II EXECUTION PLAN

CONTENTS

Chapter 1. PROJECT OUTLINE

1. Site Location : Thuwunna Area, Outskirts of Rangoon
2. Bridge Length and Width :

   L = 100 + 2 x 70 + 2 x 30 = 300 m

   B = 11.8 m

3. Quantity of Work

   Substructure

   A_1 Abutment A_1 RC Concrete, Foundation (R.C.D pile) $\phi 1.5^m$
   $l = 45^m$ n = 12 numbers

   Pier P_1 R.C. Concrete, Foundation (R.C.D pile) $\phi 1.5^m$
   $l = 30^m$ n = 6 numbers

   Pier P_2 R.C. Concrete, Foundation Open Caisson
   $\phi\ 14^m$ $l = 28^m$

   Pier P_3 R.C. Concrete, Foundation Open Caisson
   $\phi\ 14^m$ $l = 40^m$

   Pier P_4 R.C. Concrete Foundation (R.C.D Pile) $\phi 1.5^m$
   $l = 42^m$ n = 6 numbers

   Abutment A_2 R.C Concrete, Foundation pile (R.C.D pile) $\phi 1.5^m$
   $l = 45^m$ n = 12 numbers

   Superstructure

   Post tensioned Composite T-beam girder $l = 30^m$ 2 courses

   Dywidag method P.C. Box girder 70 + 100 + 70 1 course

Chapter 2. CONSTRUCTION OF SUBSTRUCTURES

1. Foundation Works

(1) Open Caisson

The caisson will be constructed in island method (as described in detail later) by assembling the cutting edge on embanked island, and raise upon it the caisson body in sequence of 4m intervals, the reach of a rod while excavating the inside by means of clamshell, and sinking it gradually. A cut-off wall will be placed on the top of the caisson body. This cut-off wall will be removed after completion of the pier, by making use of PLYSTER.

When fitted into the built-in sheaths (for PC use) in the cut-off wall, the PLYSTER will expand rigorously after a certain length of time, causing the concrete to crack all over the wall. After scrapping of the wall the concrete rubbles will be crushed and removed with the clamshell.

The caisson will be sunk as deep as 39m to 51m, including the filled soil which makes the island. In order to reduce the friction which besieges the caisson, and facilitate the sinking operation, pores will be built into the concrete wall through which air or water will be emitted to act as lubricant.

The bottom of the caisson will be concreted underwater by using tremie pipes.

(2) R.C. D_1 Pile (Reversed Circulation Drill method)

In R.C.D. method, water pressure of a head of 2m or more is applied to the ground water while drilling, so that silt and clay loosened by drilling plug the porous hole wall under such pressure to form a watertight mud film which prevents the collapsing of it even in the sand layer. (fig 1)

Equipment required for such operation, as shown in fig. 2 includes drill bit, drill pipe, rotary table, kelly-bar,

CASING-FREE DRILLING (Reverse Circulation Drilling)

CASING-FREE DRILLING

The standpipe, arranged at the top of the drill hole, maintains muddy water level over 2 m higher than ground water level. This means hydrostatic pressure of over 0.2 kg/cm^2 is always applied to the hole wall.
Also, muddy water infiltrates into the hole wall of ordinary soil, since muddy water pressure in the hole is somewhat higher than pore-water pressure. As a result, the porous hole wall is clogged with fine-particle mud, which prevents further penetration of water. Similarly, on the hole wall, thin mud film is formed with fine-particle mud such as silt. What's more, the mud film is entirely reinforced by hydrostatic pressure.
Thus, casing-free drilling is possible because both the mud film and hydrostatic pressure support the drilling hole without fail.
Unlike ordinary cast-in-place piling practice, there is no need for casing or bentonite for hole wall protection. The Hitachi Reverse Circulation Drill needs only a standpipe.

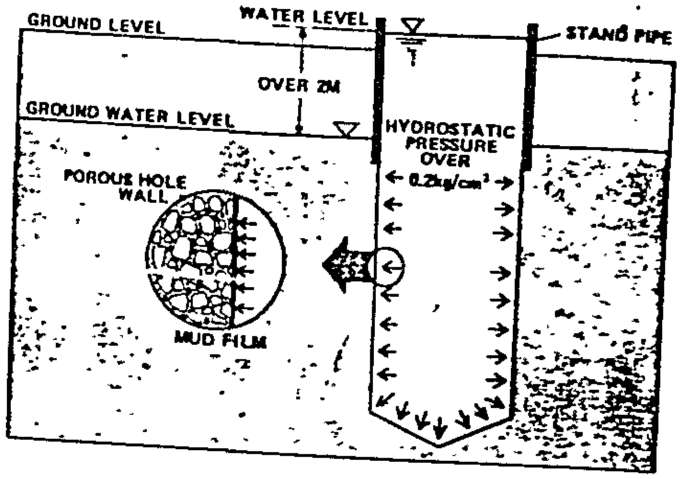


fig. 1

PUMP SUCTION DRILLING PRACTICE

Using a suction pump, drilled material is pumped up together with circulating water into the slush tank. In the tank, drilled material settles and water is recirculated into the drill hole.

PUMP SUCTION DRILLING PROCEDURE

1) The kelly bar is connected to the drill pipe which is equipped with a drill bit at the bottom. This assembly is lowered into a drill hole filled with water.
2) By actuating the rotary table, the drill bit cuts the bottom of the hole while being forced down by their own weights or with hydraulic force in case of the S500R (rock drilling use).
3) Drilled material is pumped up together with circulating water through the drill pipe by a suction pump, and discharged into the slush tank.
4) In the slush tank, drilled material settles and water is recirculated into the drill hole.

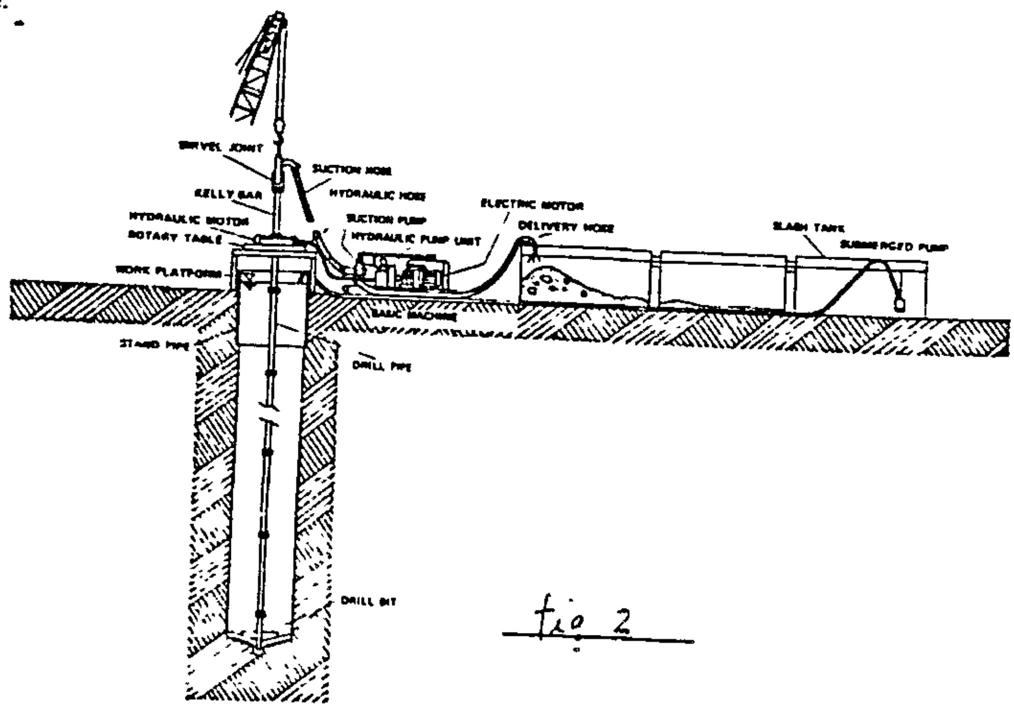
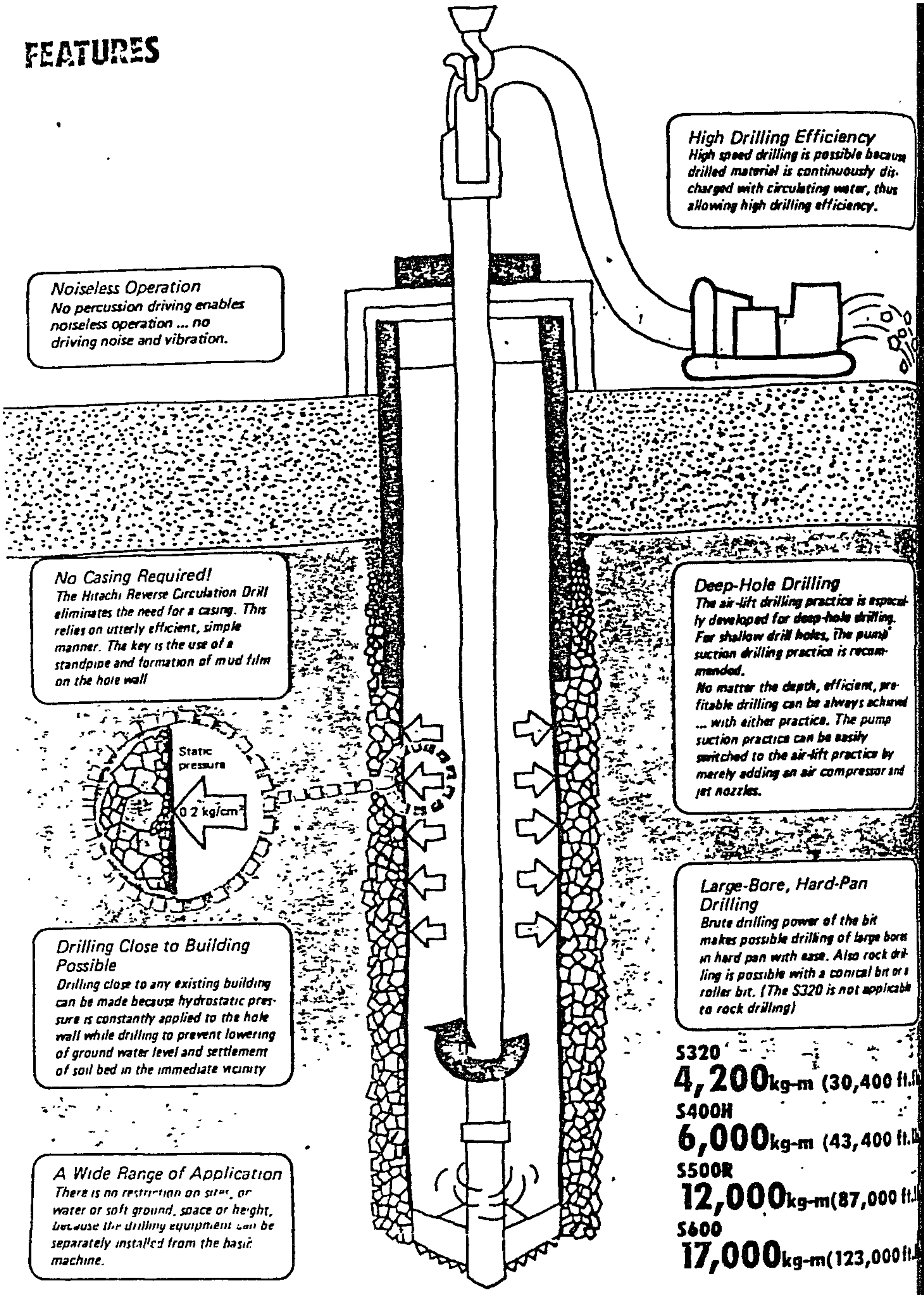


fig. 2

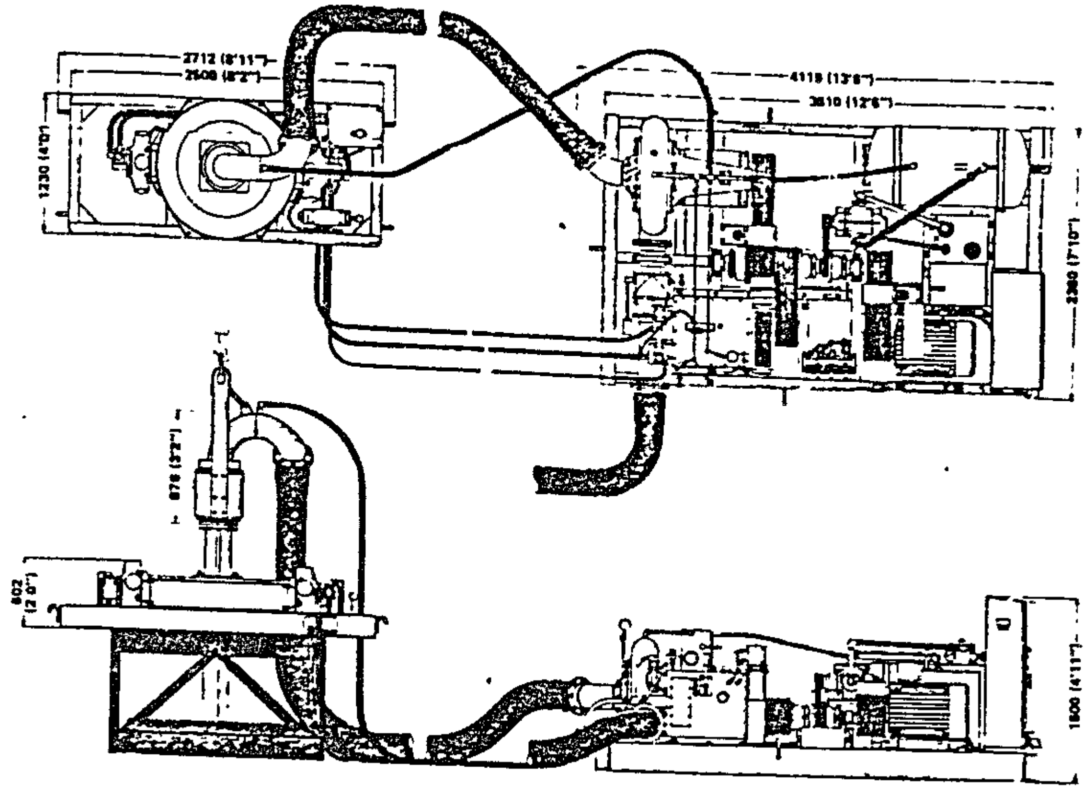
FEATURES



High Drilling Efficiency
High speed drilling is possible because drilled material is continuously discharged with circulating water, thus allowing high drilling efficiency.
Noiseless Operation
No percussion driving enables noiseless operation ... no driving noise and vibration.
No Casing Required!
The Hitachi Reverse Circulation Drill eliminates the need for a casing. This relies on utterly efficient, simple manner. The key is the use of a standpipe and formation of mud film on the hole wall
Static pressure
0.2 kg/cm²
Deep-Hole Drilling
The air-lift drilling practice is especially developed for deep-hole drilling. For shallow drill holes, the pump suction drilling practice is recommended.
No matter the depth, efficient, profitable drilling can be always achieved ... with either practice. The pump suction practice can be easily switched to the air-lift practice by merely adding an air compressor and jet nozzles.
Large-Bore, Hard-Pan Drilling
Brute drilling power of the bit makes possible drilling of large bores in hard pan with ease. Also rock drilling is possible with a conical bit or a roller bit. (The S320 is not applicable to rock drilling)
Drilling Close to Building Possible
Drilling close to any existing building can be made because hydrostatic pressure is constantly applied to the hole wall while drilling to prevent lowering of ground water level and settlement of soil bed in the immediate vicinity
A Wide Range of Application
There is no restriction on sites, or water or soft ground, space or height, because the drilling equipment can be separately installed from the basic machine.
S320
4,200kg-m (30,400 ft.lb
S400H
6,000kg-m (43,400 ft.lb
S500R
12,000kg-m(87,000 ft.l
S600
17,000kg-m(123,000ft.l

S320 SPECIFICATIONS

Unit: mm (ft.in.)



Drilling Capacity	Bit diameter	■ N-value: below 50	600–3,200mm (2'0"–10'6")
	Max. drilling depth	■ Pump suction type ■ Air-lift type	70m (230') 300m (984')
Basic Machine	Electric motor	Rated output	75 kW
		Poles	4
	Suction pump	Bore	200mm (8")
		Delivery	8m³/min (10.5 cu.yd./min)
		Total head	13m (42'8")
	Oil pump	Pressure setting	220kg/cm² (3,100 psi)
		Delivery	0–155ℓ/min (0–341 Imp. gpm)
	Vacuum pump	Delivery	3.5m³/min (4.6 cu.yd./min)
		Tank capacity	500ℓ (110 Imp. gal.)
	Suction hose	Bore	200mm (8")
		Length	4,000mm (13'2")
		Weight	130kg (290 lb.)
	Weight of basic machine		4,700kg (10,300 lb.)

Rotary table	Bore	800mm (2'8")
	Revolution	0–23 rpm
	Torque	4,200kg-m (30,400 ft-lb.)
	Weight	1,500kg (3,300 lb.)
Swivel joint	Bore	200mm (8")
	Lifting load	40,000kg (88,000 lb.)
	Weight	500kg (1,100 lb.)
Keller bar	Bore	200mm (8")
	Length	3,750mm (12'4")
	Weight	391kg (860 lb.)
Drill pipe	Bore	200mm (8")
	Length	3,000mm (9'10")
	Weight	165kg (370 lb.)

■ In case of the air-lift type, an air compressor and jet nozzles are additionally required suction hose, suction pump, delivery hose, and slash tank.

The excavated soil is pump up together with the muddy water, and pooled in a tank, from which an under water pump installed behind pulls the muddy water out and recirculate it into the excavated hole again to maintain the water head in it at the required level.

When excavation has been reached to the desired depth, the first treatment of the slime depositing at the bottom will be operated by circulation of water during which the bit remains still, after which the bit and rod will be evacuated and completes the operation.

A Reinforcement cage will next be lowered into the hole, followed by the tremie pipe set in the center of the cage and connected to the suction pipe for the R.C.D. material, and then the second slime treatment will be applied.

Immediately after completion of the slime treatment, underwater concreting will be done with the tremie pipe.

Concrete will be boured to a height 50cm in excess of the design level. The excessive portion will be leveled off during the construction of the footing. The complete process of R.C.D. piling is illustrated in fig. 3.

Points of Cautions in Execution

a) Specific gravity of the muddy water in the hole should always be maintained at above 1.02.

b) Where the exavated silt layer is thick, specific gravity of the mud water will increase and consequently lowers the hoisting capacity of the pump, water should be added to the tank in this case to lower the specific gravity of the content.

c) During early stage of excavating (up till 2 rods length) the rod and bit tend to incline under the weight of the suction hose. Care should therefore be taken to maintain the kelly-bar in vertical position.

d) In mounting the joints of the tremie pipe, the bolts should be properly tighten, the rubber packings should be properly washed and free from clay and sand to prevent leaking from it.

e) During concreting operation, the tremie nozzle end should always be maintained at least 2m deep under surface of the concrete.

f) The plunger inserted in the tremie pipe should always be prevented from inclining, such as, by hanging with wire.

g) In jointing the reinforcement cages the verticality should be properly maintained by examing from two directions using, for example, levelling cord.

h) Excessive water ousted out through concreting should be emoved from the stand pipe to the slash tank by means of a underwater pump.

i) After withdrawing the stand pipe from the ground, the hollow should back-filled to avoid falling accident.

Operation sequences by Reverse Circulation Drilling Method

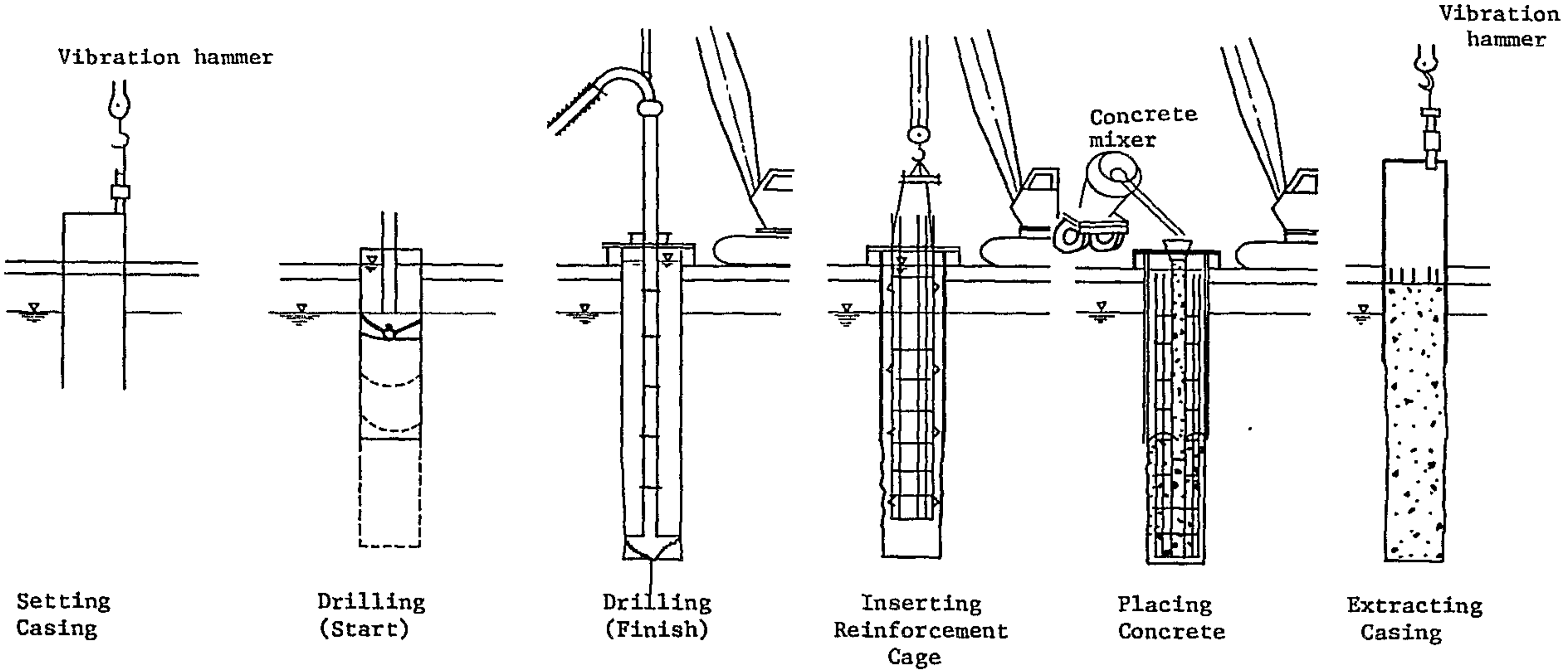
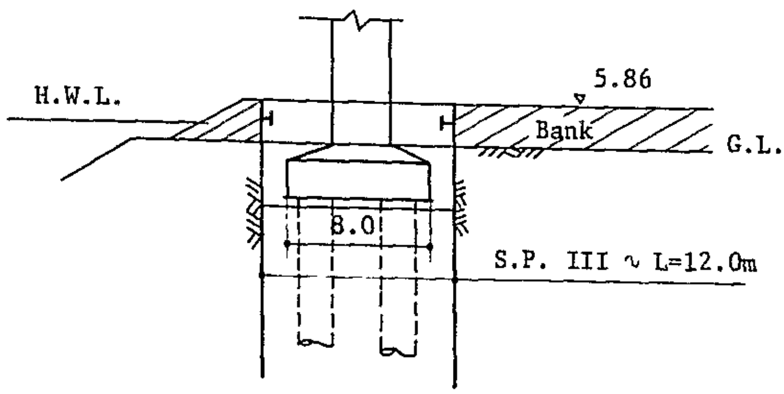


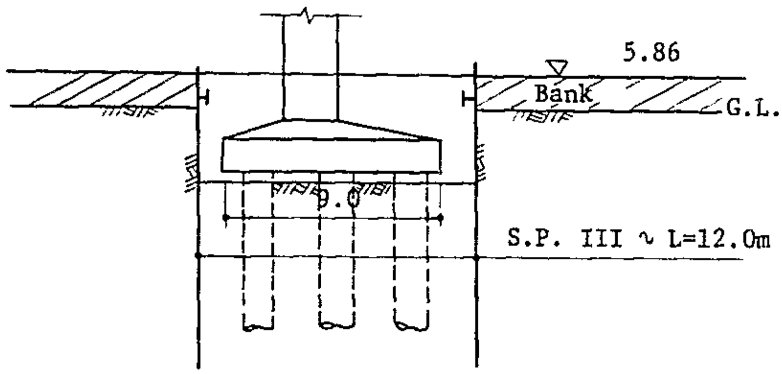
Fig. 3

(3) Sheathing for onshore foundation works

The footings of all onshore foundations are located below HWL, where the surface soil is also soft. Sheathing will therefore be done by using steel sheet piles.



(P1, P4)



(A1, A4)

Fig - 4

2. Piers and Abutments

For the construction of the body of an underwater caisson pier, a landing stage will be provided. Materials and equipment will be transported by trucks and truck mixers, while execution will be done by means of a crawler crane and concrete buckets.

As in the case of on-shore foundation works, temporary access will be used.

3. Temporary Vtilities

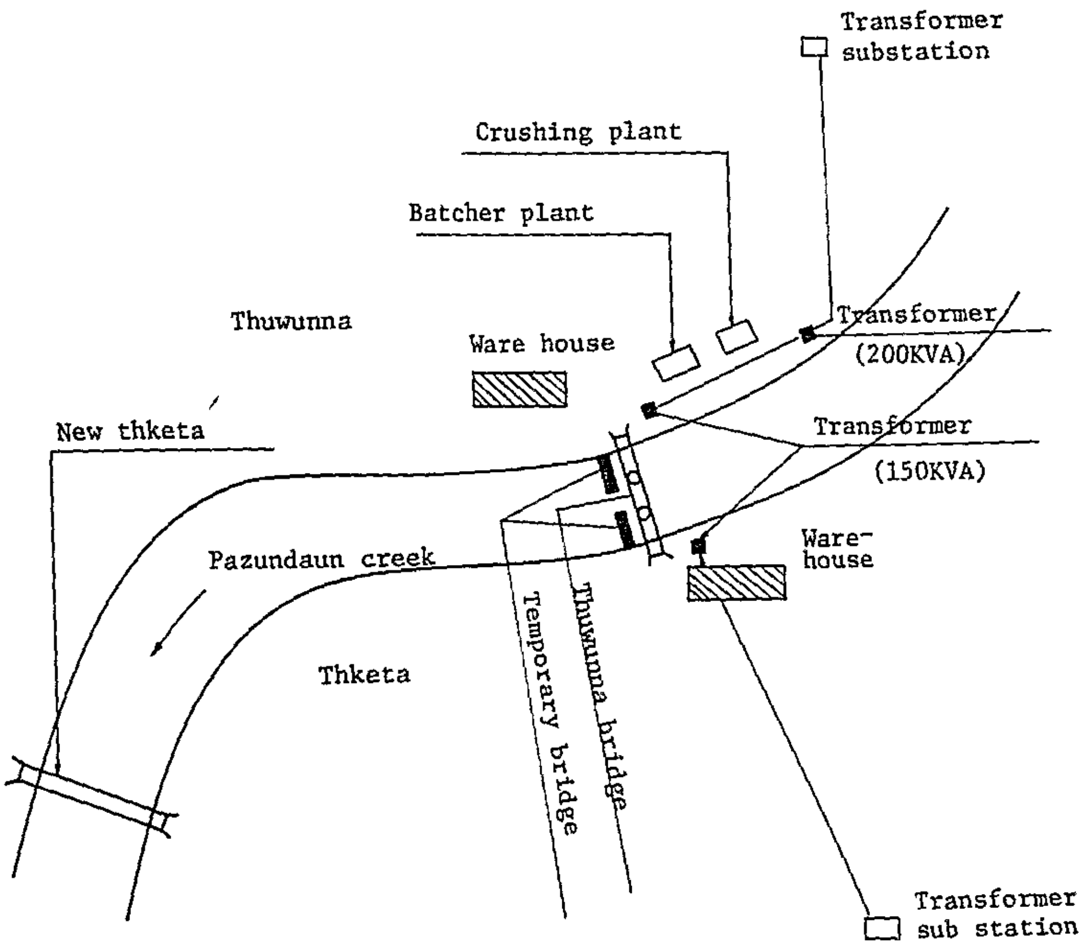


Fig - 5

(1) Power Supply Facility

The length of the high tension lines to be laid between the power transmission trunk line and the project site is estimated to be 1.5 km long for both TUWUNNA and THKETA sides of the river.

Power stations will be provided on both banks of the site.

As crushing plant and concrete plant center will be located on Thuwunna side, these stations will contain the following facilities.

Thuwunna station cubicle 200 KVA

Thuwunna and Thketa stations cubicle 150 KVA

Beside these, one generator of 300 KVA will be installed at each side to provide for the use of vibro-hammer and as stand-by power supply in case of main line power failure.

Site illumination facilities, communication facilities between the training center and the site, wireless transceivers for the communication between both bank will be furnished.

Between the power station and the site equipment, low tension and distribution panels will be provided.

For the low tension trunk line on the landing stage, cap tire cable will be used.

(2) Water Supply Facility

The supply of fresh water is required for the use in washing concrete plant and crusher plant washing, R.C.D. operation formworks washing, concrete curing equipment cleaning and human consumption.

The water supply is scheduled to be served from the service pipe line running at upstream area. The main connection(ϕ100) between the service pipe line and the project site are to be provided by the Burmese government, and is therefore excluded from the quantity estimation for this project.

The water received at the project site will be pooled in water reservoir to provide for the use in case of water supply failure.

For water distribution at site, pipe lines and hoses of ø50 and ø25 sizes will be used.

(3) Crushing Plant (fig. 6)

River gravel and river sand will be used, and the capacity of the plant will be 30 T/H. The flow chart of the plant is as shown in fig. 6.

The received gravel will be fed from a hopper (3 m^3), passed through a feeder, a jaw crusher (fine graining) and transported further by a belt conveyor to a vibrating screen, from which particles larger than 40 m/m size will be returned to the jaw crusher.

Sand will be fed from a hopper, passed through a feeder to a classifier and by a conveyor, transported to the stocking facility.

The gravel bassing thru the screen for grains under 2.5 m/m size is transported to the next screen and added to the stock of coa coarse sand. The remaining fine sand will be transported through a classifier and than to the stockage of fine sand. The crusher plant thus produces 4 types of aggregates.

Crushing Plant (30t/h)

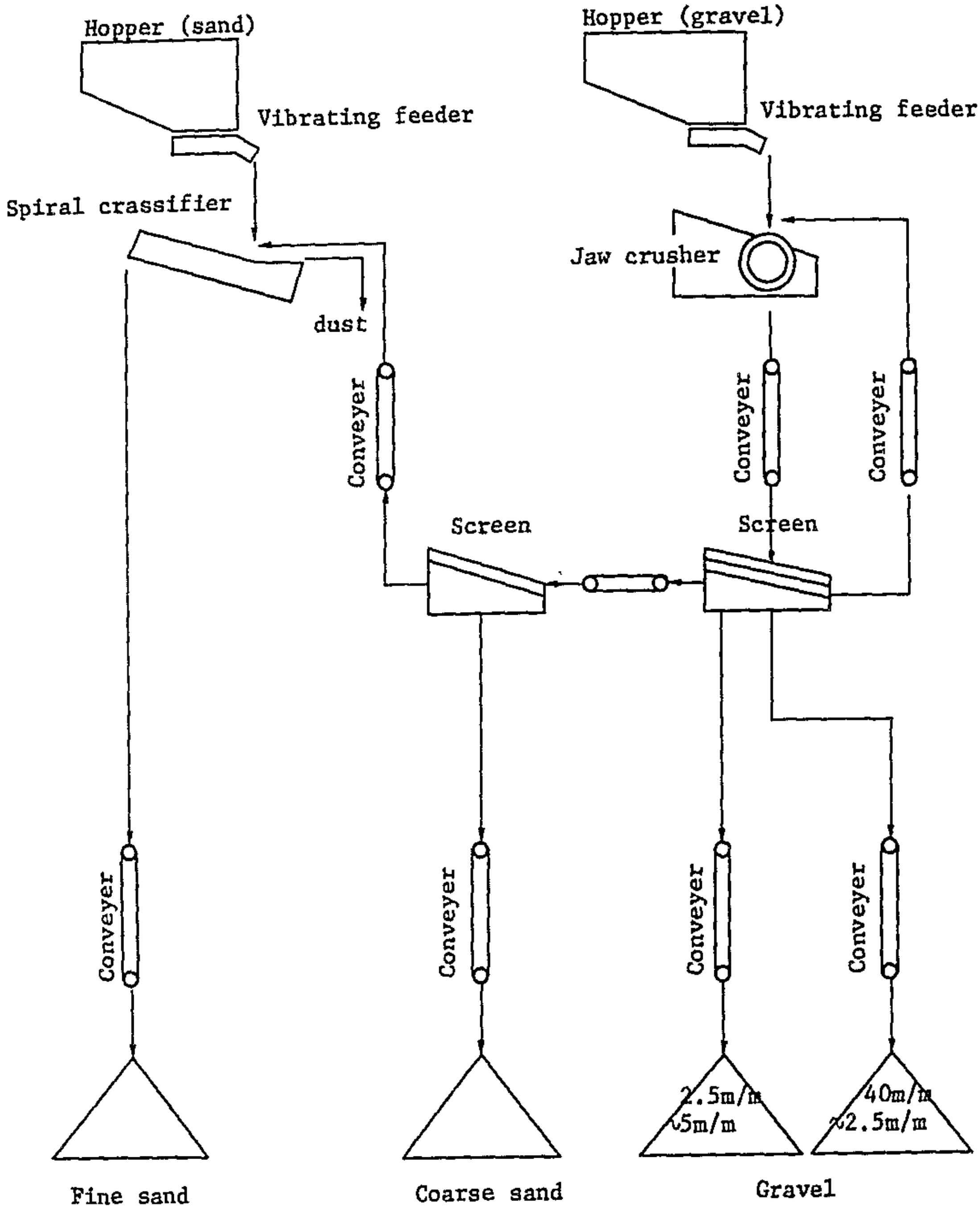


Fig. 6

(4) Batcher plant

The batcher plant will be built next to the crusher plant.

It will be of 30 m^3/h capacity and of mechanic type.

The four types of classified aggregates will be transported via conveyors, directly to the batcher plant.

A 30t cement silo will be installed for this plan.

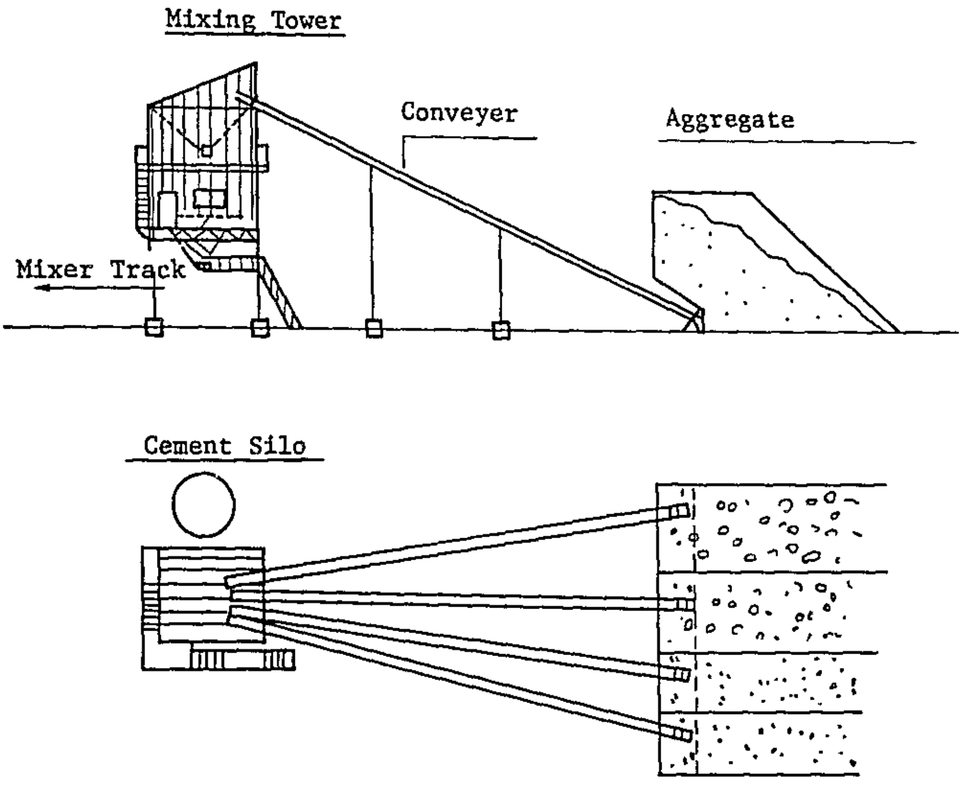


Fig. 7

(5) Temporary landing stage

a) The width of the landing stage will be 4m to meet the minimum requirement of heavy equipment. A footway of 1.0m wide will be attached to it.

A landing stage will extend from each bank to reach the caisson closer to it. On both sides of the caisson, the width will be widenned to 8.0m to serve as working zone for the heavy equipment.

As these landing stages will be used also for superstructure construction, the duration of use will be long. The height of it is therefore determined as +4.86 (H.H.W.L) at beam soffit taking the rainy season into consideration.

The span will be 8.0m to decrease the hazard of destruction by driftwood during high water period of the year.

Construction of the landing stage will be done by using a crawler crane and a vibro hammer which will proceed on forwardly, finishing the structure span by span.

Removal of the landing stage will be started after completion of the works of the construction wagon.

Removal operation will be proceeded in backward direction.

b) Design of the Temporary Landing Stage

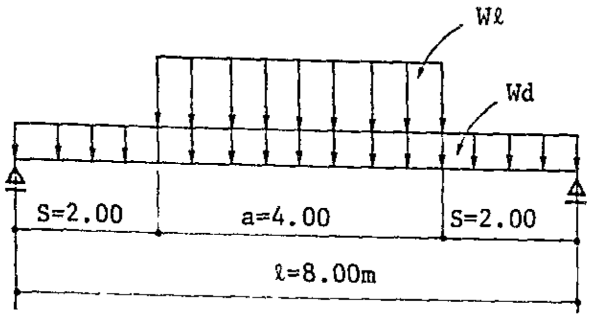
1. Design Condition

Carraigeway width	4.00^{m} (attached footway bridge 1.00^{m})
Span	8.00
Design Load	40+class crawler crane plus its load hoisting capacity. $40^{t} + 10^{t} = 50^{t}$
Allowable stress of the steel material	(SS-41)
Allowable bending tensile stress	$\sigma ta = 2.100\ kg/cm^2$
Allowable axial compressive stress	$\sigma ca = 2.100$ " $(\frac{l}{r} \leqq 20)$
Allowable shearing stress	$\sigma ta = 1.200$ "
Allowable shearing stress of bolts	$\sigma ta = 1.300$ "
Impact coefficient	$i = 0.3$

2. Calculation of the Main Beam

Load condition during the operation of live load (crawler crane)

Calculation will be made for the case where the crawler crane locates at the center of the span, with 70% of its weight imposed on a single caterpillar



Wd:	deck plate	0.20 t/m
	dead load of beam	0.15 "
		0.35 t/m

We: dead weight of crawler crane + hoisted load x 70% x (1 + i)

$= (40 + 10) \times 0.7 \times 13 \div 4 = 11.38$ t/m

$$M_{max} = \frac{Wd^{\,2}}{8} + \frac{W\ .a}{2}(\frac{a}{2} + s) - \frac{W}{2}(\frac{\ }{2} - s)^2$$

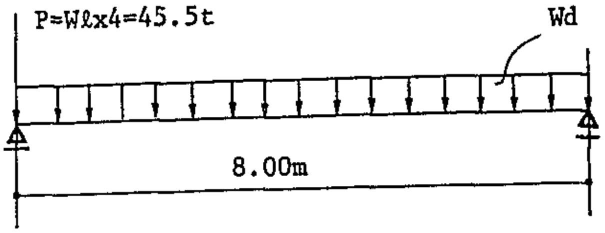
$$= \frac{0.35 x 8^2}{8} + \frac{11.38 x 4}{2}(\frac{4}{2} + 2) - \frac{11.38}{2}(\frac{8}{2} - 2)^2$$

$= 2.8 + 91.04 - 22.76 = 2.8 + 68.28$

$= 71.08$ t.m

Shearing force

Consider the case where the crawler crane stands on the support.



$$S\ max = \frac{Wd.\ell}{2} + P$$

$$= \frac{0.35 \times 8}{2} + 45.5 = 1.4 + 45.5$$

$$= 46.9^{\ t}$$

using H = 588 x 300 x 12/21

$$\sigma t = \frac{M}{Z} = \frac{71.08 \times 10^5}{4020} = 1.768 < 2,100\ kg/cm^2$$

$$\sigma t = \frac{S}{Aw} = \frac{46.900}{1.2(58.8-2 \times 2.1)} = 716 < 1200\ kg/cm^2$$

deflection $= \frac{5w\ell^4}{384EI}$

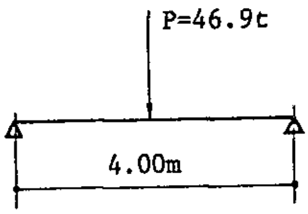
$E = 2.1 \times 10^6\ kg/cm^2 \quad I = 11.^8 \times 10^4\ cm^4$

$W = (40 + 10) \times 0.7 \quad 4 = 8.75\ t/m$

$$\sigma = \frac{5 \times 8.75 \times 10 \times 800^4}{384 \times 2.1 \times 10^6 \times 11.^8 \times 10^4}$$

$$= 1.9cm < \frac{\ell}{400} = 2.0\ cm$$

3. Deck Joint



$$M\ max = \frac{P\ell}{4} = \frac{46.9 \times 4}{4}$$

$$= 46.9^{\ t.m.}$$

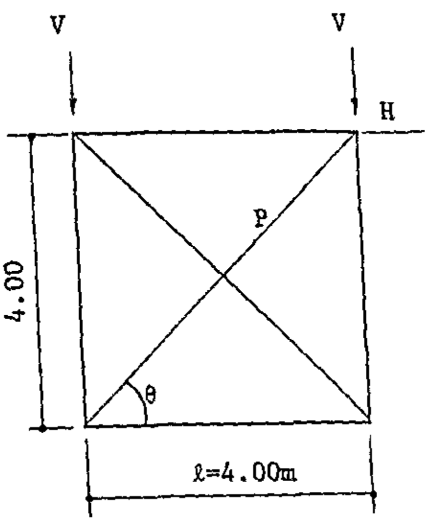
$$S\ max = 46.9^{\ t.}$$

using H-588 x 300 x 12/21

$$t = \frac{M}{Z} = \frac{46.9 \times 10^5}{4020} = 1,167 < 2100\ kg/cm^2$$

$$t = \frac{S}{Aw} = \frac{46.9 \times 10^3}{1.2(58.8-2 \times 2.1)} = 716 < 1200\ kg/cm^2$$

4. Calculation of Piles



Vertical load

$0.20 \times 4 \times 8 =$	6.4 t
$0.151^{t/m} \times 8 \times 3 =$	3.624
0.151×5 =	0.755
Crawler crane	
40 + 10 =	50.0
Others	0.221
	61.0 t

Horizontal load

taking at 10% of the load of the crawler crane.

$H = 50 \times 0.1 = 5^{t}$

i) Bracer

$P = H \sec\theta$ = 45°

$= 5 \times 1.414 = 7.07^{t}$

Diagonal bracer

L - 100 x 100 x 10

$A = 19cm^2 \quad i = 3.03^{cm} \qquad = 4 \times 1.414 = 5.66^{m}$

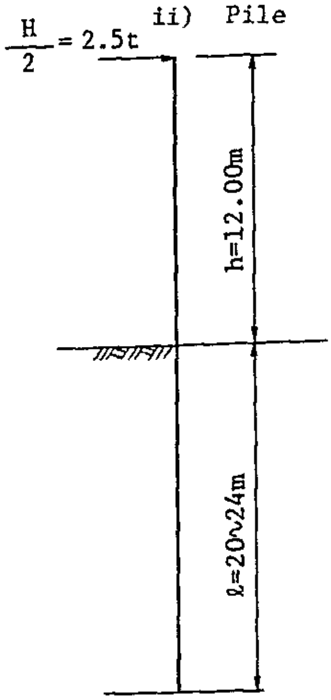
$\ell/i = 186$

$\frac{\ell}{i} \geq 93 \qquad \sigma ca = \left\{ \frac{12,000,000}{6,700 + (\ell/i)^2} \right\} \times 1.5$

$= 435 \cdot kg/cm^2$

$\sigma c = \frac{7070}{19} = 372 < 435\ kg/cm^2$

ii) Pile



$$\beta = 4\sqrt{\frac{KD}{4EI}}$$

$$= 4\sqrt{\frac{1.0 \times 40}{4 \times 2.1 \times 10^{6} \times 2.24 \times 10^{4}}}$$

$$= 0.38 \times 1.0^{-2} \ \ cm^{-1}$$

$$\frac{\pi}{\beta} = 8.27 \text{ m} < 20.0\text{m}$$

$$M\ max = = Hh \frac{\sqrt{(1+2\ \ h)^{2} + 1}}{2\ \ h}\ exp.$$

$$\left[-\tan^{-1} \frac{1}{1 + 2\beta h}\right]$$

$$1+2\beta\ h = 1+2 \times 0.38 \times 10^{-2} \times 1200 = 10.12 \ \ cm$$

$$M\ max = -2.500 \times 1200 \times \frac{\sqrt{10.12^{2}+1}}{9.12}\ exp\left[-\tan^{-1}\frac{1}{10.12}\right]$$

$$= -3,345,160 \times 0.906 = 3,030,705 \text{ cm-kg}$$

Depth giving M max

$$\ell_m = \frac{1}{\beta} \tan^{-1} \frac{1}{1 \pm 2\ \beta h}$$

$$= \frac{1}{0.38\times10^{-2}} \tan^{-1} \frac{1}{10.12} = 26 \text{ cm}$$

$$= \frac{V}{A} \pm \frac{M}{Z}$$

$$= \frac{30,500}{218.7} \pm \frac{3,030,715}{3.330} = 139.^{5} \pm 910$$

$$\fallingdotseq 1,050 \text{ kg/cm}^2 < 2100$$

iii) Bearing Strength of pile

Consider the case where 70% of (crawler crane + hoisted load) are imposed on one pile

$W = (40 + 10) \times 1.3 \times 0.7 \quad = 45.5^{t}$

$Wd = (6.4 + 3.624 + 0.755) \div 2 = 10.8\ t$

$56.3 \fallingdotseq 57$ t/pile

$Ru = 40NAp + Cu\ell$

$= 40 \times 10 \times 0.16 + 1.0 \times (0.4 \times 4) \times 20$

$= 96$ t/pile

$f = 96/57 = 1.68 > 1.5$

Temporary Landing Stage s = 1/100

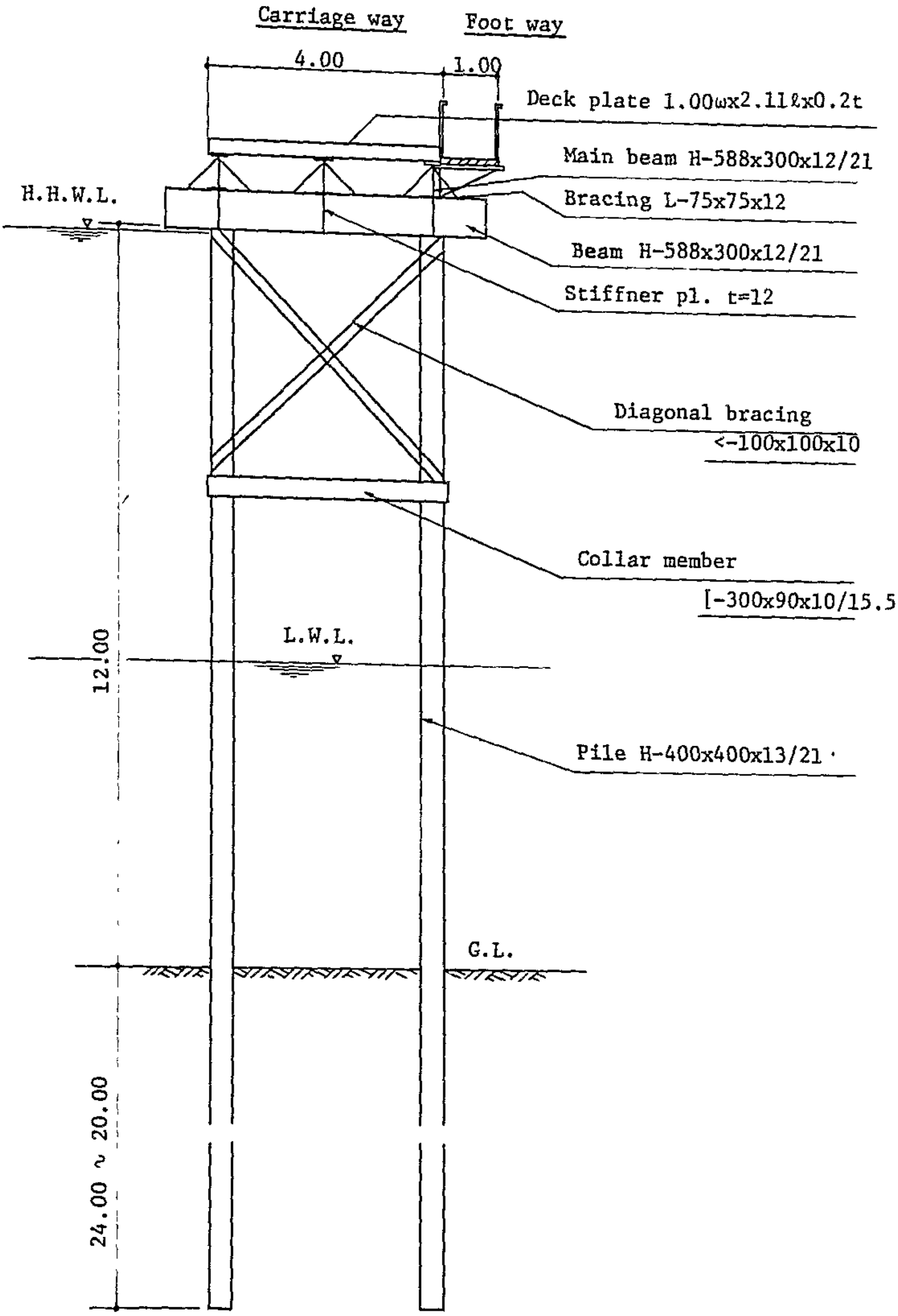


Fig. 8

Side View of Travelling Zone

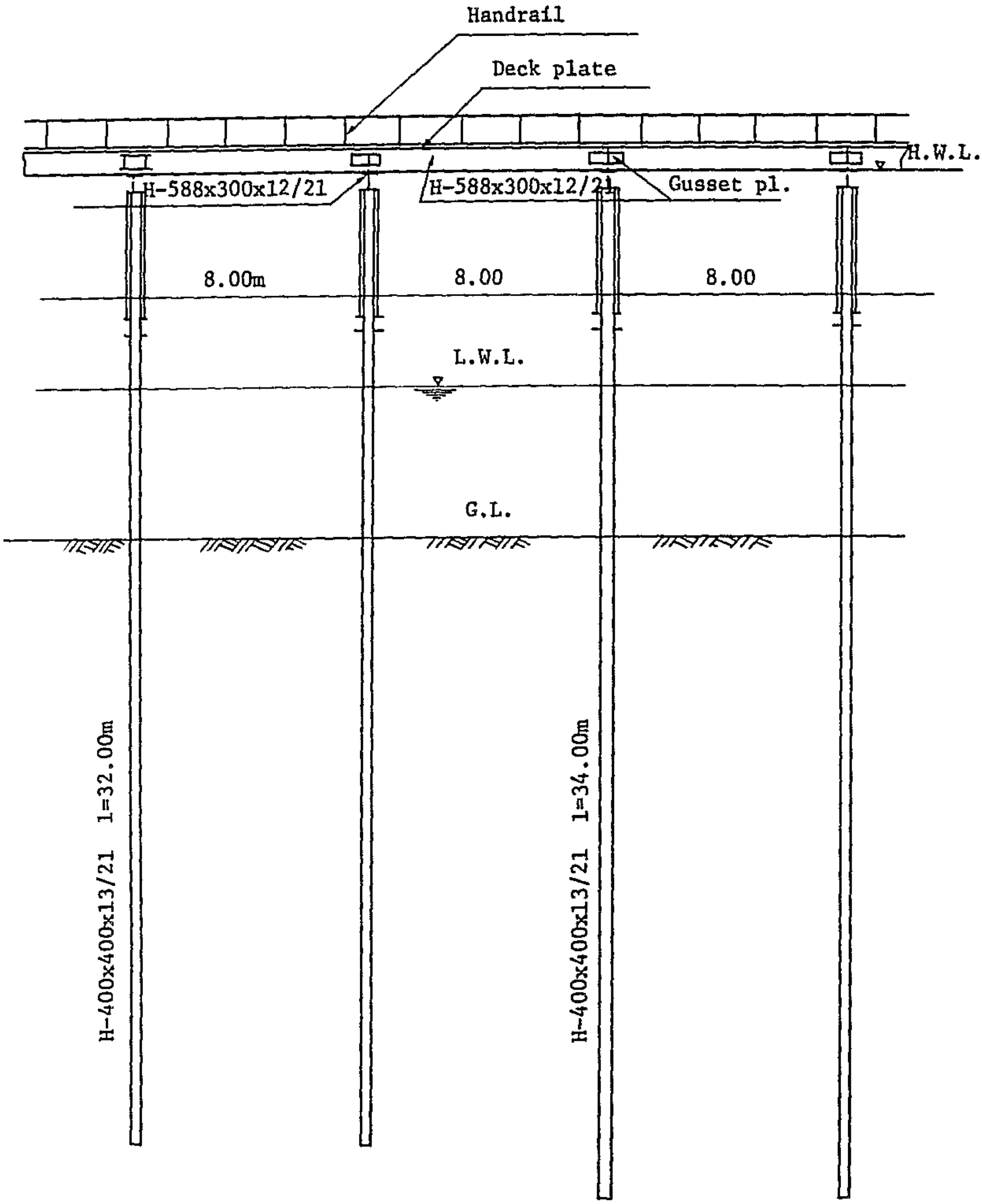


Fig. 9

(6) Island Embankment

a) In view of the large difference between high and low tide levels, the great velocity of flow, and the softness of the riverbed soil, the construction of open caisson by island method, using steel sheet piling for the embankment, is adopted for this design.

As it is necessary to make the joints between sheet piles completely water-tight, an H shape steel will be driven in place, and mounted with a guide frame (H-300).
The sheet piles will then be driven guided by this frame.

The size of the island will be 18m in diameter so as to provide enough shape for errection of scaffording and temporary storing of material around the caisson (14m diameter).

Sand (or sandy soil) will be used as fill material for embankment.

The circumference of sheet piles will be bound with 2 tiers of bands (H-250) on the outside surface in order to withhold the stress of earth pressure.

For driving and withdrawing of the shape steel and sheet piles, a vibro hammer (VM-5000) will be employed, and will be transported by the crawler crane in place for operation.

In order to tightly close the joints, sheet piles should be driven vertically. For this purpose, two-stage driving technic will be employed. (drive the sheet pile until it can stand free, close the joint, and then proceed on the second time of driving.

The crown level of the island will be at HHWL. The finished level of the embankment will, however, be 1.5m below it.

The removal of the island, as in the case of the cut-off wall, will be commenced upon completion of the pier construction.

Material for the embankment will be delivered to site by dump trucks or barges, and filling will be done by crawler

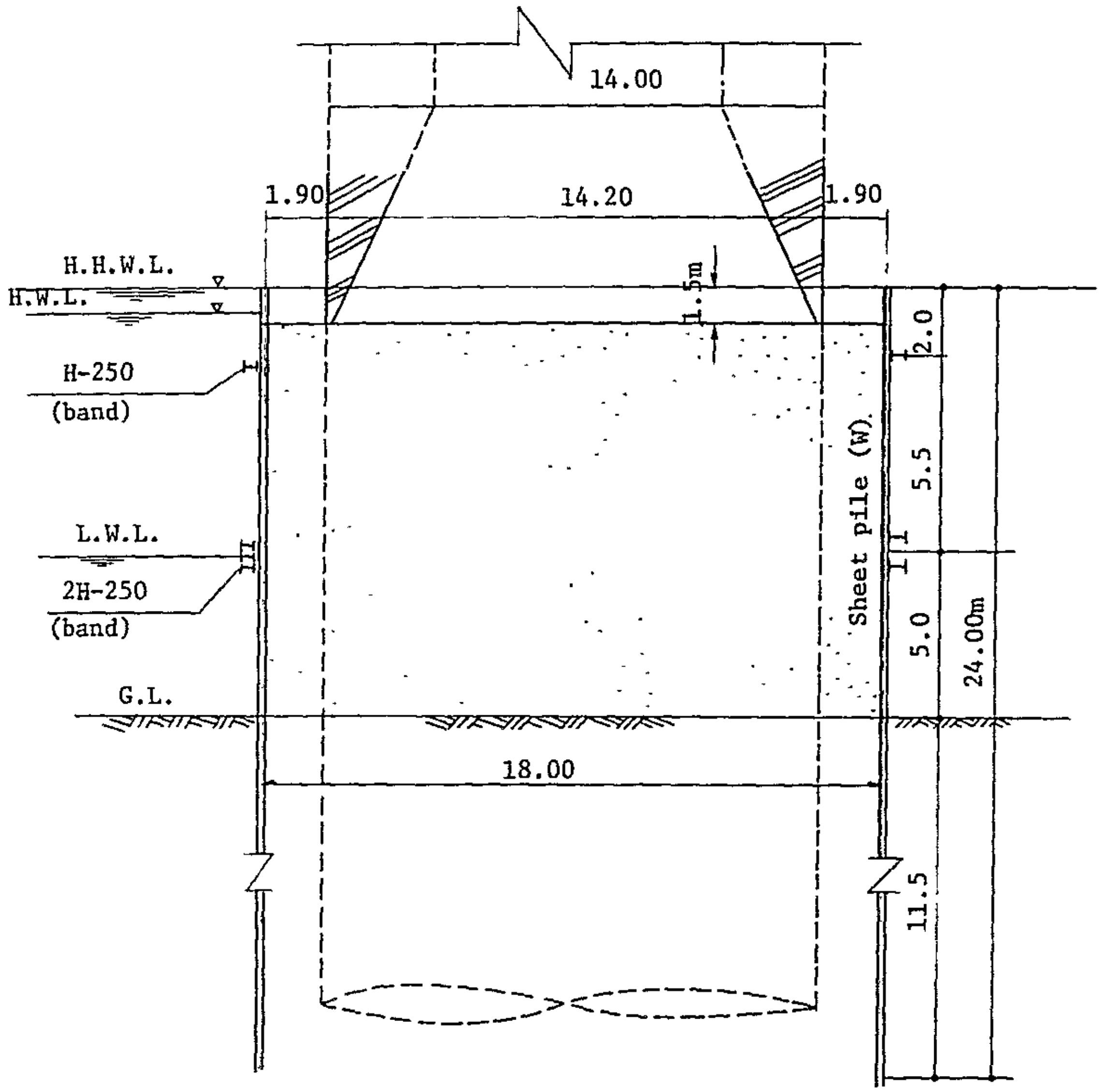

14.00
1.90
14.20
1.90
H.H.W.L.
H.W.L.
1.5m
H-250
(band)
L.W.L.
2H-250
(band)
G.L.
Sheet pile (W)
2.0
5.5
5.0
24.00m
18.00
11.5

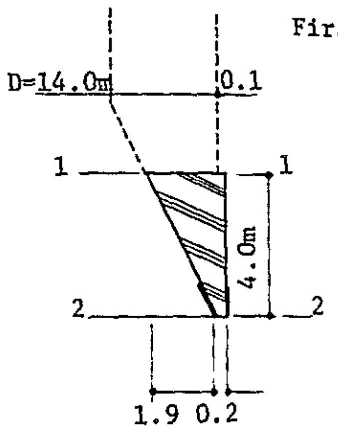
Fig. 10

crane and clamshell in combination.

b) Design of the island

1. Design condition

Island	diameter			18.0 m
H.W.L	from riverbed			11.5 m
L.W.L	"			5.0 m
Residual water level				+1.0 m
Fill material	sand	γ	=	1.8 t/m^3
	underwater	γ'	=	0.8 t/m^3
		ϕ	=	25°
		c	=	0
Riverbed soil	silt	γ	=	1.6 t/m^3
		γ'	=	0.7 t/m^3
		ϕ	=	10°
		c	=	3.5 t/m^2
Load		q	=	2.98 t/m^2



First lot concrete weight

$0.785\,(14.2^2 - 10^2) = 79.79$ m2

$0.785\,(14.2^2 - 13.8^2) = 8.79$ "

$(79.79 + 8.79) \div 2 \times 4 = 177.2$ m3

$W = 177.2 \times 2.5 = 443.0^t$

Steel shoe $W' = 15.^t$

$(443 + 15) \div (0.785 \times 14^2) = 2.98$ t/m^2

$h' = \frac{2.98}{1.8} = 1.66$ m

Earth pressure according to Rankine-Lezar formula

Active earth pressure

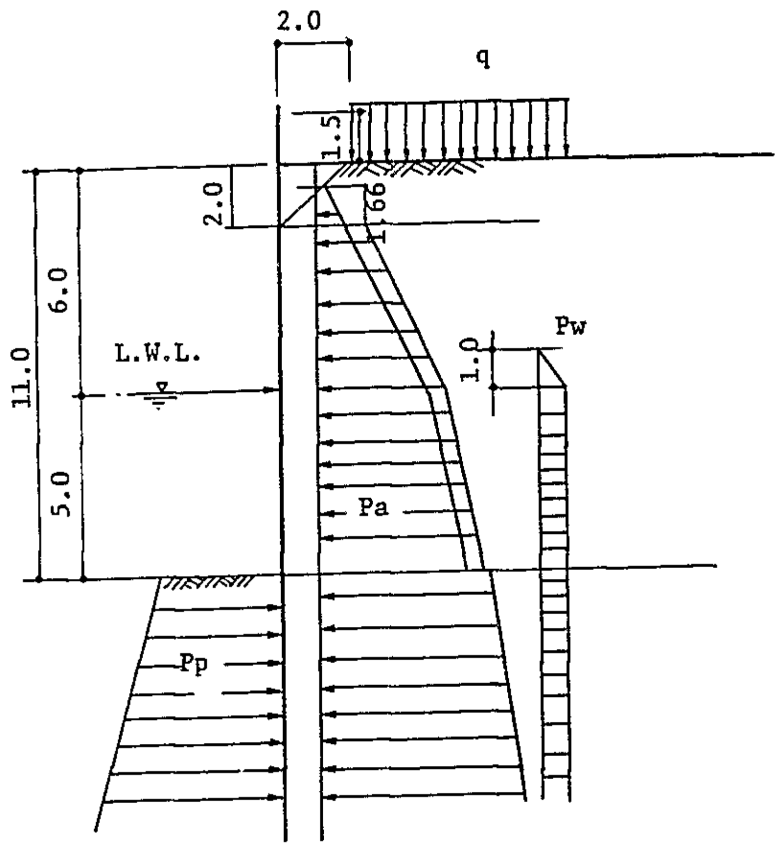
$pa = h \tan^2 (45° - \frac{\phi}{2}) - 2c \tan (45° - \frac{\phi}{2})$

Passive earth pressure

$pp = h \tan^2 (45° + \frac{\phi}{2}) + 2c \tan (45° + \frac{\phi}{2})$

Allowable stress of steel material

Steel Sheet pile	σta =	2.700 kg/cm^2
Shape Steel (SS41)	σt =	2.100 "



2. Calculation of earth pressure

Considering the case of LWL

$\phi = 25°$ $\tan^2 (45 - \frac{\phi}{2}) = 0.637^2 = 0.41$

$\phi = 10°$ $\tan^2 (45 - \frac{\phi}{2}) = 0.84^2 = 0.70$

$\tan^2 (45 + \frac{\phi}{2}) = 1.192^2 = 1.42$

Active earth pressure

- 0.5	P_a^1	=	0.41 (0.5 + 0.34) x 1.8 = 0.62 t/m^2
- 6.0	P_a^2	=	0.41 (6 + 1.66) x 1.8 = 5.65 t/m^2
-11.0	P_a^3	=	5.65 + 0.41 (5 x 0.8) = 7.29
-11.0	P_a^4	=	0.70 (7.66 x 1.8 + 5 x 0.8) - 2 x 3.0 x 0.84
		=	12.45 - 5.04 = 7.41
-11∿Z	Pp5	=	0.70 x 0.70Z + 7.41 = 0.49Z + 7.41

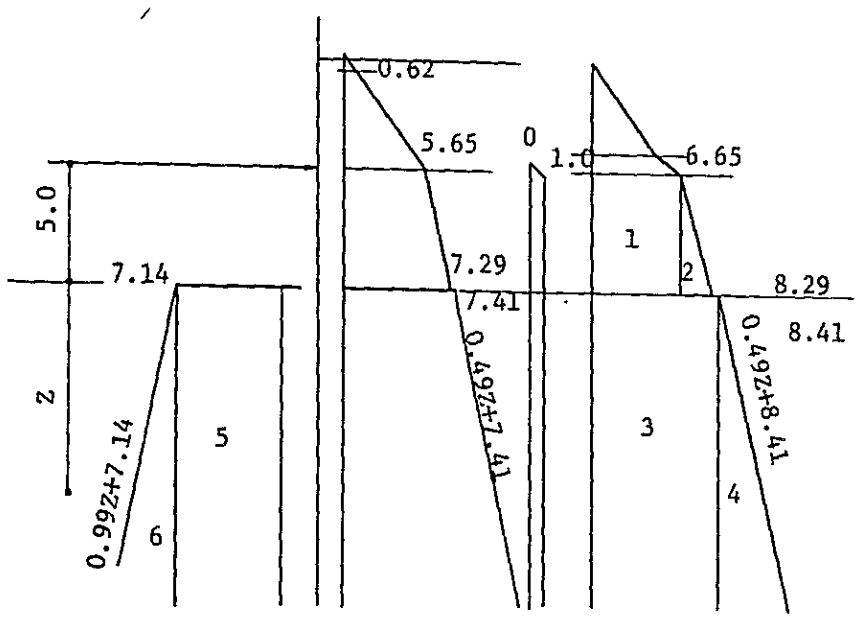
Water pressure

-6.0 Pw = 1.0 t/m^2

Passive earth pressure

-11∿Z Pp = 0.7 x 1.42Z + 2x3.0 x 1.19 = =0.99Z + 7.14

3. Calculation of the Penetration Depth of Sheet Pile



1. A_1=6.65x5= 33.25	M_1=33.25x5x1/2	= 83.13
2. 1/2x1.64x5= 4.1	M_2= 4.1x5x2/3	= 13.67
3. 8.41xZ= 8.41Z	M_3=8.41Z(5+Zx1/2)	= 42.05Z+4.2Z^2
4. 1/2x0.49ZxZ=0.245Z^2	M4=0.245Z^2(5+Zx2/3)	= 1.23Z^2+0.16Z^3
5. 7.14xZ =7.14Z	M_5=7.14Z(5+Zx1/2)	= 35.7Z+3.57Z^2

6. $1/2 \times 0.99Z \times Z = 0.495Z^2$ $M_6 = 0.495Z^2(5+Z \times 2/3) = 2.48Z^2 + 0.33Z^3$

$\Sigma Ma = 0.16Z^3 + 5.43Z^2 + 42.05Z + 96.8$

$\Sigma Mp = 0.33Z^3 + 6.05Z^2 + 35.7Z$

$0.17Z^3 + 0.62Z^2 - 6.35Z - 96.8 = 0$

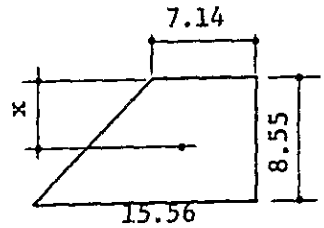
$Z = 8.55$ m

Penetration depth 8.55 m x 1.2 = 10.25

Length of steel pile = 12.5 + 10.3 = 22.8→24.0^m

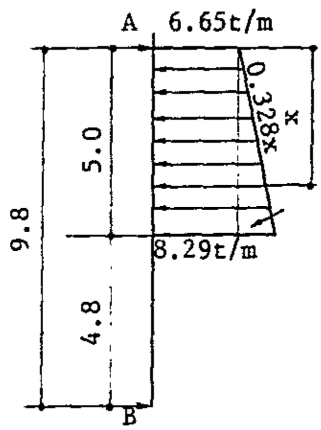
4. Calculation of the section of sheet iile

i) Hypothetical bearing point



$$X = \frac{8.55}{3} \cdot \frac{7.14 + 2 \times 15.56}{7.14 + 15.56} = 4.8^m$$

ii) Section Calculation



$$RA = \frac{1}{9.8}\left\{6.65 \times 5\left(4.8 + \frac{5}{2}\right) + \frac{1}{2} \times 1.64 \times 5\,(4.8 + 5 \times 1/3)\right\} = 27.47\ ^t$$

$$6.65 + \frac{1}{2} \times 0.33X^2 - 27.47 = 0$$

$$X = 3.78$$

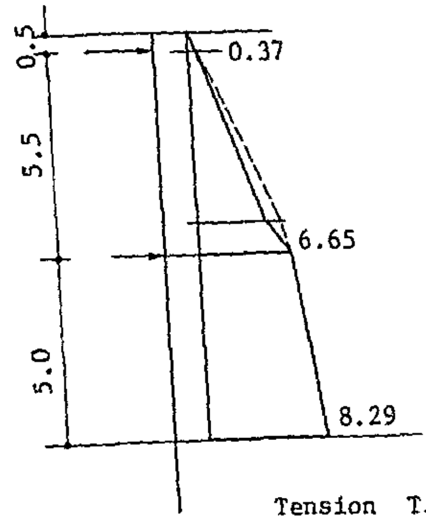
$$Mmax = 3.78 \times 27.47 - 6.65 \times \frac{2}{3.78} \times \frac{1}{2} - \frac{1}{2} \times 0.328 \times \frac{2}{3.78} \times \frac{1}{3} \times 3.78$$

$$= 53.38\ t.m$$

YSP W type $Z = 2.060\ cm^3/m$

$$\sigma t = \frac{53.38 \times 10^5}{2.060} = 2.493 < 2.700\ kg/cm^2$$

iii) Calculation of the Section of the Band



According to lower load method.

upper band

$R_1 = \frac{1}{2}(0.62+6.65)\times 5.5 = 20.0$ t/m.

lower band

$R_2 = \frac{1}{2}(6.65+8.29)\times 5 = 37.35$ t/m

Tension $T_1 = R_1\gamma = 20 \times \frac{18}{2} = 180.0^{t}$

$T_2 = R_2\gamma = 37.35 \times \frac{18}{2} = 336.2^{t}$

By using H-250

upper band $A = 92.18^{cm2}$ $t = \frac{180,000}{92.18} = 1952$

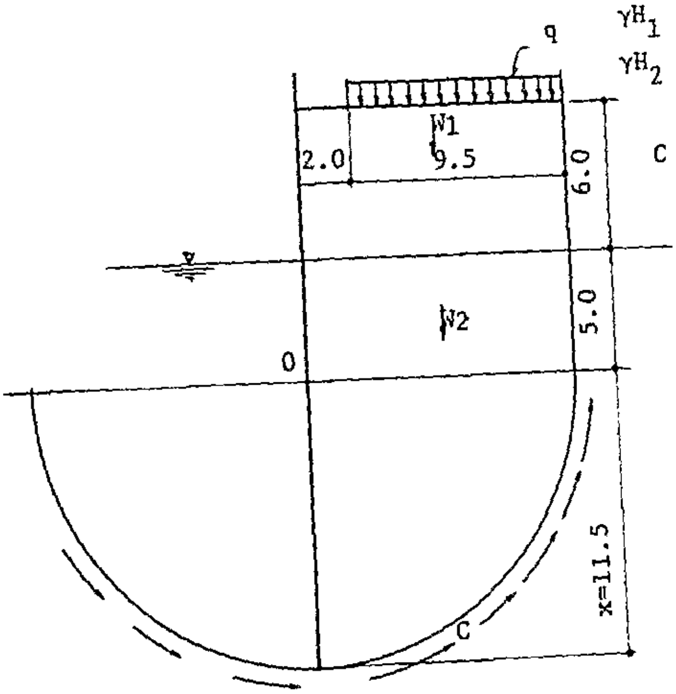
$< 2,100$

lower band $2A = 184.36\ cm^2$ $t = \frac{336,200}{184.36}$

$= 1834 kg/cm^2$

$< 2,100$

iv) Consideration on Heaving



$\gamma H_1 = 1.8 \times 6 = 10.8^{t}$

$\gamma H_2 = 0.8 \times 5 = 4.0^{t}$

$= 2.98\ t/m^2$

$C = 3.5\ t/m^2$

$$Fs = \frac{Mr}{Md} = \frac{\pi . C. X^2}{(\gamma H + q) . x . \frac{x}{2}} = \frac{2 \pi C}{\gamma H + q}$$

$$= \frac{2x3.14x3.5}{10.8+4+2.98} = \frac{21.98}{17.78} = 1.23b > 1.2$$

($\frac{Mr}{Md}$ becomes irrelevant to x)

(7) Access Road

The access roads between the existing roads and the sites on both banks will be embanked up to +5.90, higher than HWL, to serve partly as pre-load for the permanent road construction

Between these roads and the landing stages, access roads of 6m width will also be required.

Around the approach to the landing bridge, provision of parking area for the heavy equipment and vehicles will be required.

As the traffic of concrete mixers, dump truck, and heavy machines will be very heavy, the access roads will be paved with a layer of considerably thick crush stones, leveled with crusher-run.

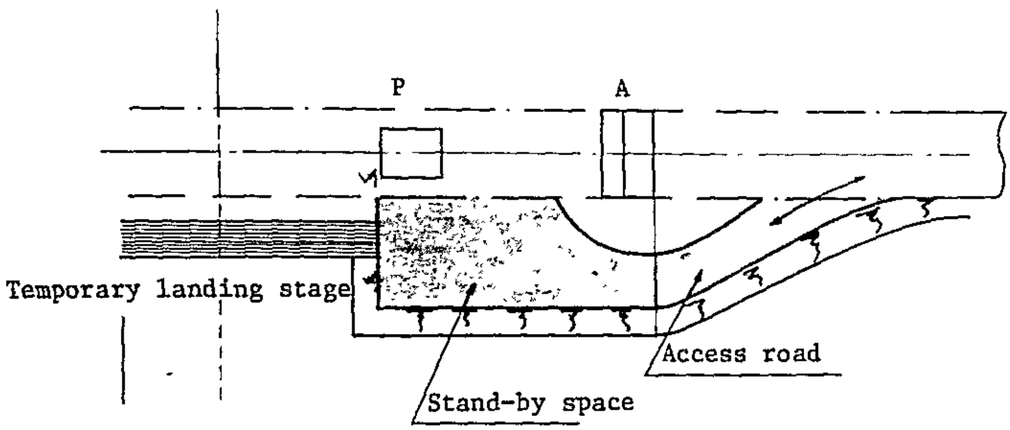


Fig. 11

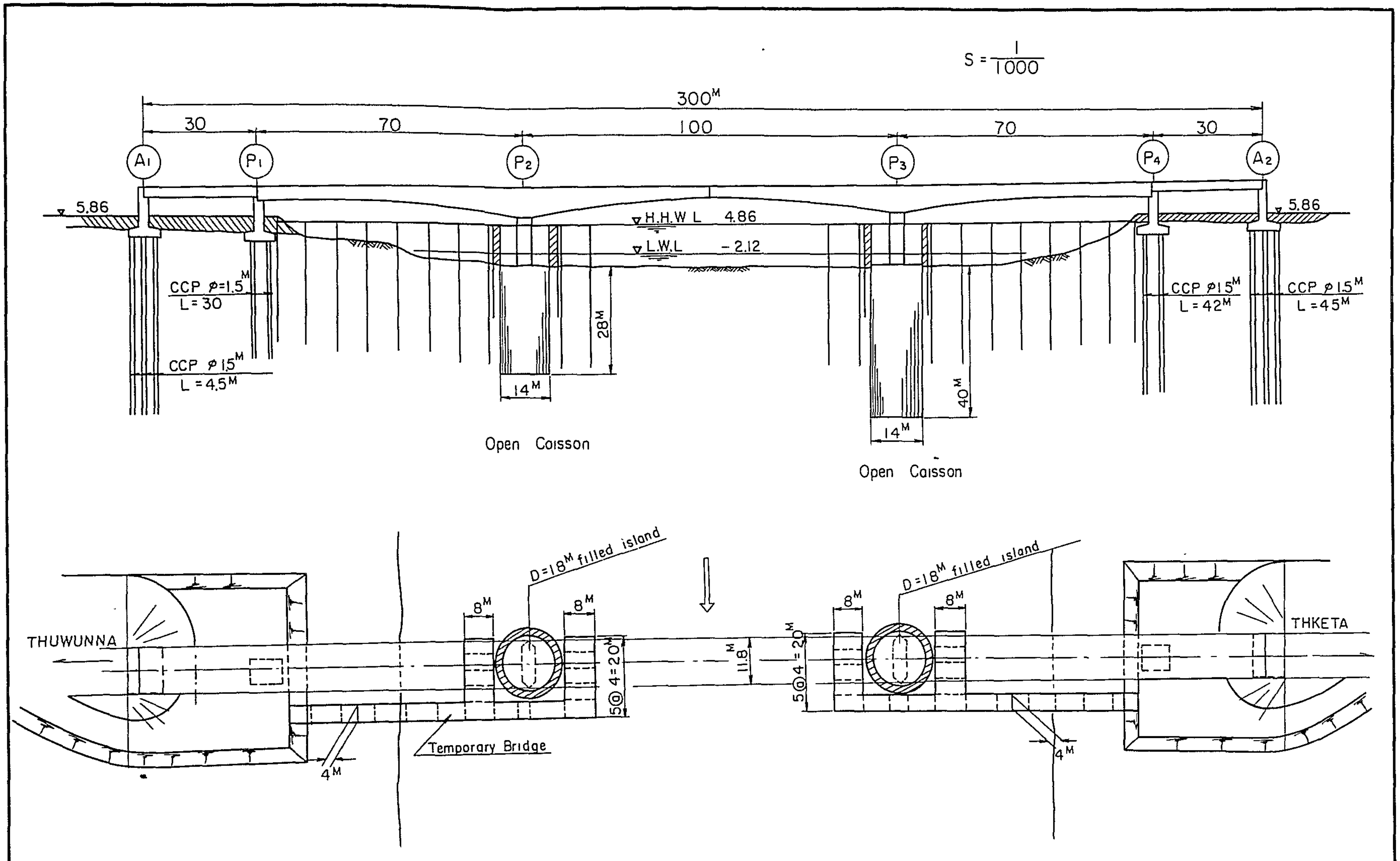


Fig 12 TEMPORARY WORK (River side)

Chapter 3. Construction of Superstructures

Construction of the superstructure as illustrated in fig. 13, is largely divided into the following sections.

(1) Three span continuous hinged rigid frame bridge.

a) Column Capital

b) Hang-over Section

c) Side Span Timbering Section

d) Central Span Suspended Scaffolding joint section.

(2) Post-tension T-beam Composite Beam

e) Main Beam Construction

f) Bridge Surface Works

(3) Temporary Utilities to Share the Same Facilities with the Substructure Works

a) Construction of the column capitals will be done using brackets errected on steel batons soundly mounted to the pier as timbering, and executed by means of crawler crane reaching from the landing stage. (Fig. 14)

b) Hang-over section will be constructed by lifting gantries as illustrated in fig. 15, and construct symmetrically on both sides, block by block from the column capital.

c) The side span timbering section will be constructed by first errecting the timbering, and then placing concrete in situ. (Fig. 16)

d) The central hinge will be joint after completion of the side spans making use of the wagons as scaffolding. (Fig. 17)

Division of Execution

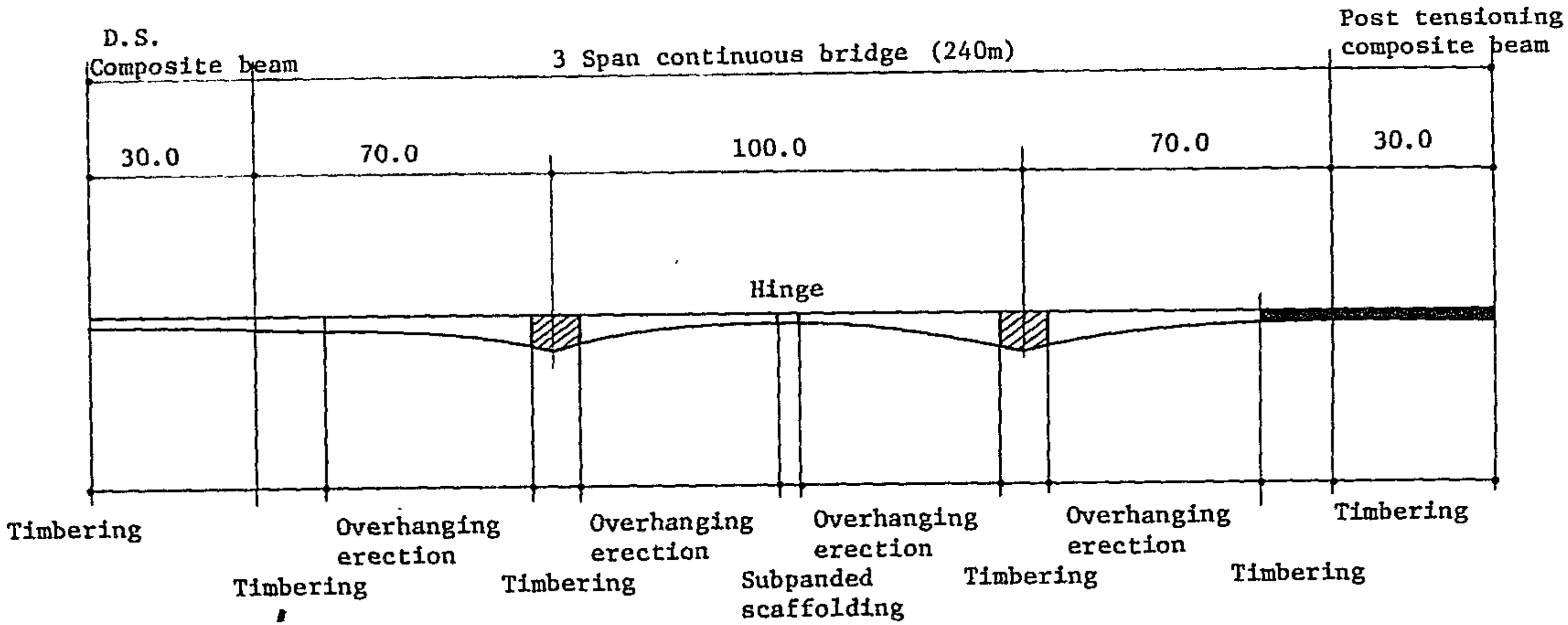
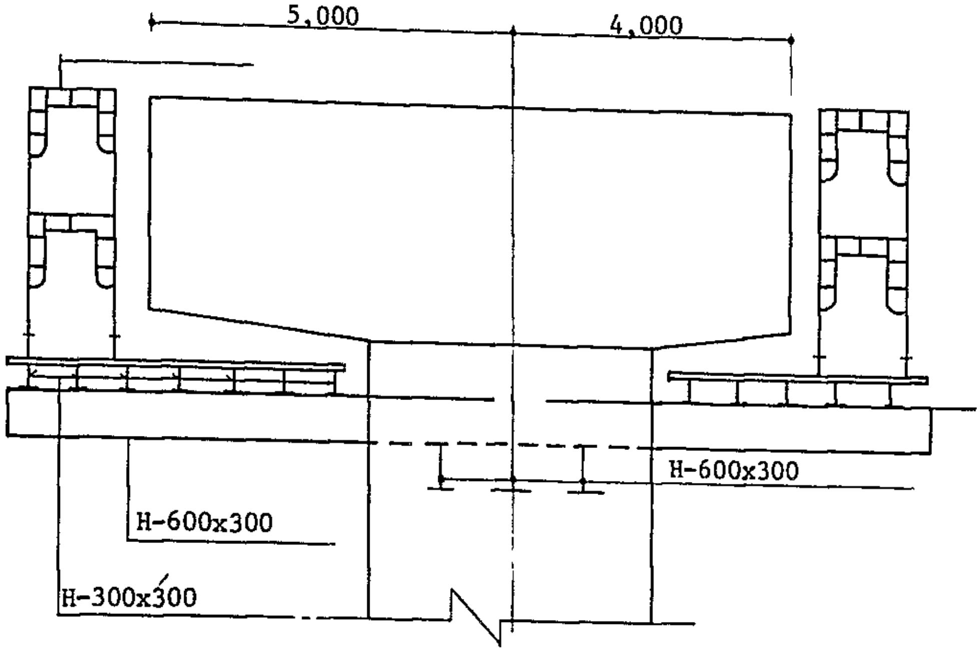
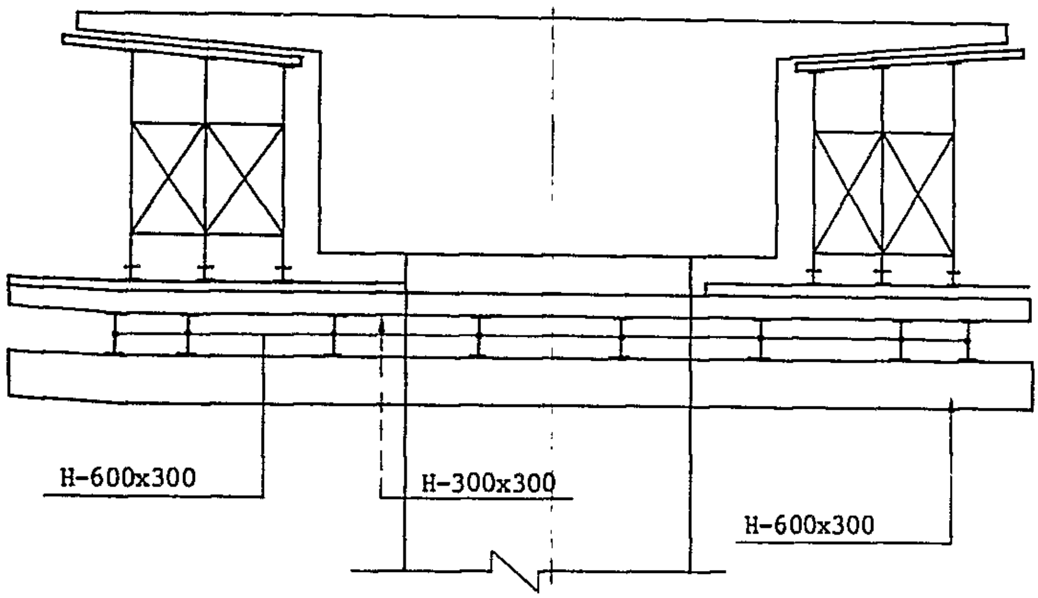


Fig. 13

Construction of column capital





Build the H-Shape Steel into the pier, and errect the scaffolding on the H-Shape Steel.

Fig. 14

Views of Work Wagon

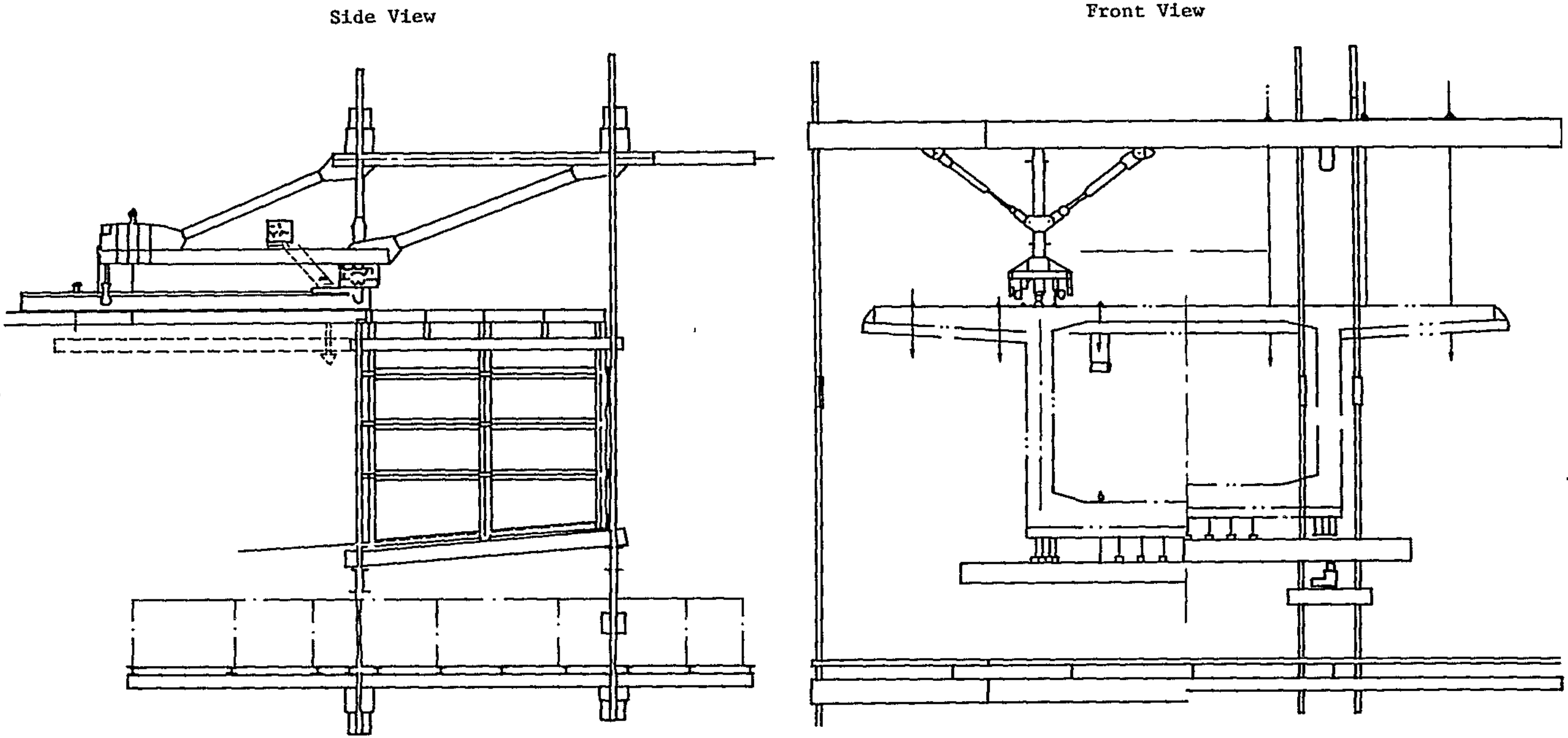


Fig. 15

Plan of P.C. Composite T-Beam Timbering

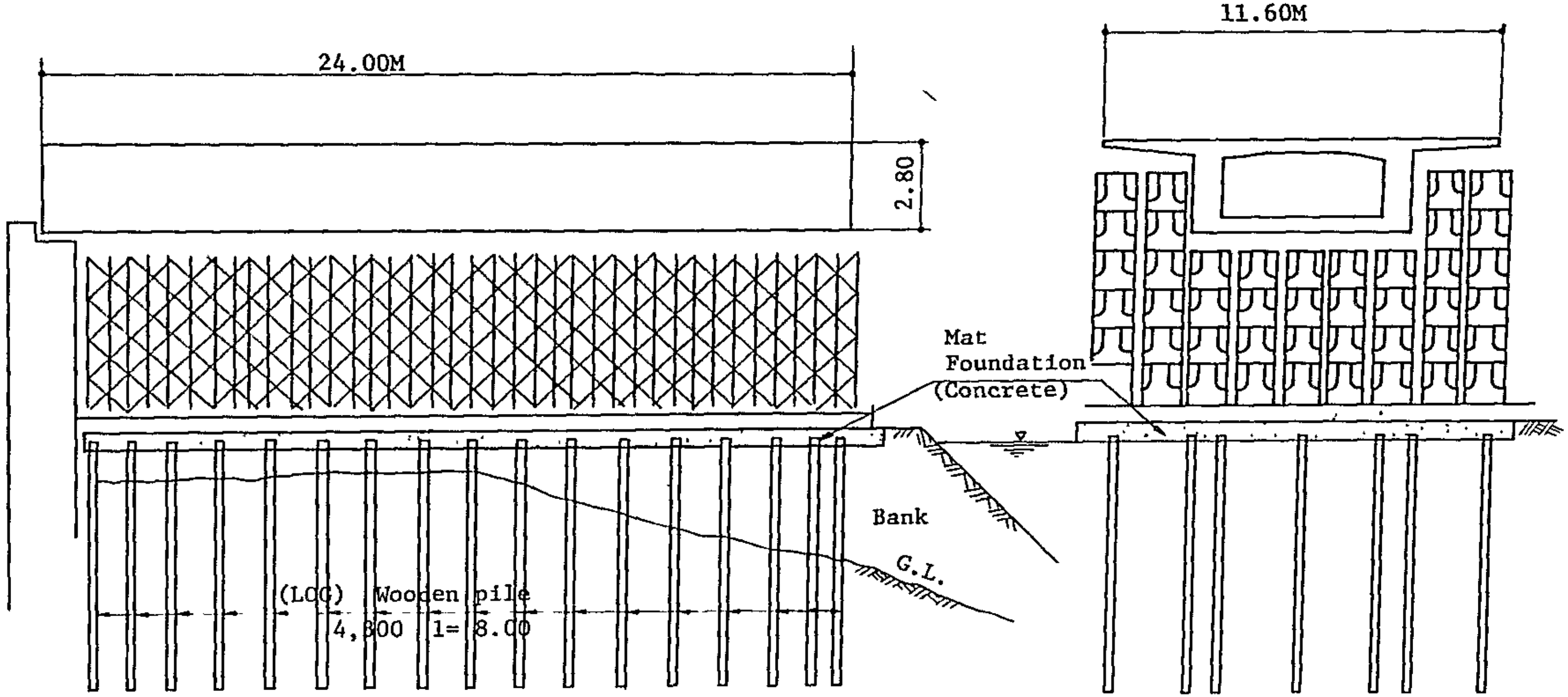


Fig. 16

Suspended Scaffolding for the Central Joint

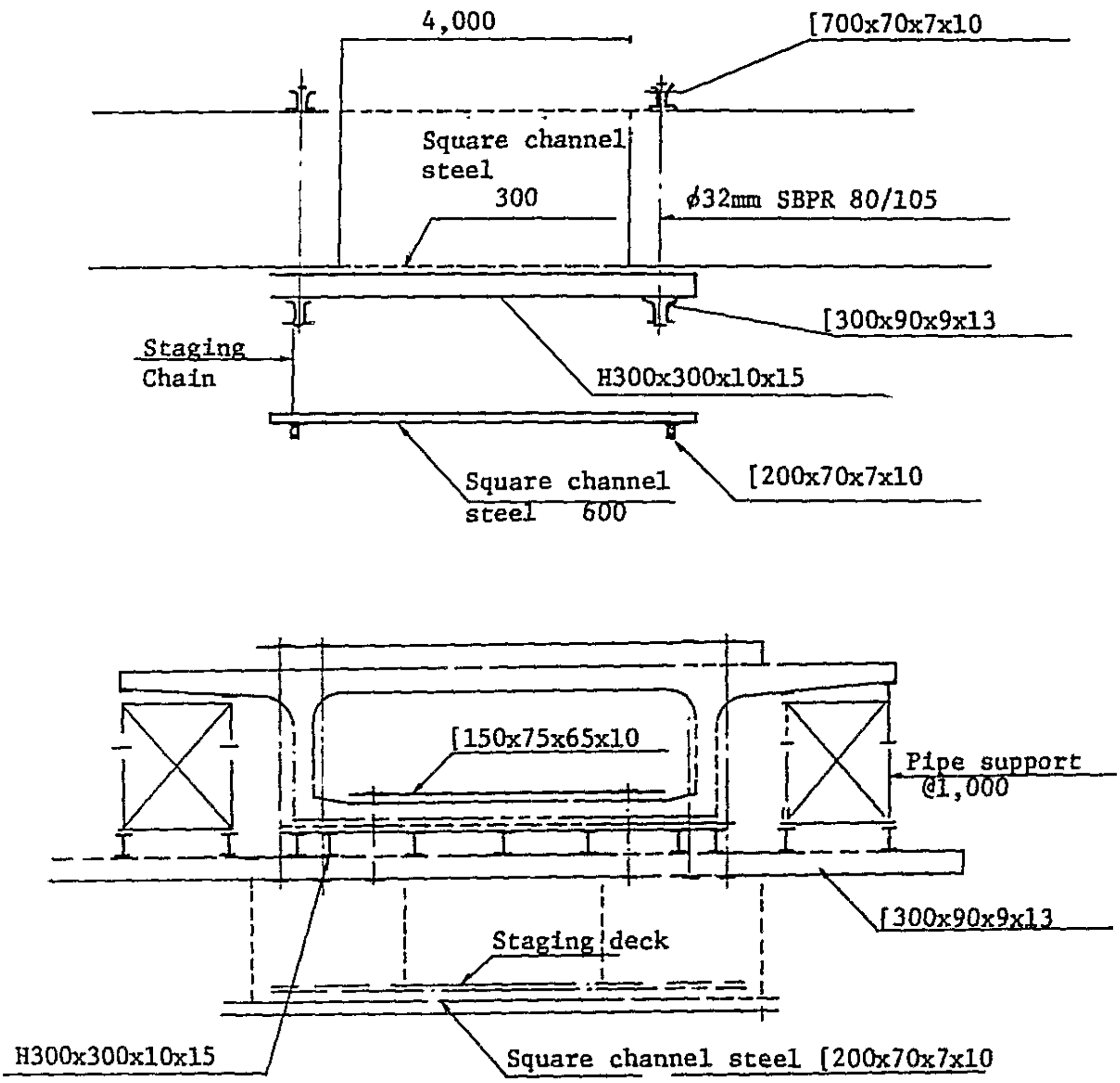


Fig. 17

Plan of P.C. Compossite T-Beam Timbering

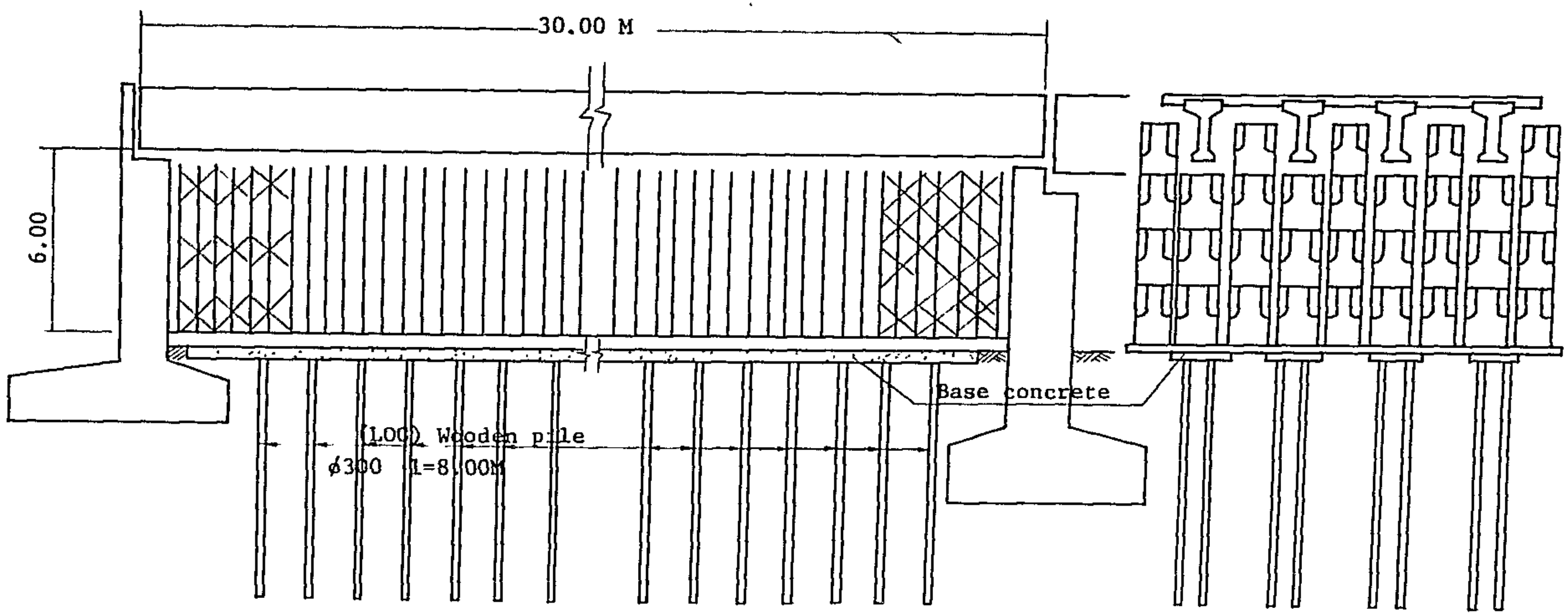


Fig. 18

Curbstone and bridge surface work

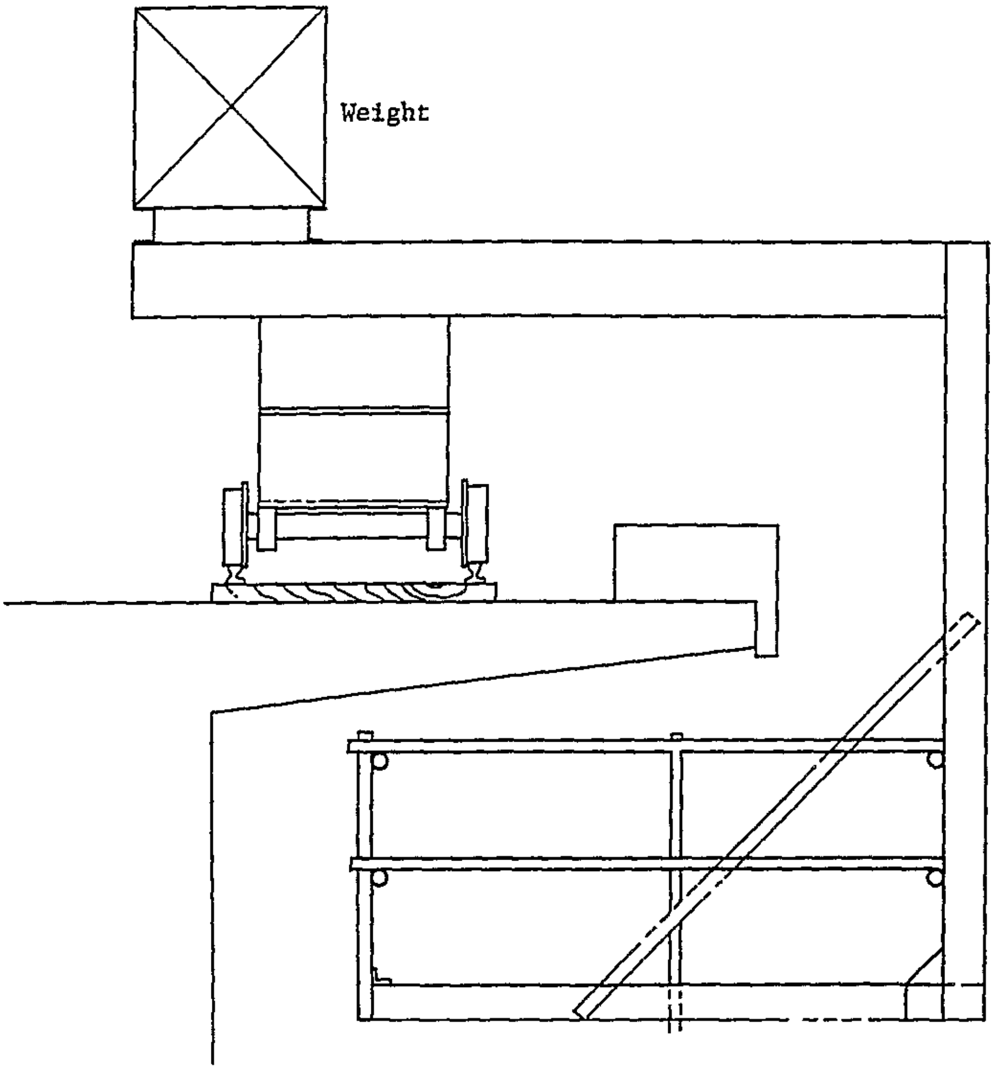


Fig. 19

Chapter 4. LIST OF MAJOR EQUIPMENT

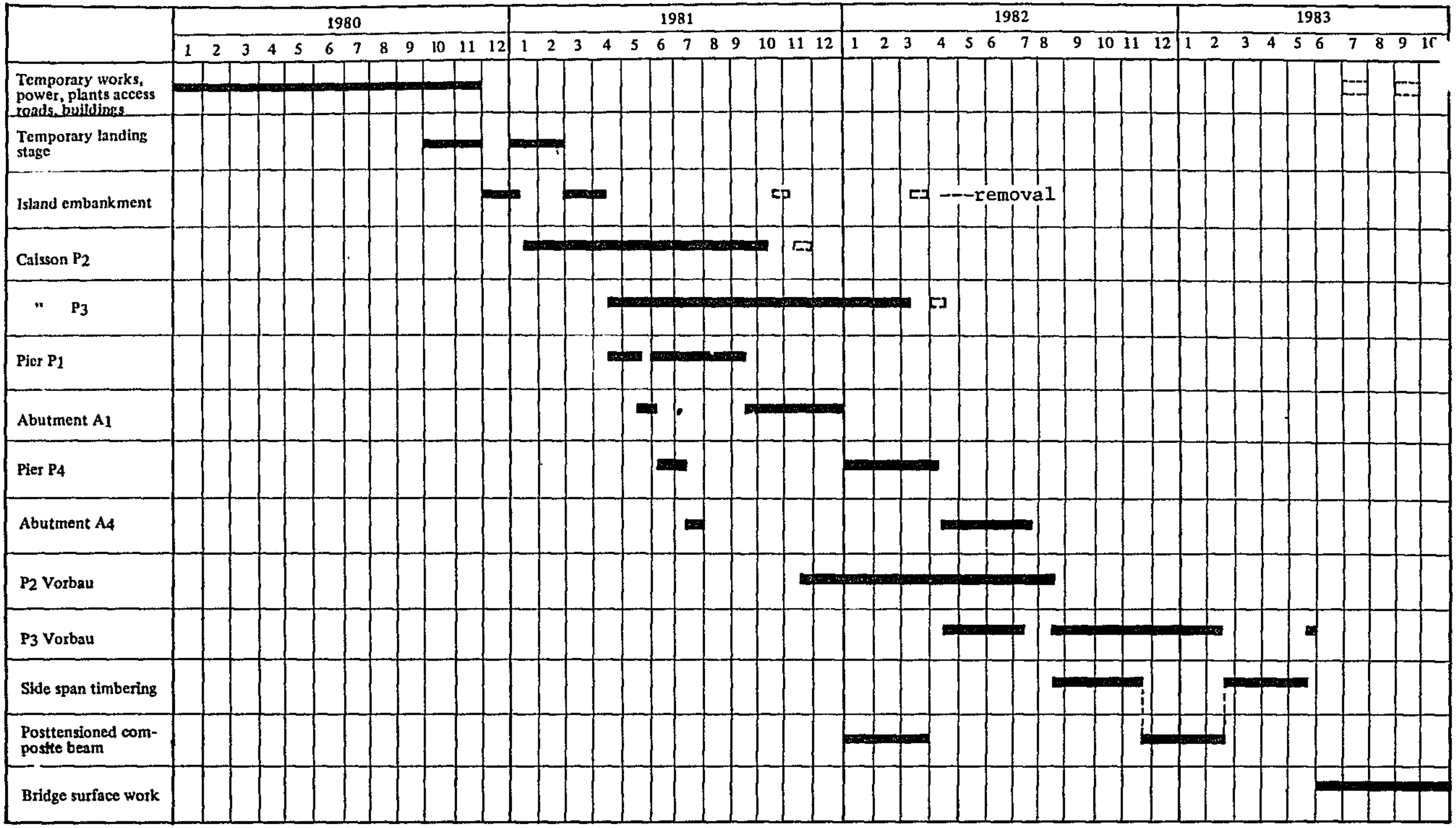
1. For Substructure

Equipment	Type	Quantity	Place of Use	Remarks
Crawler crane	40T	1	Well excavation material loading and unloading	Shared use with superstructure works
"	25T	1	-ditto-	-ditto-
Clam shell bucket	0.8m^3	1	Well excavation island earth work	
"	0.6m^3	1	Onshore foundation excavation	
Reverse machine	S-320	1	R.C.D pile	
Hammer grav	ø1500	1	-do- excavation within stand pipe	
Slosh tank	80m^3	3	-do- settling tank	
Underwater pump	8"	2	-do- R.C.D. pile	Onshore foundation excavation
"	6"	2	"	"
"	4"		"	"
"	2"	2	".	"
Tremie pipe	ø250	60m	R.C.D pile concreting	Shared use with well bottom concreting
Concrete bucket	1m^3	4	Well abutment pier	Shared use with superstructure works
Compressor	100ps	1	Pile head cutting friction reducing	
Vibro hammer	90KW	1	Driving and extracting of stand pipe, H shape steel pile steel sheet pile	
Concrete breaker		10	R.C.D. pile head treatment	
Truck	8t	2	Material conveying	Shared use with super-structure works
Dump truck	8t	4	Soil transporting	"
Truck mixer	4m^3	6	Concrete transporting	"

Equipment	Type	Quantity	Place of Use	Remarks
Bar bending machine		2	Reinforcement processing	Shared use with super-structure works
Bar cutter		1	"	"
2. For Superstructure				
Common type wagon	t.m 220	2	3 span continuous rigid frame bridge with hinge	
Dywidag jack	ø32	2	"	
Dywidag pump		2	"	
Centre-hole jack	20t	2	"	
Ship jack	20t	6	"	
Ship manual pump		2	"	
Dynamometer	100t	1	"	
Grout pump	Electric	1	"	
"	Manual	2	"	
Mixer	HM-500	2	"	
Chain block	10t	4	"	
"	5t 3t	4 4	"	
Lever block	3t 1.5	10 10	"	
Universal pulling and lifting machine	5t	2	"	
use curbstone wagon		2	"	
Hopper	1.5m^3	1		
Cart		20		
Vibrator		10		Shared use with substructure works
Formwork vibrator		12		
Mini belt conveyor	4m	4		
3. List of temporary Equipment				
Cubicle	200KVA	1	Power facility	
"	150KVA	2	"	
Generator	300KVA	2	"	
Gravel hopper	3m^3	1	Crushing plant	
Jaw crusher	20t/hr	1	"	

Equipment	Type	Quantity	Place of Use	Remarks
Vibrating Screen		2	Crushing plant	with flusher
Sand hopper	$3m^3$	1	"	
Classifier	10t/hr	1	"	with flusher
Belt conveyor		7	"	
Mixer	$1.m^3$ $30m^3$/hr	1	Batcher plant	Drum type
Batcher		3	"	1 for gravel 2 for sand
Cement silo	30t	1	"	
Belt conveyor		4	"	
Hopper	for ready mixed concrete	1	"	
Water tank		1	"	
Arc welder	15KW	2	Temporary works processing	
Gas cutter		3	"	
Dozer shovel	D50-S	1	Crushing plant	Shared use with substructure works
Backhoe	$0.7m^3$	(1)	Excavation	"
Vibro hammer	90KW	(1)		"
Crawler crane	40㌧	(1)		"
"	25㌧	(1)		"

Chapter 5. CONSTRUCTION SCHEDULE



III MATERIAL TEST

CONTENTS

Chapter 1. TEST OF BURMESE CEMENT AND CONCRETE AGGREGATES

1. Specimen

The specimens sent from Burma are two bags of cement, 80 kg of river sand, 160 kg of river gravel and 160 kg of crushed stone. The results of the designated tests using the above specimens are given in the attached papers.

2. Consideration

(1) Cement:

The cement was sent from Port of Rangoon in September last, and the specimen was delivered on February 13, 1980; about 5 months have elapsed from the shipment to the delivery of it.

The results of the test is acceptable except for the strength; the specimen is sharply short of strength compared with Japanese cement. In respect to this result of test, it is impossible to hastily conclude only from the designated test items that the result is due to the quality itself of Burmese cement or to aeration of cement.

(2) Fine aggregate:

The delivered fine aggregates are of three different places of origin. According to the test results,

a. Sorting: F.M. 2.01 ①, 1.44 ②, 2.20 ③.
In Japan, F.M. 2.8 or so is desired for sand for concrete. It can be said that the result of sorting of the three types of fine aggregates indicates their grading being fine.

b. Washing: According to the Japanese standard, Class I is of 2.5%, and Class II, 3.0% or less. The test result is better than that standard.

c. Specific gravity: 2.56 ①, 2.55 ② and 2.56 ③. Compared with Japanese standard range of specific gravity, 2.5 to 2.8 (2.6 on the average), the specimens are somewhat light.

d. According to JIS (Japanese Industrial Standard), the stability is 10% or less; however, the test result indicates 0.5% ①, 0.2% ② and 2.7% ③, which are very good.

e. In terms of organic impurities, the colors of specimens are lighter than the standard colors; they are acceptable. In the case of the specimen ①, it is considered because it contained many wood pieces that the color of the specimen ① is almost the same as the standard color.

(3) River gravel:

a. Washing: 0.22% ④, 0.13% ⑤ and 0.27% ⑥. They are considered good referring to JIS of 1.0%.

b. Specific gravity: 2.61 ④, 2.60 ⑤ and 2.58 ⑥. These results are by no means inferior to Japanese average specific gravity of 2.6.

c. Abrasion: 28.2% ④, 31.0% ⑤ and 34.6% ⑥. These are good in the light of JIS of 40% or less.

d. Stability: 4.0% ④, 4.7% ⑤ and 3.6% ⑥. Compared with the standard of 12.0% or less, they are very good.

(4) Crushed stone:

a. Washing: 0.43% ⑦, 0.30% ⑧ and 0.26% ⑨. All of the results are less than JIS of 1.0%.

b. Specific gravity: 2.70 ⑦, 2.77 ⑧ and 2.70 ⑨.
These are heavy; Japanese average specific gravity is approximately 2.65. It is considered this is because of the crushed stone containing much iron.

c. Abrasion: 29% ⑦, 26.4% ⑧ and 35.1% ⑨.
In comparison with JIS of 40% or less, they are good.

d. Stability: 4.4% ⑦, 5.7% ⑧ and 8.1% ⑨.
In comparison with JIS of 12.0% or less, they are good.

Note: The encircled figures represent Nos. of specimens, and are indicated in the test table.

Chapter 2. CEMENT

REPORT ON TEST OF CEMENT

No. S-2497

February 21, 1980

Onoda Analysis Center
1-1-7 Toyosu, Koto-ku, Tokyo,
Japan (Postal code No. 135)
c/o Onoda Cement Co., Ltd.
Tel.: (03)532-1029

The test results of the specimen as requested on February 13, 1980 are reported as tabled below.

Name of specimen: Cement

Date of sampling:

Test item: As itemized in the following table.

Testing method: JIS R 5201-1977

Result:

Specific gravity	Braine's specific surface area (cm^2/g)	Setting			Stability	Bending strength (kg/cm^2)			Compressive strength (kg/cm^2)		
		Water qt. (%)	Initial setting (hr-min)	Final setting (hr-min)		3 days	7 days	28 days	3 days	7 days	28 days
3.15	2930	26.8	1-48	3-31	Good	25.3	39.6	51.3	72	141	240

This report is prepared according to the results of analysis and measurement of the specimens presented from you.

Chapter 3. AGGREGATE

REPORT ON TEST RESULTS OF AGGREGATES FOR THUWUNNA BRIDGE OF BURMA

March 5, 1980

Technical Laboratory of
Sumitomo Construction Co.,Ltd.

1. Testing Method

1)	Sorting		JIS A1102
2)	Aggregate washing		A1103
3)	Unit weight		A1104
4)	Organic impurity		A1105
5)	Specific gravity & absorption	Fine aggregate	A1109
		Coarse "	A1110
6)	Fine aggregate surface water		A1111
7)	Abrasion		A1121
8)	Stability		A1122
9)	Soft stone		A1126

2. Type of Aggregate

Fine aggregate

1)	Wunbein Chaung	65/2	Mile Rangoon Mandalay Road
2)	Bawnt Chaung	76/10	" " " "
3)	Pyinbon Chaung	68/3	" " " "

River gravel

4)	Tharawaw Shingles	Max. dimension of aggregate Approx. 10 mm
5)	" "	Max. dimension of aggregate Approx. 25 mm
6)	" "	Max. dimension of aggregate Approx. 40 mm

Crushed stone

7)	Place of origin, unknown	Max. dimension of aggregate Approx. 10 mm
8)*	Place of origin, unknown	Max. dimension of aggregate Approx. 25 mm
9)	Place of origin, unknown	Max. dimension of aggregate Approx. 40 mm

The above 9 types of aggregates were tested.

* The crushed stone of 8) is black.

3. Result

(1) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ①

Place of origin of aggregates : Wunbein Chaung, 65/2 Mile Rangoon Mandalay Road

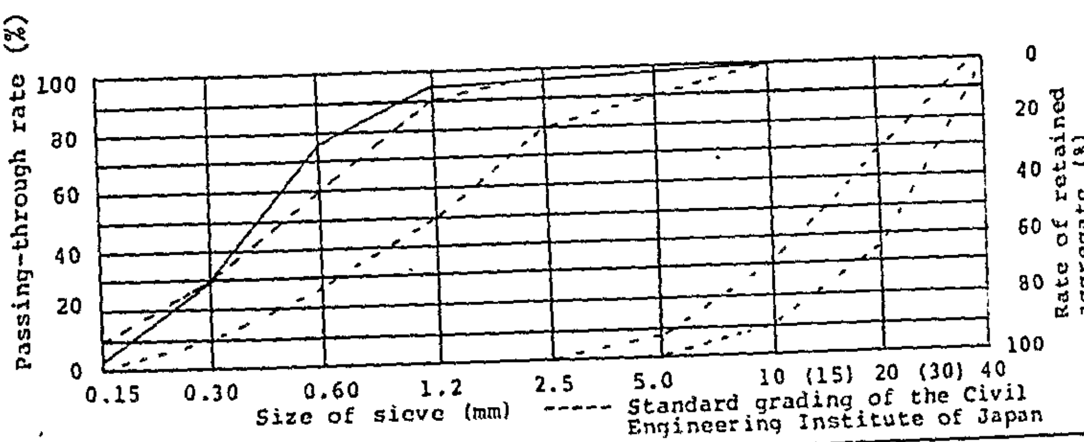
Type of aggregate : Fine aggregate

Maximum dimensions of aggregate: Approx. mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.31	1650	Acceptable	2.56	0.84	0.62	-	0.5	-
Remarks			Almost the same as standard color tone. (Containing many wood pieces)						

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1		Specimen-2		Average	Specimen-1		Specimen-2		Average
	Total retained by each sieve		Total retained by each sieve			Total retained by each sieve		Total retained by each sieve		
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30										
25										
20										
15										
10										
5						6.0	1.1	1.5	0.3	0.7
2.5						11.0	2.1	6.1	1.2	1.7
1.2						31.6	6.0	26.3	5.0	5.5
0.6						143.3	27.2	138.4	26.3	26.8
0.3						373.4	70.9	371.0	70.5	70.7
0.15						503.1	95.5	502.3	95.4	95.5
Tray						527.0	100	526.3	100	100
F.M										2.01



(2) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ②

Place of origin of aggregates : Bawnt Chaung, 76/10 Mile Rangoon Mandalay Road

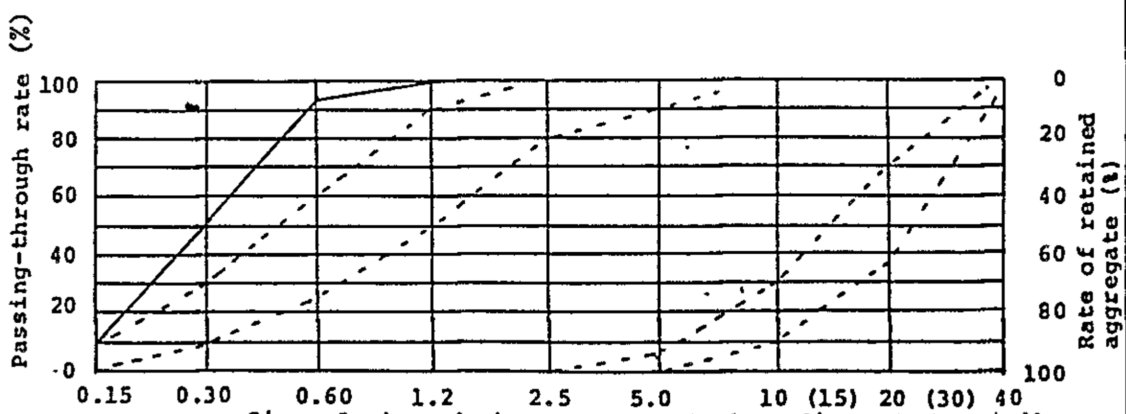
Type of aggregate : Fine aggregate

Maximum dimensions of aggregate: Approx. mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	1.99	1570	Acceptable	2.55	1.28	12.2	-	0.2	-
Remarks			Lighter than the standard color						

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1		Specimen-2		Average	Specimen-1		Specimen-2		Average
	Total retained by each sieve		Total retained by each sieve			Total retained by each sieve		Total retained by each sieve		
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30										
25										
20										
15										
10										
5										
2.5								0.3	0.1	0.1
1.2						1.2	0.4	1.1	0.4	0.4
0.6						16.6	5.6	16.4	5.3	5.5
0.3						143.3	48.6	147.7	47.6	48.1
0.15						264.4	89.6	277.1	89.3	89.5
Tray						295.0	100	310.4	100	100
F.M										1.44



(3) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ③

Place of origin of aggregates : Pyinbon Chaung 68/3 Mile Rangoon Mandalay Road

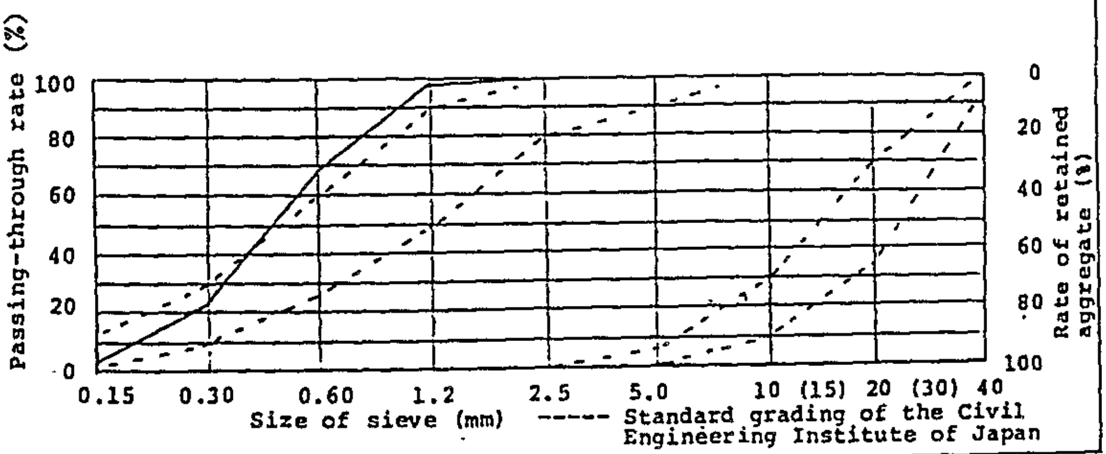
Type of aggregate : Fine aggregate

Maximum dimensions of aggregate: Approx. mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	2.10	1610	Acceptable	2.56	0.74	3.55	-	2.7	-
Remarks			Lighter than the standard color						

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1		Specimen-2		Average	Specimen-1		Specimen-2		Average
	Total retained by each sieve		Total retained by each sieve			Total retained by each sieve		Total retained by each sieve		
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30										
25										
20										
15										
10										
5										
2.5						0.3	0.1	0.7	0.1	0.1
1.2						12.9	2.4	13.6	2.6	2.5
0.6						176.1	32.9	176.6	33.5	33.2
0.3						466.5	87.2	460.1	87.3	87.3
0.15						518.5	96.9	509.1	96.6	96.8
Tray						535.2	100	526.8	100	100
F.M										2.20



(4) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ④

Place of origin of aggregates : Tharawaw Shingles

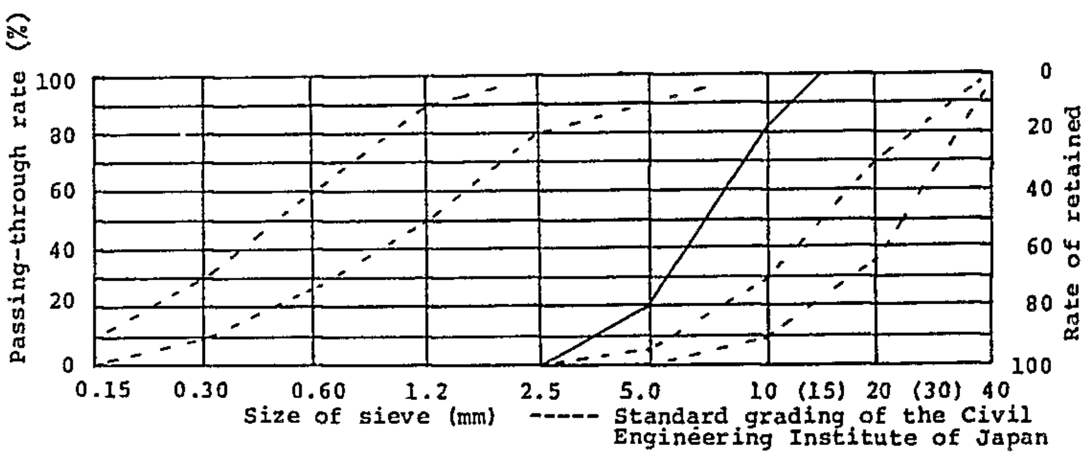
Type of aggregate : River gravel

Maximum dimensions of aggregate: Approx. 10 mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.22	1610	-	2.61	0.81	-	28.2	4.0	-
Remarks							Grading C		

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1 Total retained by each sieve		Specimen-2 Total retained by each sieve		Average	Specimen-1 Total retained by each sieve		Specimen-2 Total retained by each sieve		Average
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30										
25										
20										
15										
10	221.0	14.8	278.5	18.6	16.7					
5	1168.3	78.1	1225.9	81.7	79.9					
2.5	1492.6	99.7	1495.2	99.7	99.7					
1.2										
0.6										
0.3										
0.15										
Tray	1496.6	100	1499.8	100	100					
F.M					5.96					



(5) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ⑤

Place of origin of aggregates : Tharawaw Shingles

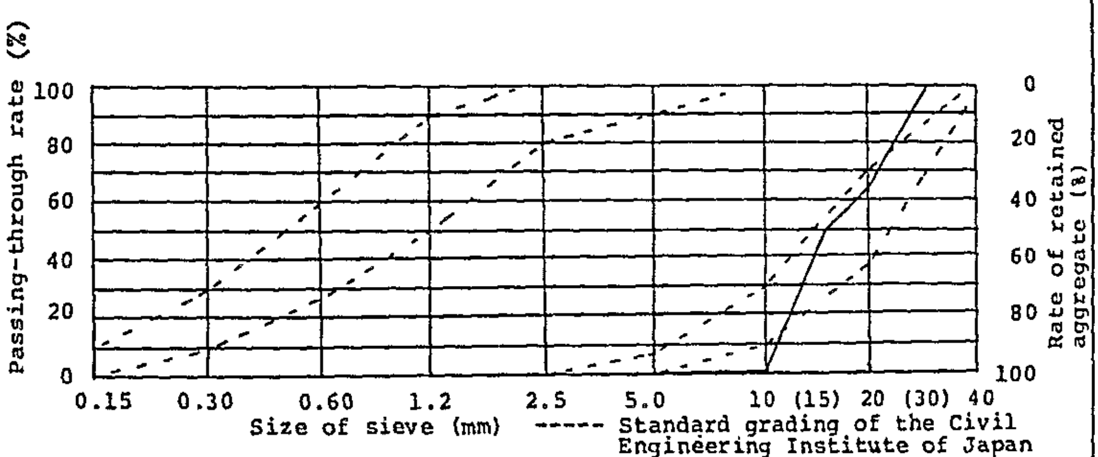
Type of aggregate : River gravel

Maximum dimensions of aggregate: Approx. 25 mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.13	1610	-	2.60	0.81	-	31.0	4.7	-
Remarks							Grading B		

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1 Total retained by each sieve		Specimen-2 Total retained by each sieve		Average	Specimen-1 Total retained by each sieve		Specimen-2 Total retained by each sieve		Average
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30										
25										
20	3761	38.3	3059	31.1	34.7					
15	6464	65.8	5558	56.6	61.2					
10	9815	99.9	9794	99.7	99.8					
5	9828	100	9823	100	100					
2.5										
1.2										
0.6										
0.3										
0.15										
Tray	9828	100	9823	100						
F.M					7.35					



(6) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ⑥

Place of origin of aggregates : Tharawaw Shingles

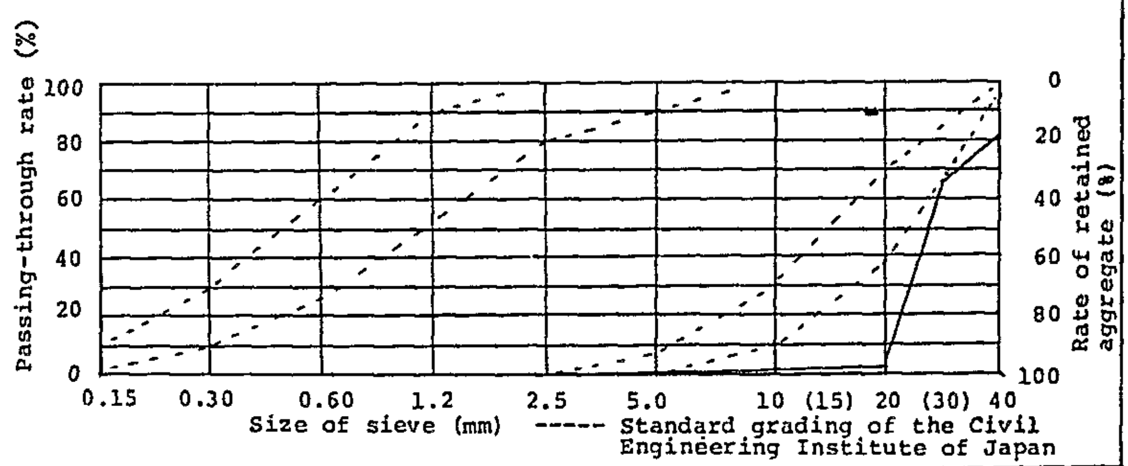
Type of aggregate : River gravel

Maximum dimensions of aggregate: Approx. 40 mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.27	1610	-	2.58	0.81	-	34.6	3.6	-
Remarks							Grading F		

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1 Total retained by each sieve		Specimen-2 Total retained by each sieve		Average	Specimen-1 Total retained by each sieve		Specimen-2 Total retained by each sieve		Average
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40	2786	18.6			18.6					
30	5370	35.8			35.8					
25	12169	81.1			81.1					
20	14600	97.3			97.3					
15	14675	97.8			97.8					
10	14810	98.7			98.7					
5	14907	99.4			99.4					
2.5	14988	99.9			99.9					
1.2										
0.6										
0.3										
0.15										
Tray	15003	100			100					
F.M					8.14					



(7) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ⑦

Place of origin of aggregates :

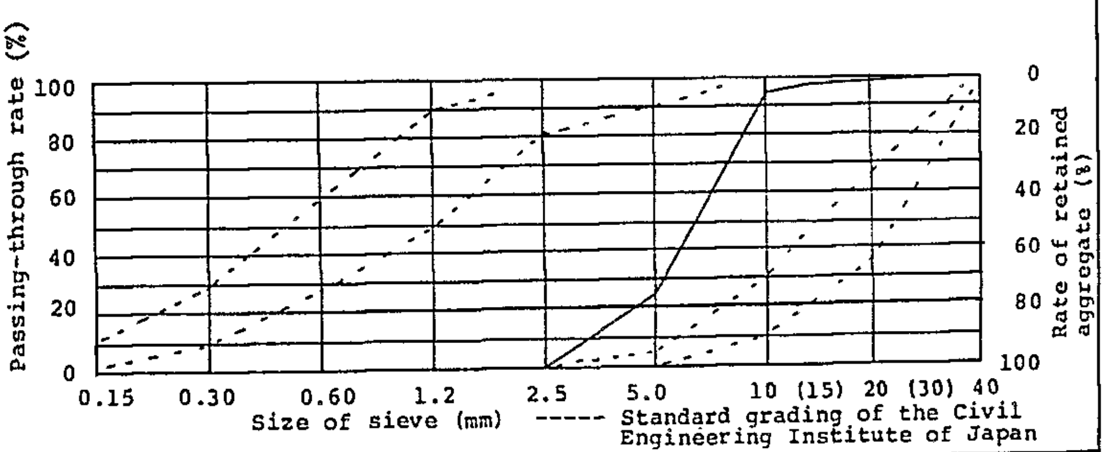
Type of aggregate : Crushed stone

Maximum dimensions of aggregate: Approx. 10 mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.43	1490	-	2.70	1.22	-	29.0	4.4	-
Remarks							Grading C		

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1		Specimen-2		Average	Specimen-1		Specimen-2		Average
	Total retained by each sieve		Total retained by each sieve			Total retained by each sieve		Total retained by each sieve		
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30										
25										
20	40.3	1.5	20.5	0.7	1.1					
15	51.7	1.9	53.0	1.8	1.9					
10	214.6	7.8	160.6	5.5	6.7					
5	2138.6	78.1	2106.6	71.6	74.9					
2.5	2732.6	99.8	2915.2	99.1	99.5					
1.2										
0.6										
0.3										
0.15										
Tray	2738.6	100	2943.0	100	100					
F.M					5.82					



(8) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ⑧

Place of origin of aggregates :

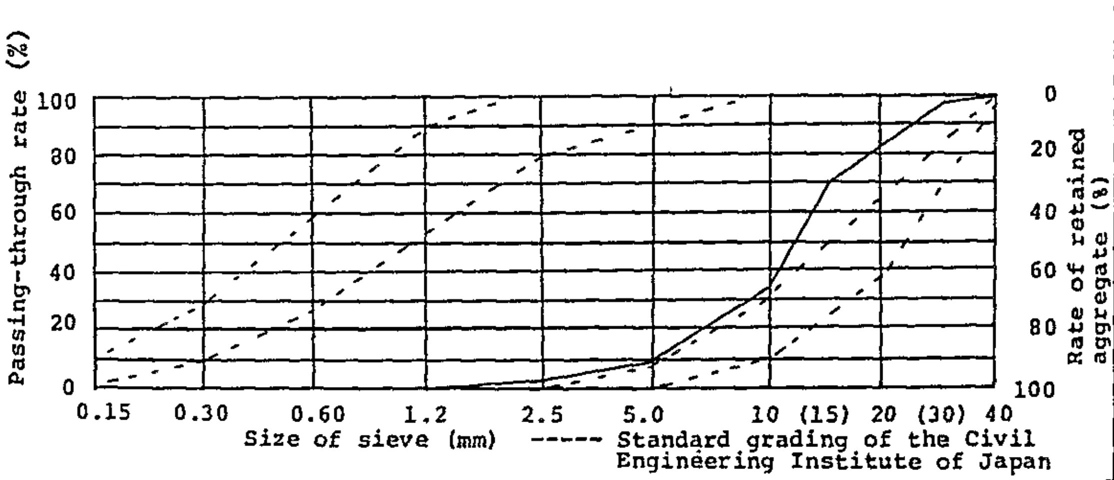
Type of aggregate : Crushed stone

Maximum dimensions of aggregate: Approx. 25 mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.30	1620	-	2.77	0.69	-	26.4	5.7	-
Remarks							Grading C		

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1		Specimen-2		Average	Specimen-1		Specimen-2		Average
	Total retained by each sieve		Total retained by each sieve			Total retained by each sieve		Total retained by each sieve		
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30	185.1	4.0			2.0					
25	392.2	8.5	220.7	4.3	6.4					
20	790.2	17.2	853.0	16.7	17.0					
15	1455.3	31.6	1572.3	30.7	31.2					
10	3130.3	68.1	3382.3	66.1	67.1					
5	4241.3	92.2	4814.4	94.0	93.1					
2.5	4527.9	98.4	5047.5	98.6	98.5					
1.2										
0.6										
0.3										
0.15										
Tray	4599.3	100	5119.9	100	100					
F.M					6.76					



(9) Table of Test Results of Agregates for Thuwunna Bridge of Burma

Test No. ⑨

Place of origin of aggregates :

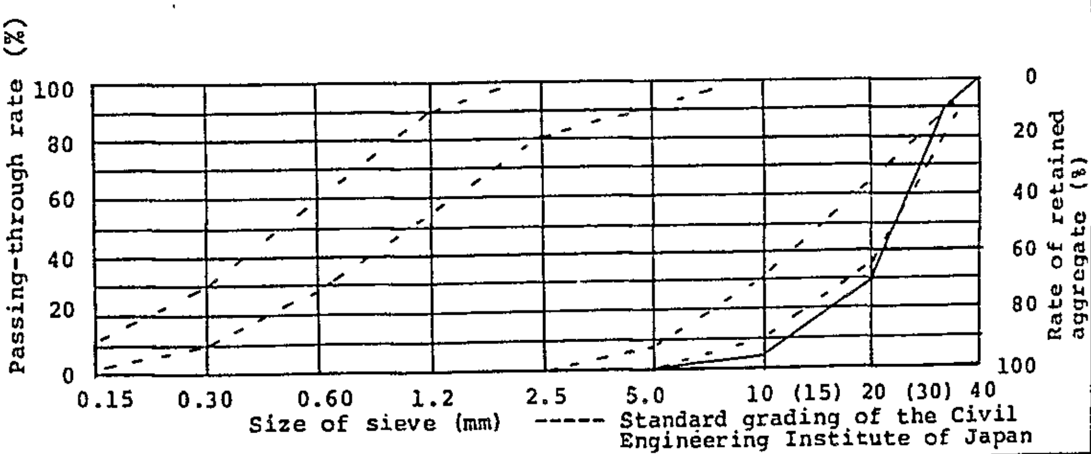
Type of aggregate : Crushed stone

Maximum dimensions of aggregate: Approx. 40 mm

Test item	Washing (%)	Unit Weight (%)	Organic impurity	Specific Gravity	Absorption (%)	Surface water (%)	Abraision (%)	Stability (%)	Soft stone (%)
Value of Analysis	0.26	1550	-	2.70	0.95	-	35.1	8.1	-
Remarks							Grading A		

Sorting (Sieve analysis) Test

Sieve size	Coarse aggregate					Fine aggregate				
	Specimen-1		Specimen-2		Average	Specimen-1		Specimen-2		Average
	Total retained by each sieve		Total retained by each sieve			Total retained by each sieve		Total retained by each sieve		
(mm)	(g)	(%)	(g)	(%)	(%)	(g)	(%)	(g)	(%)	(%)
40										
30	1493.4	12.9	1722.3	11.1	12.0					
25	4855.4	42.1	5737.3	36.8	39.5					
20	8150.5	70.6	10240.5	65.7	68.2					
15	9578.5	83.0	12501.6	80.2	81.6					
10	11274.5	97.7	15203.9	97.6	97.7					
5	11513.0	99.8	15560.1	99.9	99.9					
2.5										
1.2										
0.6										
0.3										
0.15										
Tray	11537.5	100	15581.4	100						
F.M					7.66					



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