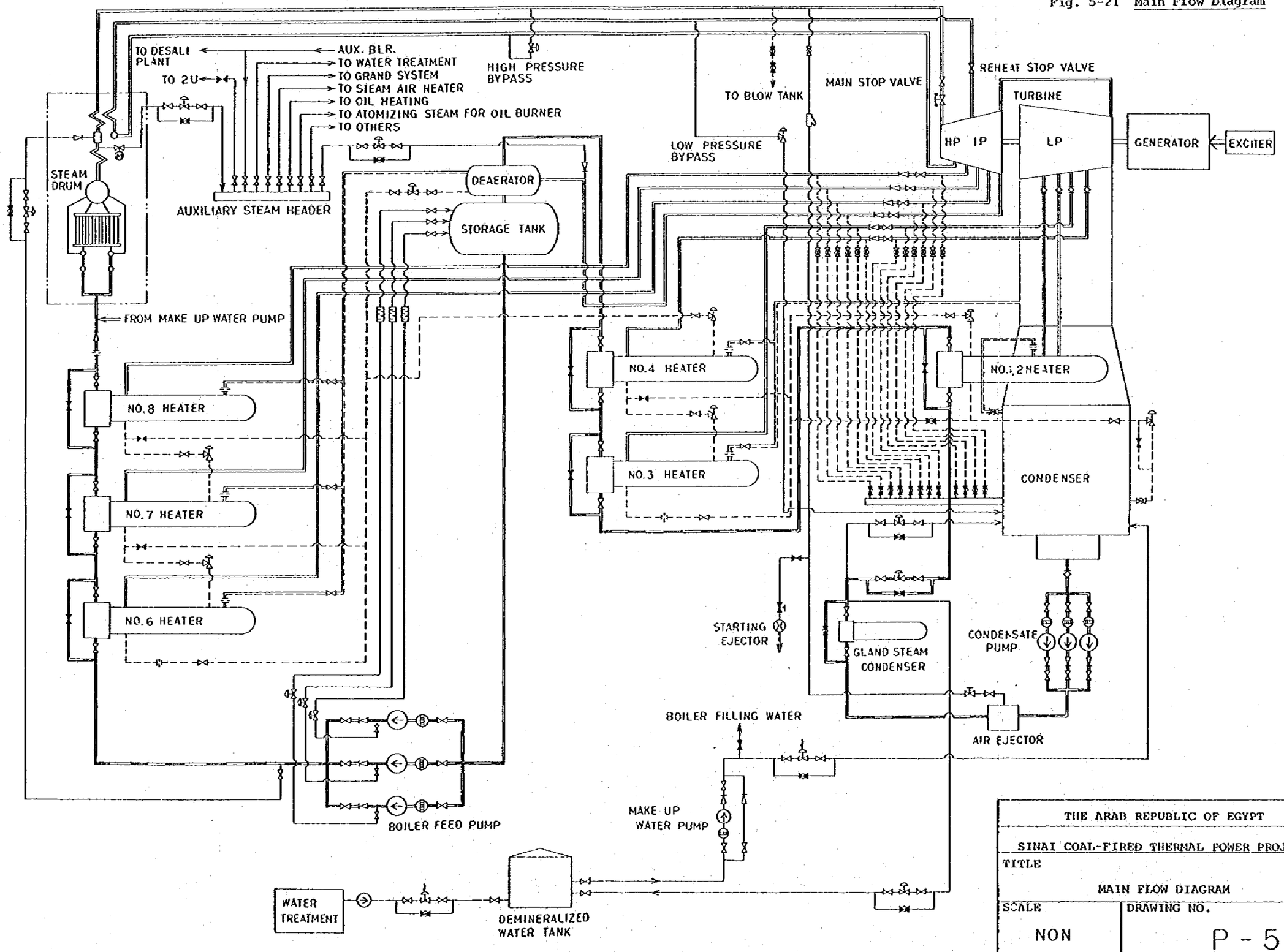
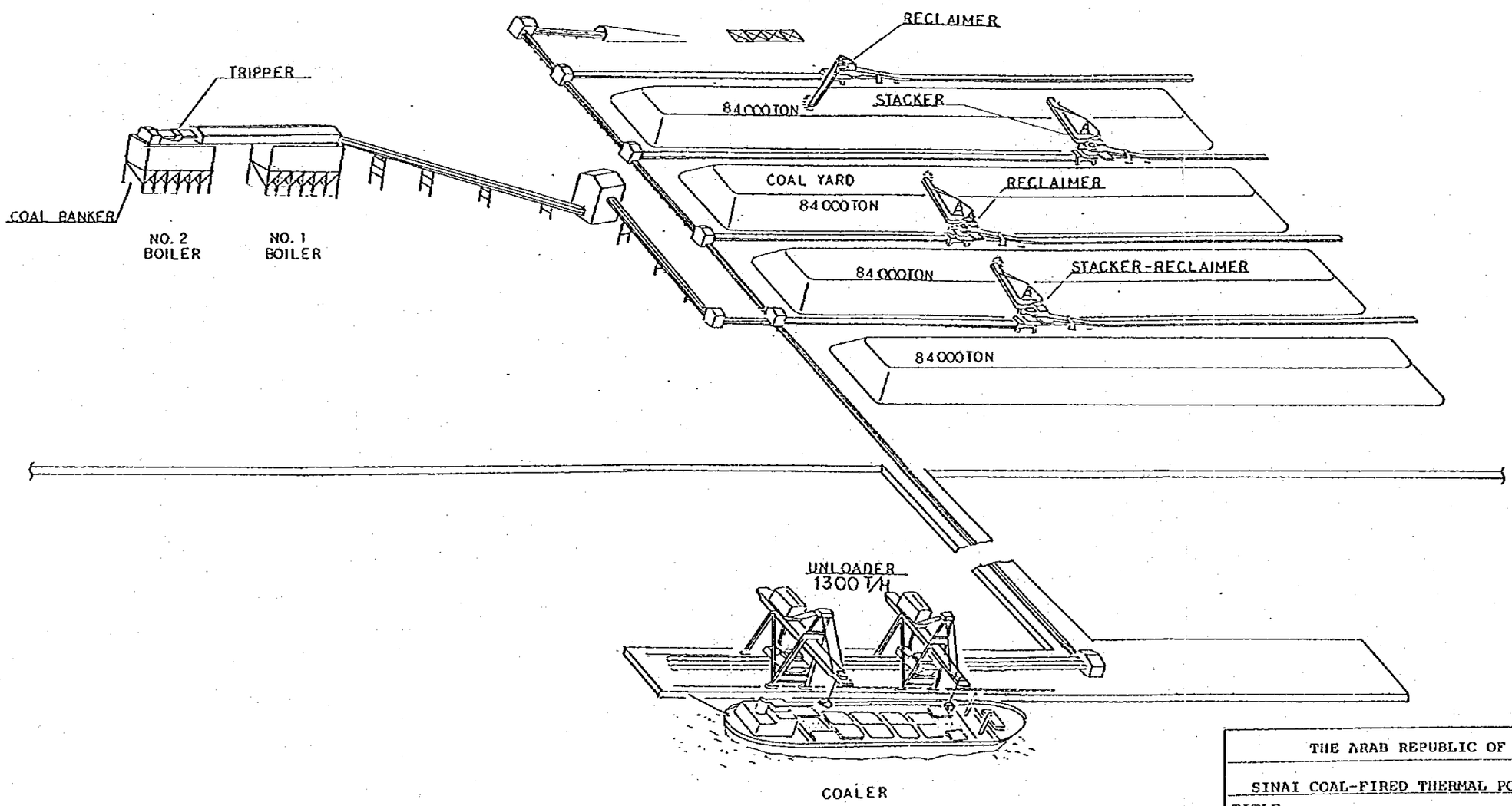
Fig. 5-21 Main Flow Diagram



THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: MAIN FLOW DIAGRAM	
SCALE: NON	DRAWING NO.: P - 5

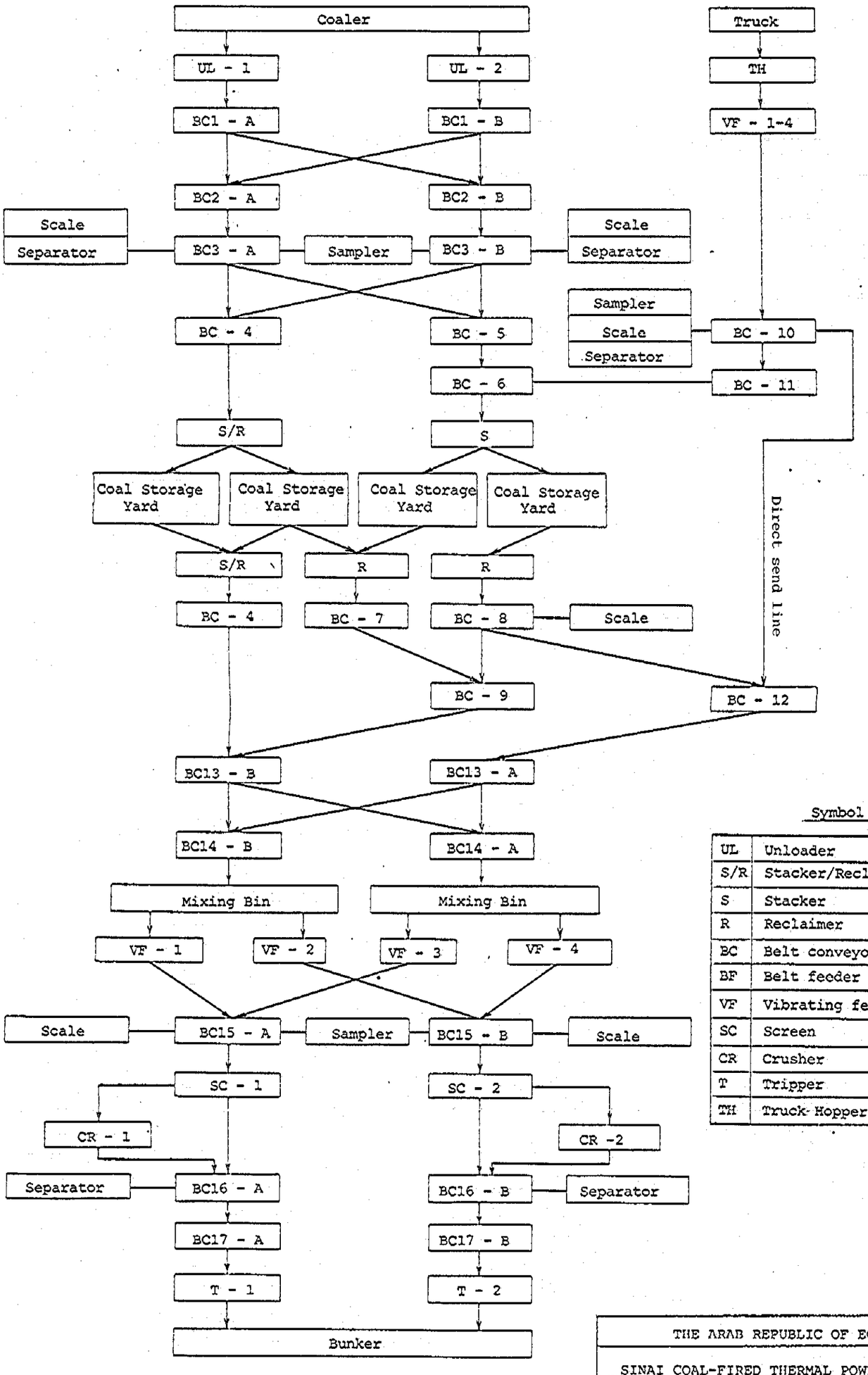
NO	REVISION	DATE	REVISED	CHECKED

Fig. 5-22 Outline of Coal Handling



THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Outline of Coal Handling	
SCALE: NON	DRAWING NO.: P - 6

Fig. 5-23 Coal Handling System Flow Chart

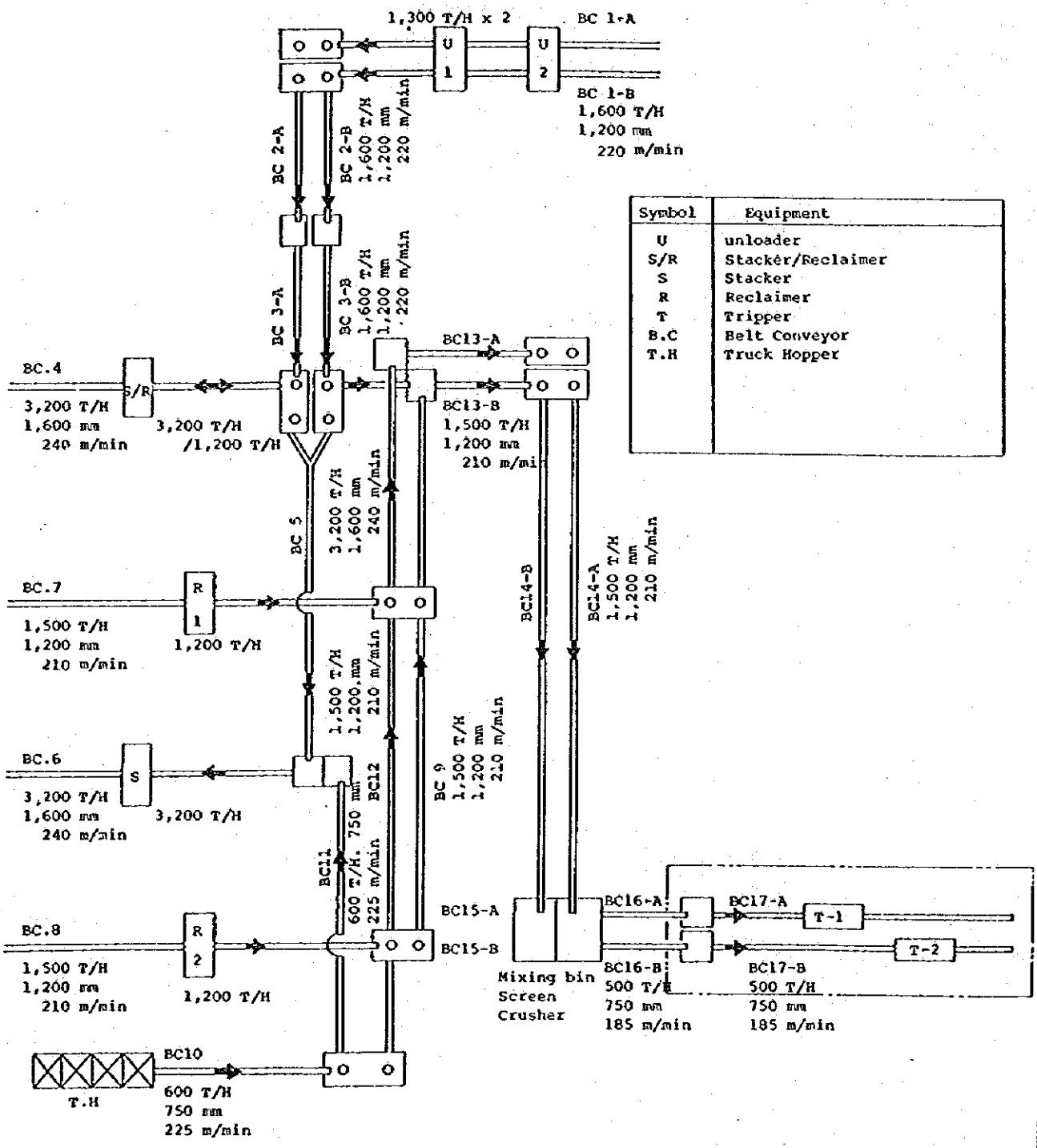


Symbol

UL	Unloader
S/R	Stacker/Reclaimer
S	Stacker
R	Reclaimer
BC	Belt conveyor
BF	Belt feeder
VF	Vibrating feeder
SC	Screen
CR	Crusher
T	Tripper
TH	Truck Hopper

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Coal Handling System Flow Chart	
SCALE: NON	DRAWING NO.: P - 7

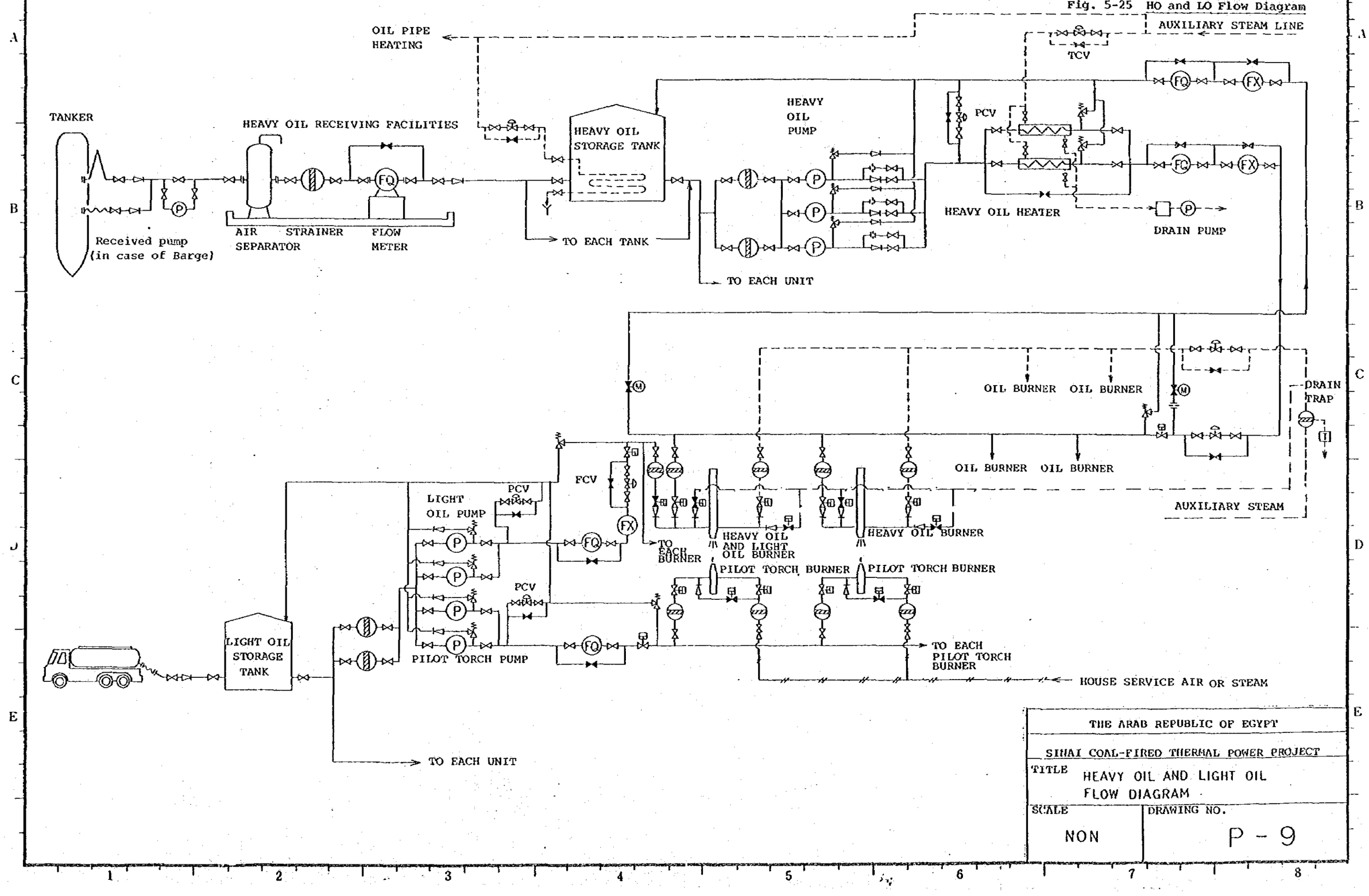
Fig. 5-24 Diagram of Coal Handling System



THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Diagram of Coal Handling System	
SCALE: NON	DRAWING NO.: P - 8

NO	REVISION	DETE	REVISED	CHECKED

Fig. 5-25 HO and LO Flow Diagram



THE ARAB REPUBLIC OF EGYPT

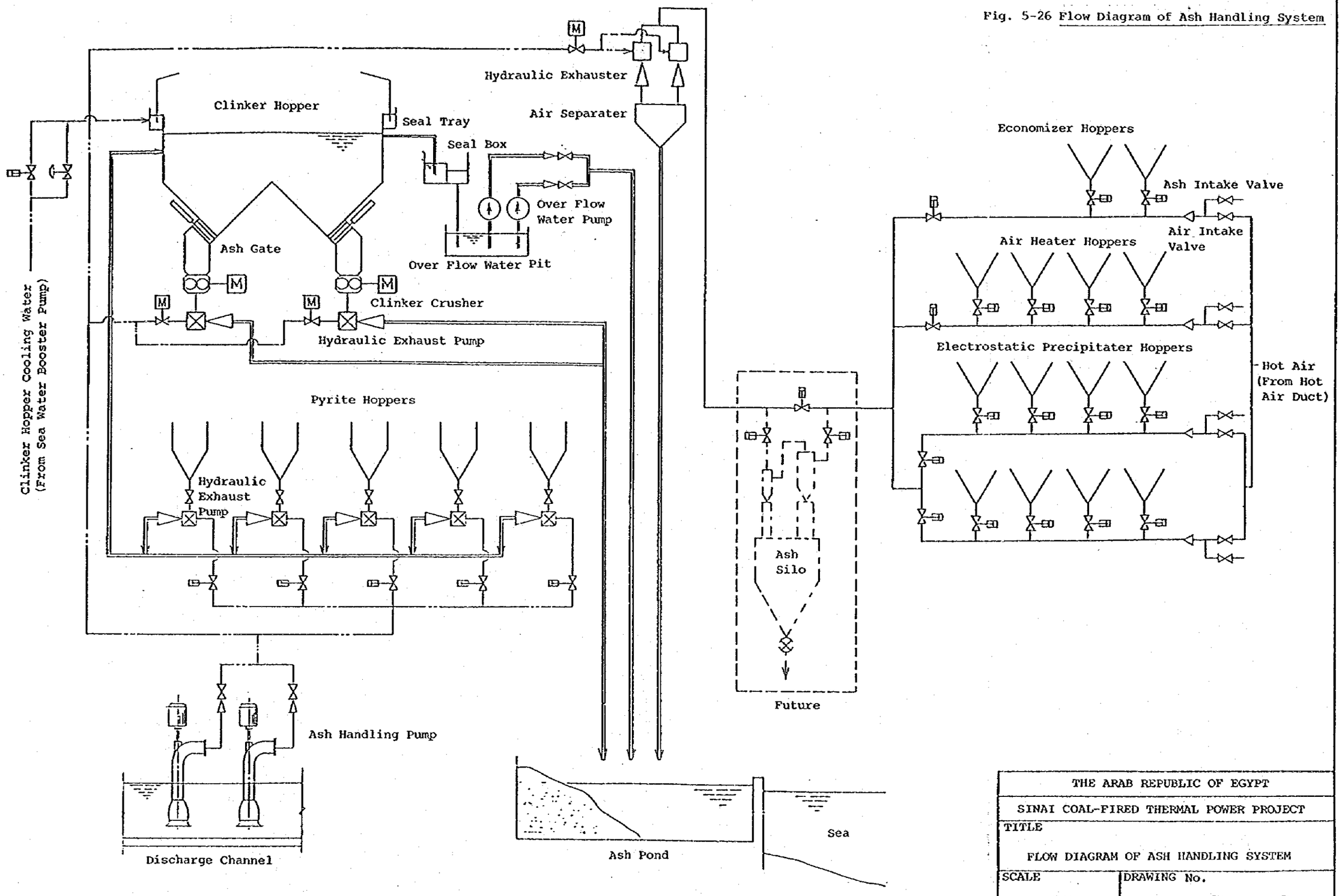
SINAI COAL-FIRED THERMAL POWER PROJECT

TITLE: HEAVY OIL AND LIGHT OIL FLOW DIAGRAM

SCALE: NON

DRAWING NO.: P - 9

Fig. 5-26 Flow Diagram of Ash Handling System



THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: FLOW DIAGRAM OF ASH HANDLING SYSTEM	
SCALE: NON	DRAWING No.: P - 10

NO	REVISION	DATE	REVISED	CHECKED

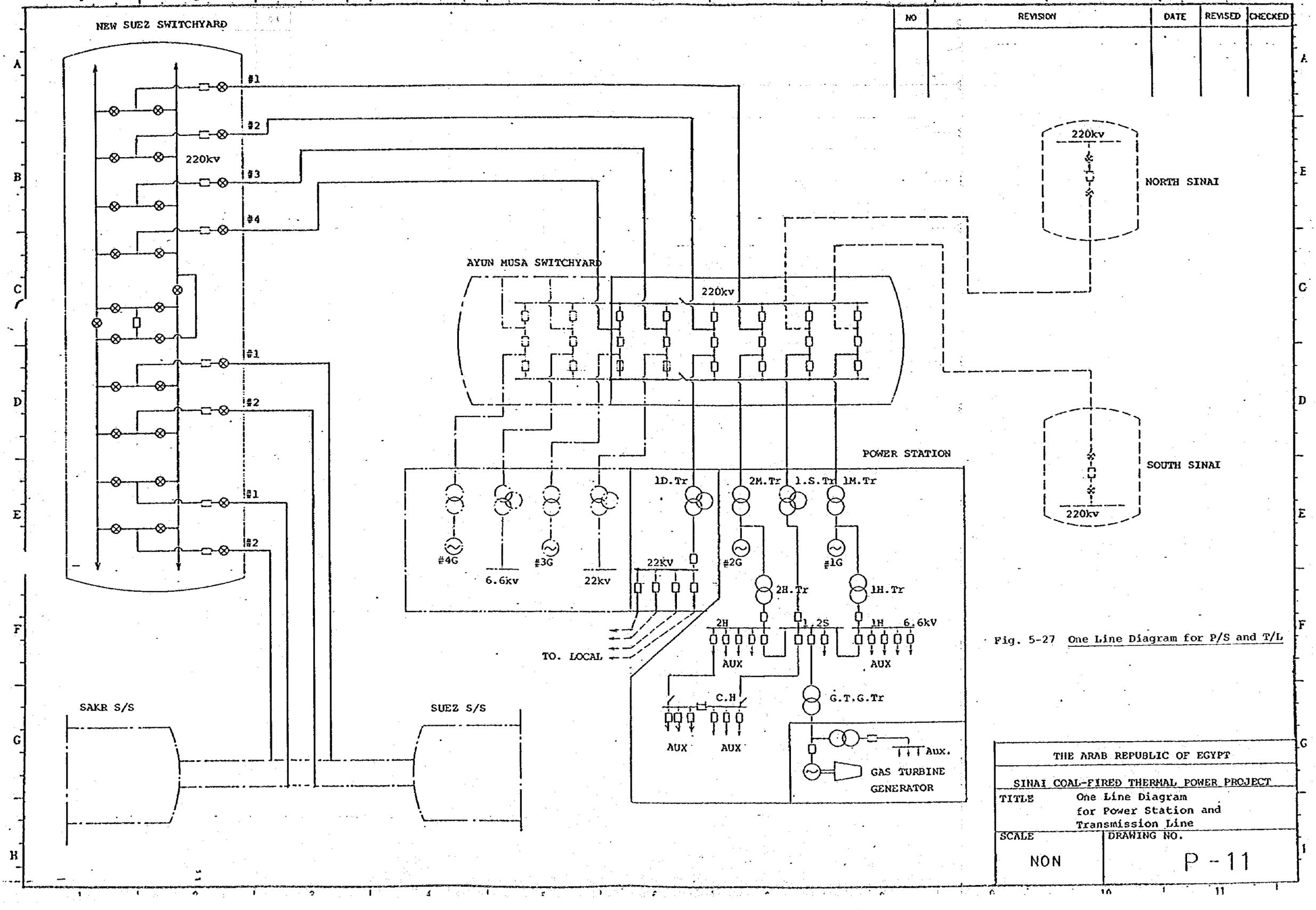


Fig. 5-27 One Line Diagram for P/S and T/L

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE	One Line Diagram for Power Station and Transmission Line
SCALE	NON
DRAWING NO.	P - 11

NO	REVISION	DETE	REVISED	CHECKED

TO. NEW. SUEZ. SWITCHYARD STATION.

No.4 No.3 No.2 No.1 NORTH SINAI SOUTH SINAI

220kV A BUS

220kV B BUS

No.4 M.Tr No.2 S.Tr No.3 M.Tr No.2 D.Tr No.1 D.Tr. No.2 M.Tr No.1 S.Tr No.1 M.Tr

40MVA 22kV 380MVA 30MVA 380MVA

22kV G.T.G 35MVA

No.4G No.3G No.2G 400MVA No.2 H.Tr 25MVA No.1 H.Tr 25MVA No.1G 400MVA

To.Local To.Local

4H 3,4S 3H 2H 1,2S 1H 6.6kV

AUX AUX AUX AUX AUX AUX Aux.Tr

4B PC 4A PC 3,4 PC 3B PC 3A PC 2B PC 2A PC 1,2S PC 1B P C 1AP C 380V

MCC MCC MCC MCC MCC MCC AUX MCC MCC AUX MCC

AUX AUX AUX AUX

C H 6.6kV

MCC 380V

AUX AUX AUX AUX

Fig. 5-28 Main One Line Diagram

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: MAIN ONE LINE DIAGRAM	
SCALE: NON	DRAWING NO.: P - 12

NO	REVISION	DATE	REVISED	CHECKED

PLANT INTERLOCK

Electric Section

Switch yard

220 KV busbar trouble → 86AY27A

Gas turbine generator start

Generator

86X

Negative phase sequence → 46GX

Over-current → 44GTX

60X

Loss of excitation → 40GX

Differential → 87GX

Earth fault → 64NGTX

Over-voltage → 59GX

Reverse power → 32GTX

Zero phase sequence → 50GAX

Excitor

Over current → 51ETX

Main Transformer

Differential → 87MTX

Over current → 51MTX

Buch holtz → 96PMTX

Earth fault → 51NMTX

Hous Transformer

Differential → 87HTX

Over current → 51HTX

Buchholtz → 96PHTX

Earth fault → 64NHTX

OFF Main transformer CB ON

OFF Excitor CB

OFF Hous transformer CB

Turbin Section

Plant Emergency trip P-B operated

L. Reheat stop valve close

L. intersept valve close

R. Reheat stop valve close

R. intersept valve close

Turbine main oil pressure too low → Main Stop valve close

Master trip lever operated

Emergency gavaner acted

→ Emergency trip system acted → Reheat stop valve close, Inter sept valve close, Exthort reverse valve close, Governing valve close

Backup governer acted

Condenser vacuum too low

→ Vacuum trip system acted → Governing valve close, Reset

No. load position too low

Turbine reset lever operated

R.H. protection acted

Thrust bearing troble

Turbine trip Sofenoid energized

Bearing metal temperature too high

Bearing oil pressure too low → Hand trip push button switch operated

Condenser exhaust temperature too high → Vibration too high

Frequency too low

Boiler Section

All flames out (WO)

All fuel shut off valve close (WO)

Furnace pressure high

Drum level too high/low

Main steam pressure too high

Main steam temperature too high

All BFP tripped

MFT. acted

MFT. reset

Both IDFs under operation

Air flow set point over

Furnace paurge P.B. operated

S.H. spray shut off valve close

R.H. spray shut off valve close

BFP. T. stop

AH, FDF, IDF, damper, vean open

Both IDFs stop

Both FDFs stop

GRF damper close

GRF. stop

PAF damper close

PAF stop

Mill (pruverizer) stop

Coal feeder stop

Heavy oil pump stop

Heavy oil shut off valve close

Light oil pump stop

Light oil shut off valve close

Torch oil pump stop

Torch oil shut off valve close

All burner valve close

All torch valve close

Symbol	Explanation
	Electrical line
	Hydraulic line
	Mechanical line
	Pneumatic line
	Mortion
	Hand operation
	"OR" logic
	"AND" logic
	"NOT" logic
(WO)	"Wipe out" logic
	Time delay relay
	2 out of 3 detection

Basic Plant Interlock

Trouble	Trip
Electrical trouble (E)	E, T, B
Turbine trouble (T)	T → E, B
Boiler trouble (B)	B, T → E
Plant Emergency trip "PB"	B, T → E

E; Electric Section

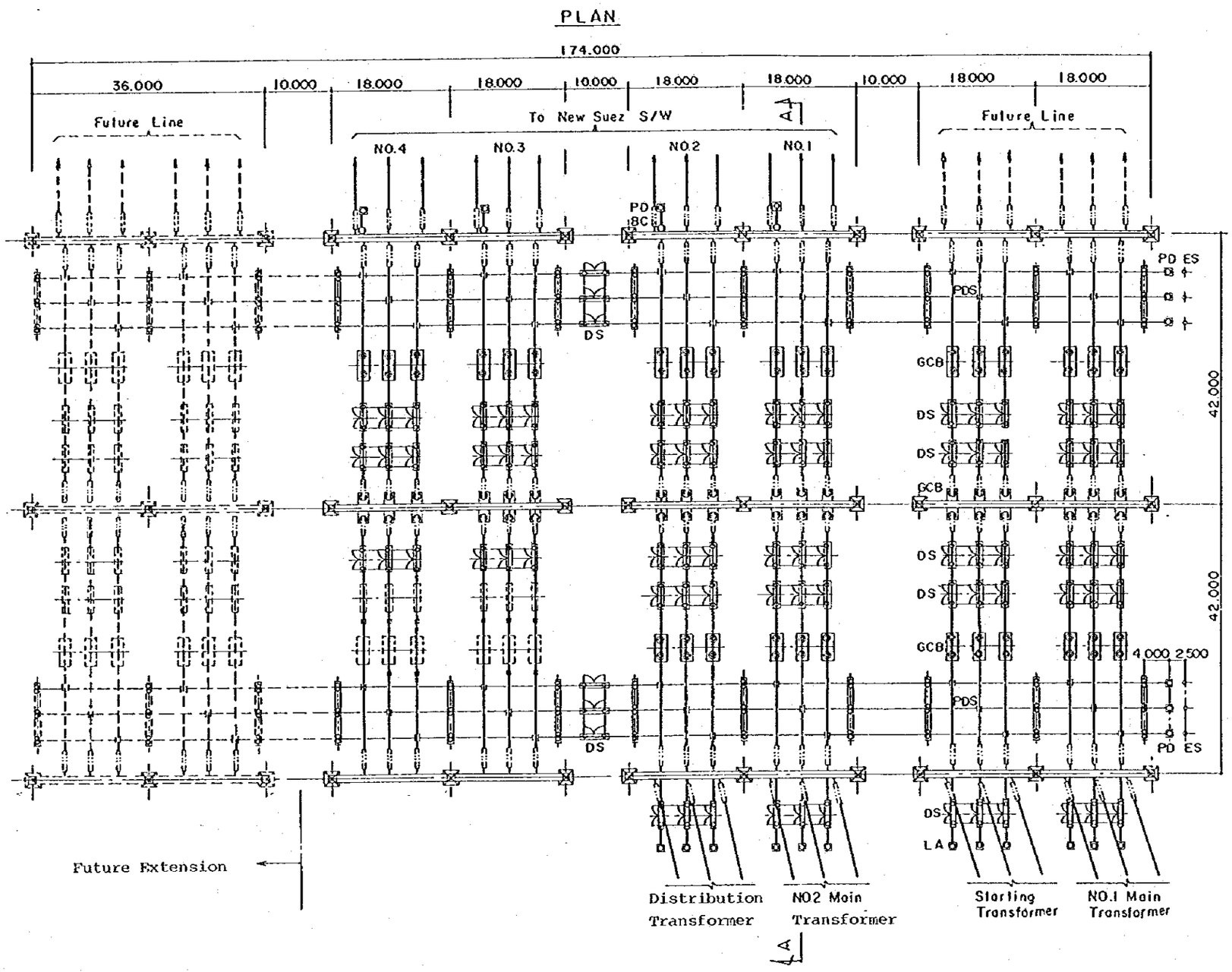
T; Turbin Section

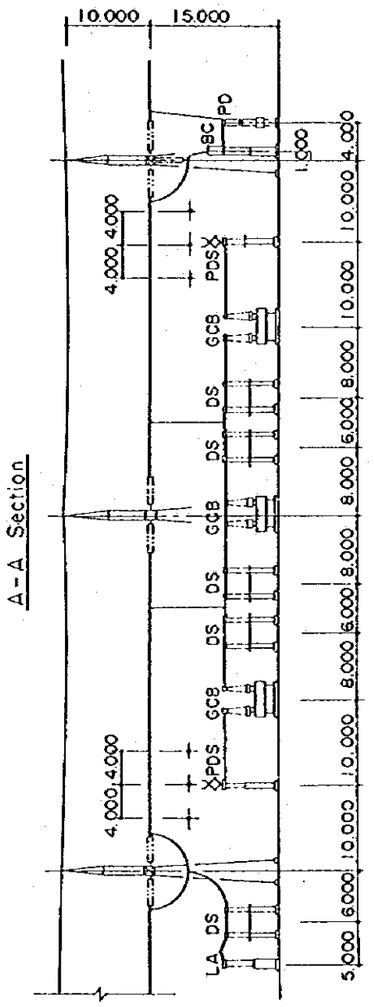
B; Boiler Section

Fig. 5-29 Plant Interlock Diagram

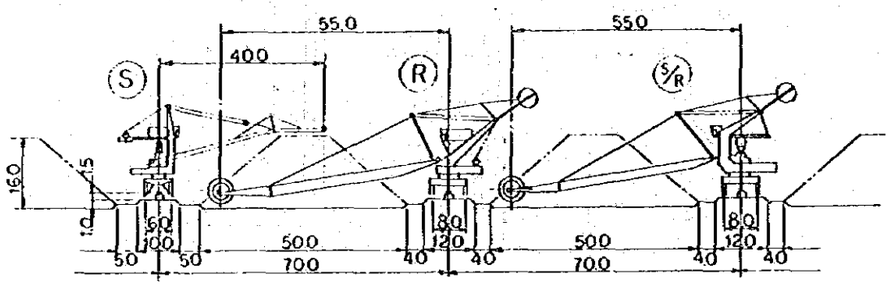
THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: PLANT INTERLOCK DIAGRAM	
SCALE: NON	DRAWING NO.: P - 13

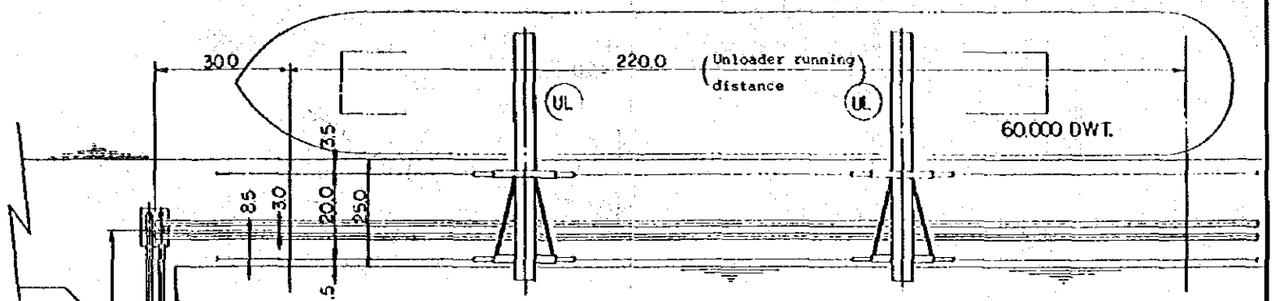
Fig. 5-30 Machinery Arrangement Plan of Ayun Musa P/S Outdoor Switch Yard

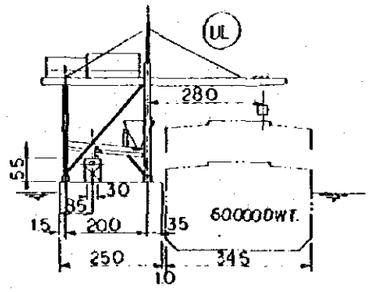


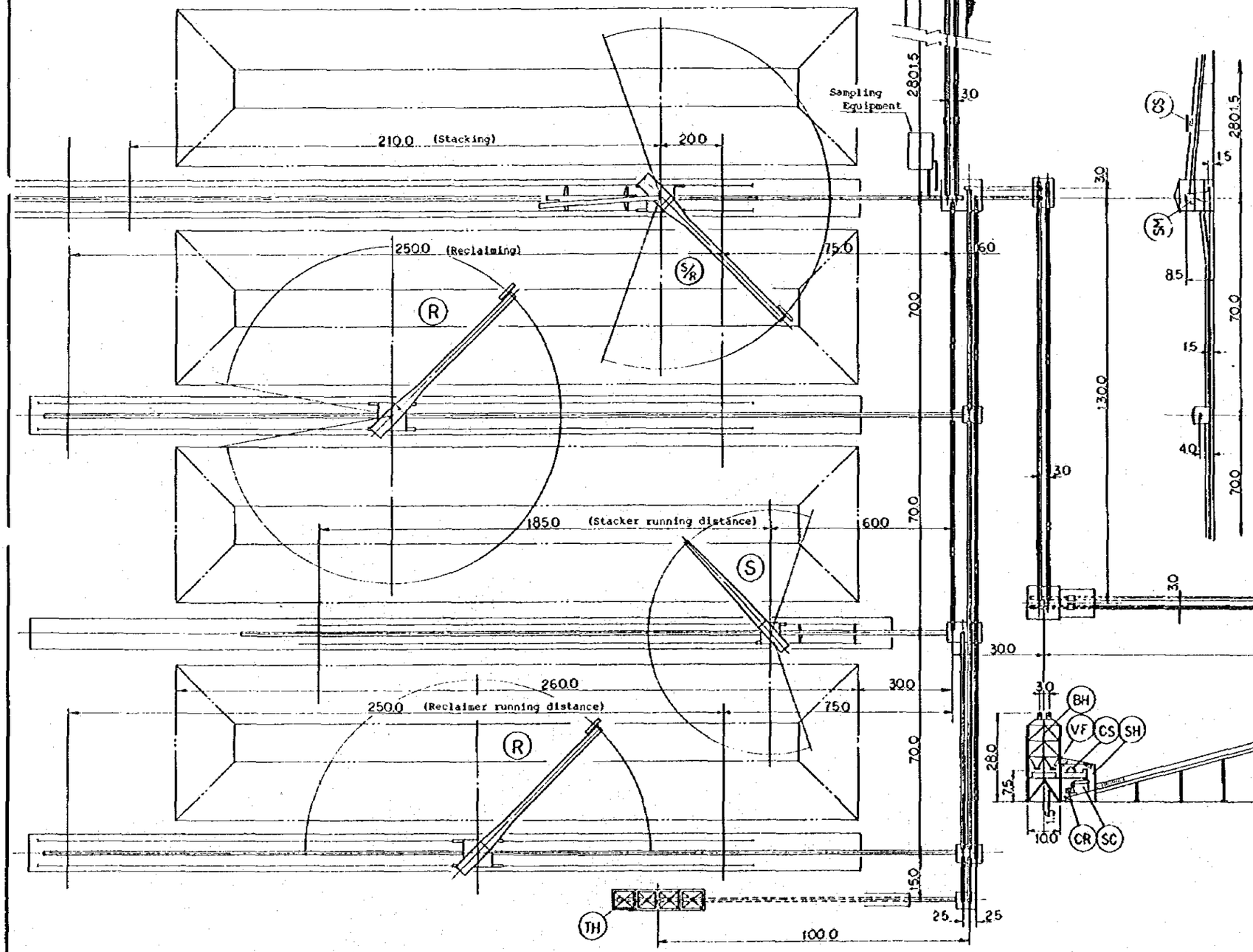


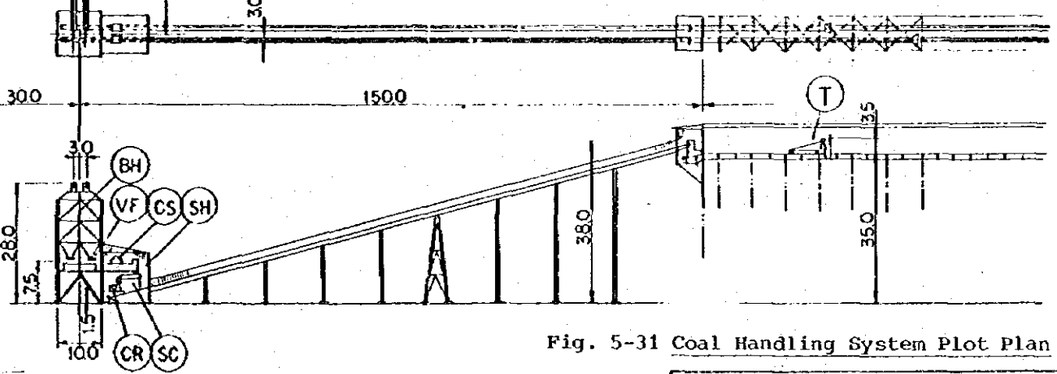
THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: MACHINERY ARRANGEMENT PLAN OF AYUN MUSA P/S OUTDOOR SWITCH YARD	
SCALE	DRAWING NO. P - 14











Symbol	Main Equipment Specification	No.
U L	1,300 T/H Unloader	2
S R	3,200/1,200 T/H Stacker/Reclaimer	1
S	3,200 T/H Stacker	1
R	1,200 T/H Reclaimer	2
T H	25 T Truck Hopper	4
M G	Magnet Separator	5
C S	Conveyor Scale	6
S M	Sampling Equipment	2
B H	300 T x 2 Mix Bin	1
V F	100 - 500 T/H Feeder	4
S C	500 T/H Screen	2
C R	75 T/H Crusher	2
T	500 T/H Toripper	2

Fig. 5-31 Coal Handling System Plot Plan

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE	COAL HANDLING SYSTEM PLOT PLAN
SCALE	DRAWING NO. P - 15

5-2-3 Civil Works

1) Civil Works

a. Land Reclamation

a) Grounds for determination of EL+4.000 of ground level

i. The elevation in Egypt is established on the basis of the Mean Sea Level at Alexandria Port.

ii. EL±0 is +1.145 Datum Level at Ayun Musa, and the lower water level is C.D.L+0.400 and the high water level is C.D.L+1.900. (Refer to attached chart "Relationship between Tidal Levels.)

iii. The significant wave height for this project is +1.500 m.

iv. The ground level of the site for this project will be high water level + significant wave height + Free board. Thus,

In C.D.L expression:

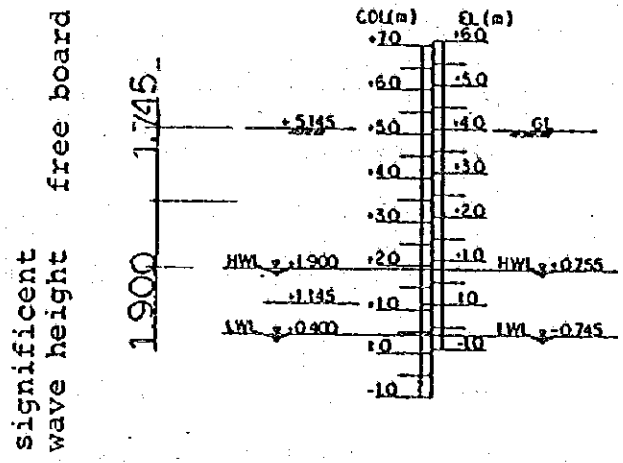
1.900 m + 1.500 m + 1.745 m = +5.145 m

In EL expression:

0.755 m + 1.500 m + 1.745 m = +4.000 m

The ground level of Abu-Sultan power plant in Ismailiya is EL+4.000.

Fig. 5-32 Relationship between Tidal Levels



b) Compacted fill material

Material to be used for compacted fill shall be selected granular material conforming to the requirements for soil group GW, GP, GM, GC or SW from classification of soil.

Table 5-15 Unified Soil Classification Including Identification and Description

Major division	Group symbol	Typical name	Field identification procedures[b]	Laboratory classification criteria[c]	
		A. Coarse-grained soils (more than half of material larger than No. 200 sieve)[d] 1. Gravels (more than half of coarse fraction larger than No. 4 sieve)[e]			
Clean gravels (little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	$D_{60}/D_{10} > 4$ $1 < D_{30}^2/D_{10}D_{60} < 3$ D_{60}, D_{30}, D_{10} = sizes corresponding to 10, 30, and 60% on grain-size curve	
	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines	Predominantly one size, or a range of sizes with some intermediate sizes missing	Not meeting all gradation requirements for GW	
Gravels with fines (appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures	Nonplastic fines or fines with low plasticity (see ML soils)	Atterberg limits below A line or PI < 4	Soils above A line with 4 < PI < 7 are borderline cases, require use of dual symbols
	GC	Clayey gravels, gravel-sand-clay mixtures	Plastic fines (see CL soils)	Atterberg limits above A line with PI > 7	
		2. Sands (more than half of coarse fraction smaller than No. 4 sieve)[e]			
Clean sands (little or no fines)	SW	Well graded sands, gravelly sands, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	$D_{60}/D_{10} > 6$ $1 < D_{30}^2/D_{10}D_{60} < 3$	

G : Gravel M : Silt

W : Well-graded C : Clay

P : Poorly graded S : Sand

c) Earth work

i. Prior to commence fill work, top soil shall be free from trash, vegetation or other debris.

ii. Fill shall be compacted in layers not exceeding 0.200 m in thickness from original surface to specified ground level.

iii. Slope of fill shall be 1:1.8.

d) Drainage system

i. Drainage system shall be furnished street drain which locate inside of fence in the plant and street drain shall be connected catchment pond.

ii. Catchment pond shall be capacity of 10 m^3.

iii. Catchment pond shall be able to set submerged pump.

b. Circulating Water System

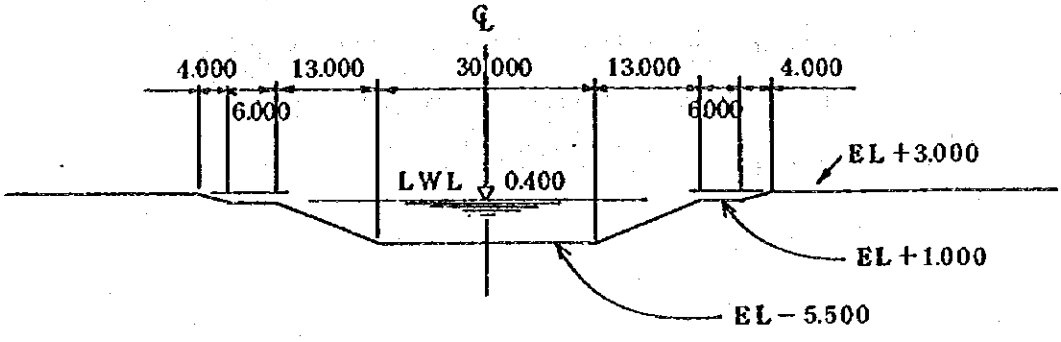
a) Intake canal

i. Circulating water shall be clean and low-temperature during the whole of year.

ii. Intake canal is not influenced by water from outlet of discharge.

iii. Typical section of intake canal is studied on the basis of the design conditions.

Fig. 5-33 Intake Canal



Required Discharge (1,200 MW)	61.4 m^3/s
Velocity of low water level at tidal condition	0.30 m/s
Coefficient of roughness	0.05
Head loss (L.W.L at tidal condition)	0.040 m
Length of intake canal	L = 1,472 m

iv. Consideration on the intake canal water velocity to be taken into account are the following items:

i) Intake canal velocity should be fairly low for effective sedimentation of fine particles like small sand.

$$L = \frac{H}{U} \times V$$

where,

L: Required length of intake canal

H: Sedimentation depth, (5.500 m - 0.745 m) at L.W.L tidal condition

U: Sedimentation speed in case of 0.080 mm particles, 0.006 m/s

V: Velocity in the intake canal 0.30 m/s at L.W.L tidal condition

$$L = \frac{(5.500 - 0.745)}{0.006} \times 0.30 = 238.000 \text{ m} \quad 1,472 \text{ m}$$

ii) If the flow velocity increases, the loss head would increase in proportion to the square of the velocity, which could cause an increase of the condenser circulating water pump power consumption.

The loss head at 0.30 m/s of flow velocity is calculated as follows.

Loss due to inflow	He	= 0.001 m
Loss due to gradual of flow condition	Hgc	= 0.001 m
Loss due to friction	Hf	= 0.038 m
Loss due to bends	Hbc	= 0.000 m
Total	H	= 0.040 m

This loss head of 0.040 m is negligibly small as compared with the loss head between the pumping structure and the condenser.

b) Circulating water pipeline

P.C. pipe, culvert box and steel pipe studied construction cost and construction period.

As a result, P.C. pipe of construction cost and construction period is superior to culvert box and steel pipe.

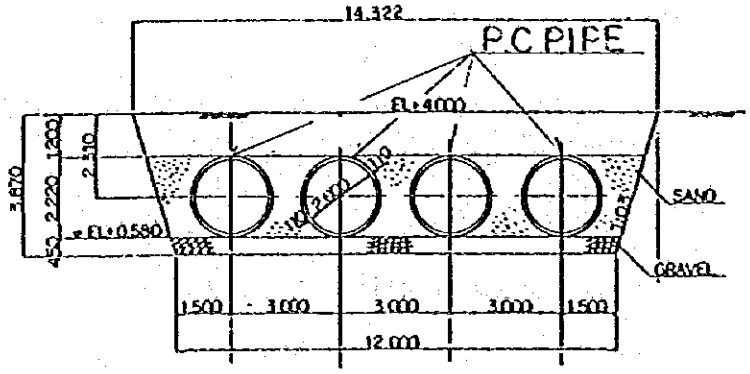
Item	Design Discharge	Construction Cost	Reference of Construction Period
Culvert Box	30.7 m^3/s	6.1×10^6 LE	3
Steel Pipe	30.7 m^3/s	5.6×10^6 LE	2
P.C. Pipe	30.7 m^3/s	4.0×10^6 LE	1

(Construction cost includes material.)

i. P.C. pipe shall be subjected to following loads.

Normal operating pressure, transient pressure, earth pressure, wheel load, buoyance force

ii. Dimension of P.C. pipe is studied by the design conditions.



Typical Section

Velocity in the P.C. pipe V = 2.4 m/s

iii. Manholes shall be provided three (3) locations on the circulating pipeline, and air valves shall be located in conjunction with the manholes.

c) Intake pumping structure

i. Intake pumping structure in this project shall be provided circulating water for the first stage 600 MW plant only, and shall be a reinforced concrete box like structure.

ii. The structure shall be sized to accommodate four screenwells for 4.400 m wide travelling screen on the inlet side, and shall be provided with four sets of gate for the screenwells and four sets of gate for the pump wells.

iii. Level of bottom slab of the structure shall be EL-5.500, and level of top slab shall be EL+4.000.

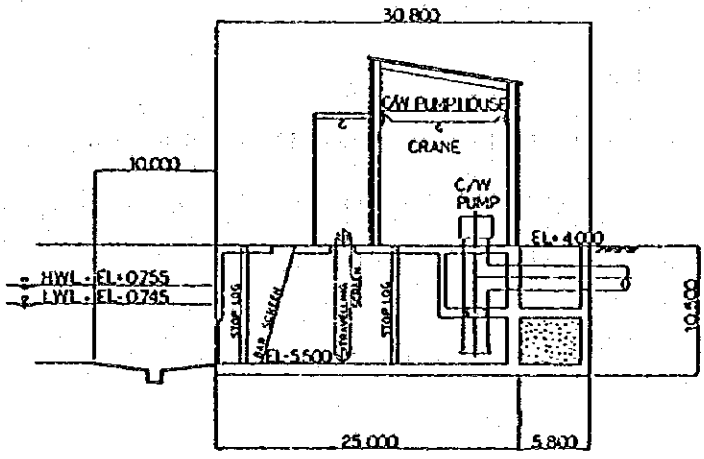
iv. The structure shall include bar screen to prevent large floating or submerged objects from entering inlet.

v. Velocity water through bar screen shall not exceed 0.47 m/s at low water level tidal conditions.

vi. The structure shall be furnished to prevent entrance of sand from outdoor.

vii. Building shall be made on the structure and plan crane.

viii. Extension for the structure shall be partly made in advance for 1,200 MW.



Longitudinal Section

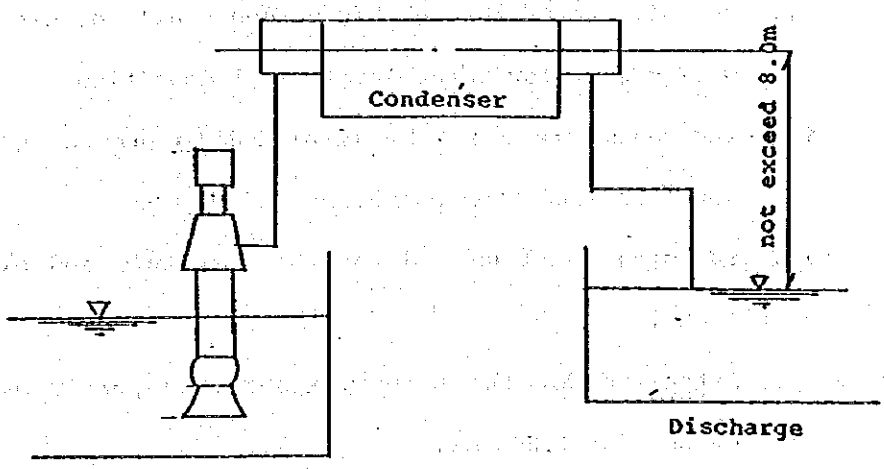
ix. Head loss will be 0.072 m at L.W.L tidal conditions as coefficient of roughness 0.016.

d) Discharge channel and discharge canal

i. Discharge channel and discharge canal shall handle the discharge from the circulating water system for the second stage 1,200 MW only.

ii. The elevation of discharge shall be such that maximum vacuum at any point in the circulating water system shall not exceed 8.0 m under any conditions.

iii. Discharge weir shall be provided to dissipate energy in the water.

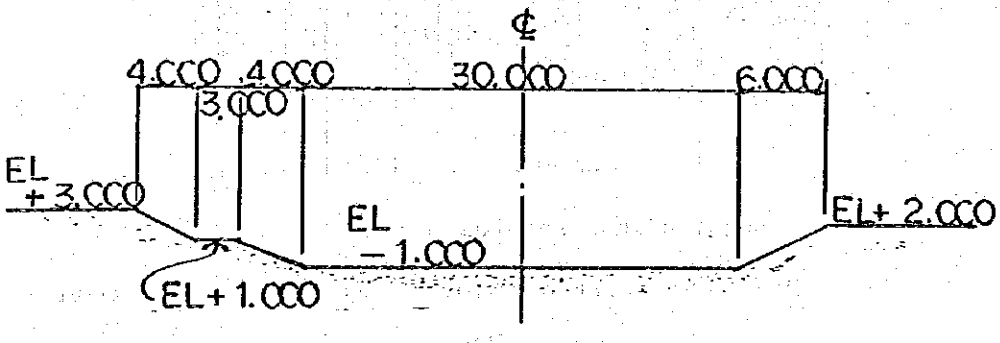


Intake Pumping Structure

iv. Outlet

Water from condenser shall not be given to influence circulating water at point of intake canal.

v. Determination of outlet



Typical Section

Item		Fisrt Stage 600MW	Second Stage 1,200MW
H.W.L.tidal conditions	Sea Level in Outlet	EL-0.745	EL-0.745
	Discharge	30.7m^3/s	61.4m^3/s
	Velocity	0.78m/s	1.11m/s
L.W.L.tidal conditions	Sea Level in Outlet	EL+0.755	EL+0.755
	Discharge	30.7m^3/s	61.4m^3/s
	Velocity	0.46m/s	0.83m/s
Coefficient of roughnese		0.05	0.05

c. Fuel Oil Storage Tank Foundation & Oil Dyke

a) These storage tanks shall be provided for the first stage 600 MW only.

	Fuel Oil Storage	Light Oil Storage
Diameter (m)	50.360 x 3 pcs	15.500 x 1 pc
Height (m)	18.260	10.660
Capacity (T)	34,000 x 3 pcs	1,800 x 1 pc

b) The minimum spacing (shell to shell) between any two adjacent tanks shall be more than height of the tank.

c) The capacity of the dyked area shall impound 110% of the total capacity of required fuel oil.

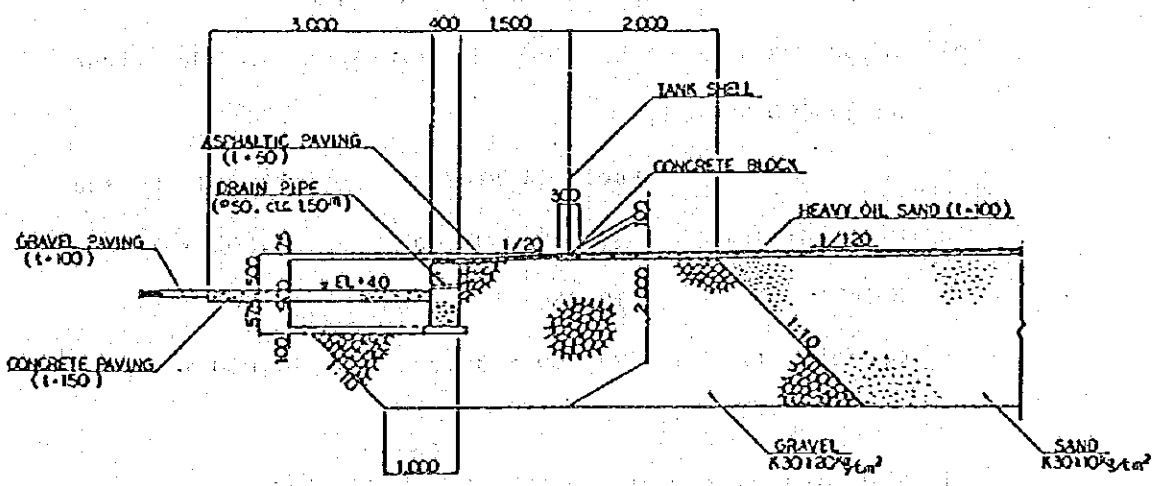
d) The minimum distance from fuel oil tank shell to an exterior dyke wall shall be 15.000 m, but not smaller than 1/2 times the height of tank.

e) The minimum distance from light oil tank shell to an exterior dyke wall shall be 1/3 times the tank height.

f) Exterior dyke wall shall be liquid tight reinforced concrete.

g) Tank foundation shall be displacement of gravel and sand.

h) The bearing capacity of displacement shall confirm $K_{30} \geq 20$ kg/cm² by using plate bearing test.



DETAIL OF TANK FOUNDATION

d. Coal Storage Yard & Coal Handling

a) Foundations for belt conveyor of coal handling shall be decided to determine sliding and overturning as spread foundation.

b) Foundations of stacker and reclaimer shall be spread foundation.

c) Retaining wall shall be provided to prevent coal from falling in the coal storage yard.

d) Tie-bar of stacker and reclaimer shall be placed to keep the gauge of rail every 9.000 m in the coal storage yard.

e. Ash Disposal Facilities

a) Ash pond facilities are fomulated as follows:

1st Stage with 600 MW : 3,200,000 m³ for 10 years

2nd Stage (Long-range plan)

600 MW : 2,560,000 m³ for 8 years

600 MW : 12,800,000 m³ for 40 years

b) Determination of unit weight of ash

Unit weight of ash (W) is 0.8 t/m³ and specific gravity of ash (γ) is 2.2 t/m³.

Solid of volume percentage of ash

$$= \frac{\text{Unit weight of ash (W)}}{\text{Specific gravity of ash } (\gamma)} \times 100$$

$= (0.8/2.2) \times 100 = 36\%$

Unit weight of ash above H.W.L. + 0.755 meters will be generally 1.2 t/m³ of dry density (rd) at optimum moisture content of 20% to 30%.

Unit weight of ash to be planned is,

$$= \frac{2.875 \times 1.2 + 2.255 \times 0.8}{5.130} = 1.0 \text{ t/m}^3$$

Fig. 5-34 Typical Section of Revetment for Ash Pond

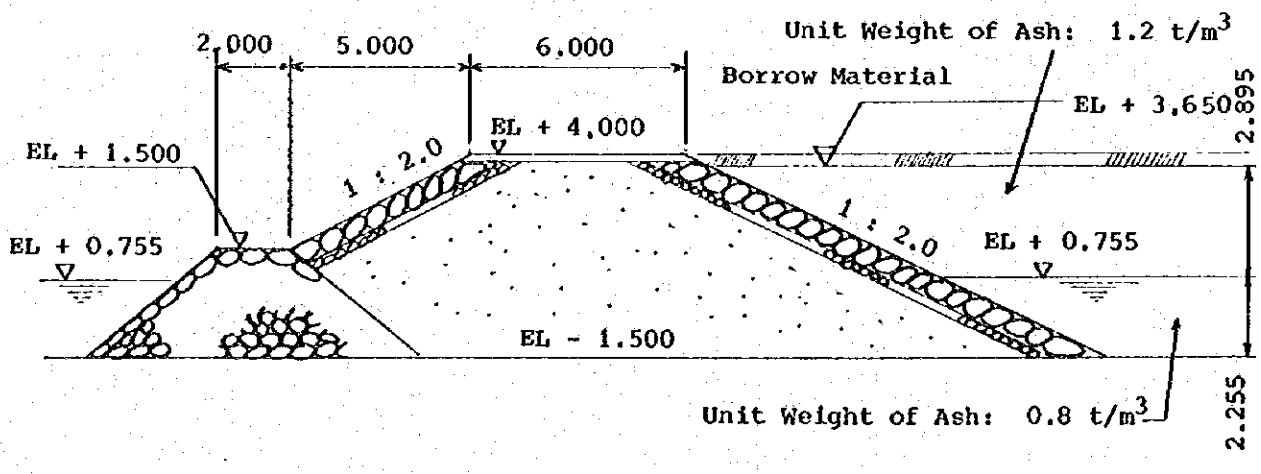


Fig. 5-35(1) Area for Ash Pond

ASH DISPOSAL FACILITIES OF 1ST STAGE FOR 10-YEAR OPERATION OF 600 MW POWER PLANT

An ash pond with a disposal capacity of 3,200,000 m³ required for 10-year operation will be built in the sea side of the power station. The revetment of the ash pond in the sea will be built on a level of about EL-1.500 m for a economical purpose. Ash will be disposed up to a level of EL+3.650 m and thereafter the suitable soil will be filled up with a thickness of 0.350 m for leveling at EL+4.000 m.

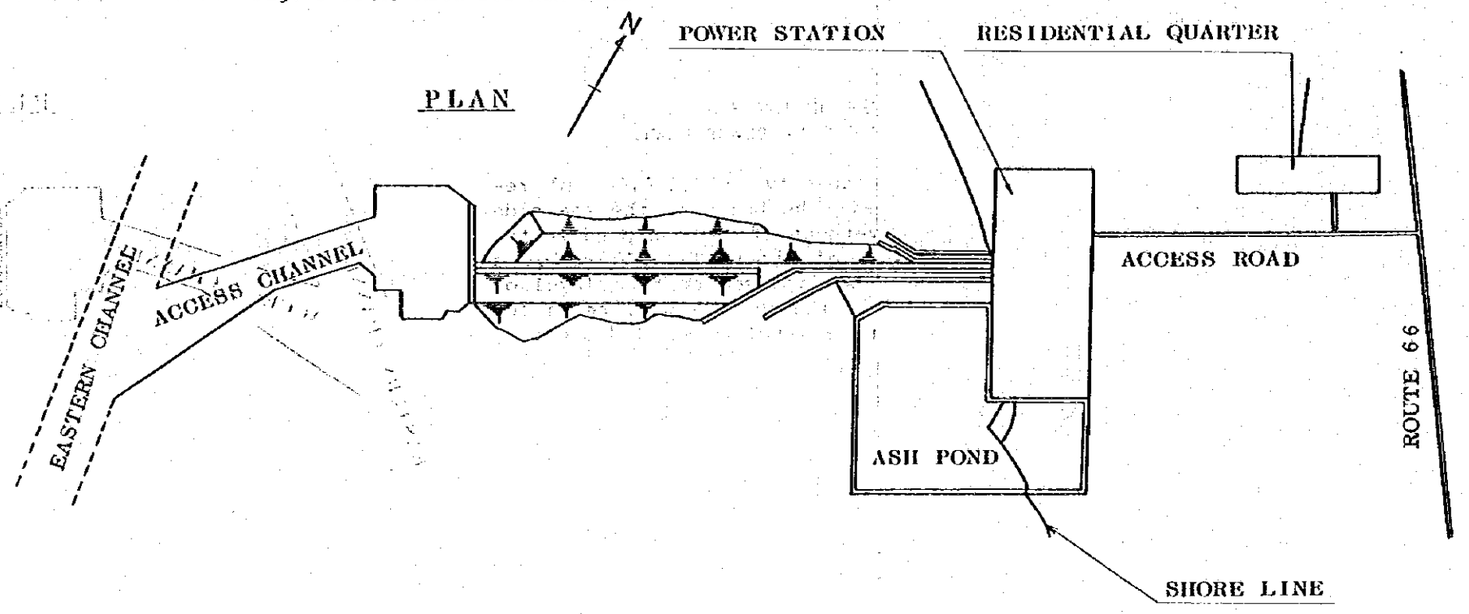
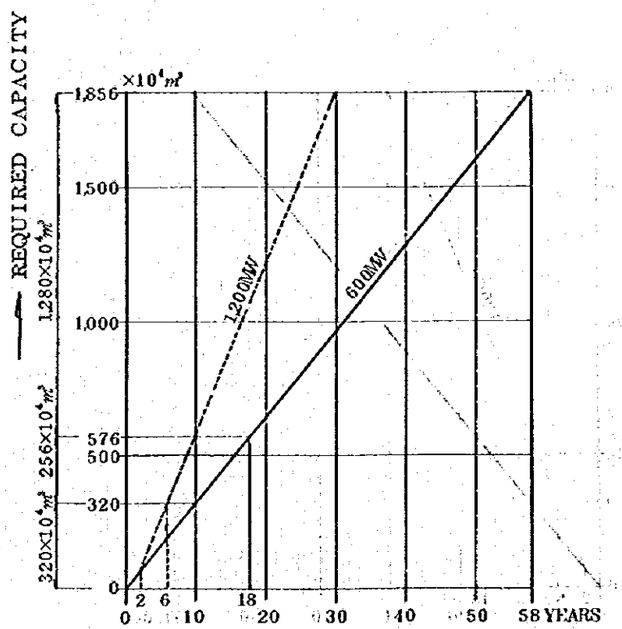


TABLE FOR REQUIRED CAPACITY

E L (m)	1st STAGE (600MW×10) EL−1.5m~EL+4.0m	
	A (m²)	V (m³)
− 5		
− 4		
− 3		
− 2		
− 1	95,000	24,000
± 0	715,000	429,000
+ 1	745,000	1,159,000
+ 2	810,000	1,936,000
+ 3	902,000	2,884,000
+ 4	953,000	3,550,000
+ 5		
+ 6		
REQUIRED CAPACITY		3,200,000

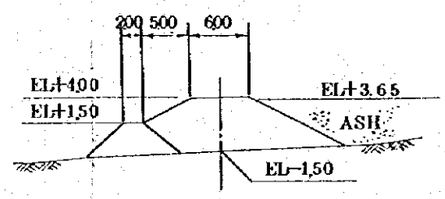


1ST STAGE (600MW-10YR.)

REQUIRED CAPACITY V=3,200,000m³

ACTUAL CAPACITY V=3,550,000m³

HEIGHT OF REVETMENT EL−1.5m~EL+4.0m



TYPICAL SECTION FOR REVETMENT

0 10m

Fig. 5-35(2) Area for Ash Pond

ASH DISPOSAL FACILITIES OF AND AFTER 2ND STAGE FOR 8-YEAR OPERATION OF 600 MW POWER PLANT (Long-range Plan)

Another ash pond with a disposal capacity of 2,560,000 m³ required for 8-year operation after 1st stage will be built adjacent to and in the direction of south of the previous ash pond. The revetment of the ash pond in the sea and filling method are the same with those planned in the 1st stage.

PLAN

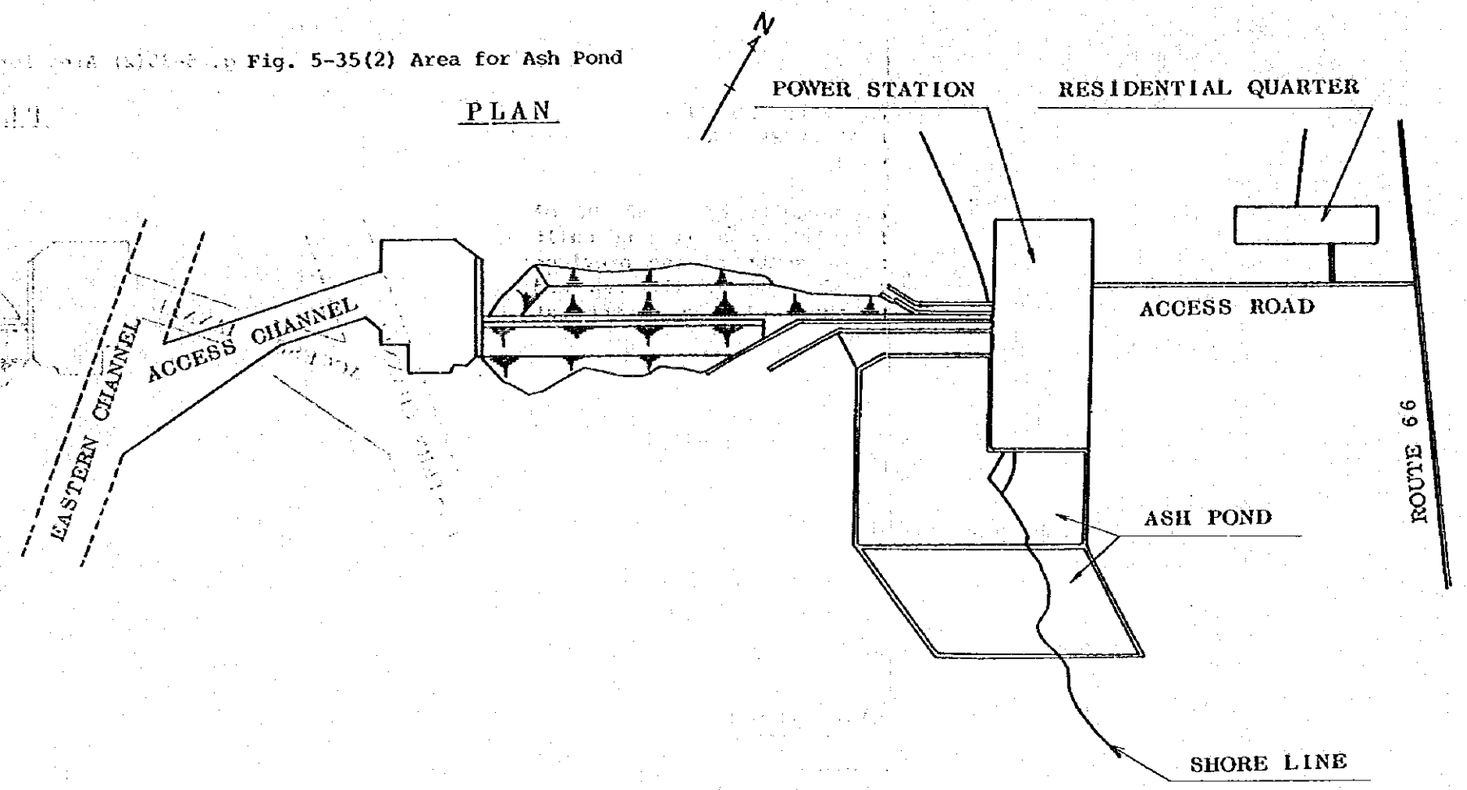
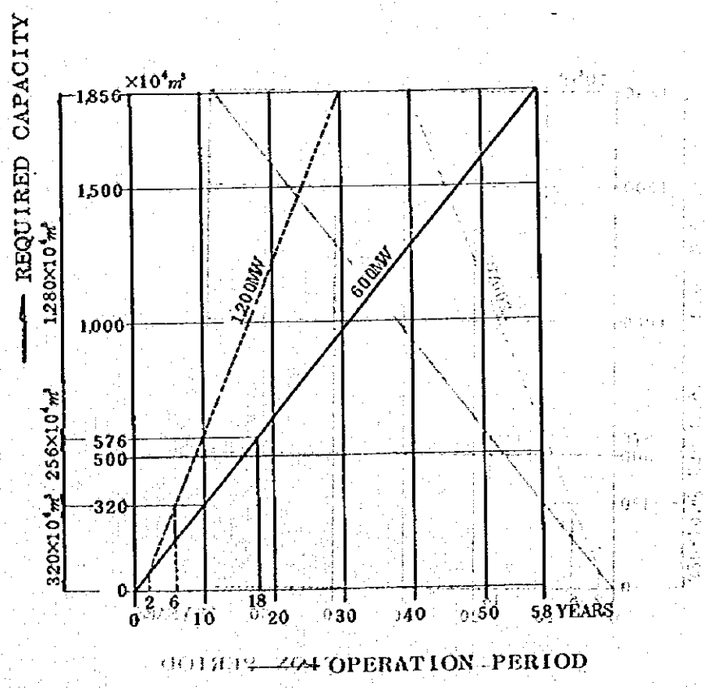


TABLE FOR REQUIRED CAPACITY

EL (m)	2nd STAGE (a) (600MW×8) EL−1.5 m ~ EL+4.0 m	
	A (m²)	V (m³)
− 5		
− 4		
− 3		
− 2		
− 1	120,000	30,000
± 0	372,000	276,000
+ 1	441,000	683,000
+ 2	543,000	1,175,000
+ 3	675,000	1,817,000
+ 4	675,000	2,778,000
+ 5		
+ 6		
REQUIRED CAPACITY		2,560,000

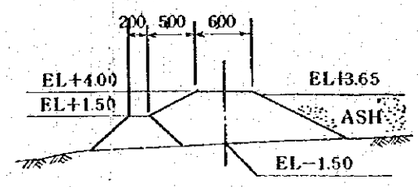


2ND STAGE (600MW−8 YR.)

REQUIRED CAPACITY V=2,560,000 m³

ACTUAL CAPACITY V=2,778,000 m³

HEIGHT OF REVETMENT EL−1.5 m ~ EL+4.0 m



TYPICAL SECTION FOR REVETMENT

0 10m

(Fig. 5-35(3) Area for Ash Pond

ASH DISPOSAL FACILITIES OF AND AFTER 2ND STAGE FOR 40-YEAR OPERATION OF 600 MW POWER PLANT (Long-range Plan)

Further expansion of the ash pond to accommodate ash of 12,800,000 m³ for 40-year operation of 600 MW power plant will be planned. The required capacity of the pond is so large that two types of the pond, Type-A and Type-B are considered.

Type-A

Where a level after ash disposal is set at EL+4.000 m, the bottom level of the revetment in the sea will be EL-5.000 m.

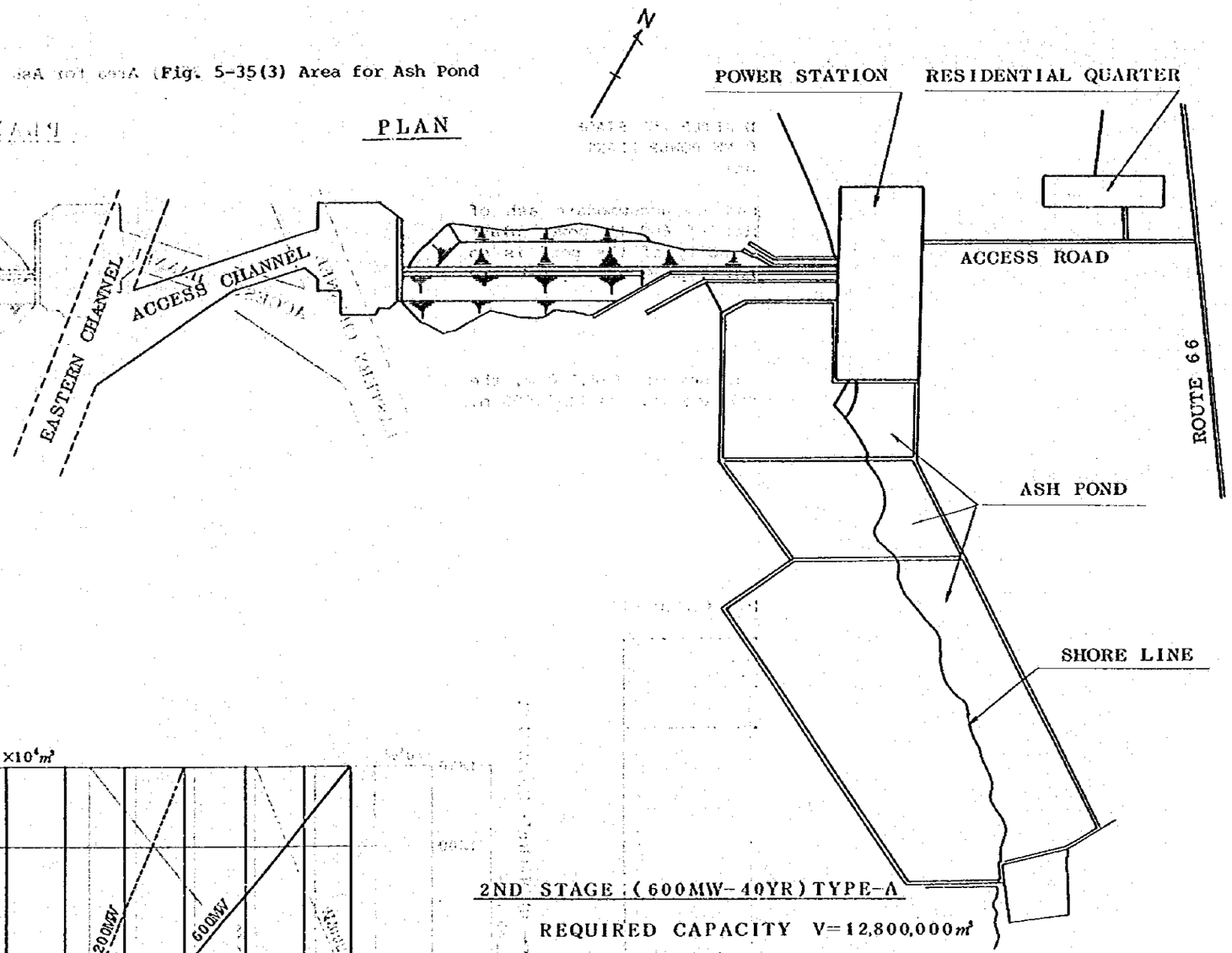
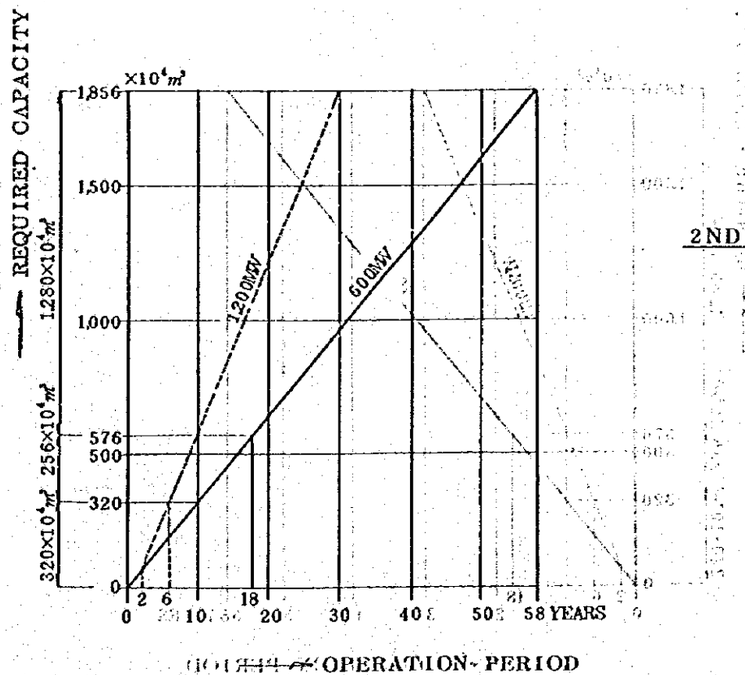


TABLE FOR REQUIRED CAPACITY

EL (m)	2nd STAGE(b) TYPE-A) EL-5.5m~EL+4.0m	
	A (m²)	V (m³)
− 5	117,000	29,000
− 4	449,000	312,000
− 3	673,000	873,000
− 2	848,000	1,633,000
− 1	1,141,000	2,584,000
± 0	1,668,000	3,988,000
+ 1	1,970,000	5,543,000
+ 2	2,292,000	7,937,000
+ 3	2,832,000	10,498,000
+ 4	2,832,000	13,330,000
+ 5		
+ 6		
REQUIRED CAPACITY		12,800,000

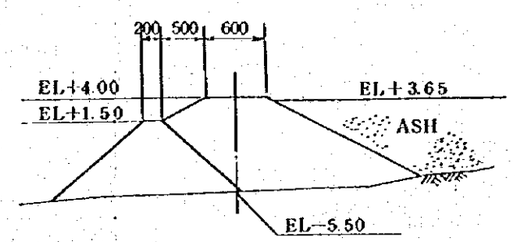


2ND STAGE : (600MW-40YR) TYPE-A

REQUIRED CAPACITY V=12,800,000m³

ACTUAL CAPACITY V=13,330,000m³

HEIGHT OF REVETMENT EL-5.5m~EL+4.0m



TYPICAL SECTION FOR REVETMENT

0 10m

Fig. 5-35(4) Area for Ash Pond

Type-B

At first, the size of the revetment and filling level will be set at EL-1.500 m in the sea bottom and at EL+4.000 m as same as the first stage. After that additional revetment with a height of 2.000 m will be built on the filled-up disposal area.

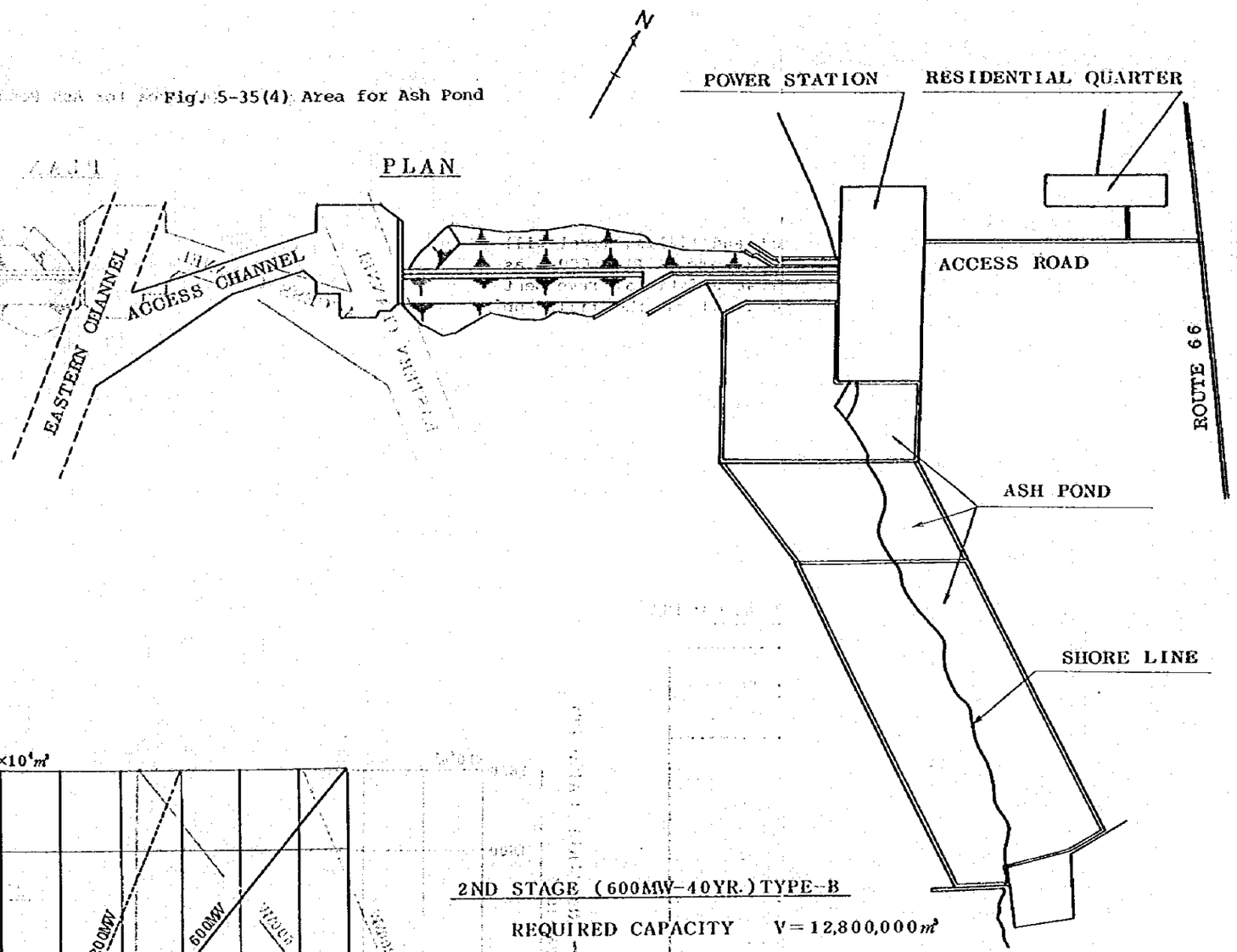
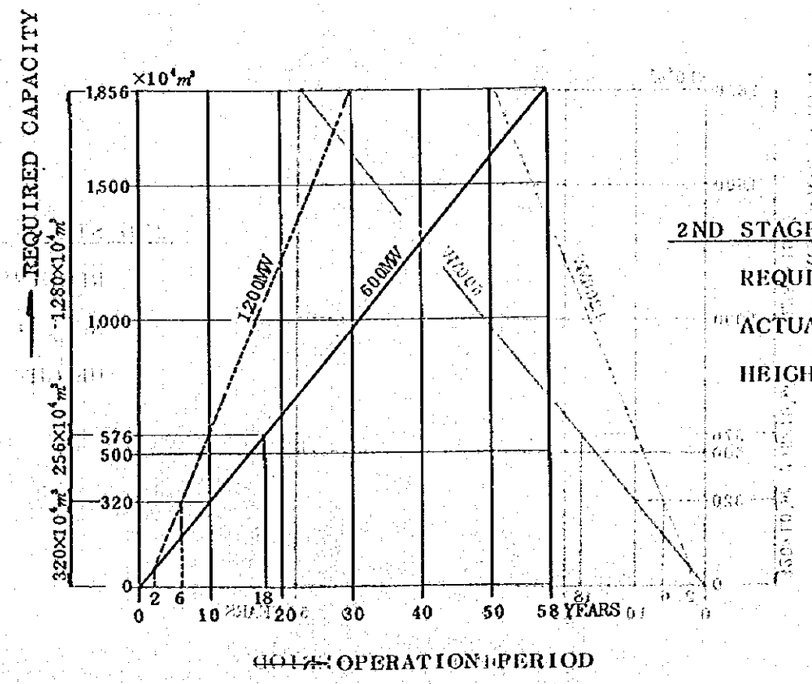


TABLE FOR REQUIRED CAPACITY

EL (m)	(600MW×40) (TYPE-B) EL-1.5m~EL+6.0m	
	A (m^2)	V (m^3)
− 5		
− 4		
− 3		
− 2		
− 1	234,000	59,000
± 0	761,000	556,000
+ 1	1,063,000	1,204,000
+ 2	1,385,000	2,691,000
+ 3	1,925,000	4,346,000
+ 4	1,925,000	6,271,000
+ 5	3,553,000	9,824,000
+ 6	3,553,000	13,377,000
REQUIRED CAPACITY		12,800,000

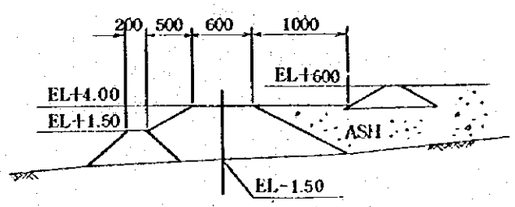


2ND STAGE (600MW-40YR.) TYPE-B

REQUIRED CAPACITY V=12,800,000m^3

ACTUAL CAPACITY V=13,377,000m^3

HEIGHT OF REVETMENT EL-1.5m~EL+6.0m



TYPICAL SECTION FOR REVETMENT

0 10m

5-2-4 Harbor Facilities

1) Design Conditions for Preliminary Design

a. Design Datum Level

For the design datum level, the elevation level (E.L.) is adopted.

In the topographic map of Egypt, the mean sea level at Alexandria is used as the base level. It was made clear during the field survey, that the mean sea level of the Gulf of Suez was 6 cm higher than that of Alexandria Port. (Based on the survey by the Survey Authority of Egypt).

b. Chart Datum Level

It was confirmed during the field survey that the bench mark at the Suez Canal Authority situated by the Canal in Suez City was EL-1.145 m. This datum level is considered to agree with the chart datum level (C.D.L.).

c. Relation between Design DAtum Level and Chart Datum Level

- EL 0.00 m = C.D.L. +1.145 m
- Mean high water springs (H.W.L.)
  = C.D.L +1.9 m
- Mean low water springs (L.W.L)
  = C.D.L +0.4 m

The relation between the elevation and the chart datum level is shown in the section of civil facilities.

d. Field Conditions

a) Wind velocity Maximum 35 m/sec

(Presumed from data obtained at site survey)

b) Wave height

Maximum wave height Hmax = 2.5 m

(Data from Meteorological Authority)

Significant wave height H1/3 = 1.3 m - 1.5 m

Period -

Wave direction South

c) Currents Maximum 1.5 knot

d) Tide

Tidal levels referred to Datum of Sounding

			Heights in meters above datum			
Place	Lat. N	Long. E	MHWS (HWL)	MHWN	MLWN	MLWS (LWL)
Suez	29°56'	32°33'	1.9	1.6	0.7	0.4

e) Littoral drift

Of littoral draft nearer to the shore nothing is known.

According to information from Suez Port Authority, bathymetric survey have revealed that only very little basin siltation has taken place since the last dredging of port Ibrahim in 1966, when the commercial basin was dredged to 9 m below MLW and Arsenel Basin to 7 m below MLW.

Also, studies of sedimentation patterns in Gulf of Suez reveal that little movement of sedimentation appear, but they are not a conspicuous phenomenon. As the waves and tidal currents in Gulf of Suez are small, a littoral drift phenomenon would not be large.

e. Design Conditions of Berths and Causeway

a) Wave height in design (significant wave height) — H 1/3 = 1.5 m

b) Wind velocity in design (Maximum wind velocity) — Umax - 35 m/sec

c) Seismic coefficient — K = 0.05

d) Current velocity — Vmax = 1.5 knot

e) Berthing velocity of ship

i.	Coaler	0.15 m/sec
ii.	Oil tanker	0.15 m/sec
iii.	Small craft	0.2 m/sec

f) Surcharge

i.	Coaler berth	3 t/m²
ii.	Oil tanker berth	1 t/m²
iii.	Small craft berth	1 t/m²

*Temporary surcharge

= ½ x (Surcharge in ordinary condition)

g) Unloader crane

i.	Weight	1,100 t 2 unit
ii.	Rail gauge	20 m

h) Height of wharf crown

Crown height of berths was determined considering sea conditions (wave height) and utility for users.

HWL + Wave height + Free board

1.9 + 1.5 + 0.745 = +4.145 m (CDL)

4.145 - 1.145 = +3 m (EL)

i) The lay of the sea bed

The sea topographical map and the sounding map, etc. will be shown in the following page.

j) Soil characteristics

As no data of soil investigation in the proposed site of harbor construction, the data of 3 boring logs drilled by EEA at the points of turbine/generator, coal storage center and cooling water intake pit in the power plant area and the data of bore holes of Suez Channel around were studied and arranged to use into the proposed port.

The location and the result of soil investigation above mentioned are attached following or additional document as reference data.

. N-value in foundation of pile's tops

N = 24.6 (supplementary values)

. N-value balanced from sea bed to pile's tops

N = 19.8 (supplementary values)

. Angle of internal friction of sand

$\phi = 35°$

k) Kind of materials used

The cement used shall be under water cement (Type V).

f. Design will be made based on the Technical Standard for Construction of Harbor Facilities of Japan.

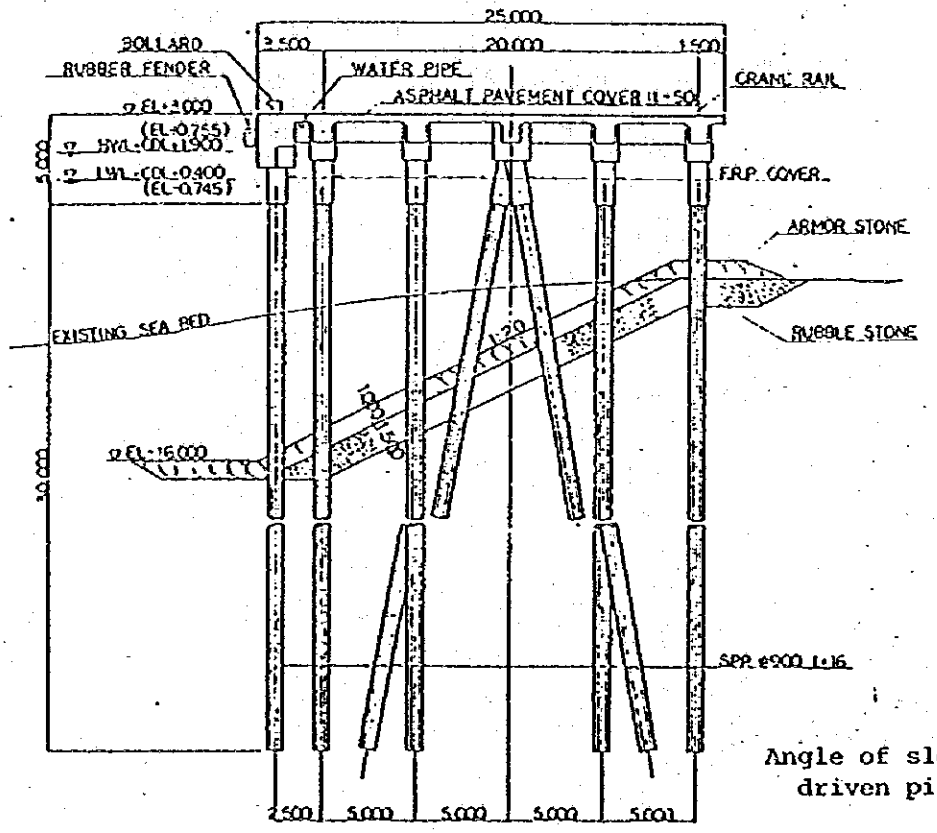
2) Preliminary Design of Harbor Facilities

a. Layout of the Harbor Facility shows next page.

b. Mooring Facility

a) Wharf of unloading for coal

Typical section is decided as follow.

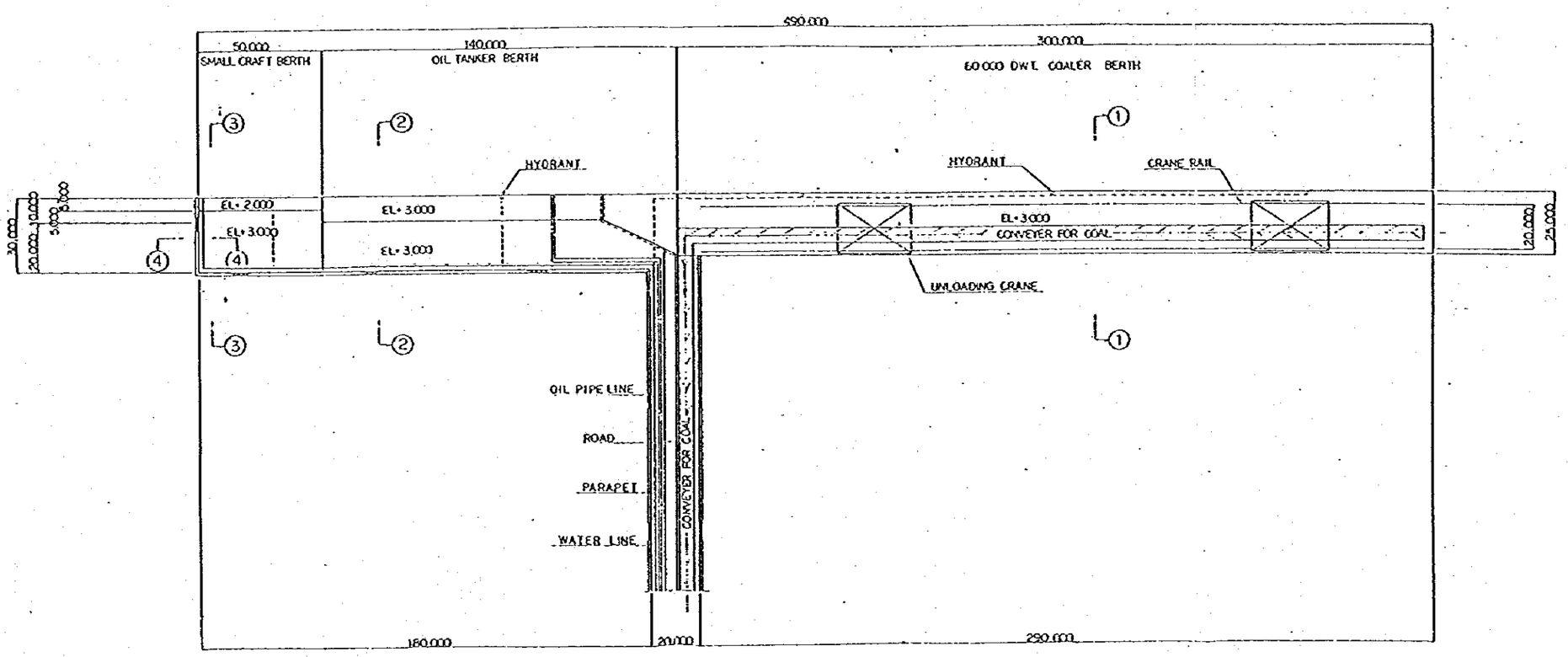


Angle of slope of driven piles = 20°

(N. B.) . Structural type shall be more studied, if it is possible to be find more economical one after soil investigation.

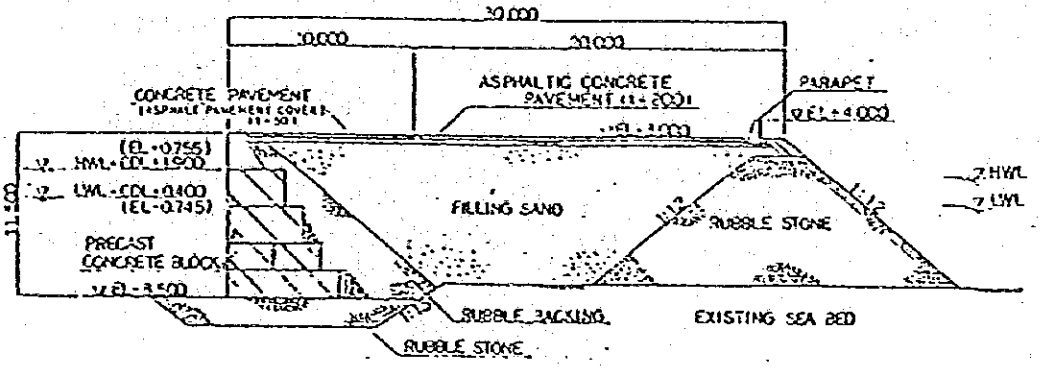
. Kind of cement used shall be unader water cement (Type V).

Fig. 5-36 Layout of Harbour Facility



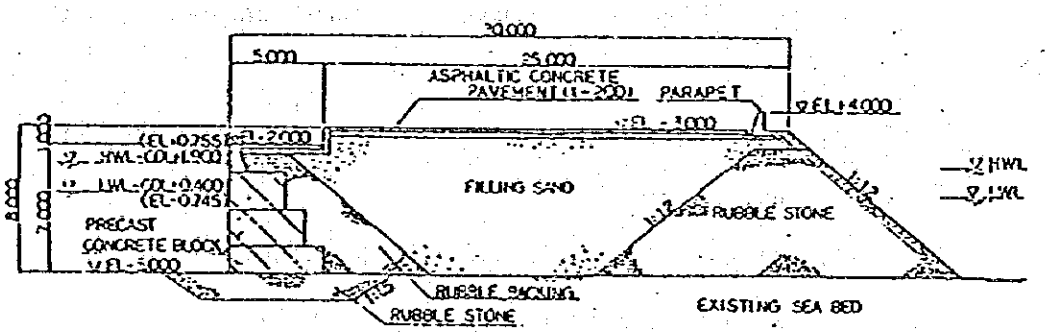
b) Wharf of unloading for oil

Typical section of the wharf of unloading for oil is decided as follow.



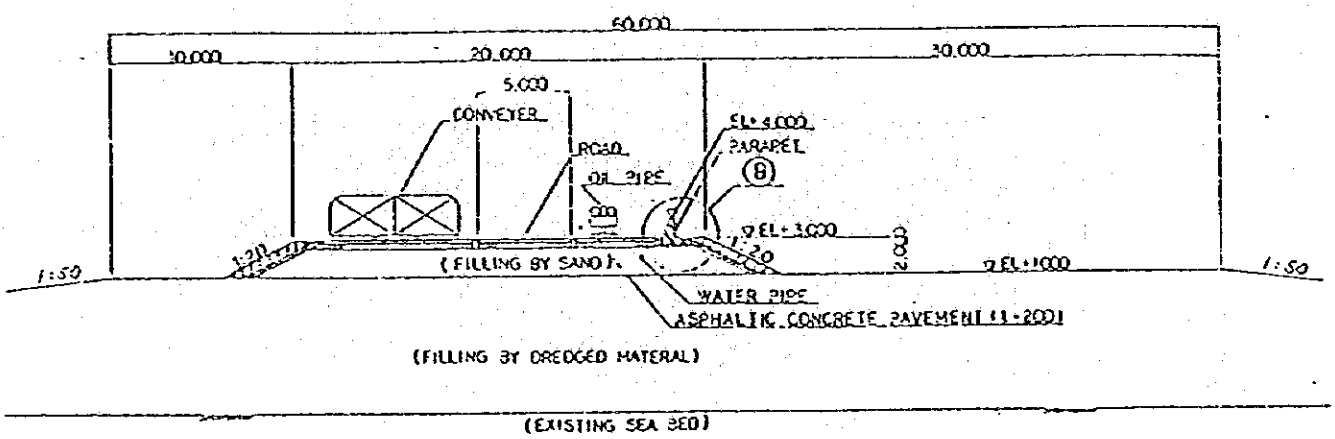
c) Wharf of small craft

Typical section of the wharf of small craft



c. Jetty (Road)

Typical section of Jetty (Road) is decided as follow.



i. Filling by dredged suitable material shall be filled up EL+1.000 in order to make cheaper construction cost.

ii. Filling and dredged materials shall be made balance of earth volume.

iii. Slope of filling by dredged material will be assumed 1:50 in consideration of stability.

iv. Width of causeway shall be 20.000 m in consideration of belt conveyor, road and pipe line.

d. Schematic Examination of Section of Major Harbour Facility

a) Wharf of unloading for coal

i. Impacted force by the ship and fender

Impacted force by the ship shall be calculated with an appropriate formula.

Fig. 5-37 Plan of Girder

s=1/200

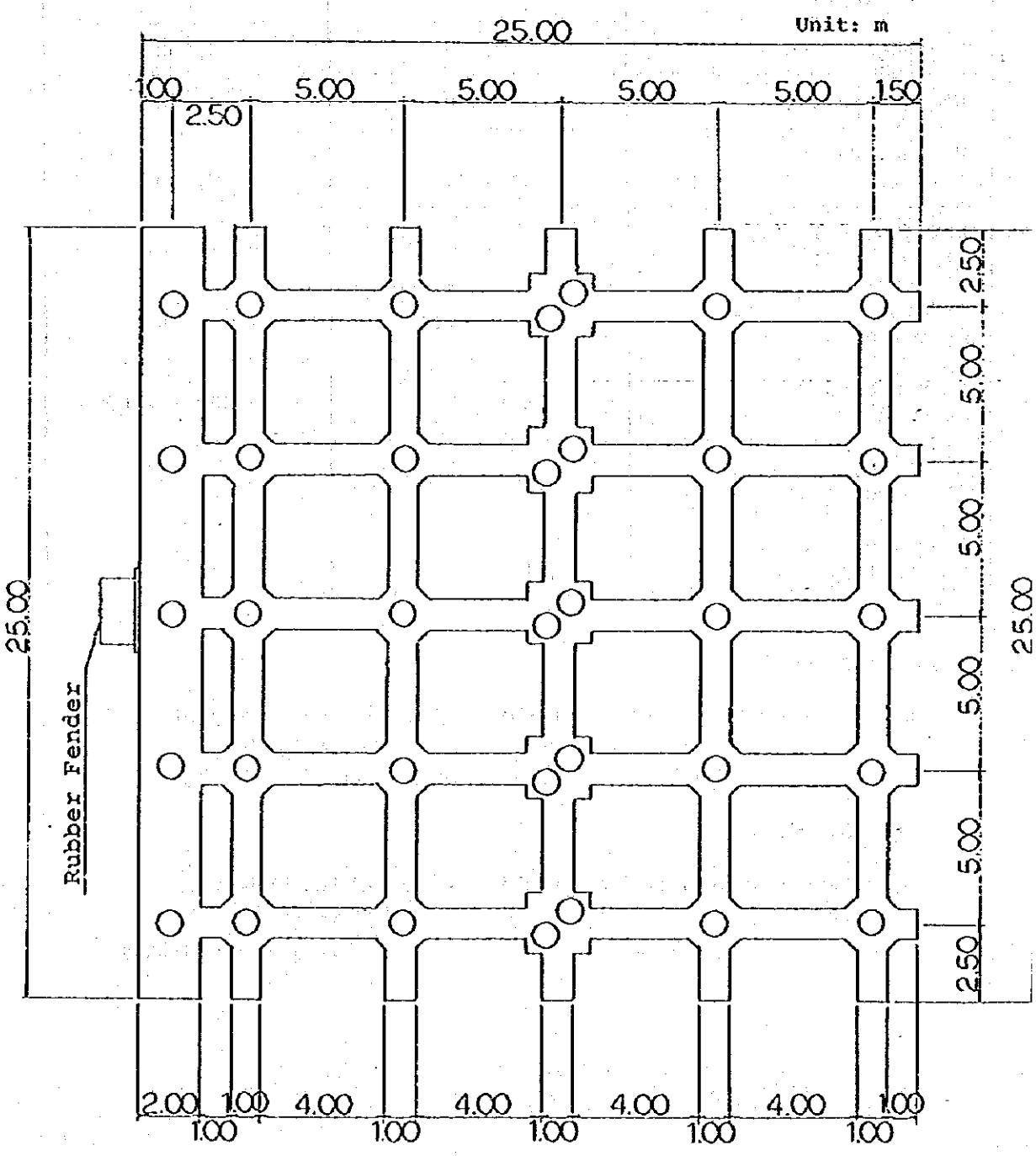


Table 5-16 Result of Computation

Item	Wharf of Coal	Wharf of Oil
Deadweight tonnage (D/W)	60,000	5,000
Drainage tonnage (T)	78,000	6,600
Added weight (T)	29,000	3,300
Virtual Weight of ship (T)	110,000	9,900
Berthing Velocity of ship (m/s)	0.15	0.15
Effective Berthing energy of ship (t.m)	62.6	5.7
Rubber Fender to be used	CH-1,300	V-400H x 2,000
Absorbing energy of rubber fender (t.m)	74.4	7.2
Reaction force of rubber fender (t)	149	66

* Wharf for Coal

Effective berthing energy of ship < Absorbing energy of rubber fender

62.5 T < 74.4 T ----- Satify

* Wharf for Oil

Effective berthing energy of ship < Absorbing energy of rubber fender

5.7 T < 7.2 T ----- Satify

ii. Determination of batter piles

i). Design conditions

Table 5-17 External Force of Design

Unit: ton

Load conditions / Load	Normal conditions W = 3.0 t/m²		Impacted force by ship W = 3.0 t/m²		earthquake (extreme) W = 1.5 t/m²	
	V	H	V	H	V	H
Surcharge on the slab	375.0	-	(-) 375.0	-	187.5	9.38
Dead load of slab	262.5	-	262.5	-	262.5	13.13
Dead load of piles	V1 = 11.7 V2 = 23.4	- -	V1 = 11.7 V2 = 23.4	-	V1 = 11.7 V2 = 23.4	0.29
Impacted force by ship	-	-	-	* 50.0	-	-
Total	672.6	-	(297.6) 672.6	50.0	485.1	22.8

* Impacted force by ship can be calculated as 1/3 X reaction of rubber fender.

ii) Pushing and pulling forces from batter piles

Batter piles can be calculated by impacted force by ship.

Pulling capacity of ship 70/3

= 2.33 t < Impacted force by ship = 50 t

Unit : ton

Case	Item	Axial force of batter pile	
		P1	P2
1	Normal condition	69.62	69.62
2	Berthing velocity (without surcharge)	127.40	-65.80
3	Berthing velocity	166.20	-26.98
4	Earthquake	94.24	6.16
Design for axial force		166.20	-65.80

iii) Determination of stress for axial force

. Allowable stresses of steel piles

Compressive stress of axial direction

(The material is STK 41-JIS.)

in $0 < \frac{L}{r} < 93$

$\sigma_{sa} = 1{,}400 - 8.4\ (L/r - 20)$

where,

L: Effective buckling length of the pile (cm)

r: Radius of gyration of area for the cross sectional area of pile (cm)

$\sigma_{sa} = 1{,}400 - 8.4\ (1{,}660/\ 31.3 - 20)$

$= 1{,}123\ kg/cm^2$

. Stresses of batter piles

$\sigma s = P/A$

where,

A: Gross of section area 444.3 cm²

P: Pushing force 166.2 t

$$\sigma s = \frac{166.2 \times 10^3}{444.3} = 374 \text{ kg/cm}^2 < \sigma sa$$

= 1.123 kg/cm² Satisfy

iv) Study for embedded length of batter piles

Ultimate bearing capacity can be designed to drive the sand layer.

* Pushing force (Pl = 166.2 t)

$Ru = 40.N.\ Ap + (\bar{N}s/5 \times LsU)$

where,

Ru : Ultimate bearing capacity of the pile (t)

Ap : Area of head top of the pile (0.635 m²)

LsU: Whole skin area of pile (2.88 m x L m)

$\bar{N}s$: Mean N value for the total enbeded length of the piles

N : N value at head top of the pile

$$N = \frac{N_1 + N_2}{2}$$

$$\bar{N}s = \frac{(15 + 15 + 15 + 15 + 30 + 28.5)}{6}$$

= 19.8

$N_1 = 28.5$

$$N_2 = \frac{(15 \quad 15 + 15 + 30 + 28.5)}{5} = 20.7$$

$$N = \frac{28.5 + 20.7}{2} = 24.6$$

Ru = 40 x 24.6 x 0.635 +

(19.8/5 x 17.6 x 2.88) = 825.54 t

$$\text{Safety factor } F = \frac{Ru}{P_1} = \frac{825.54}{166.2} = 4.97 > 2.5 \quad \text{(Satisfied)}$$

* Extracting force (P_2 = -65.8 t)

$$Ru' = 19.8/5 \times 17.6 \times 2.88 = 200.7 \text{ t}$$

$$\text{Safety factor } F = \frac{200.7}{65.6} = 3.05 > 3.0 \quad \text{(Satisfied)}$$

Ru': Resistance for extracting force of pile

iii. Determination of vertical pile (for one rigid frame 5 piles)

i) Design conditions Unit: ton

	Normal Condition W = 3 t/m²		Earthquake W = 1.5 t/m²		During Operation	Storm
	V	H	V	H	V	V
Surcharge on the slab	375	-	187.5	9.38	-	-
Dead load of slab	262.5	-	262.5	13.13		
Wheel load	-	-	-	-	242.1*	264.1*
Total	637.5	-	450	22.50	242.1	264.1

* for one support point

Unit load per travel wheel are as shown in the following figure case (1)

ii) Characteristic length of pile

$$= \sqrt[4]{\frac{Es}{4EI}}$$

$$Kr = 0.15 N = 0.15 \times 15 = 2.25 \text{ kg/cm}^3$$

$$Es = KrB = 2.25 \times 90 = 202.5 \text{ kg/cm}^2$$

$$EI = 2.1 \times 10^6 \times 43.4 \times 10^4$$

$$= 91.14 \times 10^{10}$$

$$= \sqrt[4]{\frac{202.5}{4 \times 91.14 \times 10^{10}}} = 0.00273^{cm^{-1}}$$

$$= 0.273^{m^{-1}}$$

$$= 3.66^{m}$$

h = 18.50 m (Pile length from sea bottom)

$\beta h = 0.273 \times 18.5 = 5.05$

iii) Bending moment

$$\varphi(\beta h) = \frac{1 + \beta h}{2\beta h} = 0.60$$

Mo = 4.5 x 18.5 x 0.6 = 49.95 t.m

iv) Stress

	$= \frac{P}{A} + \frac{H}{Z}$	sa
Normal conditions	$\frac{637,500/5}{444.3} = 287.0$	1.072
Earthquake	$\frac{90 \times 10^3}{444.3} + \frac{49.95 \times 10^3}{9,640} = 720.6$	1.608
During operation	$\frac{242,100}{444.3} = 545$	1,072
Storm	$\frac{264,100}{444.3} = 594$	1,608

Slenderness

$$\frac{L}{r} = \frac{1,850}{31.3} = 59$$

$\sigma sa = 1,400 - 8.4\ (59 - 20) = 1.072\ kg/cm^2$

Extreme $\sigma sa = 1.072 \times 1.5 = 1.608$

v) Study for pushing force (Storm)

$$Ru = 40\ N\ Ap + \frac{\bar{N}}{S}\ .LsU$$

$$= 40 \times 24.6 \times 0.625 + \left(\frac{19.8}{5} \times 17.6 \times 2.88\right)$$

$$= 825.54\ t$$

$$\text{Safety factor } F = \frac{Ru}{P}$$

$$= \frac{825.54}{264.1} = 3.1 > 2.5 \quad \text{Satisfy}$$

b) Wharf of unloading for oil

i. Result of safety factor and bearing capacity of rubble base

Item / Section		Normal condition		Earthquake	
		Sliding	Overturning	Sliding	Overturning
EL-2.00		1.73	3.04	1.40	2.44
EL-4.50		1.89	2.46	1.44	1.89
EL-6.50		1.76	1.46	1.32	1.13
EL-8.50		2.05	2.88	1.52	1.85
Compressive in forward of wall	Upper rubble mound	t/m² 37.51		t/m² 49.60	
do.	Lower	29.33		34.67	
Allowable bearing capacity		52.60		47.080	

ii. Result of examination for sliding in base

Normal condition F = 1.06 > 1.00

Earthquake F = 1.353 > 1.00

c). Design condition to be calculated(for reference)

Fig. 5-38 GEOLOGICAL SECTION FOR BOREHOLES ALONG AYUN MUSA

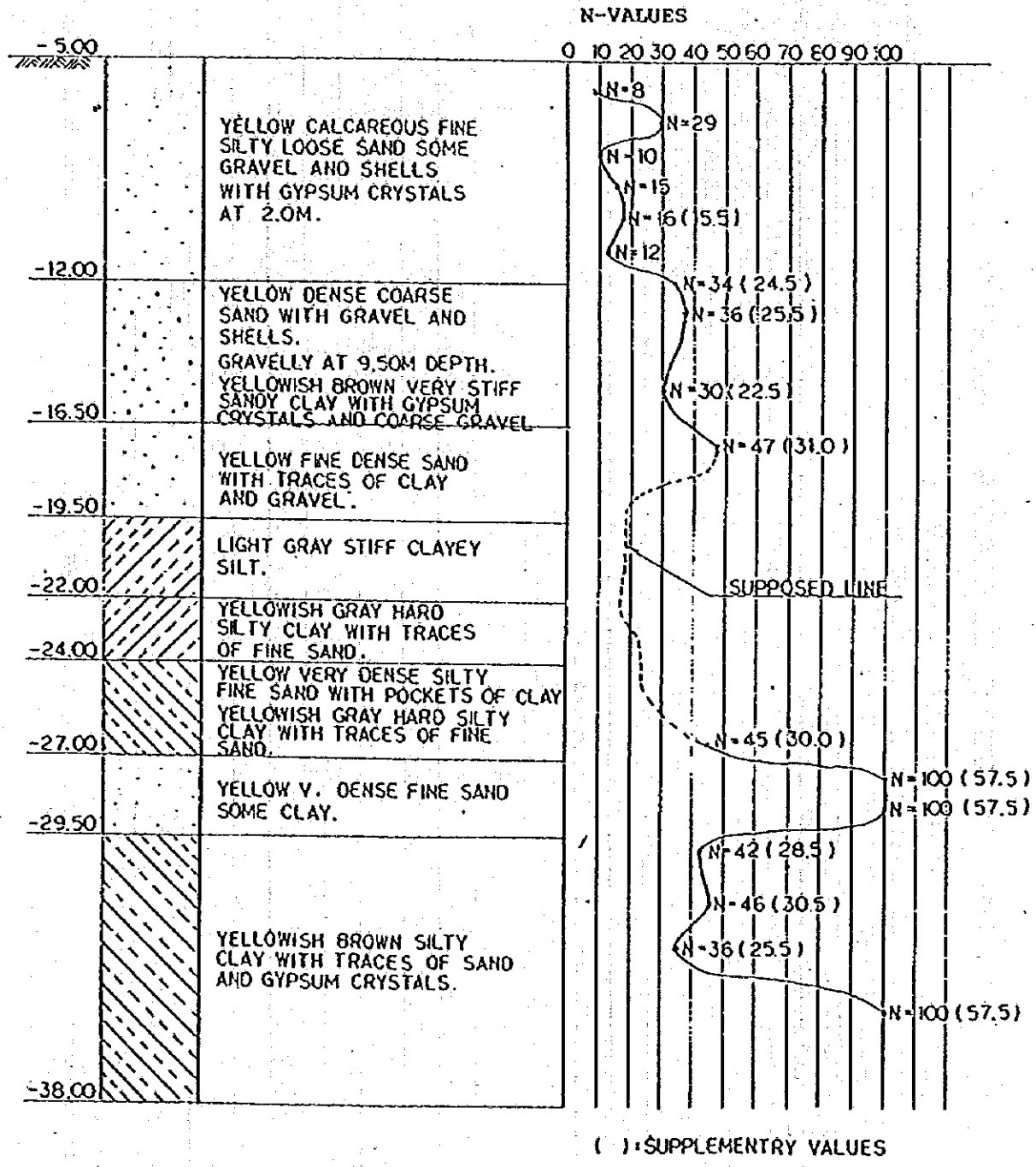
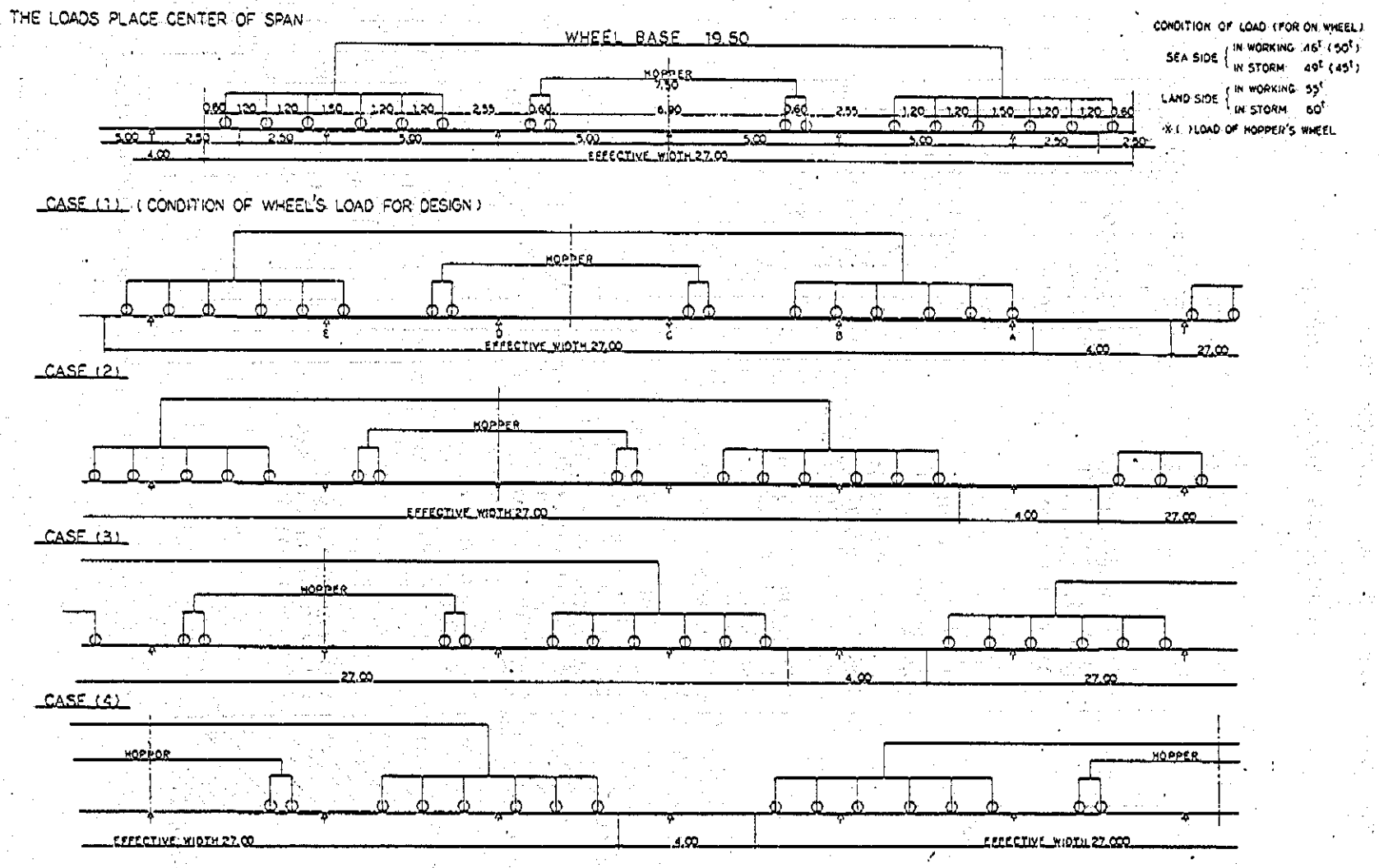


Fig. 5-39 CONDITION OF UNLOADING CRANE'S WHEELS (Unit: m)



d) Corrosion control

Mortal lining with fiberglass reinforced plastic cover shall be placed above -0.6 m CDL (splash and tidal zone) and tar-epo coating shall be painted below -0.6 m CDL till one m depth from under ground and aluminum anode as Cathoric protection shall be set for getting the effect of corrosion control below Mean Sea Level. Anode plates shall be set each pile below M.S.L.

Protective current densities will be taken below typical values or more.

In sea water	0.1 A/m²
In rubble work	0.05 A/m²
In soil (below sea water)	0.02 A/m²

e. Fender

Coaler berth	Rubber fender C-1300 type (25 - 30 m pitch)
Oil tanker berth	Rubber fender V-400H type (10 - 20 m pitch)
Small craft berth	Rubber fender V-150H type (5 - 10 m pitch)

f. Post

Tractive forces on post

	Bollard	Bitt
Coaler berth	150 t x 2 nos	70 t (25 - 30 m pitch)
Oil tanker berth	50 t x 2 nos	25 t (20 - 25 m pitch)
Small craft berth	25 t x 2 nos	15 t (10 - 15 m pitch)

g. Channel

a) Length of channel

The length of a channel at a harbour entrance and the area of a continuous moving basin shall be kept 5 time of ship length or more by considering the stopping distance of the ship.

Generally, two or three tug boats will be used for 60,000 DWT-class ship, the length of the channel was determined as 1,300 m into considering above situations.

b) Width of channel

The width of channel shall be applied follows in accordance with the length of objective ship, the width of objective ship, remarkable large traffic volume, meteorological and sea conditions.

1. The length or more of objective ship, in case of a channel crossed by sailing ships.
2. Half length or more of objective ship, in case of a channel not crossed by sailing ships.

Width of channel was determined as 200 m in considering length of channel and use of tug boat.

Water depth of channel was determined as same as the depth of coaler berth.

h. Basins

This basins used for ship maneuvering (mooring, releasing, turning), not for anchorage or mooring with two anchors.

The area of a basin for turning of the bow of ship shall exceed an area of circle with the radius of 1.5 times the overall length of the ship. For the turning of the bow of ship by using an anchor or using tug boats, the area should exceed an area of circle with the radius of the overall length of the ship.

The area of basin was determined calculation above mentioned adding freeboard. Water depth was taken as the same as each berth.

a) Basin for coaler

Area 500 m x 550 m = 275,000 m^2

Water depth EL-16 m (C.D.L -14.855 m)

b) Basin for oil tanker

Area 350 x 380 = 133,000 m^2

Water depth EL-8.5 m (C.D.L -7.355 m)

c) Basin for small craft

Area 140 x 150 = 21,000 m^2

Water depth EL-5.0 m (C.D.L -3.855 m)

i. Dredging

Side slopes of channel and basins

The grade of side slopes was calculated as 1:3 in considering permanent stability after dredging.

At the proposed area, break waters are not necessary because of small waves and currents.

Dredging soil volume, 3,900,000 m^3 will be dredged by cutter suction pump dredger.

j. Rough Quantities of Major Materials

Major Material	Quantities
Concrete	20,000 m³
Stone (20 - 500 kg)	100,000 m³
Stone (0 - 20 kg)	20,000 m³
Sand	150,000 m³
Steel pipe pile	5,500 t
	(900 ø, t - 16, L = 34 m)
Steel bar (Round)	100 t
Steel bar (Deformed)	900 t
Fender	20 nos
Bit, etc.	23 nos
Marking sign, etc.	15 nos

k. Aggregates used

Aggregates will be transported from following the place of production..

a) Ataqa

Rubble and Armor stone 20 - 1,000 kg (each size)

Stone for rubble backing 0 - 50 kg

Crushed stone 5 - 10 kg

Crushed stone coarse aggregate 20 m/m, 40 m/m, 50 m/m

Sand & fine aggregate

Transportation to the site

Water way by stone (sand) berge dist. 10 km

On road by truck dist. 50 km

b) Kabret

Sand and fine aggregate

By truck dist. 35 km

c) Fanara

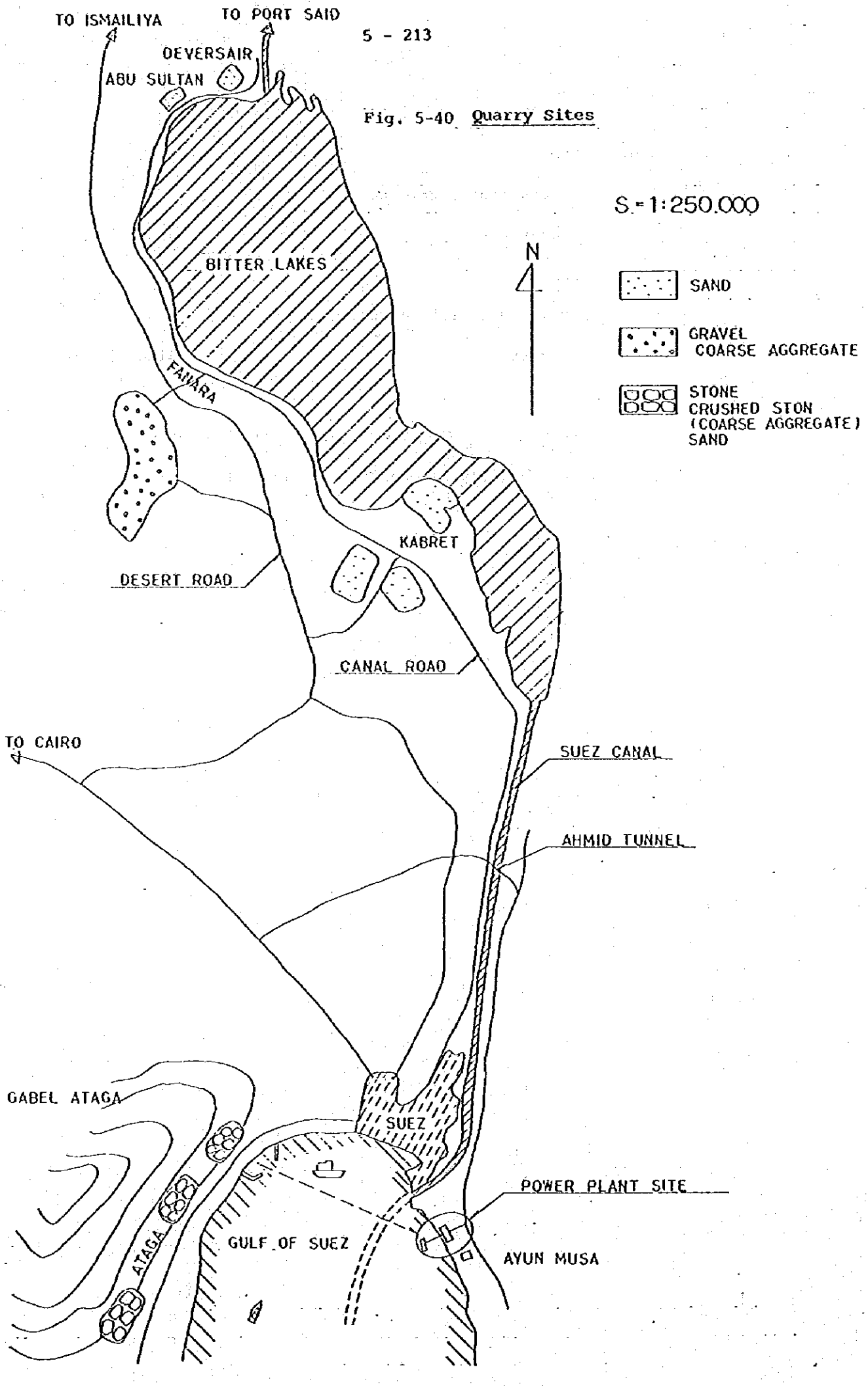
Gravel and coarse aggregate

By truck dist. 50 km

1. Cement

Halkis Cement Company at Ataqa in Suez shall supply cement which apply International Standard.

Fig. 5-40 Quarry Sites



m. Water Supply for Construction Work

After commencement of order, contractors shall construct a RO Desalination plant as temporary. Before operation of this plant, water for construction will be transported from Port Tewfic or private jetty owned by Suez Petroleum Company by water barge or tank rolly.

n. Labor Supply

Most of laborers can be got in Suez City where population is about 0.4 million.

A lot of skilled laborers from the project of New Aswan High Dam completed already are living in Suez. Contractors can employ them without arrangement for their accommodations.

Laborers as commuters from Suez will be able to attend their working places about half hour's commute using bus and transportation boat.

Divers and some specialists of works will be employed from foreign countries.

o. Machinery & Equipment for Construction Works

Some kind of machineries and equipments in Egypt are available to use as rental or subcontractor.

But, generally, rental cost is rather expensive in comparison with normal depreciation.

Available machineries & equipments to arrange in Egypt are shown below list.

List of Machineries & Equipments

Dump truck	6 t, 12 t, 25 t, 40 t
Truck	6 t, 25 t
Trailer	25 t, 45 t
Transportation boat	20 - 30 persons
Bus, micro bus	
Floating crane	200 t, 500 t
Tug boat	1,500 HP
Motor scraper	24 m^3, 16 m^3
Bulldozer	11 t
Truck crane	15 - 20 t

Machineries & equipments not mentioned above shall be imported by contractors, otherwise rented from special organs (for example, Suez Canal Authority).

Dredger	Cutter suction	5,000 HP - 8,000 HP	1 fleet
	Grub type	2 - 8 m^3 backet	1 - 2 fleet
Backet-crane pontoon		2 - 4 m^3	2 - 3 fleet
Piling pontoon		Hummer 6 - 9 t	1 fleet
Piling pontoon		Hummer 2 - 4 t	1 fleet
Flat barge		100 - 300 t	some fleet
Crane barge		30 - 60 t	a few fleet

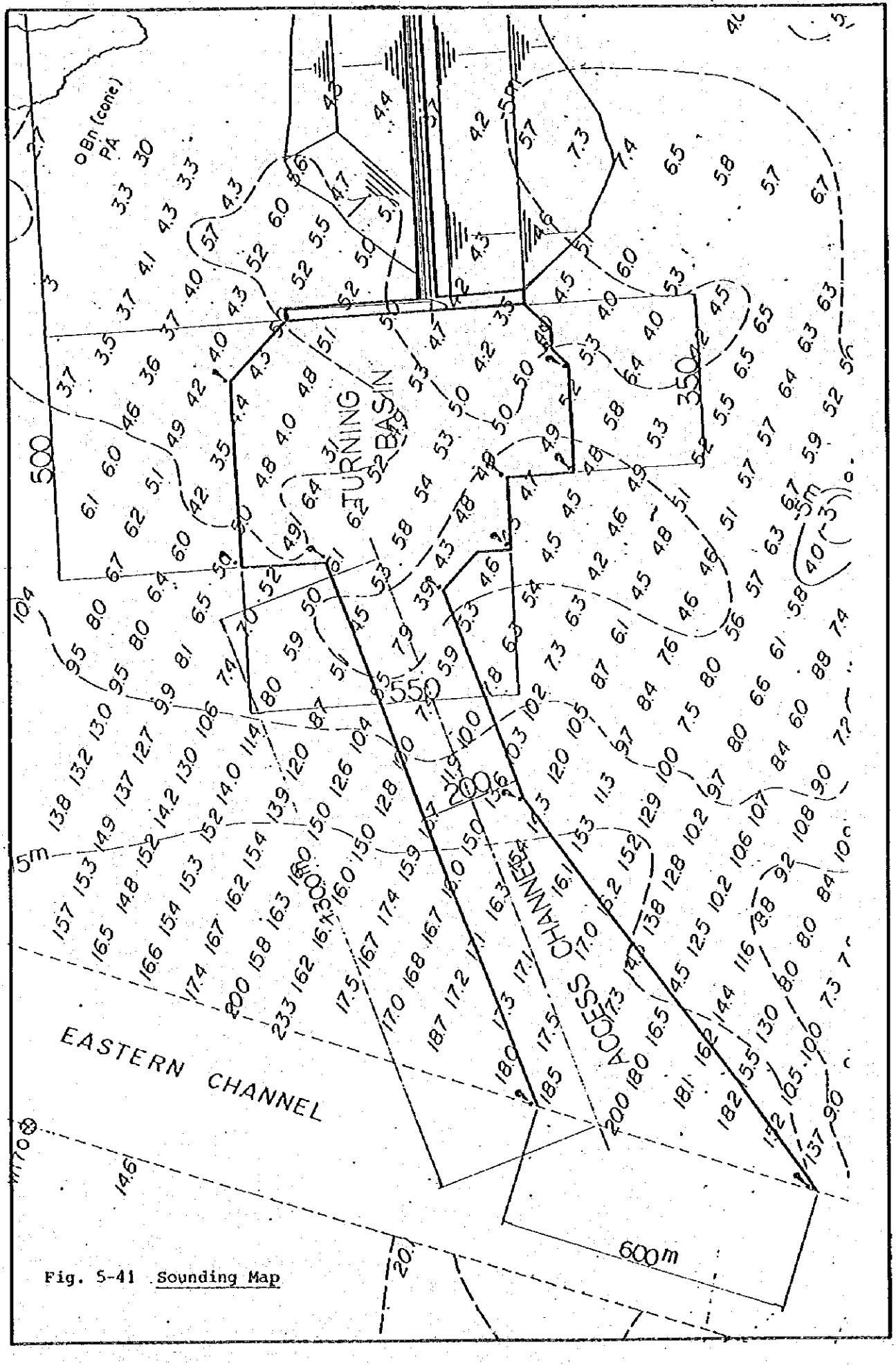
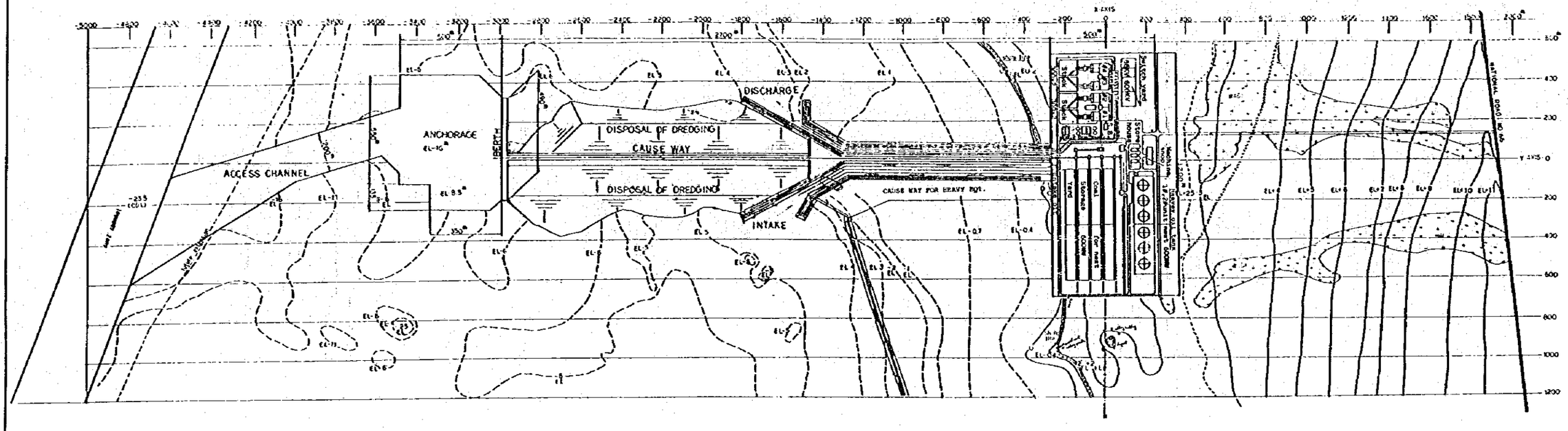
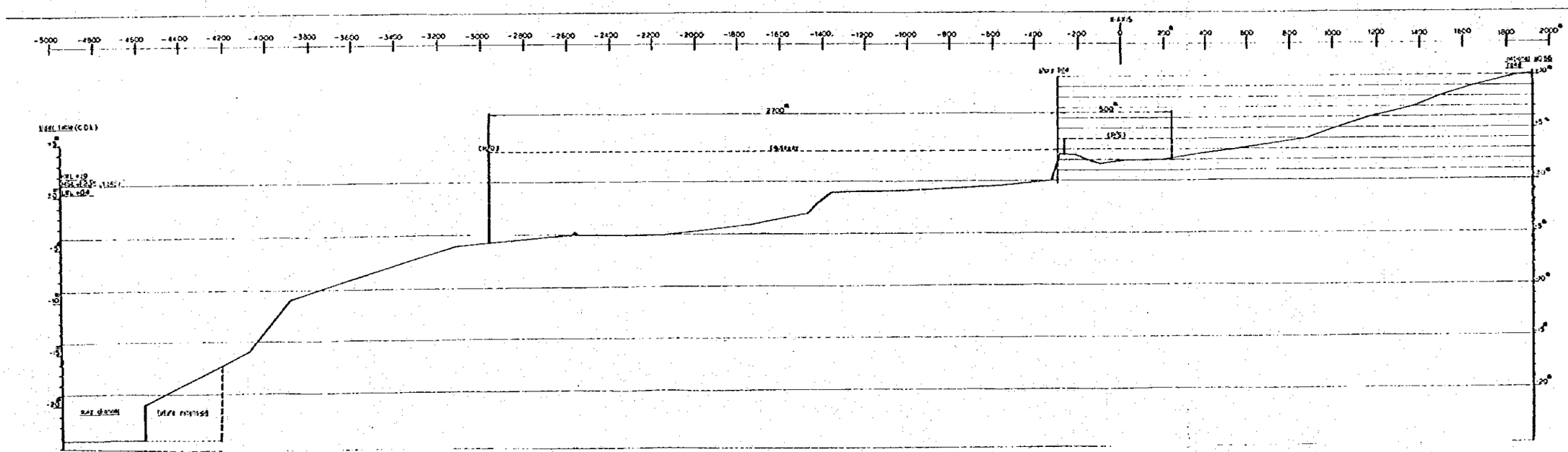


Fig. 5-41 Sounding Map

Fig. 5-42 General Layout of 1,200 MW Coal-Fired Thermal Power Plant





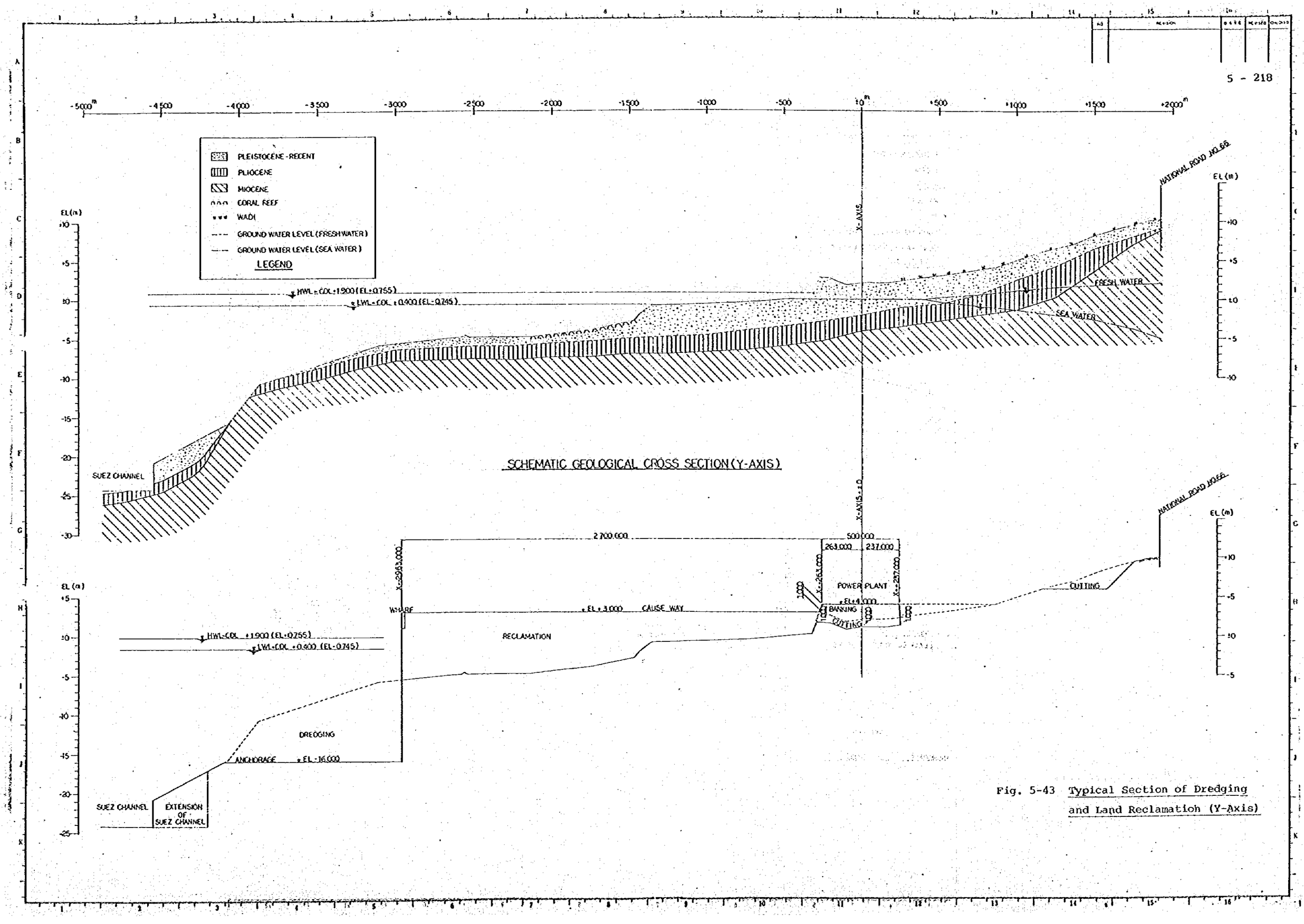


Fig. 5-43 Typical Section of Dredging and Land Reclamation (Y-Axis)

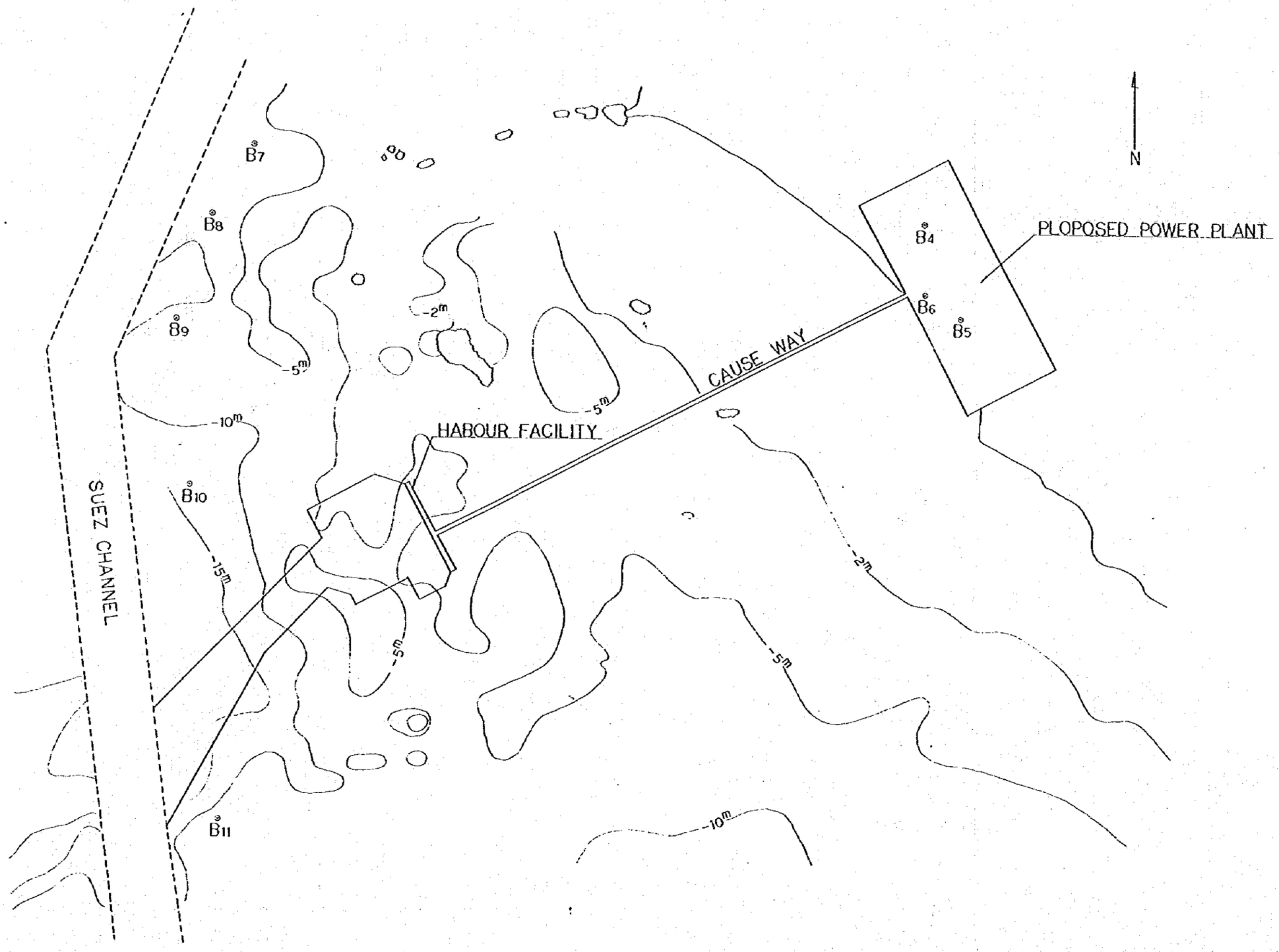


Fig. 5-44 North Ayun Musa (Borring Location)

Fig. 5-45 GEOLOGICAL SECTION FOR BOREHOLES ALONG SUEZ CHANNEL

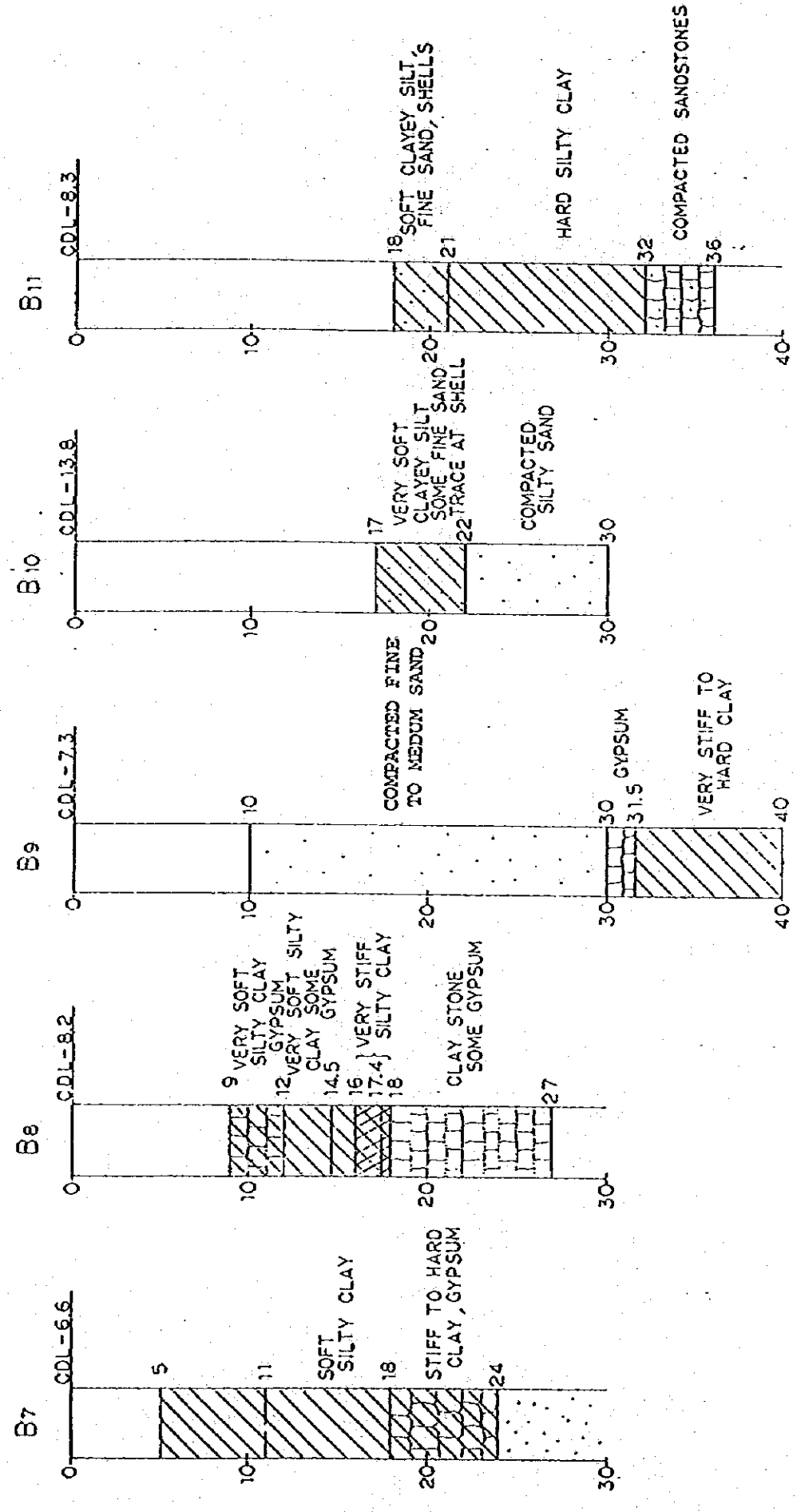
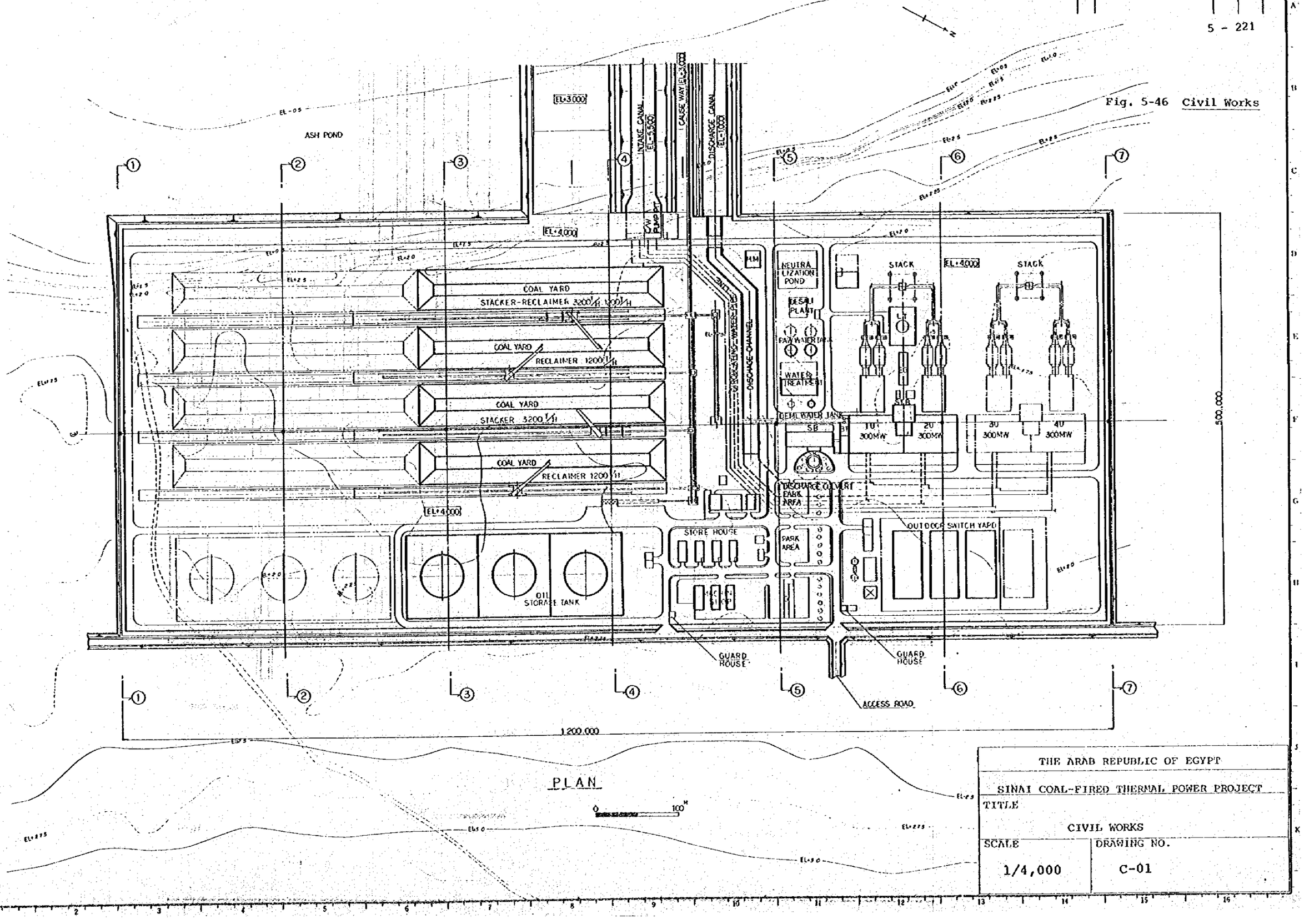
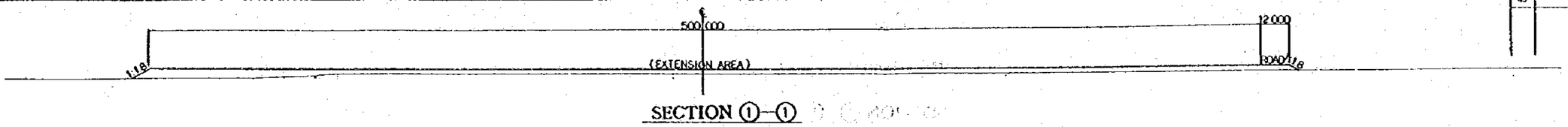


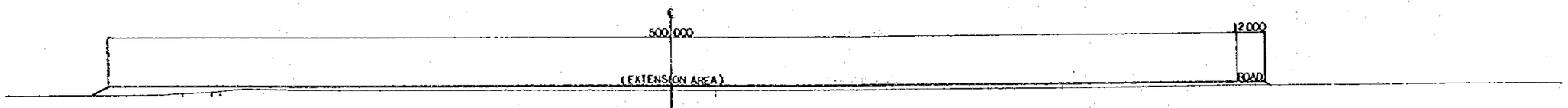
Fig. 5-46 Civil Works



THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: CIVIL WORKS	
SCALE: 1/4,000	DRAWING NO.: C-01



SECTION ①—①



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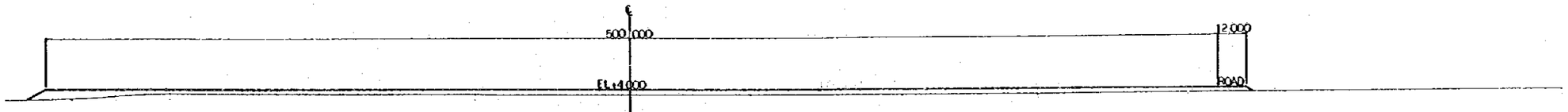

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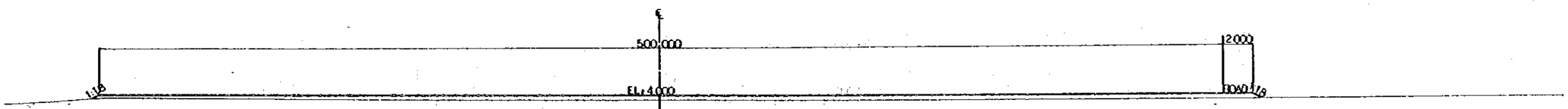

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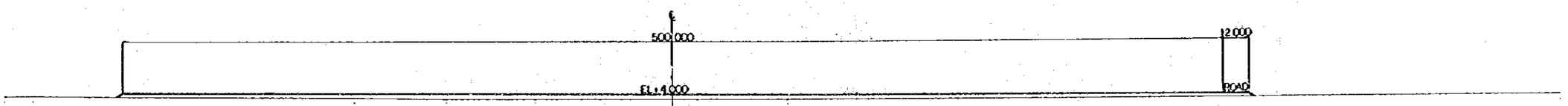
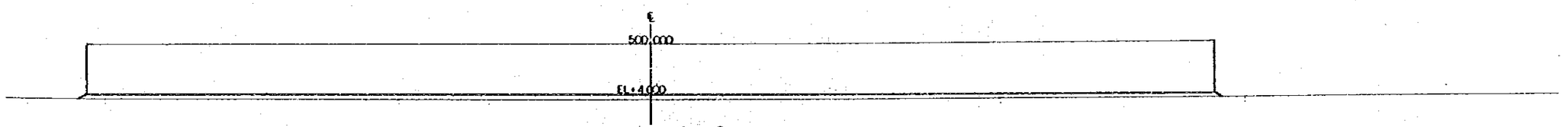
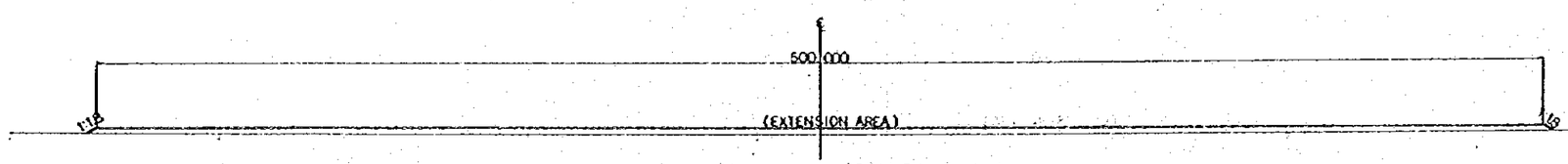


SECTION ⑤—⑤

Fig. 5-47 Sectional View of Land Reclamation



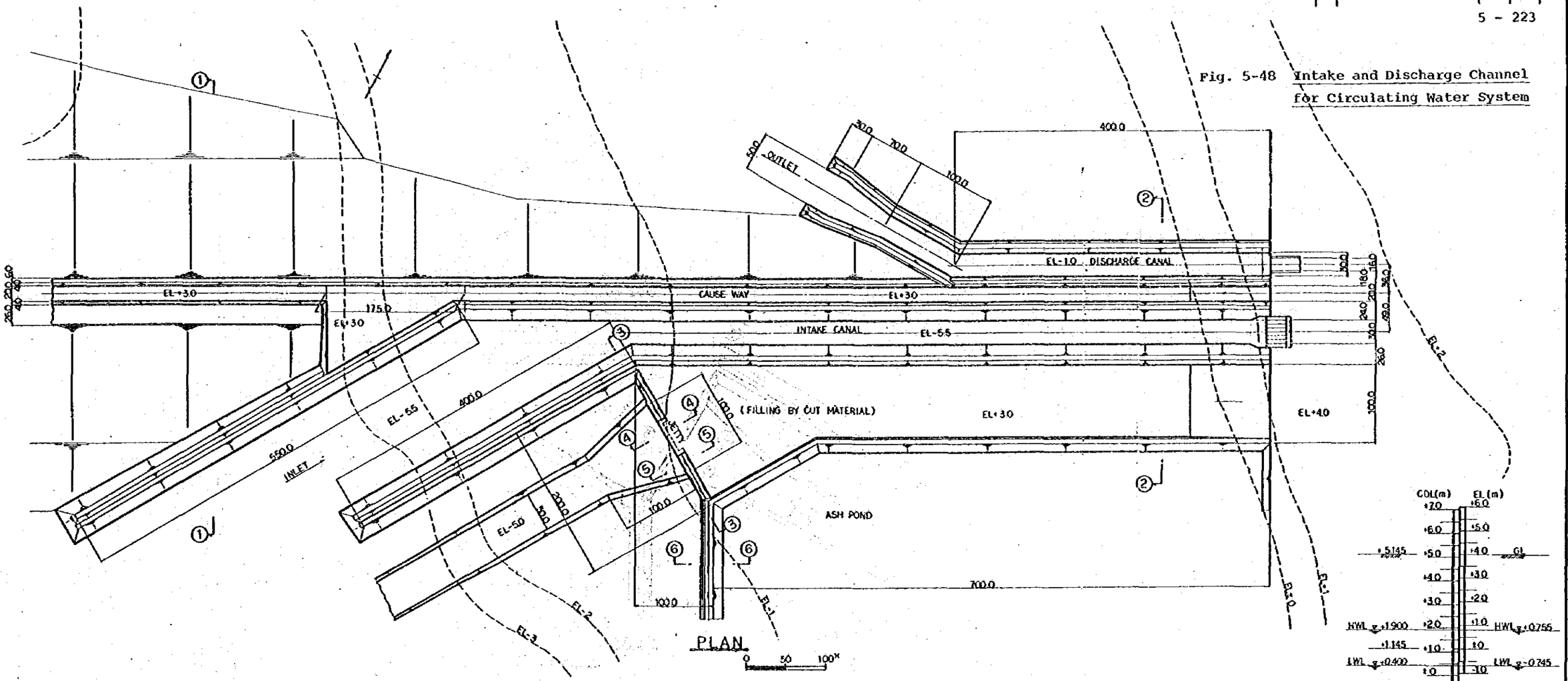
SECTION ⑥—⑥

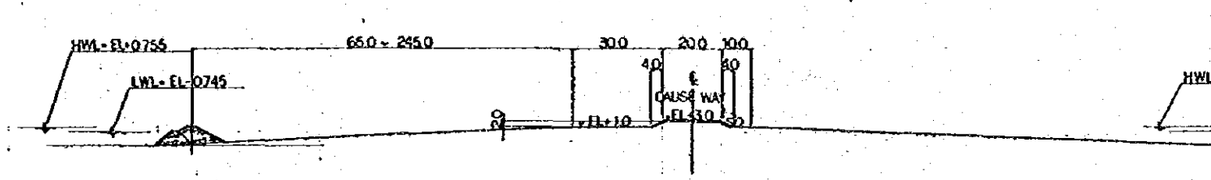


SECTION ⑦—⑦

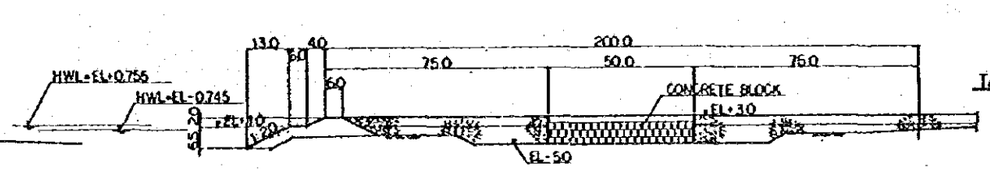
THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: SECTIONAL VIEW OF LAND RECLAMATION	
SCALE: 1/2,000	DRAWING NO.: C-02

Fig. 5-48 Intake and Discharge Channel for Circulating Water System

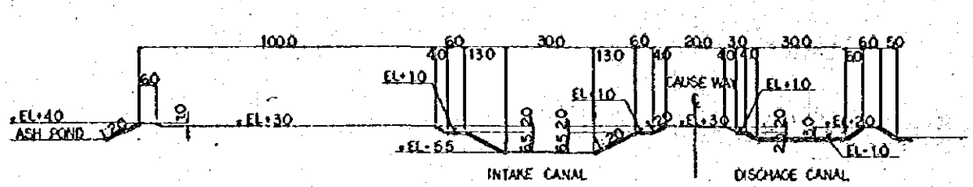




SECTION ①-①



SECTION ③-③



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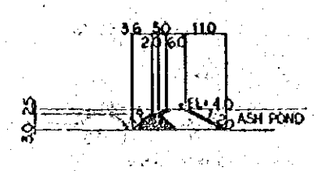

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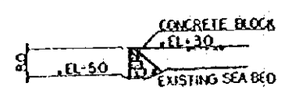
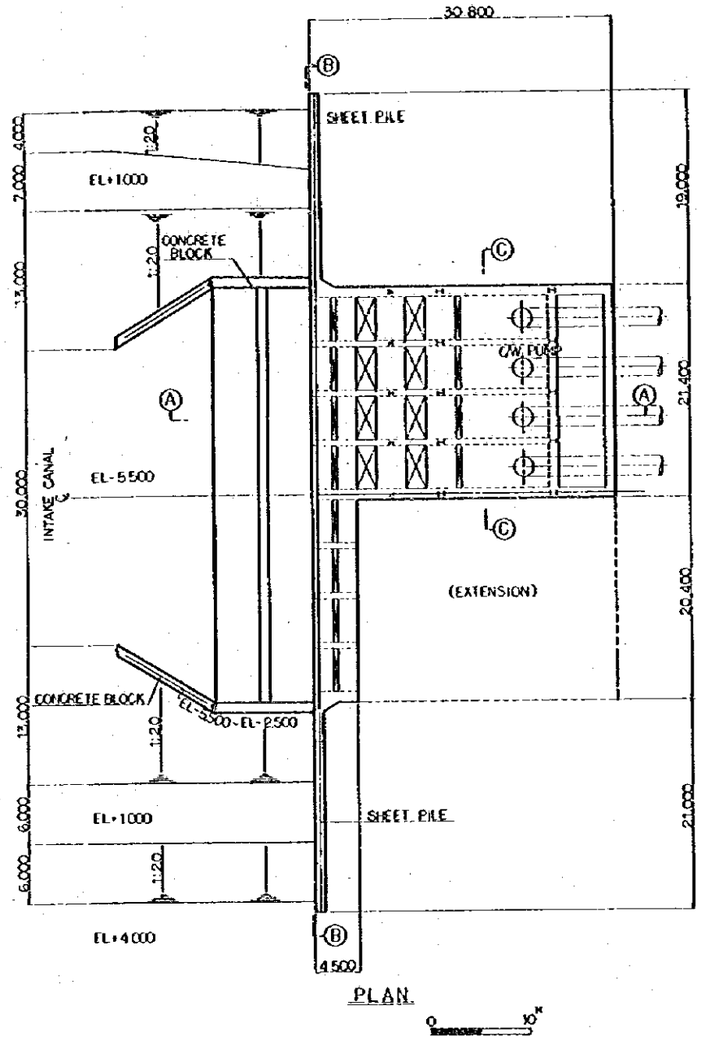


SECTION ④-④

SECTION ⑤-⑤

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE INTAKE AND DISCHARGE CHANNEL FOR CIRCULATING WATER SYSTEM	
SCALE 1/5,000 1/2,000	DRAWING NO. C-03

Fig. 5-49 Intake Pumping Structure for Circulating Water System



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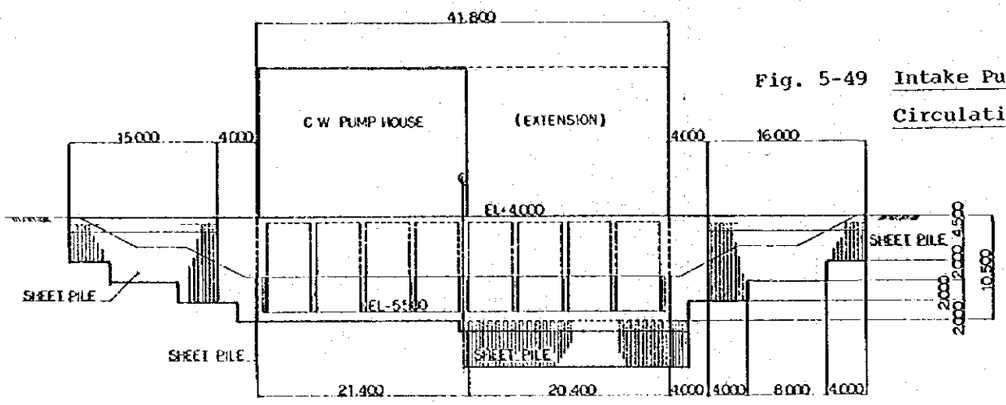

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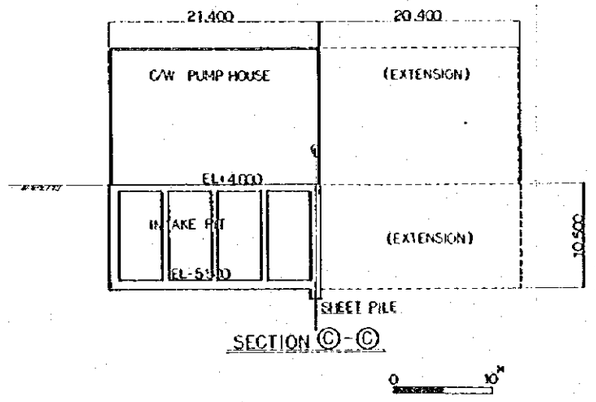

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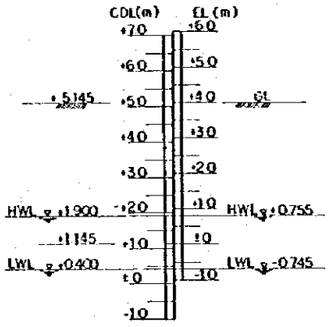
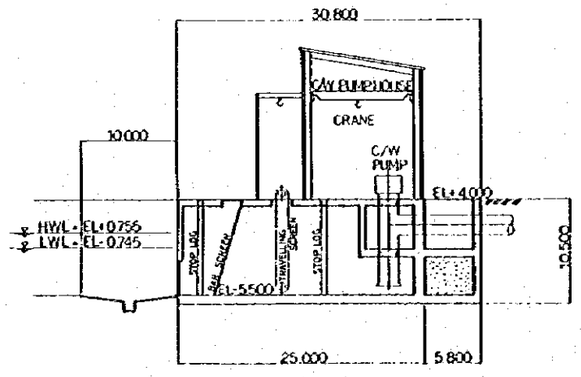


TABLE OF TIDAL



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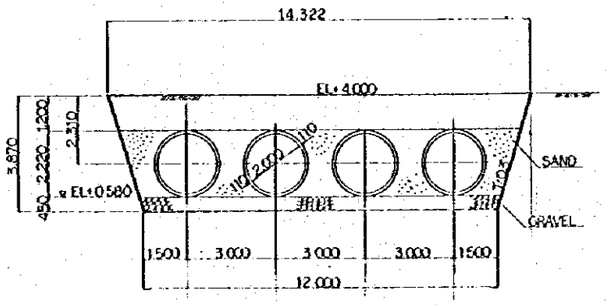
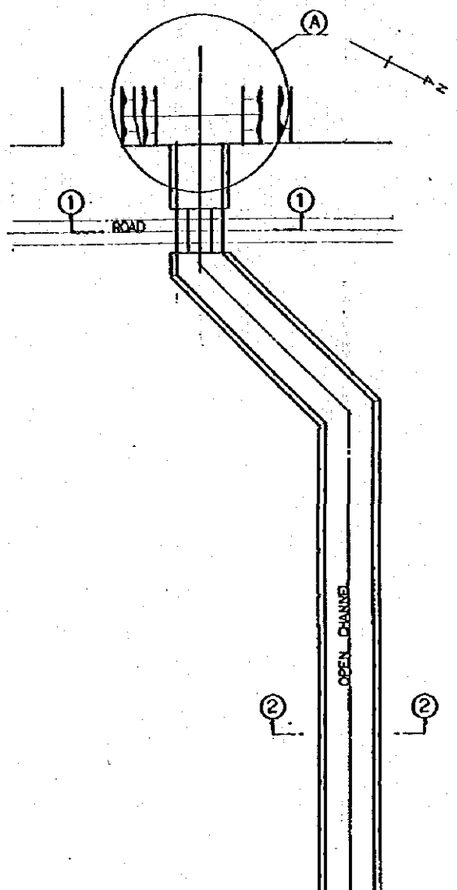
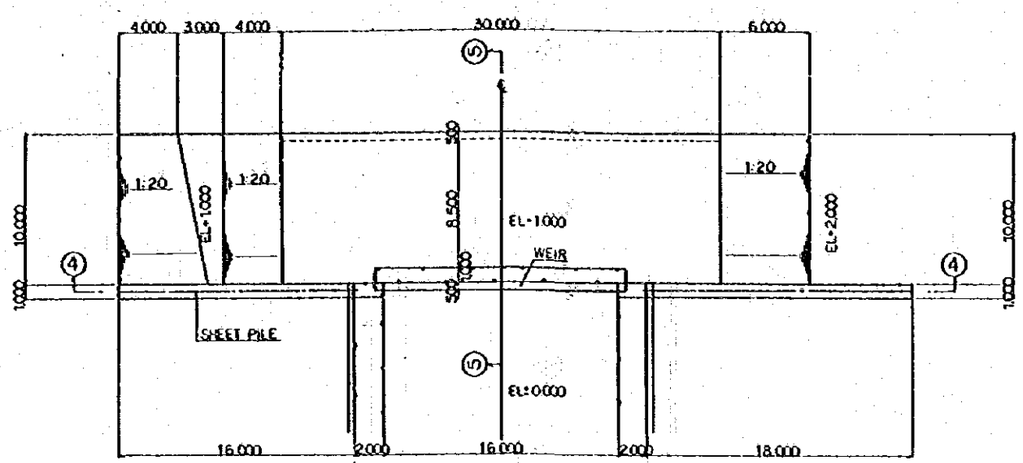


CIRCULATING WATER PIPE LINE

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: INTAKE PUMPING STRUCTURE FOR CIRCULATING WATER SYSTEM	
SCALE: 1/600, 1/200	DRAWING NO.: C-04





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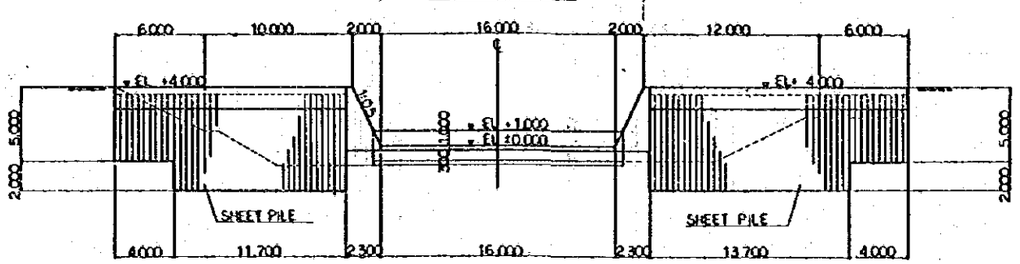

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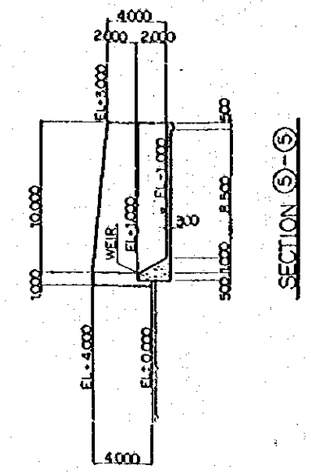

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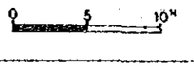
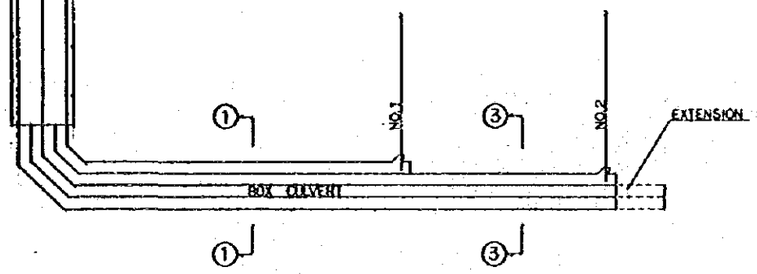
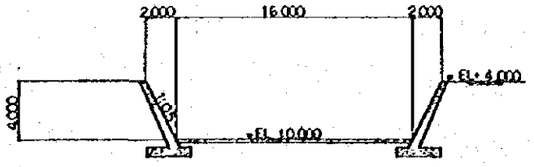


Fig. 5-50 Box Culvert, Channel and Weir for Circulating Water System



PLAN



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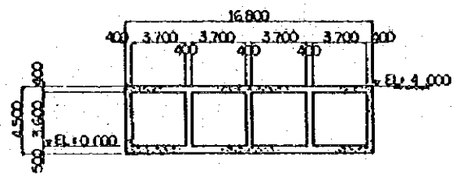
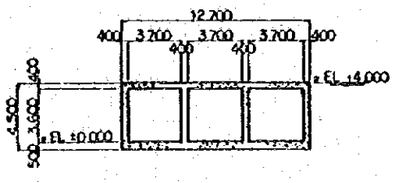
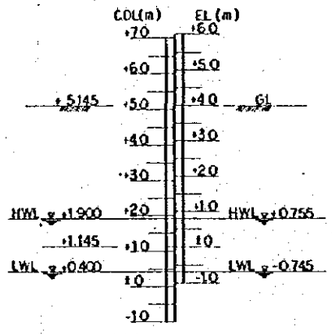
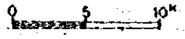


SECTION ①-①

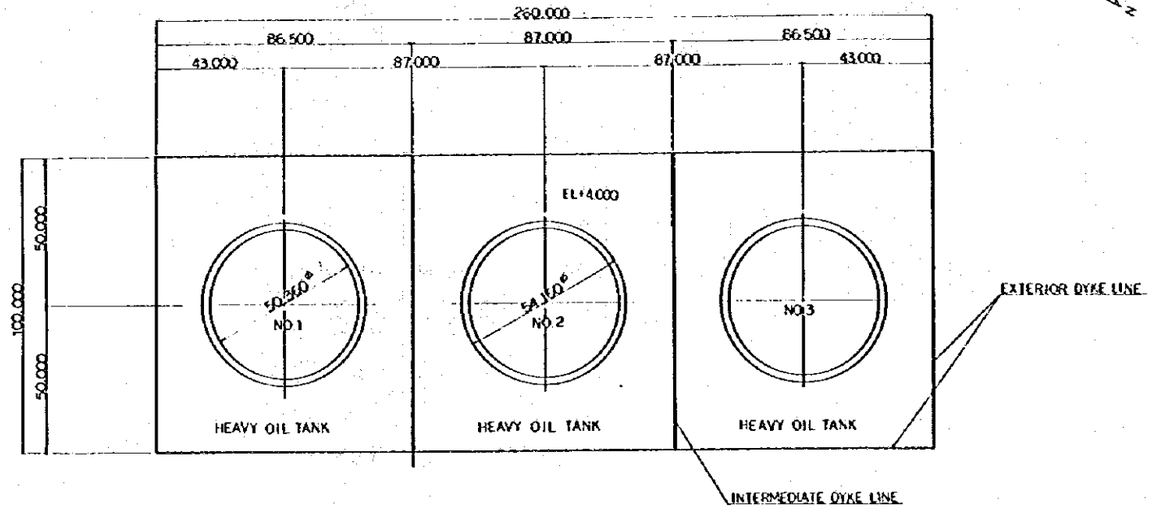


SECTION ③-③





THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE BOX CULVERT, CHANNEL AND WEIR FOR CIRCULATING WATER SYSTEM	
SCALE 1/400	DRAWING NO. C-05



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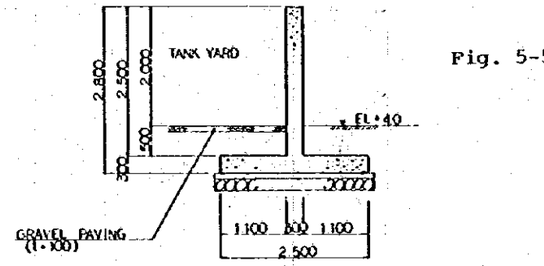
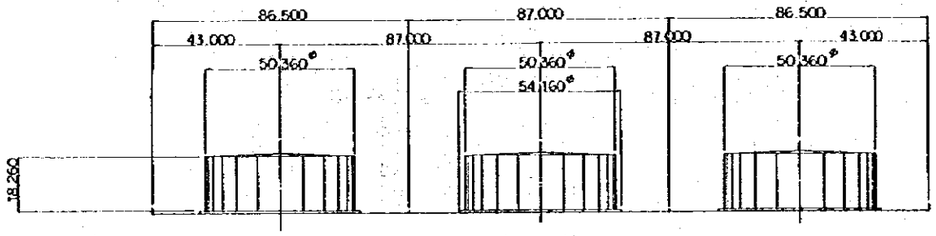
0 50M



DETAIL OF EXTERIOR DYKE

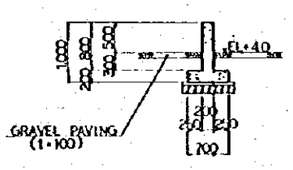
0 2M

Fig. 5-51 Fuel Oil Storage Tank Foundation & Oil Dyke



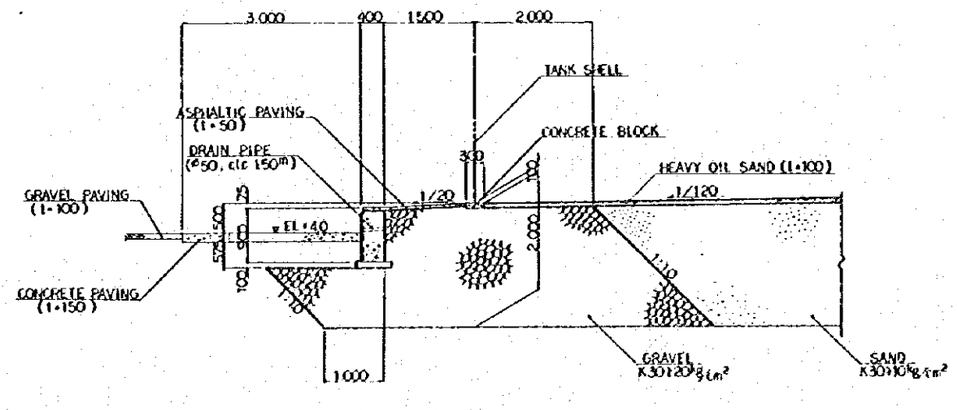
SECTION ①-①

0 50M



DETAIL OF INTERMEDIATE DYKE

0 2M

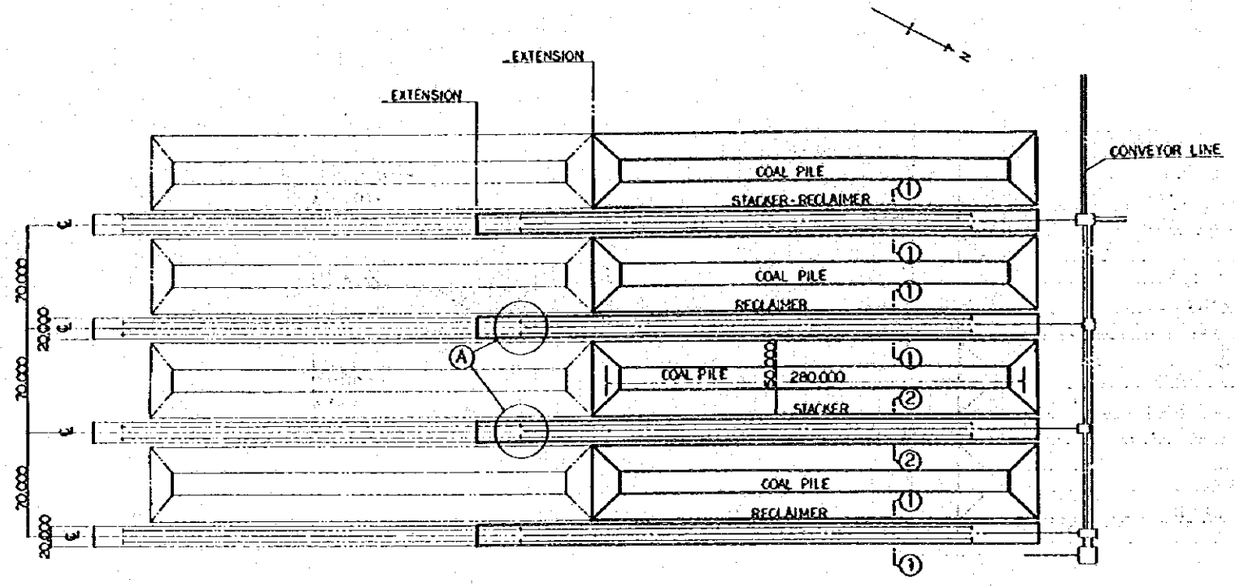


DETAIL OF TANK FOUNDATION

0 2M

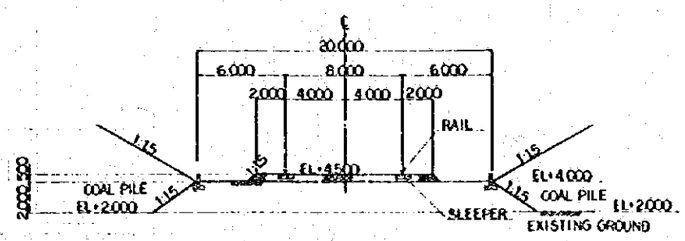
THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Fuel Oil Storage Tank Foundation & Oil Dyke	
SCALE: 1/2,000 1/100	DRAWING NO.: C-06

NOV. 15th '83



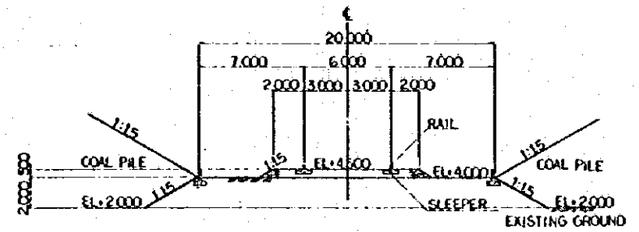
PLAN

0 100M



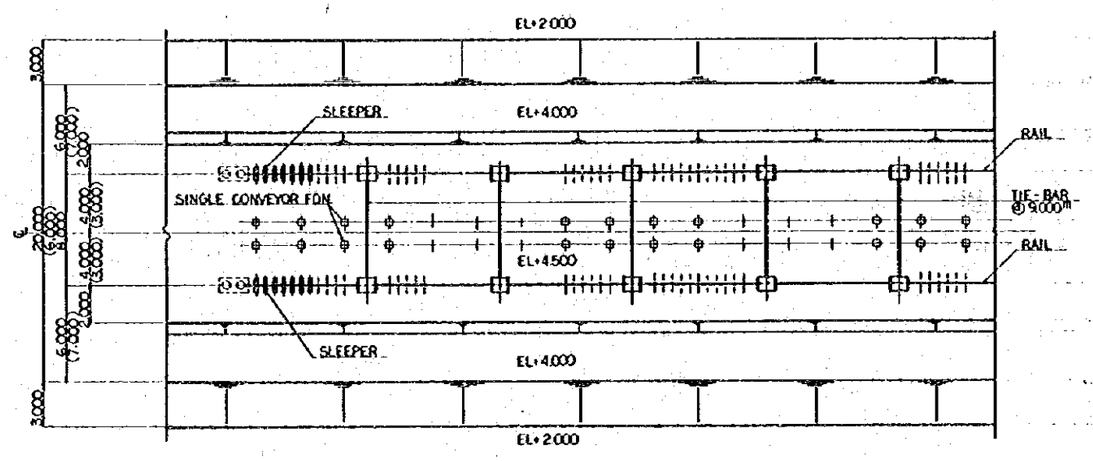
① - ① SECTION
(RECLAIMER)
(STACKER-RECLAIMER)

0 10M



② - ② SECTION
(STACKER)

0 10M



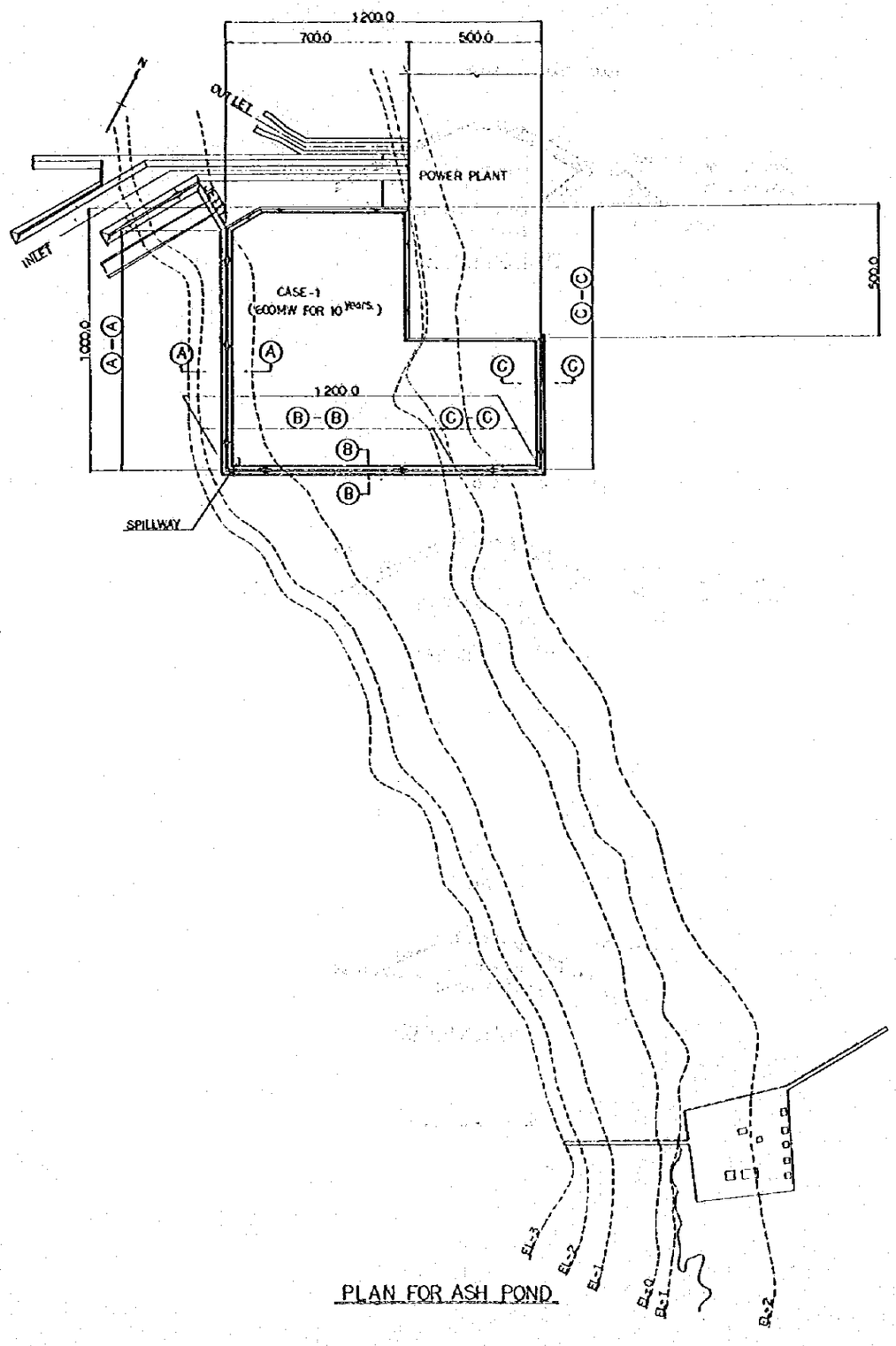
Ⓐ DETAIL

( )---STACKER

0 10M

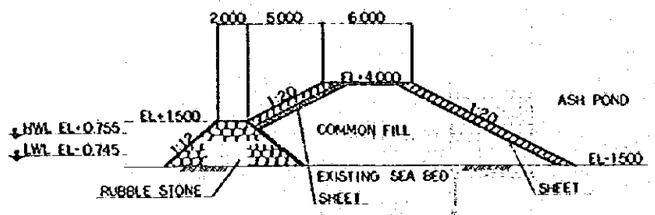
Fig. 5-52 Coal Storage Yard

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE Coal Storage Yard	
SCALE 1/4,000 1/400	DRAWING NO. C-07



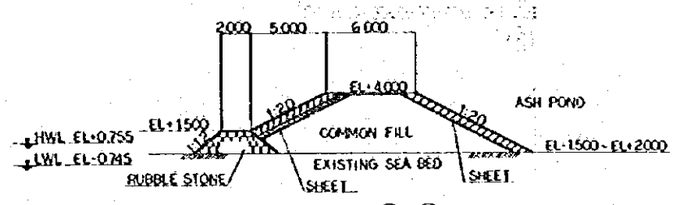
PLAN FOR ASH POND

0 500M



SECTION Ⓐ-Ⓐ

Fig. 5-53 Ash Disposal Facility



SECTION Ⓑ-Ⓑ

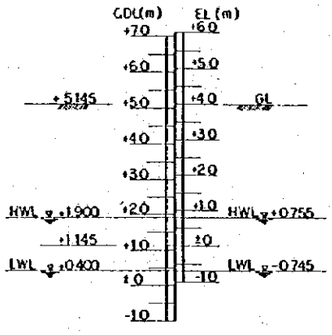
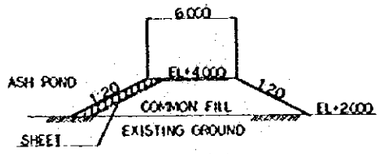


TABLE OF TIDAL

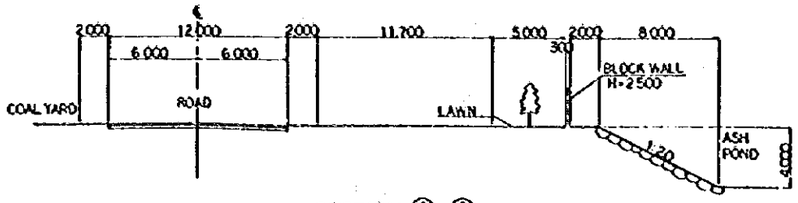


SECTION Ⓒ-Ⓒ

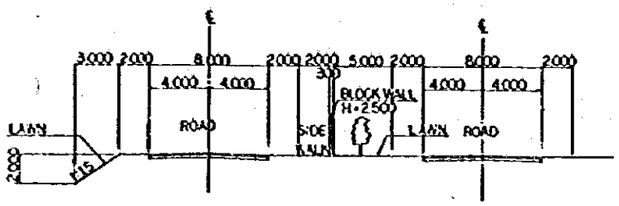
0 10M

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Ash Disposal Facility	
SCALE: 1/20,000 1/400	DRAWING NO.: C-08

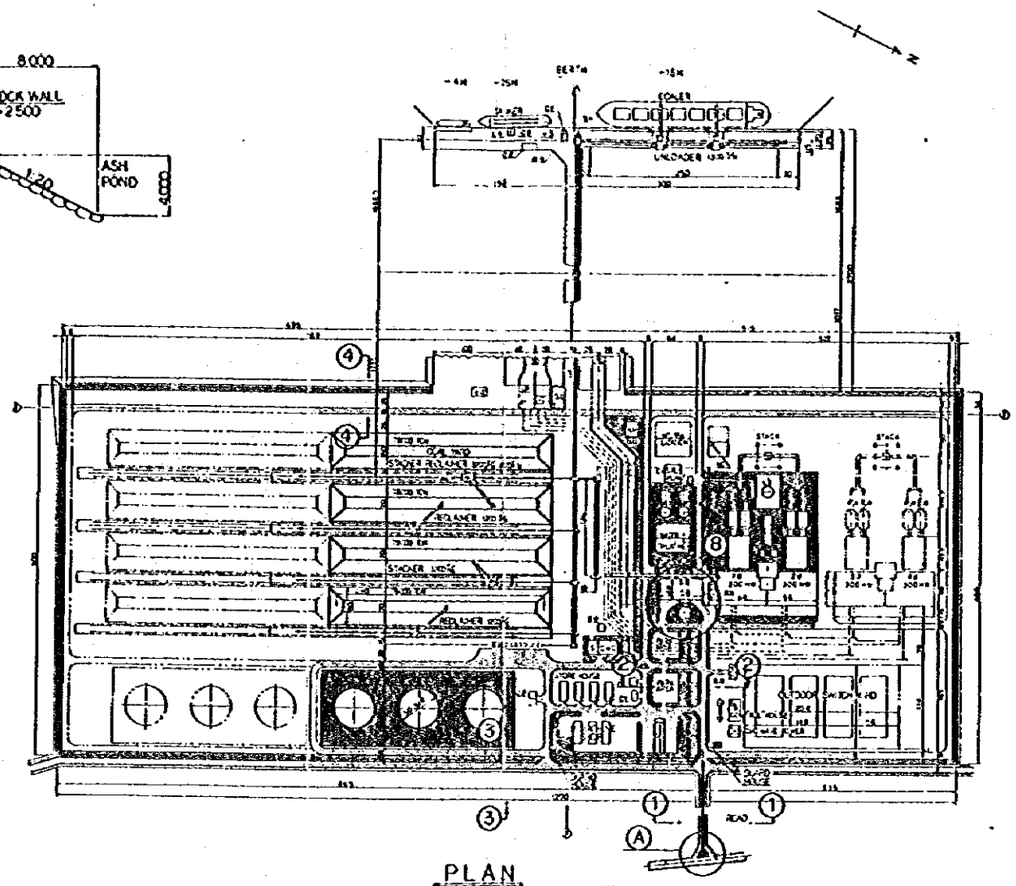
Fig. 5-54 Road and Landscaping

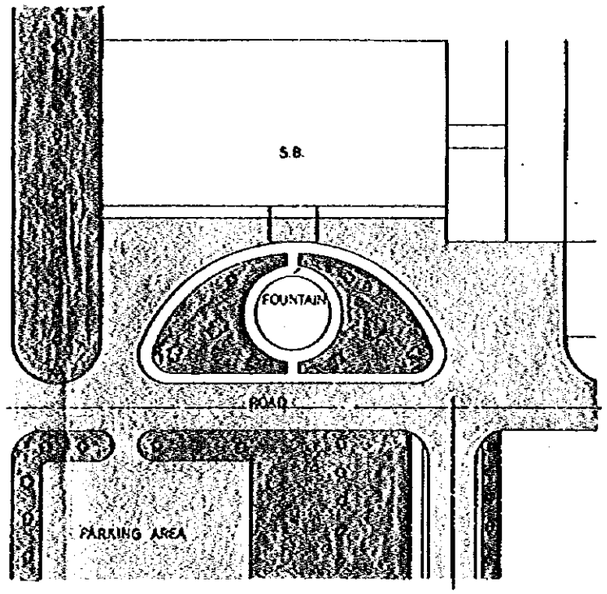


SECTION ④-④

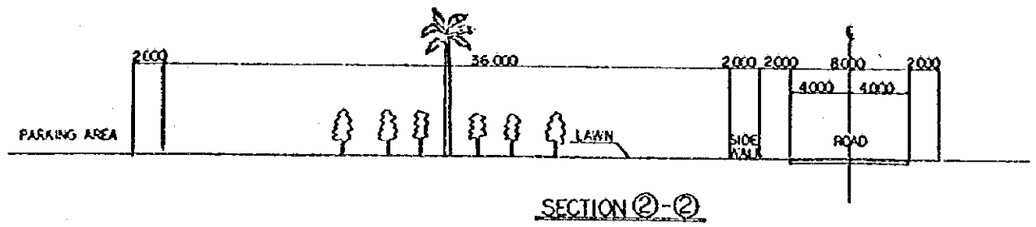


SECTION ③-③

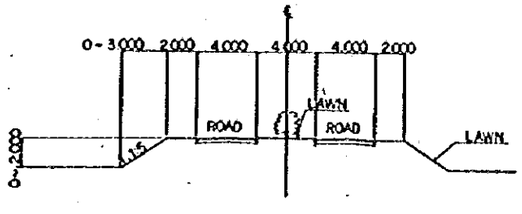




DETAIL Ⓑ



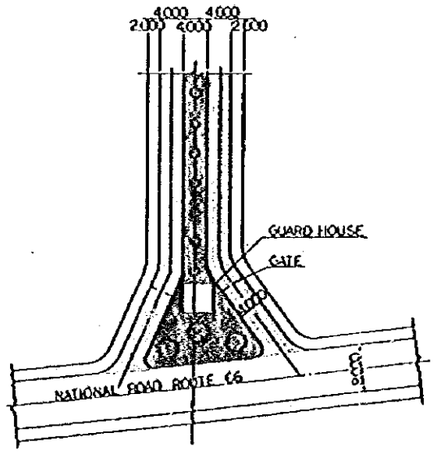
SECTION ②-②



SECTION ①-①

LEGEND

- ASPHALTIC PAVEMENT
- PLANTATION
- GRAVEL PAVEMENT



DETAIL Ⓐ

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Road and Landscaping	
SCALE: 1/400	DRAWING NO.: C-09

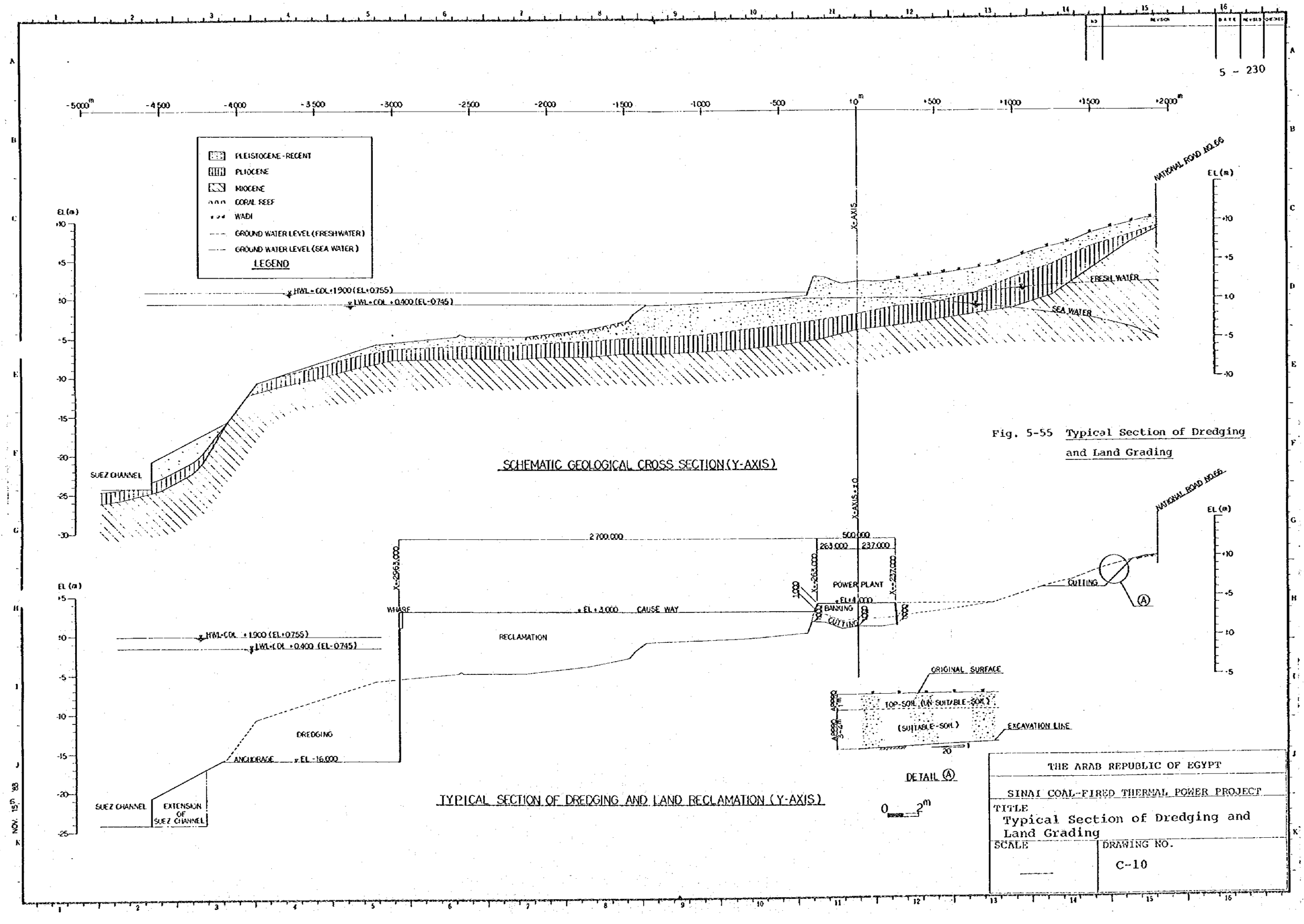


Fig. 5-55 Typical Section of Dredging and Land Grading

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Typical Section of Dredging and Land Grading	
SCALE: ———	DRAWING NO.: C-10

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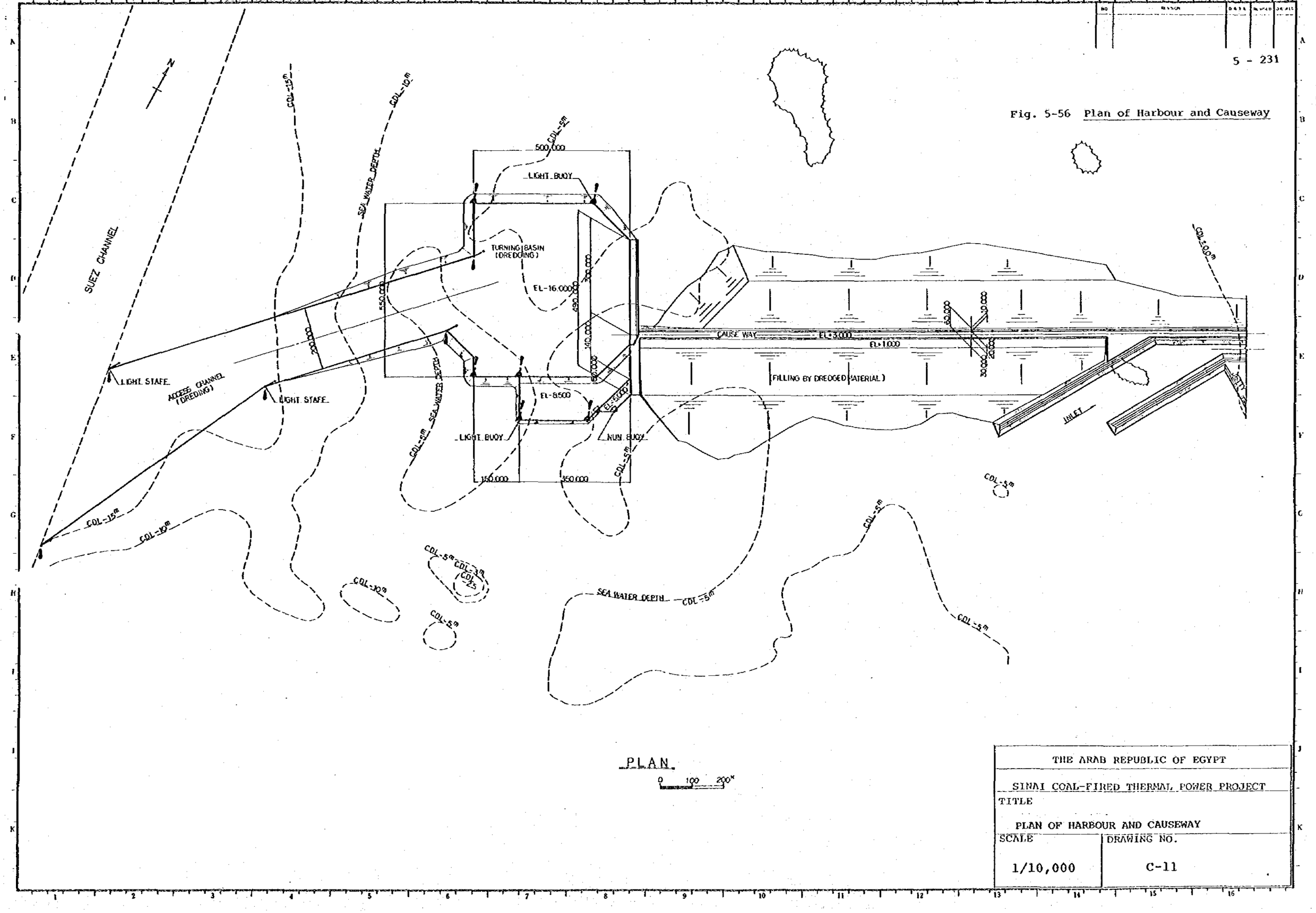
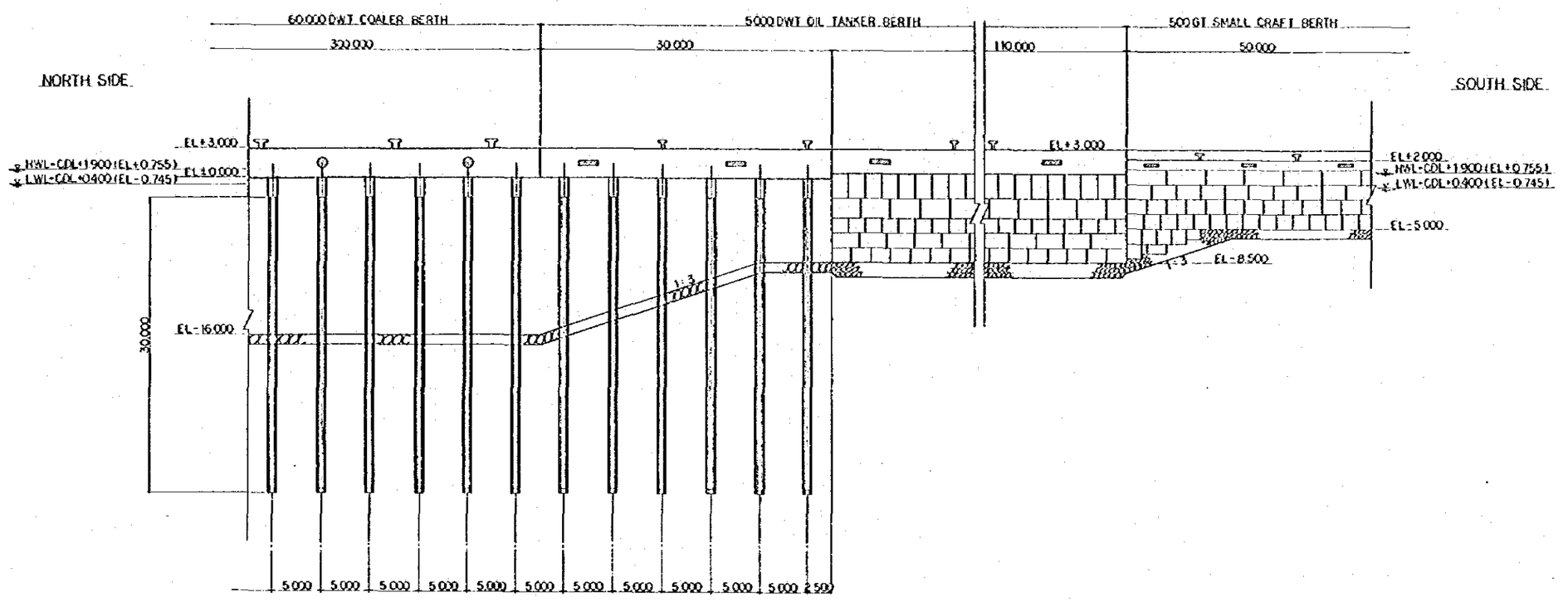
Fig. 5-56 Plan of Harbour and Causeway



THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE PLAN OF HARBOUR AND CAUSEWAY	
SCALE 1/10,000	DRAWING NO. C-11

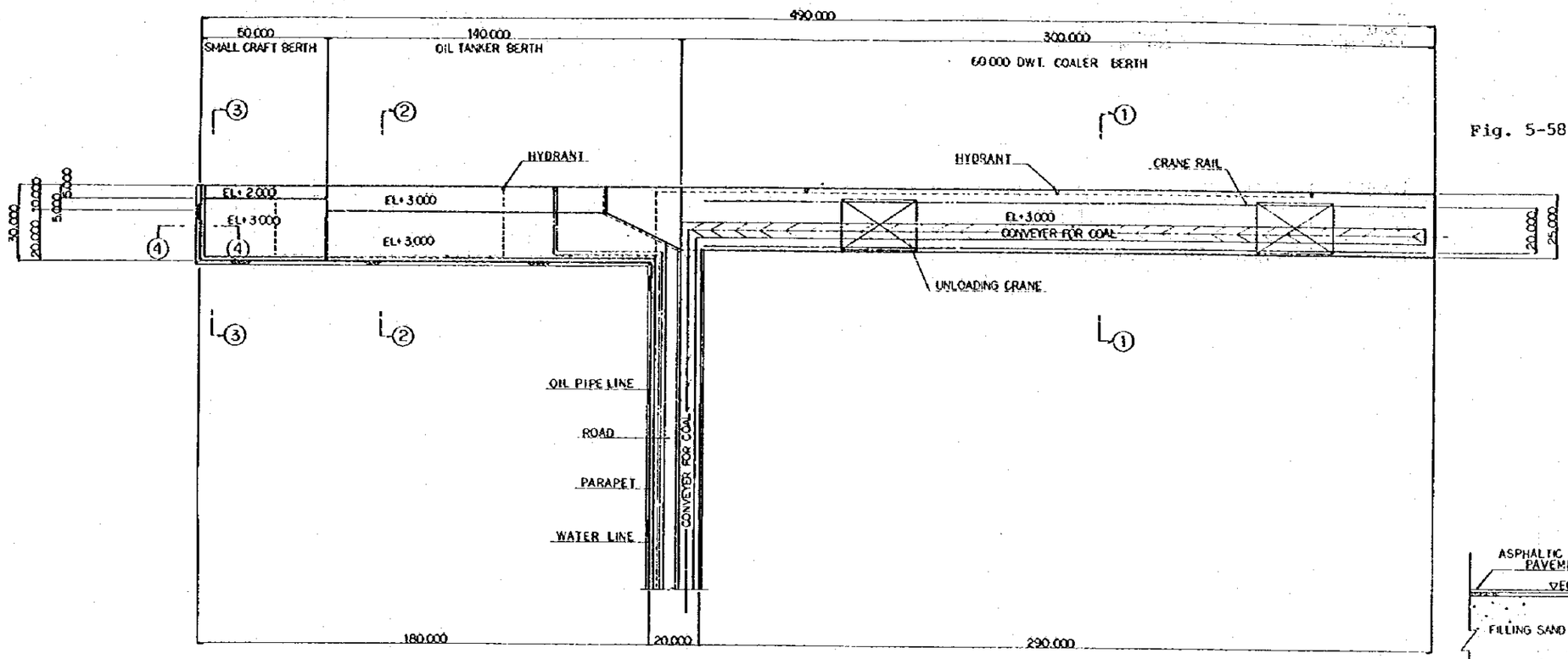
Fig. 5-57 Front View of Berths



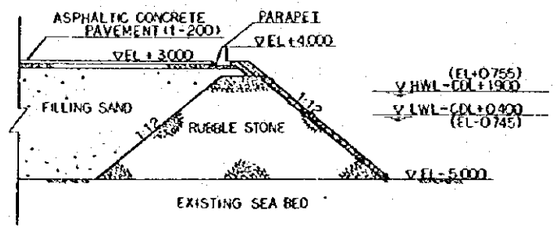
0 5 10M

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Front View of Berths	
SCALE: 1/500	DRAWING NO.: C-12

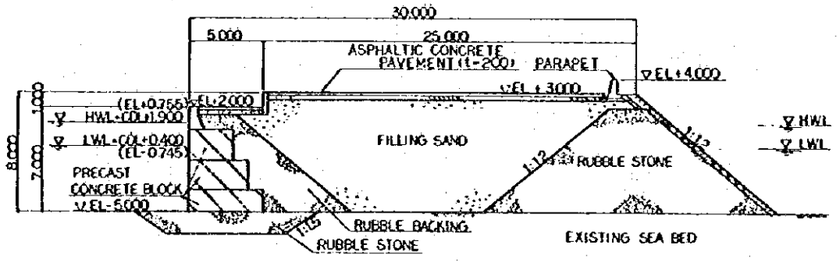
Fig. 5-58 Detail of Wharf



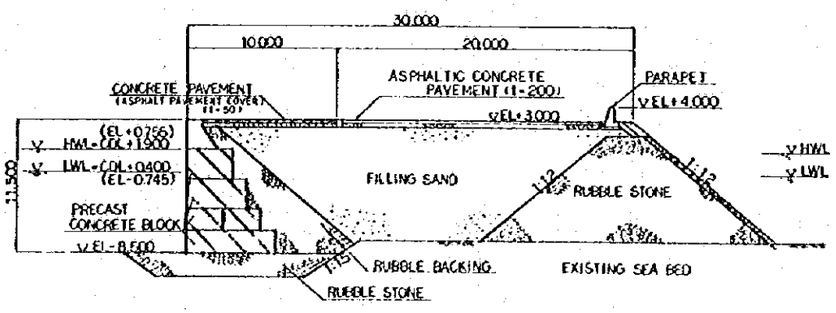
PLAN



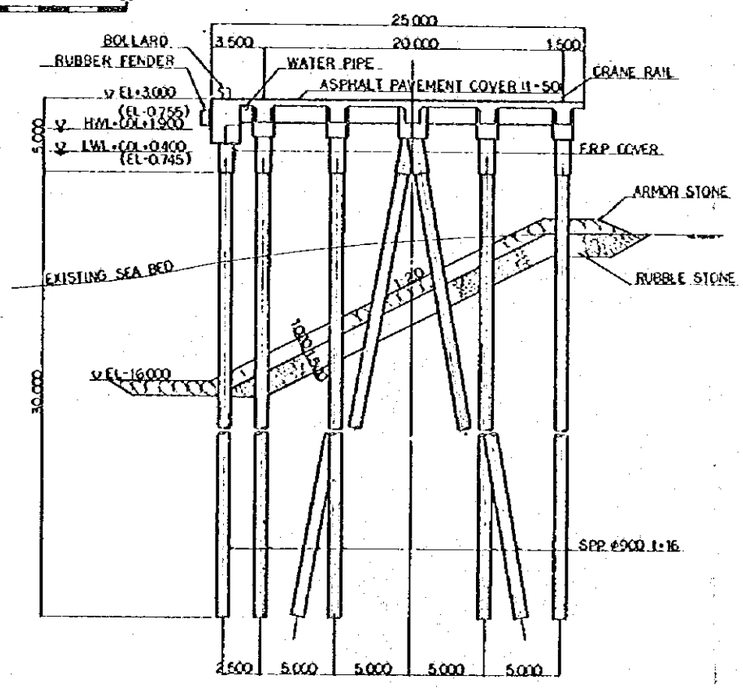
SECTION ④-④
(REVETMENT)



SECTION ③-③
(SMALL CRAFT BERTH)



SECTION ②-②
(OIL TANKER BERTH)



SECTION ①-①
(COALER BERTH)

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: Detail of Wharf	
SCALE: 1/2,000 1/400	DRAWING NO.: C-13

Fig. 5-59 Detail of Causeway

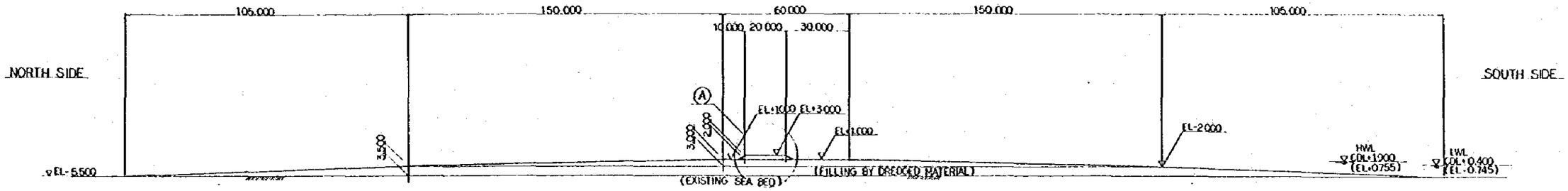
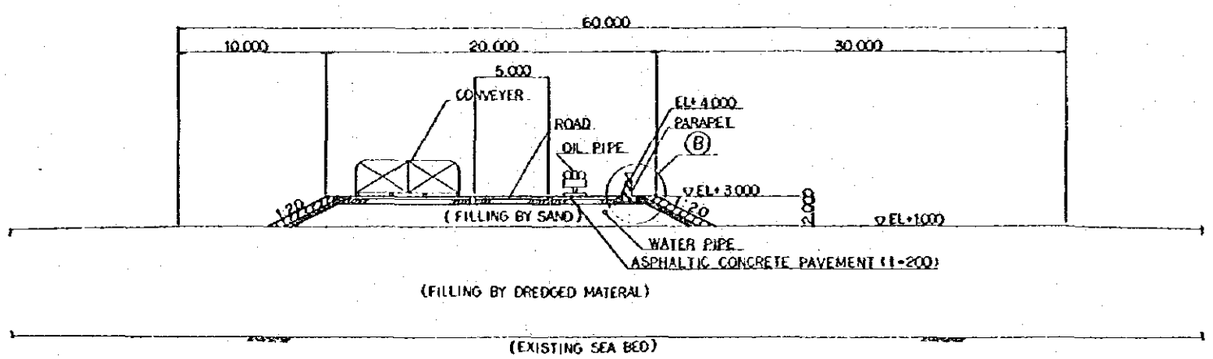


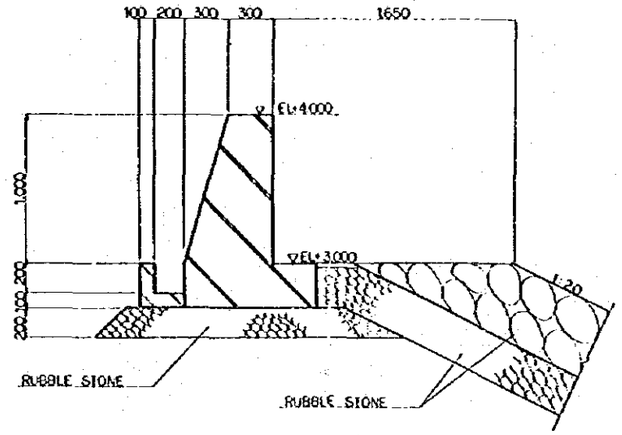
Fig. 5-59 SECTION OF CAUSE WAY

0 50M



Ⓐ DETAIL

0 5 10M



Ⓑ DETAIL

0 0.5 1M

THE ARAB REPUBLIC OF EGYPT	
SINAI COAL-FIRED THERMAL POWER PROJECT	
TITLE: DETAIL OF CAUSEWAY	
SCALE: 1/2,000 1/400 1/40	DRAWING NO.: C-14