	2.2		1226	2.0
	1920	0.3		1842	0.5
2	0134	2.0	17	0046	1.9
SA	0740	0.4	SU	0658	0.5
	1352	2.1		1257	2.0
	2006	0.4		1918	0.5
3	0224	2.0	18	0120	1.9
SU	0827	0.5	M	0736	0.6
	1439	2.0		1331	2.0
	2053	0.5		1955	0.5
4	0315	1.9	19	0158	1.9
M	0916	0.6	TU	0816	0.6
	1529	1.9		1410	1.9
	2141	0.6		2036	0.5
5	0411	1.8	20	0242	1.9
TU	1008	0.8	W	0901	0.6
	1621	1.8		1454	1.9
	2234	0.7		2123	0.6
6	0512	1.7	21	0333	1.8
W	1105	0.9	TH	0954	0.7
	1722	1.6		1547	1.8
	2333	0.8		2220	0.6
7	0622	1.6	22	0436	1.7
TH	1213	1.0	F	1059	0.7
	1834	1.5		1651	1.7
				2331	0.7
8	0042	0.9	23	0552	1.7
F	0734	1.6	SA	1216	0.8
	1329	1.0		1812	1.6
	1951	1.5			
9	0152	0.9	24	0052	0.6
SA	0838	1.6	SU	0716	1.7
	1437	1.0		1338	0.7
	2056	1.5		1939	1.6
10	0249	0.9	25	0211	0.6
SU	0928	1.7	M	0830	1.8
	1525	0.9		1450	0.6
	2146	1.5		2056	1.7
11	0332	0.8	26	0318	0.5
M	1008	1.7	TU	0933	1.9
	1602	0.8		1551	0.5
	2224	1.6		2159	1.8
12	0408	0.8	27	0415	0.4
TU	1040	1.7	W	1027	2.0
	1633	0.8		1644	0.4
	2254	1.6		2253	1.9
13	0442	0.7	28	0505	0.4
W	1108	1.8	TH	1116	2.1
	1704	0.7		1732	0.4
	2321	1.7	O	2342	2.0
14	0515	0.6			
TH	1133	1.9			
	1736	0.6			
●	2347	1.8			
15	0549	0.6			
F	1158	1.9			
	1809	0.6			

MARCH

	TIME	M		TIME	M
1	0551	0.3	16	0521	0.6
F	1202	2.1	SA	1125	1.9
	1816	0.4		1738	0.5
			●	2344	1.9
2	0028	2.0	17	0557	0.5
SA	0634	0.4	SU	1156	2.0
	1246	2.1		1814	0.5
	1858	0.4			
3	0114	2.0	18	0017	2.0
SU	0716	0.5	M	0633	0.5
	1328	2.0		1230	2.0
	1938	0.5		1851	0.5
4	0158	2.0	19	0055	2.0
M	0758	0.6	TU	0713	0.5
	1410	2.0		1309	2.0
	2019	0.6		1931	0.5
5	0243	1.9	20	0137	2.0
TU	0839	0.7	W	0756	0.5
	1453	1.8		1352	2.0
	2100	0.7		2017	0.5
6	0330	1.8	21	0225	1.9
W	0923	0.8	TH	0844	0.6
	1538	1.7		1441	1.9
	2145	0.8		2109	0.6
7	0424	1.7	22	0321	1.8
TH	1012	0.9	F	0942	0.6
	1630	1.6		1540	1.8
	2237	0.9		2213	0.6
8	0527	1.6	23	0429	1.7
F	1111	1.0	SA	1050	0.7
	1736	1.5		1652	1.7
	2341	0.9		2329	
9	0638	1.6	24	0547	1.7
SA	1220	1.0	SU	1210	0.7
	1857	1.5		1817	1.6
10	0052	0.9	25	0051	0.6
SU	0746	1.6	M	0708	1.7
	1330	1.0		1330	0.7
	2008	1.5		1941	1.7
11	0157	0.9	26	0207	0.6
M	0841	1.6	TU	0821	1.8
	1428	0.9		1440	0.6
	2102	1.5		2052	1.8
12	0248	0.8	27	0310	0.5
TU	0924	1.7	W	0922	1.8
	1514	0.8		1539	0.5
	2143	1.6		2151	1.8
13	0331	0.7	28	0404	0.4
W	0959	1.7	TH	1014	1.8
	1553	0.7		1630	0.5
	2216	1.7		2241	1.8
14	0409	0.7	29	0452	0.4
TH	1029	1.8	F	1101	2.0
	1629	0.7		1714	0.5
	2245	1.8		2327	2.0
15	0445	0.6	30	0535	0.3
F	1057	1.9	SA	1144	2.0
	1703	0.6		1755	0.5
	2314	1.8	O		
			31	0010	2.1
			SU	0614	0.5
				1225	2.0
				1832	0.5

APRIL

	TIME	M		TIME	M
1	0051	2.0	16	0610	0.5
M	0651	0.6	TU	1207	2.0
	1304	1.9		1828	0.5
	1908	0.6			
2	0130	1.9	17	0034	2.0
TU	0727	0.7	W	0654	0.5
	1341	1.9		1252	2.0
	1944	0.7		1914	0.5
3	0209	1.8	18	0122	2.0
W	0804	0.7	TH	0742	0.5
	1419	1.8		1342	1.9
	2021	0.8		2006	0.5
4	0250	1.8	19	0216	1.9
TH	0843	0.8	F	0836	0.5
	1459	1.7		1438	1.9
	2104	0.8		2105	0.5
5	0336	1.7	20	0317	1.9
F	0929	0.9	SA	0937	0.6
	1545	1.6		1544	1.8
	2154	0.9		2213	0.6
6	0430	1.6	21	0426	1.8
SA	1022	0.9	SU	1047	0.6
	1644	1.5		1659	1.7
	2254	0.9		2329	0.6
7	0534	1.6	22	0542	1.7
SU	1123	0.9	M	1202	0.6
	1756	1.5		1820	1.7
8	0000	0.9	23	0045	0.6
M	0640	1.6	TU	0657	1.7
	1229	0.8		1317	0.6
	1900	1.6		1935	1.7
9	0105	0.8	24	0156	0.5
TU	0738	1.6	W	0803	1.8
	1329	0.8		1423	0.6
	2004	1.6		2040	1.8
10	0201	0.8	25	0257	0.5
W	0827	1.6	TH	0906	1.8
	1421	0.8		1521	0.5
	2049	1.6		2137	1.9
11	0249	0.7	26	0350	0.5
TH	0906	1.7	F	0958	1.9
	1506	0.7		1611	0.5
	2127	1.7		2226	1.9
12	0331	0.7	27	0437	0.5
F	0941	1.8	SA	1045	1.9
	1547	0.7		1655	0.6
	2201	1.8		2310	1.9
13	0411	0.6	28	0517	0.6
SA	1015	1.8	SU	1127	1.9
	1626	0.6		1733	0.6
	2235	1.9	O	2350	1.9
14	0450	0.5	29	0553	0.6
SU	1049	1.9	M	1205	1.8
	1705	0.5		1806	0.7
●	2311	2.0			
15	0529	0.5	30	0027	1.9
M	1126	2.0	TU	0626	0.7
	1745	0.5		1241	1.8
	2351	2.0		1838	0.7

15-5/6

RED SEA - SUEZ

LAT 29°56'N LONG 32°33'E

TIME ZONE -0200 TIMES AND HEIGHTS OF HIGH AND LOW WATERS YEAR 1991

	TIME	M		TIME	M		TIME	M		TIME	M
	MAY					**JUNE**					
1	0102	1.8	16	0017	2.0	1	0138	1.7	16	0157	1.9
W	0658	0.7	TH	0639	0.4	SA	0742	0.6	SU	0817	0.2
	1315	1.7		1241	1.9		1359	1.6		1433	1.8
	1911	0.8		1902	0.4		2003	0.7		2050	0.3
2	0137	1.8	17	0111	2.0	2	0214	1.6	17	0257	1.8
TH	0732	0.7	F	0732	0.4	SU	0824	0.6	M	0916	0.2
	1349	1.7		1338	1.9		1440	1.6		1537	1.8
	1948	0.8		1959	0.4		2050	0.7		2153	0.3
3	0213	1.7	18	0208	1.9	3	0255	1.6	18	0400	1.8
F	0810	0.8	SA	0829	0.4	M	0910	0.6	TU	1018	0.3
	1427	1.7		1439	1.8		1525	1.6		1643	1.8
	2031	0.8		2101	0.4		2142	0.7		2300	0.4
4	0253	1.7	19	0310	1.9	4	0341	1.6	19	0506	1.7
SA	0854	0.8	SU	0930	0.4	TU	0959	0.6	W	1123	0.4
	1510	1.6		1546	1.8		1615	1.6		1751	1.7
	2121	0.8		2209	0.5		2236	0.7			
5	0340	1.6	20	0418	1.8	5	0430	1.5	20	0008	0.4
SU	0944	0.8	M	1037	0.4	W	1051	0.6	TH	0614	1.6
	1603	1.6		1658	1.8		1708	1.6		1231	0.4
	2217	0.8		2320	0.5		2331	0.7		1858	1.7
6	0433	1.6	21	0528	1.7	6	0523	1.5	21	0117	0.5
M	1039	0.8	TU	1147	0.5	TH	1144	0.6	F	0722	1.6
	1702	1.6		1811	1.8		1803	1.6		1337	0.5
	2317	0.8								2002	1.7
7	0531	1.6	22	0031	0.5	7	0027	0.7	22	0221	0.5
TU	1137	0.8	W	0638	1.7	F	0616	1.5	SA	0828	1.5
	1804	1.6		1257	0.5		1238	0.6		1438	0.5
				1920	1.8		1856	1.6		2100	1.7
8	0017	0.8	23	0139	0.5	8	0122	0.6	23	0318	0.5
W	0628	1.6	TH	0746	1.7	SA	0710	1.5	SU	0926	1.5
	1235	0.8		1402	0.5		1332	0.6		1531	0.6
	1901	1.6		2023	1.8		1948	1.7		2151	1.6
9	0113	0.7	24	0240	0.5	9	0214	0.6	24	0407	0.6
TH	0720	1.6	F	0847	1.7	SU	0804	1.6	M	1017	1.5
	1328	0.7		1500	0.5		1424	0.5		1614	0.6
	1950	1.7		2119	1.8		2038	1.7		2234	1.6
10	0204	0.7	25	0334	0.5	10	0304	0.5	25	0445	0.6
F	0807	1.6	SA	0942	1.7	M	0857	1.6	TU	1059	1.5
	1417	0.7		1551	0.6		1517	0.5		1649	0.6
	2035	1.7		2209	1.8		2129	1.8		2311	1.6
11	0251	0.6	26	0421	0.6	11	0354	0.4	26	0514	0.6
SA	0850	1.7	SU	1030	1.7	TU	0950	1.7	W	1134	1.4
	1504	0.6		1634	0.6		1609	0.4		1717	0.6
	2116	1.8		2252	1.8		2220	1.9		2341	1.6
12	0336	0.6	27	0501	0.6	12	0444	0.3	27	0540	0.6
SU	0932	1.8	M	1112	1.7	W	1043	1.8	TH	1204	1.5
	1549	0.6		1710	0.7		1702	0.3		1746	0.6
	2158	1.9		2330	1.8		2311	1.9			
13	0419	0.5	28	0534	0.6	13	0535	0.3	28	0000	1.6
M	1016	1.8	TU	1149	1.8	TH	1130	1.8	F	0607	0.5
	1634	0.5		1741	0.7		1756	0.3		1232	1.5
	2242	1.9								1818	0.6
14	0504	0.4	29	0004	1.7	14	0005	1.9	29	0036	1.6
TU	1101	1.9	W	0602	0.7	F	0626	0.2	SA	0639	0.5
	1720	0.4		1222	1.6		1234	1.8		1300	1.5
	2328	2.0		1810	0.7		1851	0.3		1855	0.6
15	0550	0.4	30	0035	1.7	15	0100	1.9	30	0105	1.6
W	1149	1.9	TH	0631	0.7	SA	0721	0.2	SU	0714	0.5
	1809	0.4		1252	1.6		1332	1.8		1331	1.5
				1843	0.7		1949	0.3		1935	0.5
			31	0106	1.7						
				0704	0.7						
			F	1324	1.6						
				1920	0.7						

	TIME	M		TIME	M		TIME	M		TIME	M
	JULY					**AUGUST**					
1	0137	1.6	16	0236	1.8	1	0213	1.5	16	0403	1.5
M	0753	0.4	TU	0853	0.1	TH	0840	0.3	F	1014	0.4
	1407	1.5		1517	1.8		1451	1.5		1652	1.6
	2019	0.5		2129	0.3		2115	0.5		2301	0.5
2	0214	1.6	17	0335	1.7	2	0256	1.5	17	0510	1.4
TU	0835	0.4	W	0951	0.2	F	0925	0.4	SA	1118	0.5
	1447	1.5		1619	1.7		1538	1.5		1800	1.5
	2105	0.5		2230	0.3		2207	0.5			
3	0254	1.5	18	0437	1.6	3	0345	1.4	18	0014	0.6
W	0919	0.4	TH	1052	0.3	SA	1016	0.4	SU	0627	1.3
	1531	1.5		1725	1.6		1633	1.5		1230	0.6
	2155	0.6		2339	0.4		2306	0.5		1909	1.4
4	0339	1.5	19	0545	1.5	4	0444	1.3	19	0129	0.6
TH	1006	0.5	F	1158	0.4	SU	1117	0.4	M	0744	1.2
	1619	1.5		1833	1.6		1738	1.5		1341	0.6
	2247	0.6								2012	1.4
5	0428	1.4	20	0049	0.5	5	0012	0.5	20	0233	0.6
F	1057	0.5	SA	0657	1.4	M	0554	1.3	TU	0848	1.2
	1713	1.5		1307	0.5		1227	0.4		1438	0.6
	2344	0.6		1939	1.5		1848	1.5		2103	1.4
6	0524	1.4	21	0159	0.5	6	0121	0.4	21	0318	0.5
SA	1153	0.5	SU	0808	1.3	TU	0711	1.3	W	0938	1.3
	1811	1.5		1413	0.5		1338	0.4		1521	0.6
				2039	1.5		1956	1.5		2144	1.4
7	0043	0.5	22	0300	0.5	7	0225	0.3	22	0351	0.5
SU	0625	1.4	M	0910	1.3	W	0824	1.4	TH	1016	1.3
	1253	0.5		1509	0.6		1444	0.3		1554	0.5
	1911	1.6		2131	1.5		2058	1.6		2217	1.5
8	0142	0.5	23	0349	0.5	8	0324	0.2	23	0418	0.4
M	0729	1.4	TU	1002	1.3	TH	0929	1.5	F	1046	1.4
	1355	0.4		1552	0.6		1544	0.2		1625	0.5
	2011	1.6		2213	1.5		2155	1.7		2245	1.5
9	0240	0.4	24	0423	0.5	9	0418	0.1	24	0444	0.4
TU	0833	1.5	W	1042	1.3	F	1027	1.6	SA	1112	1.4
	1455	0.3		1625	0.6		1640	0.1		1656	0.4
	2109	1.7		2247	1.5		2248	1.8		2309	1.5
10	0336	0.3	25	0450	0.5	10	0509	0.0	25	0513	0.3
W	0935	1.5	TH	1115	1.3	SA	1120	1.7	SU	1136	1.5
	1553	0.3		1659	0.5		1732	0.1		1729	0.4
	2205	1.7		2334	1.5	●	2358	1.8	O	2332	1.6
11	0429	0.2	26	0510	0.4	11	0558	0.1	26	0544	0.3
TH	1033	1.6	F	1141	1.4	SU	1212	1.8	M	1201	1.6
	1649	0.2		1722	0.5		1823	0.0		1803	0.4
●	2259	1.8	O	2341	1.5					2359	1.6
12	0522	0.1	27	0542	0.4	12	0028	1.8	27	0617	0.3
F	1129	1.7	SA	1206	1.4	M	0646	0.0	TU	1228	1.6
	1744	0.1		1755	0.5		1304	1.8		1838	0.4
	2352	1.9					1913	0.1			
13	0614	0.0	28	0000	1.6	13	0119	1.8	28	0000	1.6
SA	1225	1.8	SU	0612	0.3	TU	0734	0.0	W	0650	0.3
	1839	0.1		1232	1.5		1356	1.8		1300	1.6
				1829	0.4		2005	0.2		1916	0.4
14	0046	1.9	29	0032	1.6	14	0210	1.7	29	0102	1.6
SU	0705	0.0	M	0646	0.3	W	0824	0.1	TH	0727	0.3
	1321	1.8		1301	1.5		1451	1.7		1336	1.6
	1934	0.1		1907	0.4		2058	0.3		1956	0.4
15	0140	1.8	30	0102	1.6	15	0304	1.6	30	0140	1.6
M	0758	0.0	TU	0722	0.3	TH	0917	0.2	F	0806	0.3
	1418	1.8		1333	1.5		1548	1.6		1418	1.6
	2030	0.2		1946	0.4		2156	0.4		2041	0.4
			31	0130	1.6				31	0223	1.5
				0806	0.3					0852	0.3
			W	1409	1.6				SA	1507	1.6
				2029	0.4					2134	0.5

15-6/6

RED SEA - SUEZ

LAT 29°56'N LONG 32°33'E

TIME ZONE -0200 TIMES AND HEIGHTS OF HIGH AND LOW WATERS YEAR 1991

SEPTEMBER

Day	TIME	M	Day	TIME	M
1 SU	0315	1.4	16 M	0547	1.3
	0946	0.4		1138	0.7
	1606	1.5		1829	1.4
	2238	0.5			
2 M	0420	1.3	17 TU	0037	0.7
	1054	0.4		0707	1.2
	1717	1.5		1251	0.7
	2352	0.5		1932	1.4
3 TU	0541	1.3	18 W	0143	0.7
	1214	0.4		0813	1.3
	1835	1.5		1353	0.7
				2025	1.4
4 W	0108	0.4	19 TH	0231	0.6
	0707	1.3		0902	1.3
	1332	0.4		1440	0.6
	1948	1.5		2106	1.5
5 TH	0216	0.3	20 F	0307	0.5
	0823	1.4		0940	1.4
	1439	0.3		1518	0.6
	2050	1.6		2140	1.5
6 F	0315	0.2	21 SA	0339	0.5
	[illegible]	[illegible]		1011	1.5
	1537	0.2		1553	0.5
	2145	1.7		2209	1.6
7 SA	0407	0.1	22 SU	0410	0.4
	1019	1.7		1038	1.6
	1629	0.1		1627	0.5
	2235	1.8		2235	1.6
8 SU	0455	0.0	23 M	0442	0.4
	1109	1.8		1103	1.6
	1718	0.1		1701	0.4
	● 2323	1.9		O 2301	1.7
9 M	0540	0.0	24 TU	0514	0.3
	1157	1.9		1129	1.7
	1805	0.1		1736	0.4
				2329	1.7
10 TU	0009	1.9	25 W	0548	0.3
	0624	0.1		1159	1.8
	1244	1.9		1812	0.4
	1850	0.2			
11 W	0056	1.8	26 TH	0000	1.8
	0708	0.1		0622	0.3
	1332	1.8		1232	1.8
	1937	0.3		1849	0.4
12 TH	0142	1.7	27 F	0036	1.7
	0752	0.3		0700	0.3
	1421	1.8		1311	1.8
	2024	0.4		1931	0.5
13 F	0231	1.6	28 SA	0117	1.7
	0838	0.4		0742	0.4
	1513	1.7		1355	1.7
	2116	0.5		2018	0.5
14 SA	0324	1.5	29 SU	0204	1.6
	0929	0.5		0831	0.4
	1612	1.6		1447	1.7
	2214	0.6		2114	0.5
15 SU	0428	1.3	30 M	0301	1.5
	1028	0.6		0931	0.5
	1718	1.5		1551	1.6
	2323	0.7		2222	0.5

OCTOBER

Day	TIME	M	Day	TIME	M
1 TU	0413	1.4	16 W	0610	1.4
	1046	0.5		1147	0.8
	1706	1.6		1833	1.5
	2340	0.5			
2 W	0541	1.4	17 TH	0032	0.8
	1209	0.5		0719	1.4
	1826	1.6		1254	0.8
				1929	1.5
3 TH	0057	0.5	18 F	0129	0.7
	0708	1.5		0813	1.5
	1327	0.5		1350	0.8
	1938	1.6		2016	1.6
4 F	0206	0.4	19 SA	0216	0.7
	0820	1.6		0855	1.5
	1432	0.4		1436	0.7
	2040	1.7		2054	1.6
5 SA	0303	0.3	20 SU	0256	0.6
	0919	1.7		0930	1.6
	1529	0.3		1517	0.6
	2134	1.8		2127	1.7
6 SU	0354	0.2	21 M	0333	0.5
	1010	1.8		1000	1.7
	1618	0.3		1556	0.6
	2223	1.9		2157	1.7
7 M	0440	0.2	22 TU	0409	0.5
	1057	1.9		1029	1.8
	1704	0.3		1633	0.5
	● 2308	1.9		2228	1.8
8 TU	0523	0.2	23 W	0445	0.4
	1142	1.9		1100	1.9
	1748	0.3		1710	0.5
	2352	1.9		O 2301	1.8
9 W	0603	0.3	24 TH	0522	0.4
	1225	1.9		1133	1.9
	1829	0.4		1749	0.5
				2337	1.9
10 TH	0034	1.8	25 F	0600	0.4
	0642	0.4		1211	2.0
	1308	1.9		1830	0.5
	1910	0.5			
11 F	0116	1.8	26 SA	0018	1.9
	0721	0.5		0641	0.4
	1351	1.8		1254	1.9
	1951	0.6		1914	0.5
12 SA	0159	1.6	27 SU	0105	1.8
	0801	0.6		0728	0.4
	1436	1.7		1342	1.9
	2035	0.7		2005	0.5
13 SU	0245	1.5	28 M	0157	1.8
	0844	0.7		0822	0.5
	1526	1.6		1438	1.8
	2124	0.8		2103	0.5
14 M	0340	1.4	29 TU	0300	1.7
	0936	0.8		0925	0.5
	1623	1.6		1542	1.8
	2222	0.8		2211	0.6
15 TU	0450	1.4	30 W	0414	1.6
	1038	0.8		1040	0.6
	1728	1.5		1655	1.7
	2327	0.8		2326	0.6
			31 TH	0539	1.6
				1159	0.6
				1812	1.7

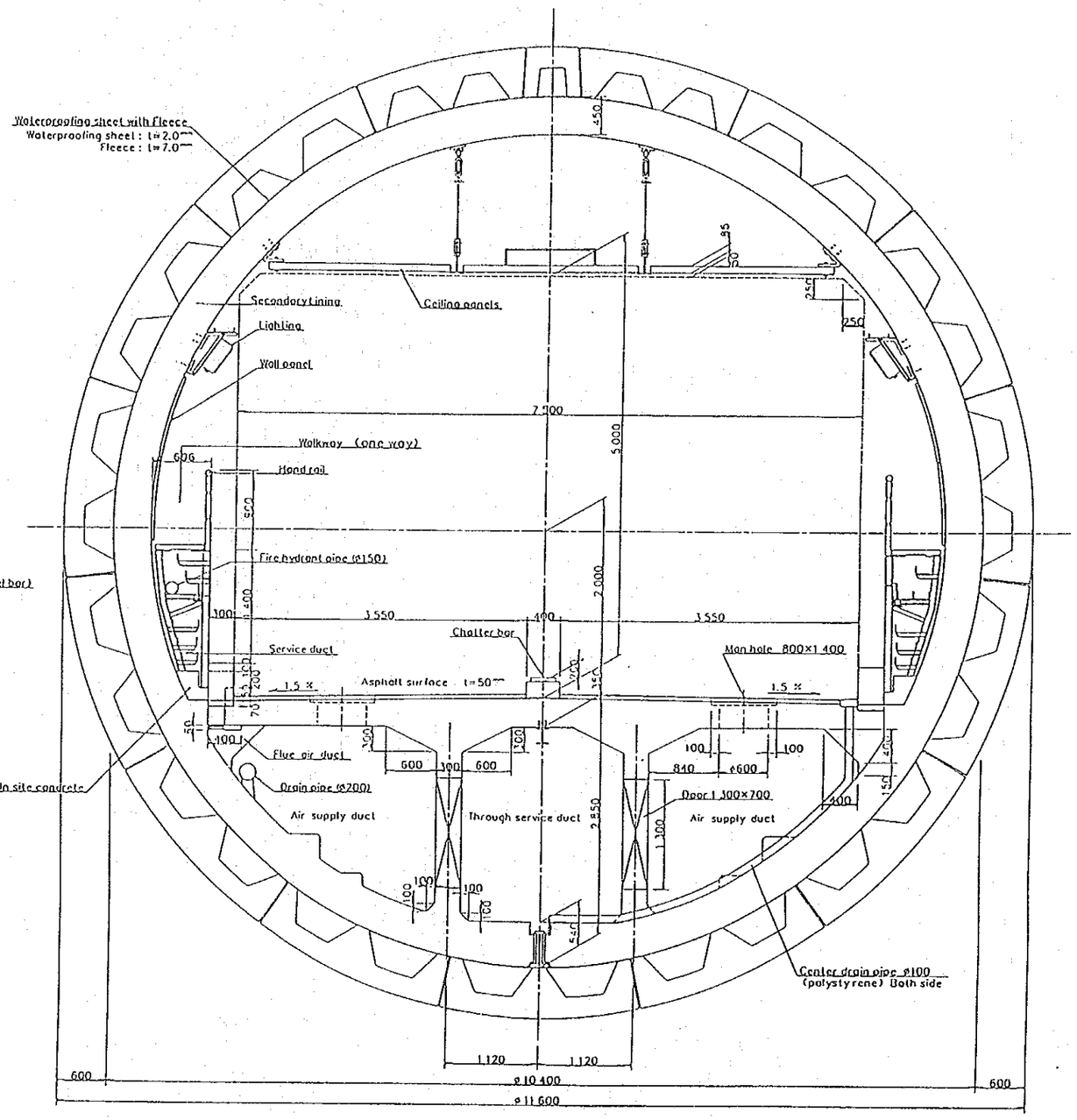
NOVEMBER

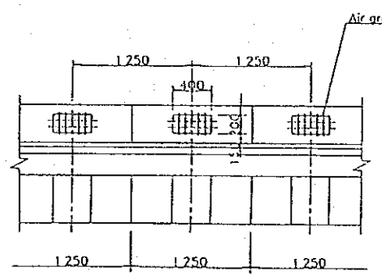
Day	TIME	M	Day	TIME	M
1 F	0041	0.5	16 SA	0023	0.9
	0700	1.7		0706	1.6
	1315	0.6		1254	0.9
	1923	1.8		1907	1.6
2 SA	0150	0.5	17 SU	0119	[illegible]
	0810	1.7		0758	[illegible]
	1421	0.5		1349	0.8
	2026	1.8		1955	[illegible]
3 SU	0249	0.4	18 M	0209	0.7
	0908	1.8		0841	[illegible]
	1518	0.5		1438	0.8
	2122	1.9		2038	[illegible]
4 M	0341	0.4	19 TU	0254	0.6
	1000	1.9		0919	1.8
	1608	0.5		1523	0.7
	2211	1.9		2118	[illegible]
5 TU	0427	0.4	20 W	0337	0.6
	1046	2.0		0956	1.9
	1653	0.5		1606	0.6
	2256	1.9		2157	1.9
6 W	0508	0.5	21 TH	0418	0.5
	1129	2.0		[illegible]	[illegible]
	1734	0.6		1648	0.6
	● 2338	1.9		O 2238	1.9
7 TH	0546	0.5	22 F	0500	0.5
	1209	2.0		1113	2.0
	1812	0.6		1731	0.5
				2322	1.9
8 F	0017	1.8	23 SA	0544	0.4
	0620	0.6		1156	2.1
	1247	1.9		1816	0.5
	1847	0.7			
9 SA	0055	1.8	24 SU	0009	1.9
	0653	0.6		0630	0.4
	1324	1.9		1243	2.1
	1922	0.7		1904	[illegible]
10 SU	0132	1.7	25 M	0100	[illegible]
	0728	0.7		0721	[illegible]
	1401	1.8		1334	[illegible]
	2000	0.8		[illegible]	[illegible]
11 M	0210	1.6	26 TU	0156	[illegible]
	0808	0.8		0817	[illegible]
	1440	1.7		1430	[illegible]
	2042	0.8		[illegible]	[illegible]
12 TU	0254	1.6	27 W	[illegible]	[illegible]
	0853	0.8		[illegible]	[illegible]
	1524	1.7		[illegible]	[illegible]
	2130	0.8		2157	[illegible]
13 W	0347	1.5	28 TH	[illegible]	[illegible]
	0947	0.9		[illegible]	[illegible]
	1615	1.6		1639	[illegible]
	2224	0.8		[illegible]	[illegible]
14 TH	0452	1.5	29 F	0526	[illegible]
	1048	0.9		[illegible]	[illegible]
	1713	1.6		[illegible]	[illegible]
	2324	0.8			
15 F	0603	1.5	30 SA	[illegible]	[illegible]
	1152	0.9		0642	[illegible]
	1812	1.6		[illegible]	[illegible]
				[illegible]	[illegible]

DECEMBER

Day	TIME	M	Day	TIME	M
1 SU	0129	0.6	16 M	0021	0.8
	0753	1.8		0647	1.7
	1405	0.7		1258	0.9
	2010	1.8		1846	1.7
2 M	0233	[illegible]	17 TU	0119	0.8
	0856	1.9		0745	1.7
	1507	[illegible]		1356	0.8
	2110	[illegible]		1944	1.7
3 TU	0329	[illegible]	18 W	0214	0.7
	0950	1.9		0837	1.8
	1601	0.7		1450	0.8
	2203	[illegible]		2039	1.7
4 W	0417	0.6	19 TH	0306	0.6
	1038	2.0		0925	1.9
	1647	0.7		1540	0.7
	2250	[illegible]		2131	1.8
5 TH	0458	0.6	20 F	0355	0.6
	1120	2.0		1011	2.0
	1726	0.7		1629	0.6
	2331	1.8		2221	1.9
6 F	0532	0.7	21 SA	0444	0.5
	1157	[illegible]		1057	2.0
	1759	0.7		1716	0.5
	●			O 2312	1.9
7 SA	0007	1.8	22 SU	0532	0.4
	0602	0.7		1144	2.1
	1230	1.9		1804	0.4
	1828	0.8			
8 SU	0040	1.7	23 M	0003	2.0
	0631	0.7		0621	0.4
	1301	1.9		1234	2.2
	1858	0.8		1853	0.4
9 M	0110	1.7	24 TU	0057	2.0
	0703	0.8		0713	0.4
	1331	1.9		1325	2.2
	1930	0.8		1945	0.4
10 TU	0142	1.7	25 W	0152	2.0
	0739	0.8		0807	0.4
	1402	1.8		1418	2.1
	2007	[illegible]		2039	0.4
11 W	0218	1.7	26 TH	0251	2.0
	0820	0.8		0905	0.5
	1436	1.8		1515	2.1
	2049	[illegible]		2138	0.4
12 TH	0259	1.7	27 F	0355	1.9
	0907	0.8		1007	0.5
	1515	[illegible]		1617	2.0
	2136	[illegible]		2241	0.5
13 F	0347	1.6	28 SA	0504	1.9
	0958	[illegible]		1116	0.6
	1600	1.7		1725	1.9
	2222	[illegible]		2351	0.6
14 SA	0442	1.6	29 SU	0618	1.8
	1056	[illegible]		1230	0.7
	1651	1.7		1838	1.8
	2323	0.5			
15 SU	0544	1.6	30 M	0104	0.6
	1156	0.9		0732	1.8
	1747	[illegible]		1345	0.7
				1951	1.7
			31 TU	0215	0.7
				0840	1.8
				1455	0.8
				2059	1.7

Drawings





Arrangement of Flue air duct

Dwg. 1 Typical Section

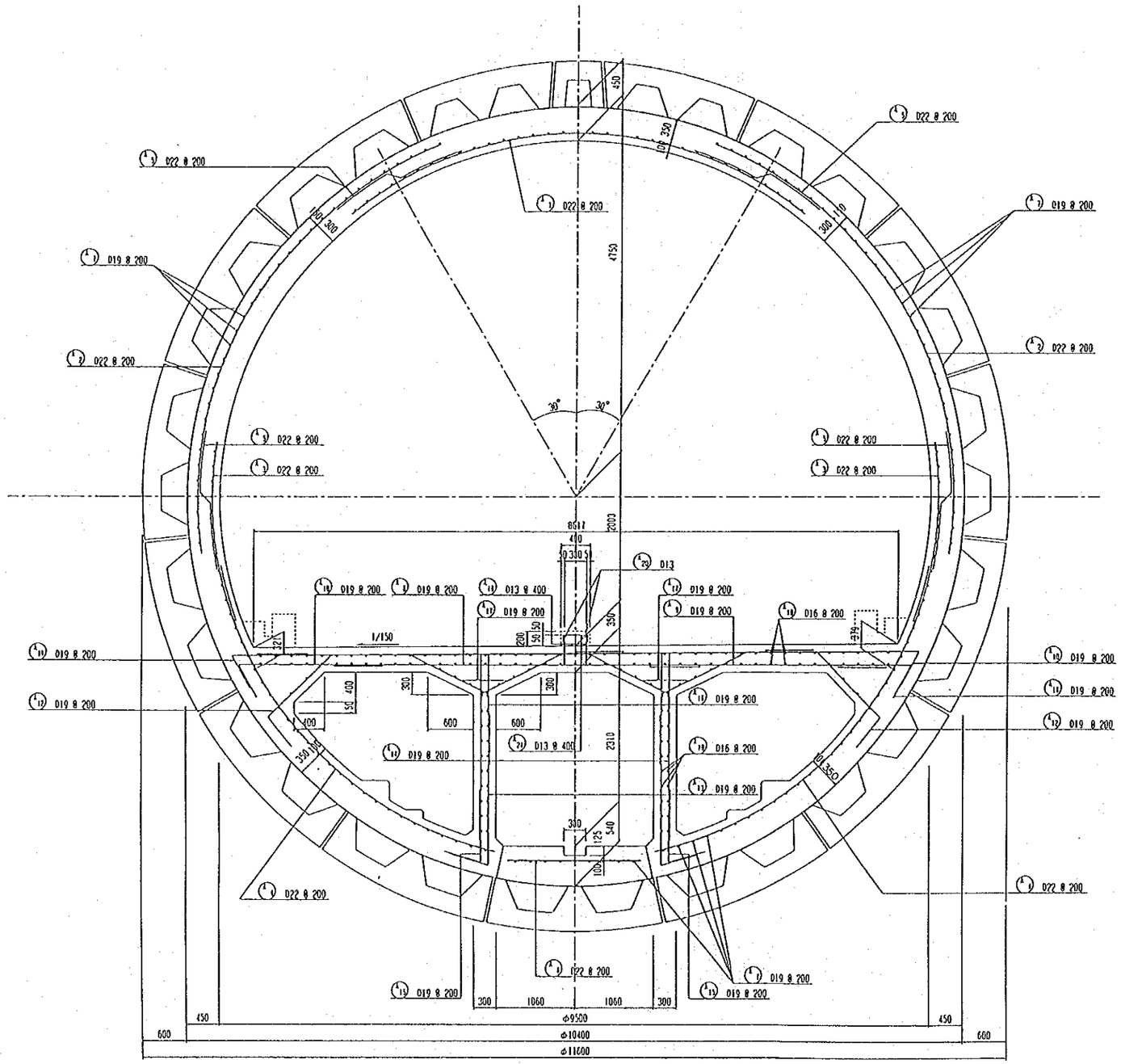
D-1

AHAMED HAMDI TUNNEL

TYPICAL SECTION

Scale		Date		Review	

JICA



Dwg. 2 General Arrangement of Reinforcing Steel Bar

LIST OF REINFORCEMENT

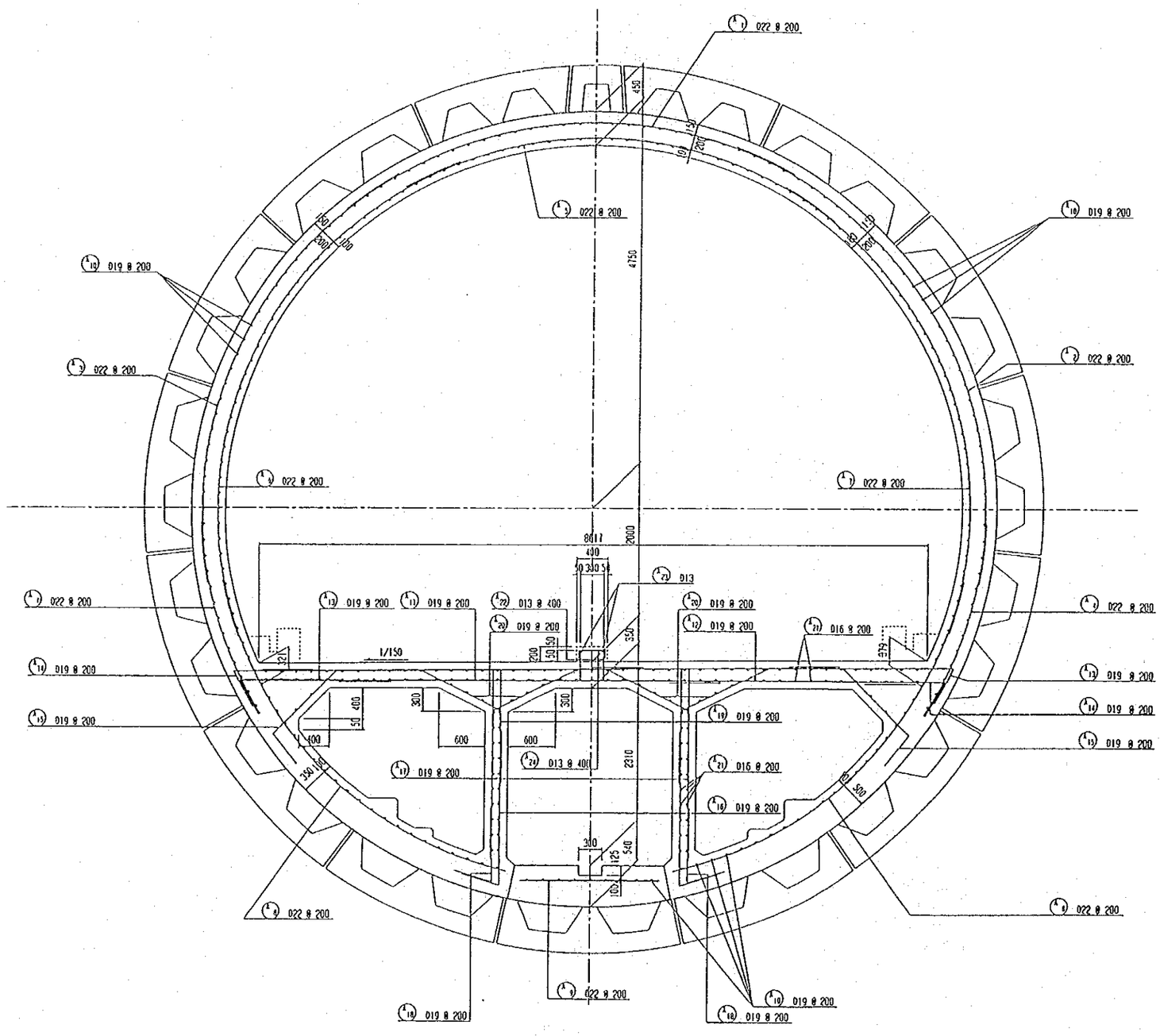
MARK	DIA	LENGTH	EACH	WEIGHT/m	WEIGHT/ONE	WEIGHT	REMARKS
PER ONE SENTERING (L = 10,500 m)							
A 1	D22	6 620	52	3.04	20.1	1 045	
2	〃	6 830	104	〃	20.8	2 163	〃
3	〃	2 460	104	〃	7.48	778	〃
4	〃	5 590	104	〃	17.0	1 768	〃
5	〃	1 820	208	〃	5.53	1 150	
6	〃	1 790	52	〃	5.44	283	
7	D19	10 200	180	2.25	23.0	4 140	〃
8	〃	4 910	104	〃	11.0	1 144	〃
9	〃	3 180	104	〃	7.16	745	〃
10	〃	2 500	104	〃	5.63	585	
11	〃	1 500	104	〃	3.38	352	〃
12	〃	1 670	104	〃	3.76	391	
13	〃	2 510	104	〃	5.65	588	
14	〃	2 470	104	〃	5.56	578	
15	〃	1 460	104	〃	3.29	342	
16	〃	1 470	104	〃	3.31	344	
17	〃	1 170	104	〃	2.63	274	
18	D16	10 200	142	1.56	15.9	2 258	
19	D13	400	54	0.995	0.398	21	
20	〃	500	27	〃	0.498	13	
					D22	7 187 kg	
					D19	9 484 〃	
					D16	2 258 〃	
					D13	34 〃	
					TOTAL	18 963 kg	

AHAMED HAMDI TUNNEL

GENERAL ARRANGEMENT OF REINFORCING STEEL BAR

Scale		Date		Review	

JICA



Drw. 3 Arrangement of Reinforcing Steel Bar under the Canal

LIST OF REINFORCEMENT

MARK	DIA	LENGTH	EACH	WEIGHT/m	WEIGHT/ONE	WEIGHT	REMARKS
PER ONE SENTERING (L = 10,500 m)							
A 1	D22	6 060	52	3.04	18.4	957	
2	"	7 080	52	"	21.5	1 118	"
3	"	6 310	52	"	19.2	998	"
4	"	2 650	104	"	8.06	838	"
5	"	5 850	52	"	17.8	926	"
6	"	7 560	52	"	23.0	1 196	"
7	"	6 790	52	"	20.6	1 071	"
8	"	5 590	104	"	17.0	1 768	"
9	"	1 790	52	"	5.44	283	
10	D19	10 200	241	2.25	23.0	5 543	"
11	"	4 910	104	"	11.0	1 144	"
12	"	3 188	104	"	7.16	745	"
13	"	2 500	104	"	5.63	586	
14	"	1 500	104	"	3.38	352	"
15	"	1 670	104	"	3.76	391	
16	"	2 510	104	"	5.65	588	
17	"	2 470	104	"	5.56	578	
18	"	1 460	104	"	3.29	342	
19	"	1 470	104	"	3.31	344	
20	"	1 170	104	"	2.63	274	
21	D16	10 200	142	1.56	15.9	2 258	
22	D13	400	54	0.995	0.398	21	
23	"	500	27	"	0.499	13	
24	"	10 200	2	"	10.1	20	

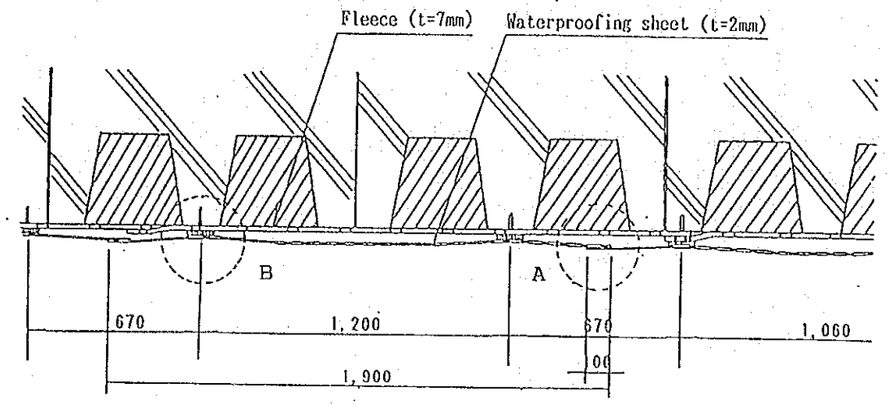
D22	9 155 kg
D19	10 887 "
D16	2 258 "
D13	54 "
TOTAL	22 354 kg

AHAMED HAMDI TUNNEL

ARRANGEMENT OF REINFORCING STEEL BAR UNDER THE CANAL

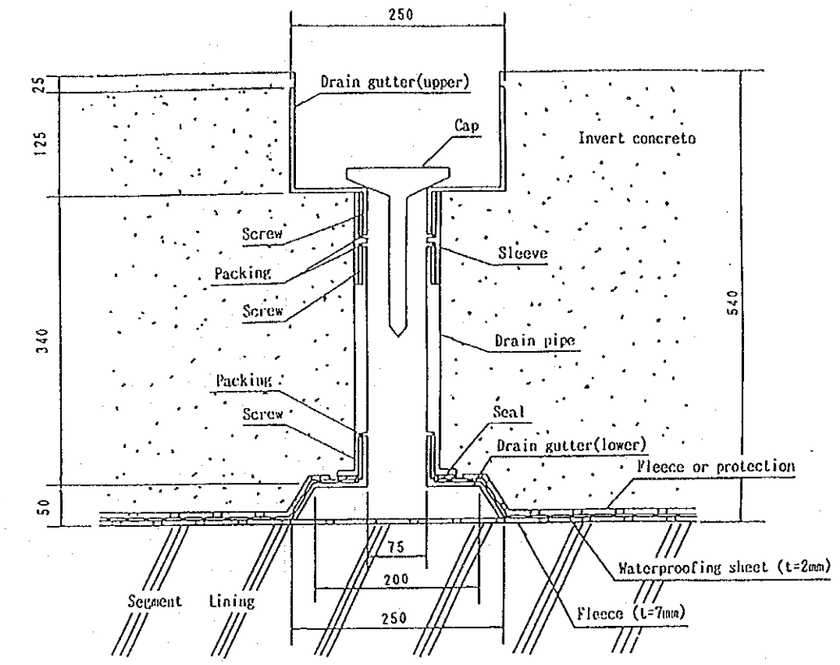
Scale		Date		Review	

JICA

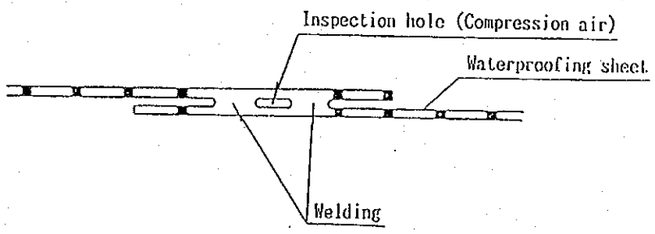


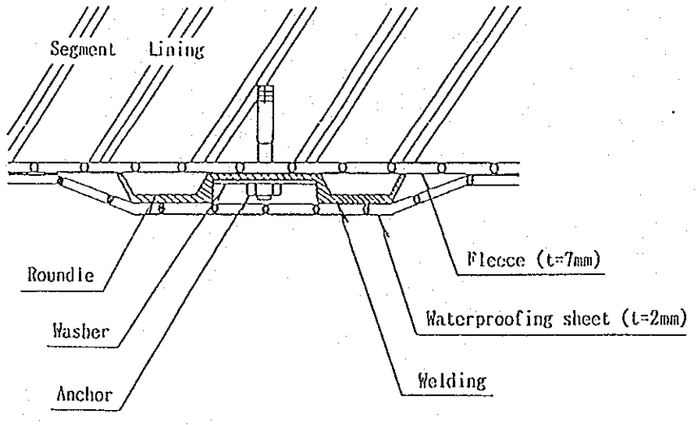
DETAIL A

DETAIL B



DETAIL OF DRAIN GUTTER

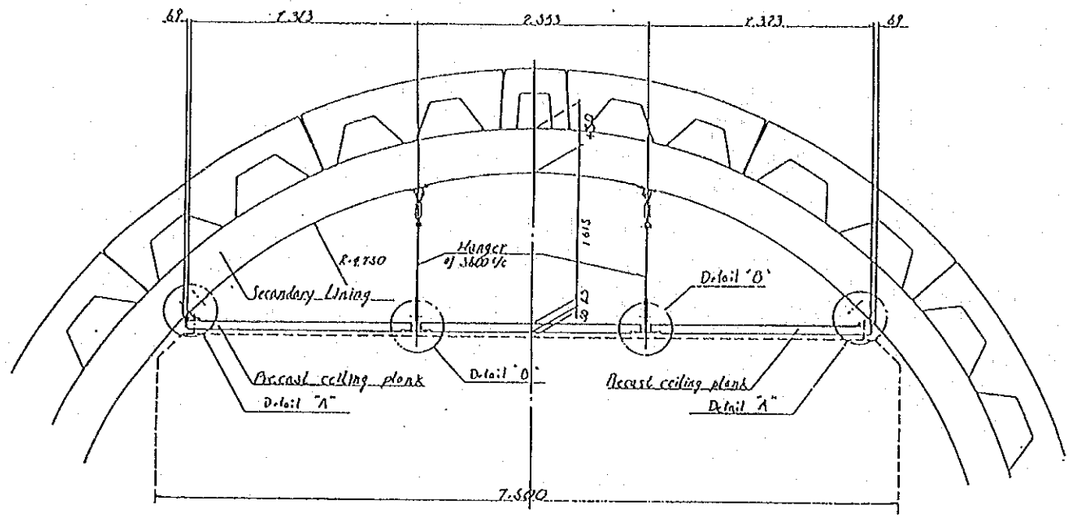




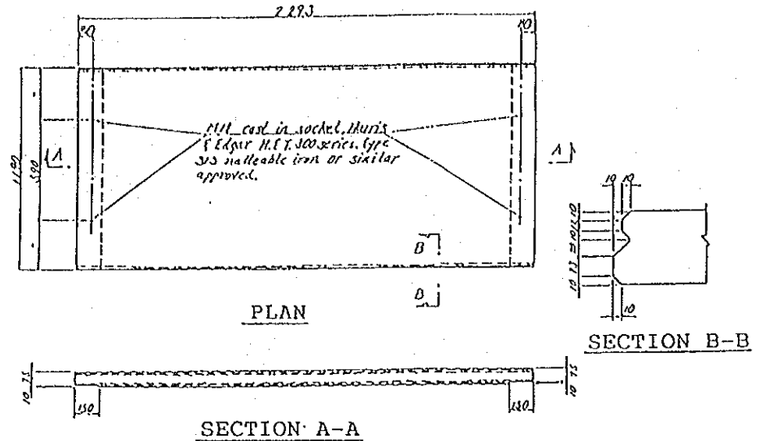
APPLICATION OF THE WATERPROOFING MEMBRANCE

AHAMED HAMDI TUNNEL					
WATERPROOFING MEMBRANCE AND DRAIN GUTTER					
Scale		Date		Review	
JICA					

Drw. 4 Waterproofing Membrance and Drain gutter



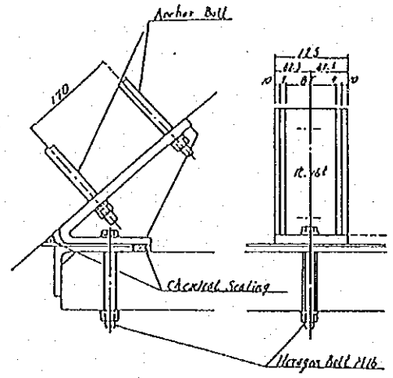
POSITION OF SUPPORT AND HANGER



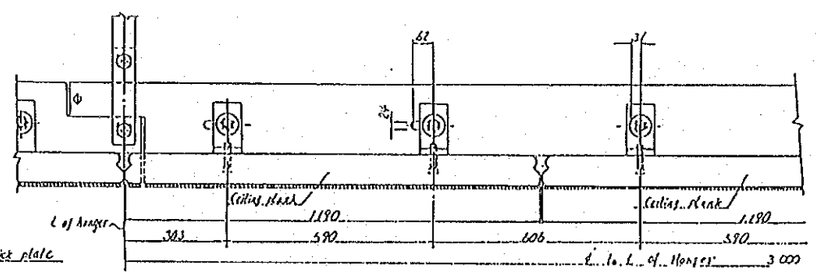
MIDDLE CEILING PRECAST CONCRETE PANEL

MIDDLE HANGER

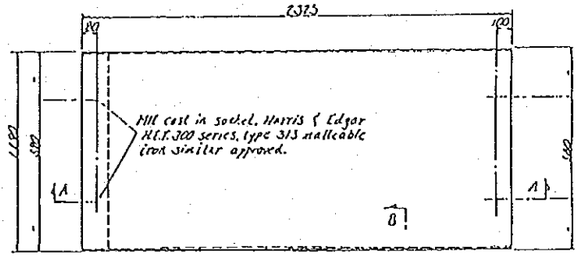
DETAIL OF EAVES FIXING



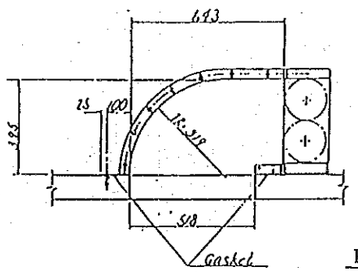
SUPPORTS



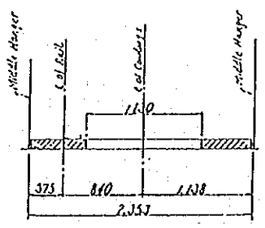
ELEVATION ON MIDDLE HANGER



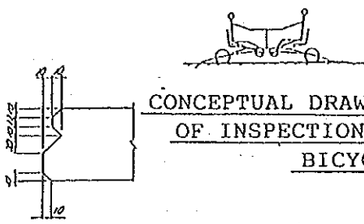
SIDE CEILING PRECAST CONCRETE PANEL



EXHAUST COWLINGS



POSITION RAIL AND COWLINGS



CONCEPTUAL DRAWING OF INSPECTION BICYCLE

Note; The rail composed of single steel angle is set up for inspection bicycle running along it.

AHAMED HAMDI TUNNEL

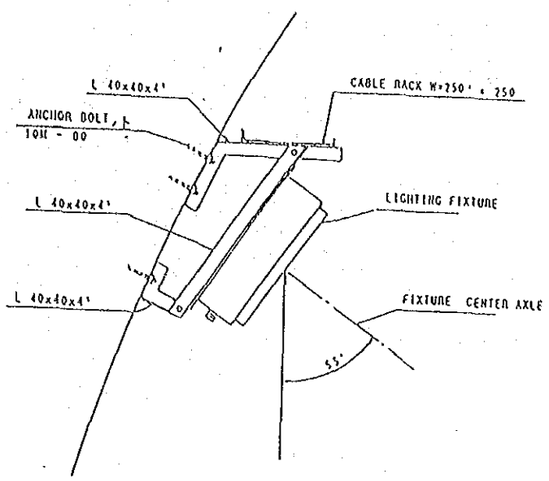
CEIRING STRUCTURE AND ARRANGEMENT

Scale		Date		Review	

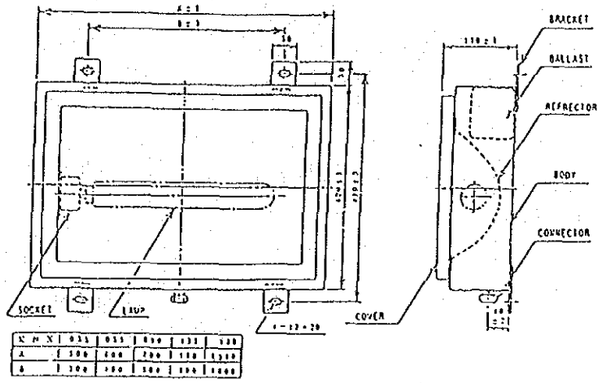
JICA

Drw. 5 Ceiling

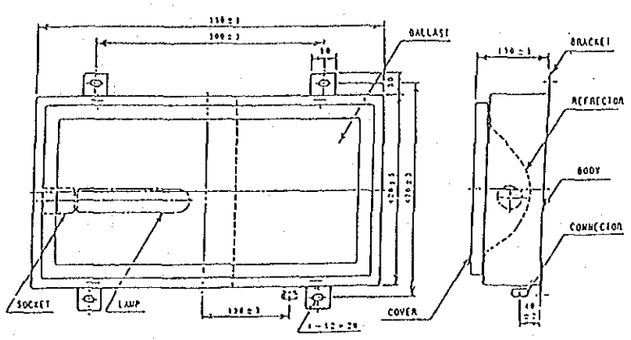
INSTALLATION OF LIGHTING FIXTURE



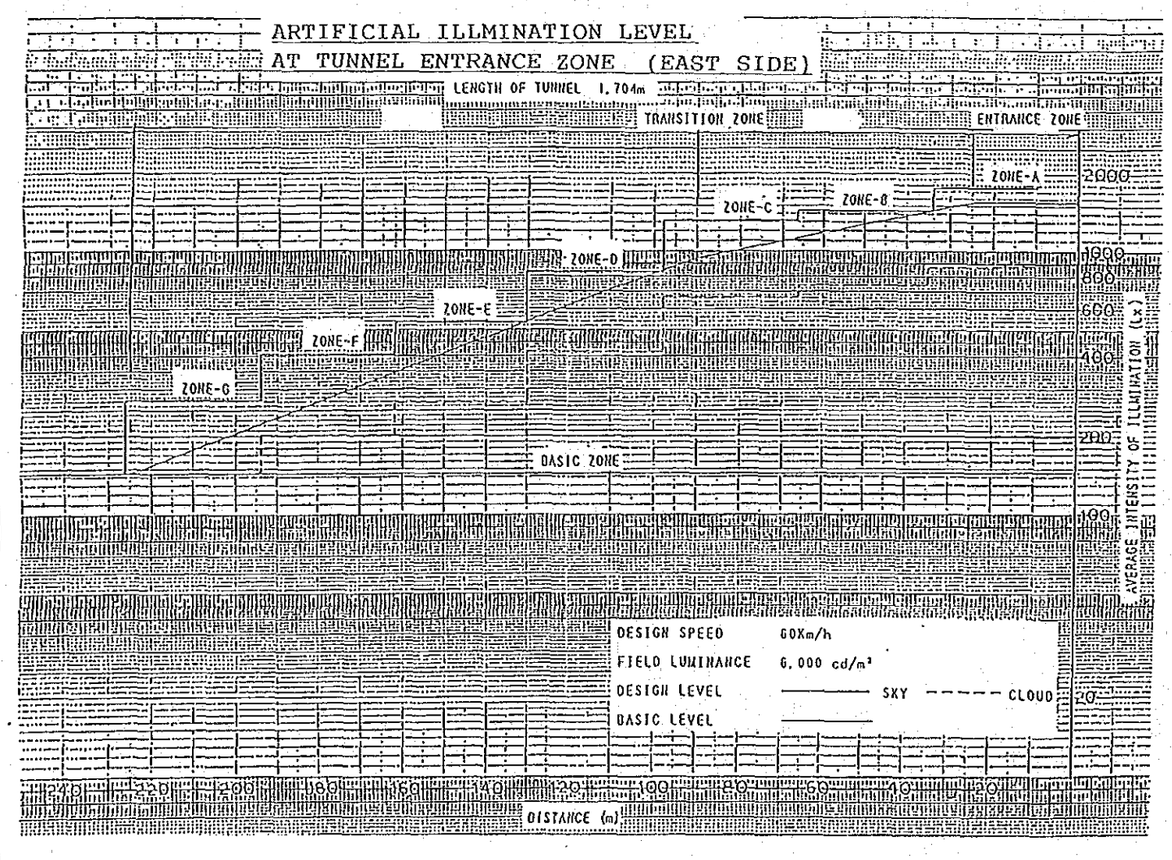
LOW PRESSURE SODIUM LAMP FIXTURE (mm)



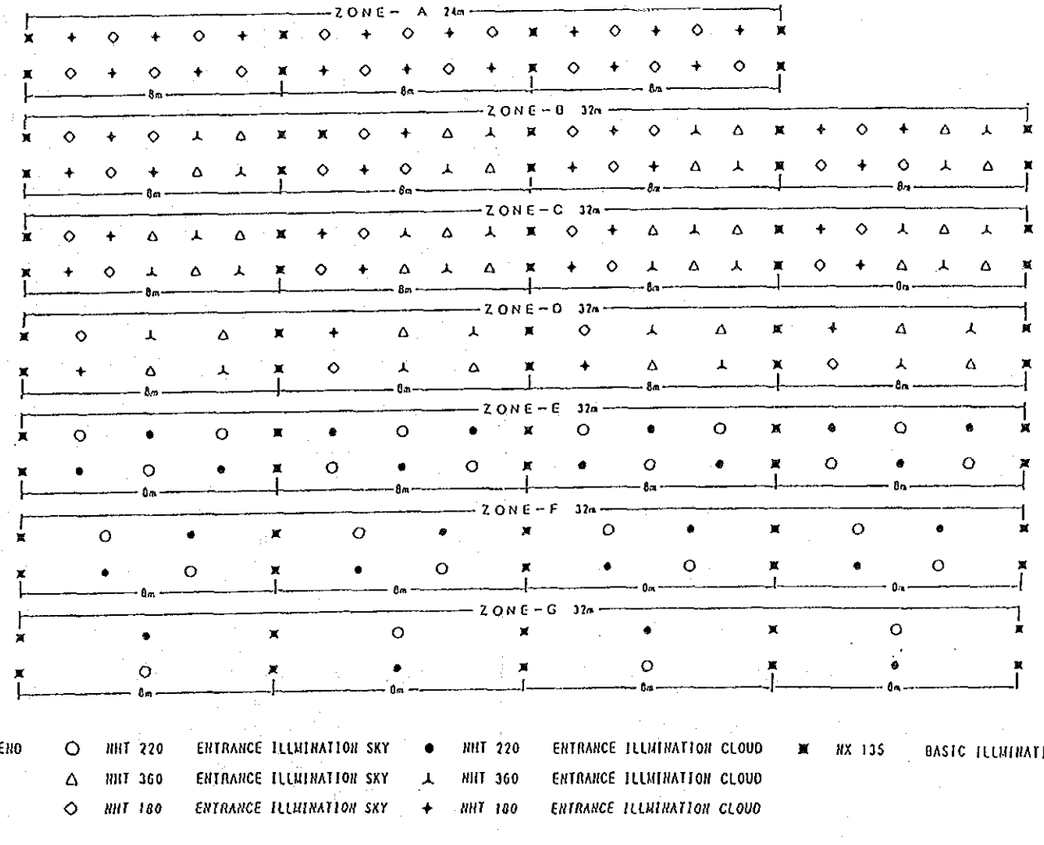
HIGH PRESSURE SODIUM LAMP FIXTURE (mm)



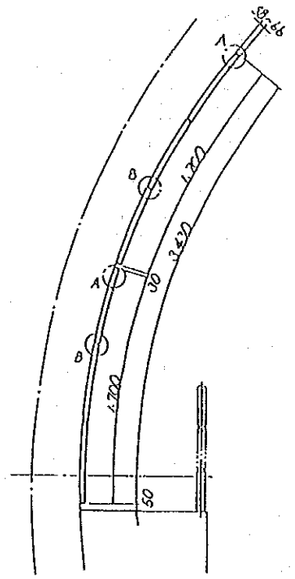
ARTIFICIAL ILLMINATION LEVEL AT TUNNEL ENTRANCE ZONE (EAST SIDE)

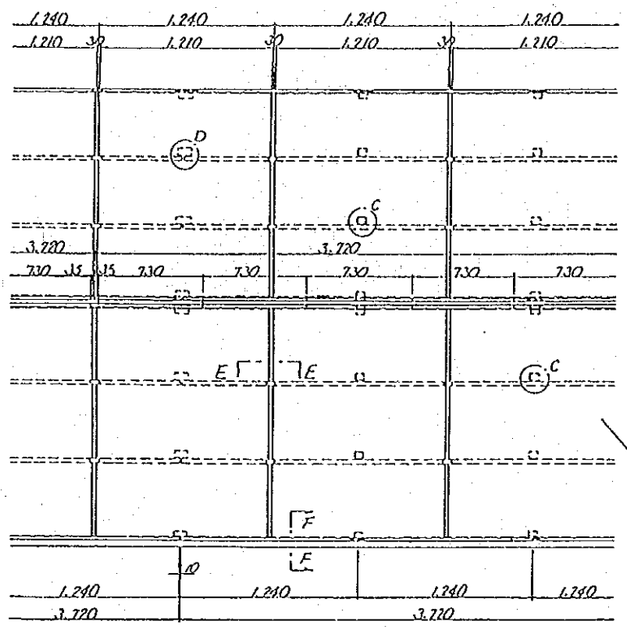


EAST SIDE ENTRANCE ILLMINATION FIXTURE LAYOUT

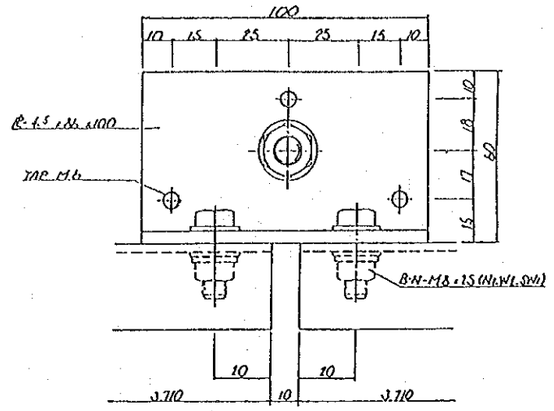


Drw. 6 Tunnel Lighting by Sodium Lamp



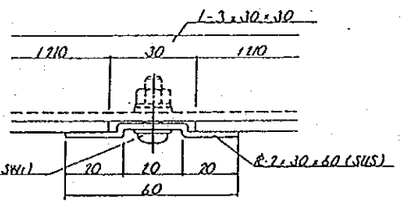


STANDARD ARRANGEMENT OF WALL PANEL

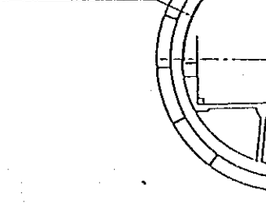


DETAIL D

Silicic acid calcium panel with inorganic coating

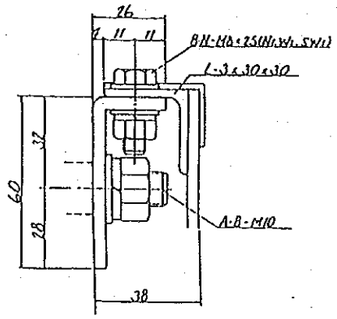


SECTION E-E

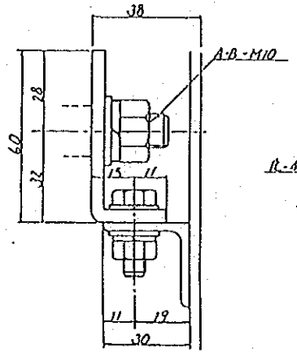


SECTION F-F

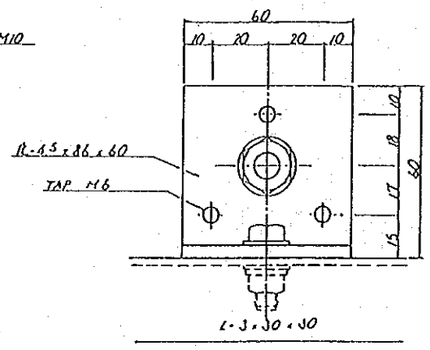
SCHEMATIC GENERAL ARRANGEMENT



DETAIL A



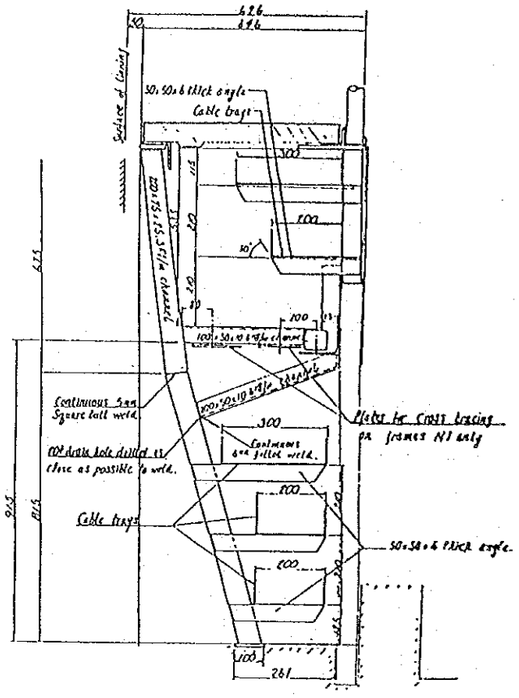
DETAIL B



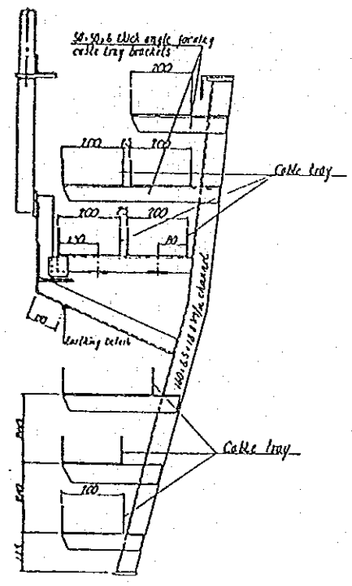
DETAIL C

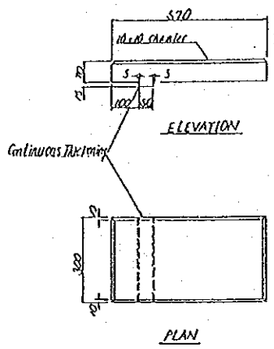
AHAMED HAMDI TUNNEL					
GENERAL ARRANGEMENT OF WALL PANEL					
Scale		Date		Review	
JICA					

Drw. 7 Wall Panel

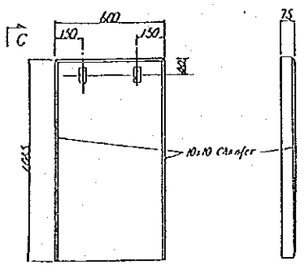


STANDARD WALKWAY FRAME

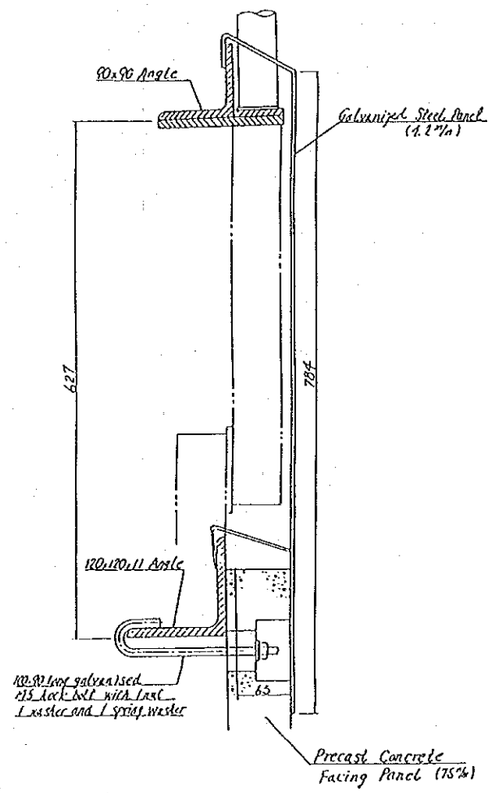




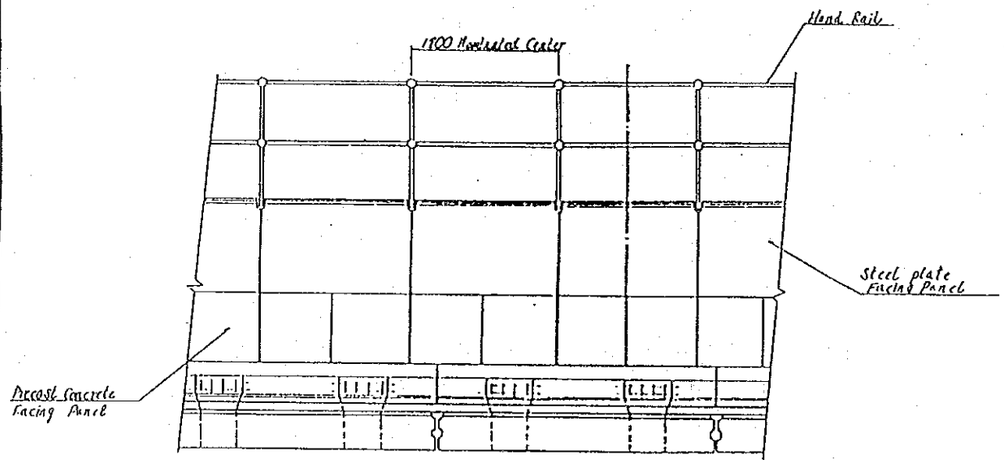
PRECAST CONCRETE FLOOR PANEL



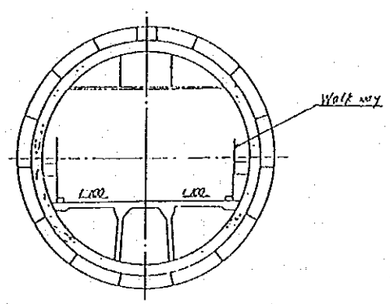
PRECAST CONCRETE FACING PANEL



STEEL PLATE FACING PANEL



WALKWAY GENERAL ARRANGEMENT



SCHEMATIC GENERAL ARRANGEMENT

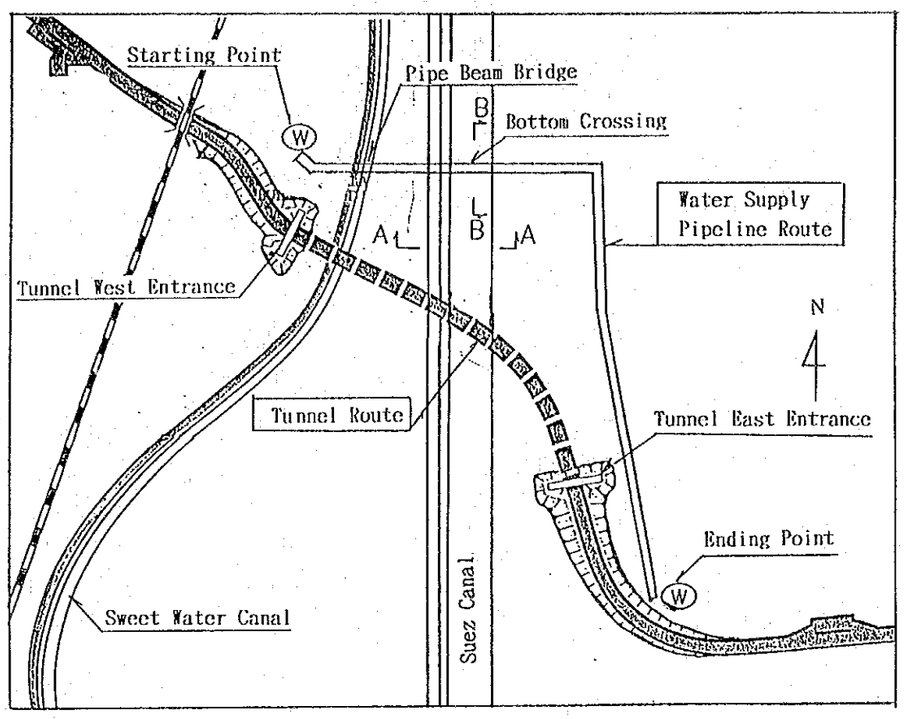
AHAMED HAMDI TUNNEL

TUNNEL WALKWAY

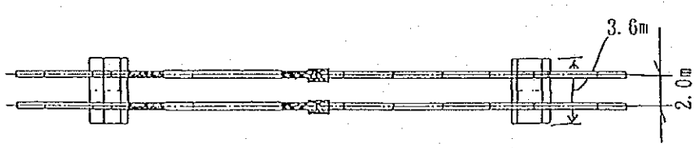
Scale		Date		Review	

JICA

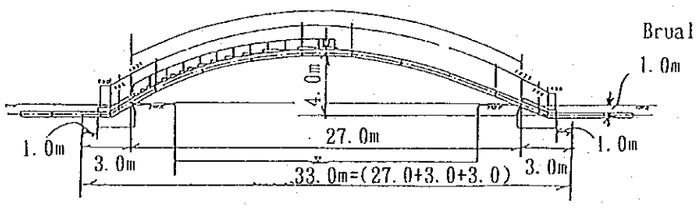
Drw. 8 Walkway



Fresh Water Supply Pipeline to be moved out from Tunnel to onland route with Crossing Suez Canal

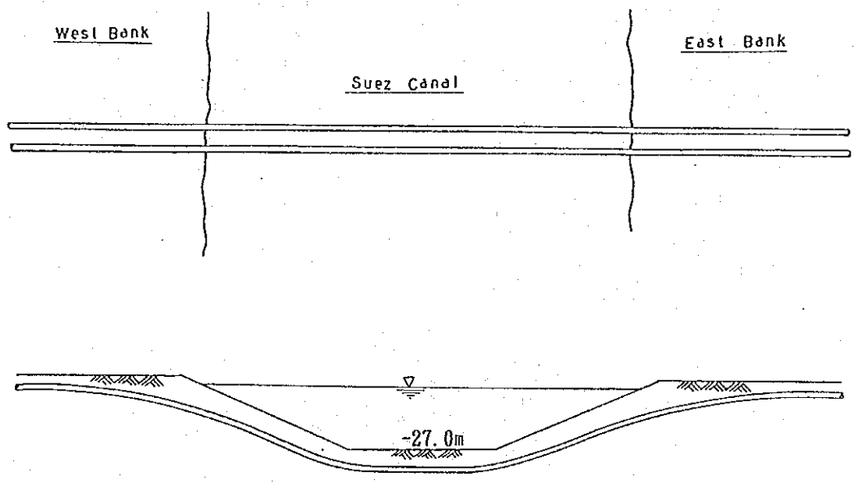


Plane

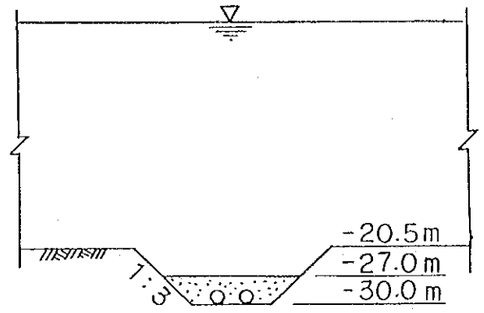


Vertical

500mm NID Arched Pipe Beam Bridge



Bottom Pull Method for the Canal Crossing Pipeline (A-A)



Bottom Pull Method for the Canal

Crossing Pipeline (B-B)

Drw. 9 Fresh Water Supply Pipeline