

5.3. Intake

5.3.1 General

Stress analysis, especially steel reinforcement bar arrangement for the intake structure, is stated here with one exception of structural analysis of inclined waterway conduit, which has been dealt with in Part IV STRUCTURAL CALCULATION.

Main items dealt with here are as follows:

- (1) Reinforcing bar arrangement of each intake tower,
 - (i) side wall
 - (ii) anchorage of tension bar
 - (iii) gate support
 - (iv) overhung platform

5.3.2 Reinforcing Bar Arrangement of No. 3 Intake

Profile, sectional plan and sections of No. 3 intake are shown in Fig.5.3.1 to Fig.5.3.3:

(1) Inclined conduit

The inclined conduit seen in the right half of the profile is protected by the same reinforcing bar arrangement for the real inclined conduit of block 2, which is shown in Section 5.2.4 structural analysis of inclined waterway conduit.

(2) Side wall

As seen in the profile and sectional plan of block 1, two shafts are confined in a long and slender mass concrete, of which the side wall is 1,450 m of width. This side wall should resist a high water pressure of about 70 m, when the shaft is empty.

The side wall is considered as a fixed beam or slab, of which both the ends are built in the mass concrete. Thus the side wall is designed as a fixed beam.

According to the Design Standard of Reinforced Concrete in Japan (1986), the span of a fixed beam is a clear span. Then the span in this case is $l = 2.10$ m.

The design load is as follows:

$$W = \text{HWL } 209 - \text{EL } 138 = 71 \text{ m}$$

$$\text{Bending moment at the end } M = \frac{wl^2}{12} = 26.1 \text{ t-m}$$

$$\text{Shearing force at the end } Q = \frac{wl}{2} = 74.6 \text{ t}$$

Reinforcement bar arrangement and stress analysis is shown in Table 5.3.1.

As shown above the shearing stress is below the allowable shearing stress, however, to secure the stirrup is provided.

Stirrup

$$A_w = \frac{V_s S}{\sigma_{saj} d}$$

- where, A_w : sectional area of stirrups in the space of stirrups S
 S : space of stirrups in the direction of axis of member = 30 cm
 V_s : shearing force borne by stirrups
 $= V - V_c$
 V : shearing force = 74.6 t
 V_c : shearing force borne by concrete
 $= \frac{1}{2} \tau_a j b d = \frac{1}{2} \times 10.4 \times 0.875 \times 100 \times 135 = 61.4 \text{ t}$

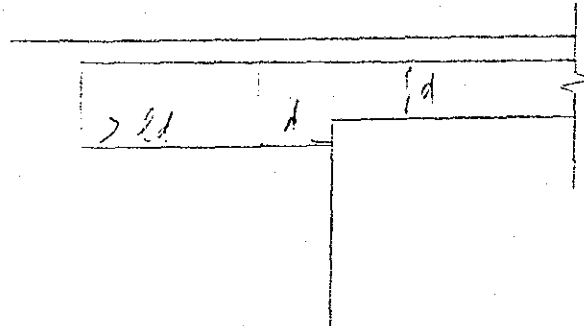
$$\therefore A_w = \frac{13,200 \times 30}{2,340 \times 0.875 \times 135} = 1.43 \text{ cm}^2$$

$$\therefore \text{D16} \times 5 \text{ Nos/m} = 9.93 \text{ cm}^2 @ 300 \text{ in the direction of axis of member}$$

(3) Anchorage of tension bar

According to the Design Standard of Reinforced Concrete in Japan (1986), the anchorage length of tension bar shall be greater than the sum of the basic anchorage

length l_d and effective depth d of the beam from the fixed end, in case that the beam is confined by one surface as shown below:



$$l_d = 1.3 \frac{\sigma_s}{4\tau_o} \phi$$

where, l_d : basic anchorage length of tension bar
 σ_s : tensile stress of steel bar = 1,100 kg/cm²
 τ_o : allowable bond stress = 15 kg/cm² x 1.3 = 19.5 kg/cm²
 ϕ : diameter of bar = 22 mm

$$\therefore l_d = 1.3 \frac{1,100}{4 \times 19.5} \times 22 = 403 \text{ mm}$$

$$\therefore l > l_d + d = 40 \text{ cm} + 135 \text{ cm} = 175 \text{ cm} \rightarrow 2.0 \text{ m}$$

(4) Compressive stress of partition

The partition wall between the two shafts receives the compression, whose magnitude is as shown below:

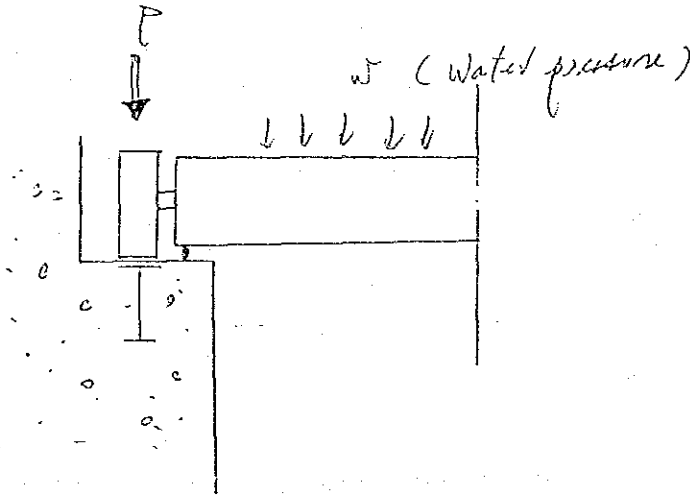
$$C = 71 \text{ t/m}^2 \times 3.1 \text{ m}^2/\text{m} = 220 \text{ t/m}$$

Since the partition wall is a kind of short column, the compressive stress of the wall is as follows:

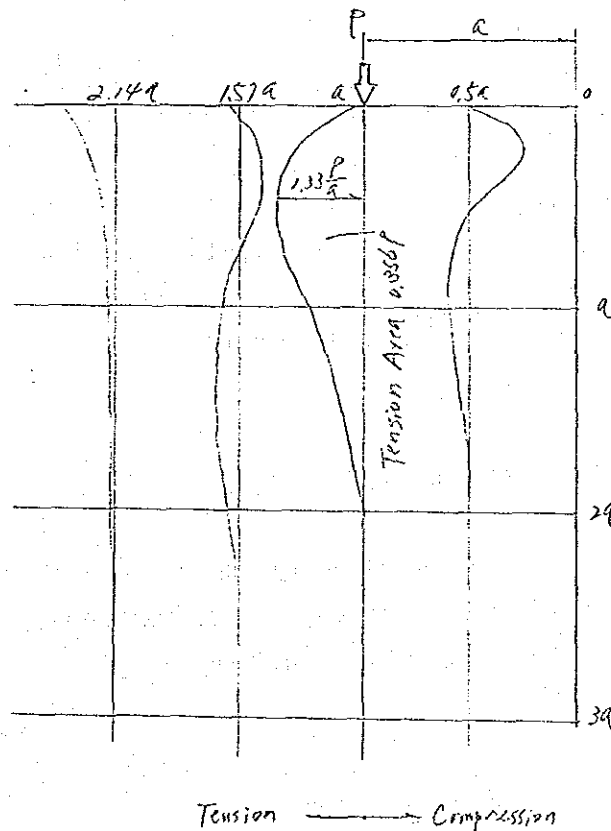
$$\sigma_c = \frac{220 \times 10^3}{100 \times 180} = 22 \text{ kg/cm}^2 < 78 \text{ kg/cm}^2$$

(5) Gate support

When a concentrated load acts on a structure near the edge of a concrete face, such as in a gate support, a special attention is required.



The stresses at any point in the concrete are analyzed and given graphically in the Technical Memorandum No. 563, Stresses Near the Edge of a Concrete Support, United States Bureau of Reclamation, as shown below:



The graph shows that:

- 1) - The maximum tensile stress is $0.33 \frac{P}{a}$
- 2) - The maximum tensile stress occurs at a distance $0.53a$ directly below the load.
- 3) - The total lateral tension force is $0.356P$, as represented by the area of the tensile stress curve directly under the load.
- 4) - The total lateral tension force is distributed over the depth $2a$.

If the maximum tensile stress ($0.33 \frac{P}{a}$) is greater than the allowable concrete tensile stress then reinforcing steel is required.

$$A_s = \frac{0.356P}{f_s}$$

where f_s is the allowable tensile stress in the reinforcing steel. (this assumes that the concrete takes no tension, which is conservative. The concrete may be assumed to take some of the tensile stress, in which case the total tension requiring steel will be represented by the area bounded by the stress curve and the abscissa whose value is the allowable stress in the concrete.)

Detailing Requirements

- (a) Reinforcing can be provided in several ways. However,
 - (i) It is essential to transmit the tensile forces back into the mass concrete where they can be distributed at lower stress levels, and
 - (ii) The reinforcing steel must not "pull out" in the tension area under the load.

A simple way of achieving these conditions is:

- (i) To provide reinforcing bars and transmit the tensile forces into the mass concrete by bond. The horizontal length of the bars is therefore dependent on the bond strength.

- (ii) To bend the reinforcing and extend the bars down the face of the concrete a distance of at least $2a$, to prevent pull out and to securely reinforce the corner.
- (b) To ensure that the reinforcing is placed in the tension zones, bars of the least practical diameter should be used because their mandrel radius is less than large bars.
- (c) The upper row of horizontal reinforcing bars should not be located further away from the load bearing face than $0.53a$. This is sometimes difficult.
- (d) All horizontal bars must be located within the depth $2a$ to be effective. It is superior to provide two or three rows of bars over this depth, but frequently for convenience of installation, only one row of bars is installed.

Details of the gate support of No. 3 intake are illustrated in Fig. 5.3.4.

Water pressure on No. 3 intake gate	:	$H = \text{HWL } 209.0 - \text{EL } 140.427$ $= 68.6 \text{ m}$
Size of gate	:	$A = 2.20 \text{ m} \times 2.20 \text{ m} = 4.84 \text{ m}^2$
Weight of gate	:	$W = 6.1 \text{ t}$
Number of roller	:	4 nos.
Load per roller	:	$P = (68.6 \text{ t/m}^2 \times 4.84 \text{ m}^2 + 6.1 \cdot \cos 37.56^\circ)/4$ $= 84.2 \text{ t}$
Line load just under the H-beam	:	$p = P/90 \text{ cm} = 0.94 \text{ t/cm} = 940 \text{ kg/cm}$
Max. tensile stress of concrete	:	$\sigma_t = 0.33 \frac{P}{a} = 0.33 \frac{940}{25}$ $12.4 \text{ kg/cm}^2 > 5.2 \text{ kg/cm}^2$

Therefore, the reinforcing bar is required.

$$A_s = \frac{0.356p}{f_s} = \frac{0.356 \times 940 \text{ kg/cm}}{2,340 \text{ kg/cm}^2} = 0.143 \text{ cm}^2/\text{cm}$$

$$= 14.3 \text{ cm}^2/\text{m}$$

then, D19 @150 = 19.1 cm²/m

$$\begin{aligned} \text{Anchorage length: } l_d &= \frac{\sigma_s}{4\tau_o} \phi = \frac{2,340 \text{ kg/cm}^2}{4 \times 19.5} \times 19 \\ &= 570 \text{ mm} \rightarrow 750 \text{ mm} \end{aligned}$$

where, the coefficient 1.3 adopted in (3) Anchorage of tension bar in the side wall is reduced to 1.0, because the tension bar for the gate support is embedded in the mass concrete.

The arrangement of steel bar is shown in Fig. 5.3.4.

(6) Overhung slab for steps in Block 2

The typical section of the inclined conduit including an overhung slab for steps is shown in Fig. 5.3.5:

Load per horizontal 1 m

$$\begin{aligned} \text{Dead load} \quad \text{slab} &: 0.30 \cdot \text{Acc}\theta \times 1.0 \times 2.4 = 0.91 \text{ t/m} \\ \text{steps} &: \frac{1}{1.3} \times 5 \times \frac{1}{2} \times 0.20 \times 0.26 \times 2.4 = 0.24 \text{ t/m} \end{aligned}$$

$$\text{Live load} \quad 180 \text{ kg/m}^2 \times 1.0 \text{ m} = 0.18 \text{ t/m}$$

$$W = 1.33 \text{ t/m}$$

$$M = \frac{1}{2} w l^2 = \frac{1}{2} 1.33 \times 0.90^2 = 0.54 \text{ t-m/m}$$

$$Q = w l = 1.33 \times 0.90 = 1.20 \text{ t/m}$$

$$M = 0.54 \text{ t-m/m}$$

$$Q = 1.20 \text{ t/m}$$

$$b = 100 \text{ cm}$$

$$d = 27 \text{ cm}$$

$$A_s = D16 @ 200 = 9.93 \text{ cm}^2$$

$$\sigma_c = 6 \text{ kg/cm}^2$$

$$\sigma_s = 222 \text{ kg/cm}^2$$

$$\tau = \frac{Q}{jbd} = \frac{1,200}{0.875 \times 100 \times 27} = 1.5 \text{ kg/cm}^2$$

5.3.3 Reinforcing Bar Arrangement of No. 2 Intake

Profile, sectional plan and sections of No. 2 intake are shown in Fig. 5.3.6 to Fig. 5.3.8:

(1) Right side wall of intake tower

In the same manner as in the No. 1 intake the right side wall of No. 2 intake tower is designed as a fixed beam, of which the clear span is 2.10 m and thickness of wall is 1.25m.

The design head is

$$w = \text{HWL } 209 - \text{EL } 151 = 58 \text{ m}$$

$$\text{Bending moment at the end } M = \frac{wl^2}{12} = 21.3 \text{ t-m}$$

$$\text{Shearing force at the end } Q = \frac{wl}{2} = 60.9 \text{ t}$$

Reinforcing bar arrangement and stress analysis is shown in Table 5.3.2.

As shown above the shearing stress is below the allowable shearing stress, however, to secure the stirrup is provided.

Stirrup

Formula and notations shall be referred to Section 5.3.2 (2) side wall of the No. 3 intake.

$$V = 60.9 \text{ t}$$

$$V_c = \frac{1}{2} \times 10.4 \times 0.875 \times 100 \times 115 = 52.4$$

$$V_s = 60.9 - 52.4 = 8.5 \text{ t}$$

$$A_w = \frac{8,500 \times 30}{2,340 \times 0.875 \times 115} = 1.08 \text{ cm}^2$$

D16 x 5 Nos/m = 9.93 cm² @300 in the direction of axis of member.

(2) Anchorage of tension bar

Conception, formula and notations shall be referred to Section 5.3.2 (2) Anchorage of tension bar of No. 3 intake.

$$l_d = 1.3 \frac{1,100}{4 \times 19.5} \times 22 = 403 \text{ mm}$$

$$\therefore l > l_d + d = 40 \text{ cm} + 115 = 155 \text{ cm} \rightarrow 2.0 \text{ m}$$

(3) Gate support, part 1

Conception, formula and notations shall be referred to Section 5.3.2 (5) Gate support of No. 3 intake.

Details of the gate support of No. 2 intake are illustrated in Fig.5.3.9.

Water pressure on No. 2 intake gate	:	H = HWL 209.0 - EL 154.0 = 55.0 m
Size of gate	:	A = 2.20 m x 2.20 m = 4.84 m ²
Weight of gate	:	W = 5.1 t
Number of roller	:	4 nos.
Load per roller	:	P = (55.0 t/m ² x 4.84 m ² + 5.1 t-cus 37.56°)/4 = 67.6 t
Line load just under the H-beam	:	p = P/70 cm = 0.966 t/cm = 966 kg/cm
Max. tensile stress of concrete	:	$\sigma_t = 0.33 \frac{P}{a} = 0.33 \frac{966}{25}$ = 12.8 kg/cm ² > 5.2 kg/cm ²

$$A_s = \frac{0.356p}{f_s} = \frac{0.356 \times 966}{2,340} = 0.147 \text{ cm}^2/\text{cm}$$

$$= 14.7 \text{ cm}^2/\text{m}$$

$$D19 @150 = 19.1 \text{ cm}^2/\text{m}$$

$$\text{Anchorage length: } l_d = \frac{\sigma_s}{4\tau_o} \phi = \frac{2,340}{4 \times 19.5} \times 19$$

$$= 570 \text{ mm} \rightarrow 600 \text{ mm}$$

(4) Gate support, part 2

As shown in Section F-F of the figure at the beginning of this Section and in the figure of (3) Gate support, part 1, the load of water pressure via gate, 67.6 t/roller shall be supported by a vertical wall of 65 cm thick and cantilever as illustrated in Fig.5.3.10:

(a) Bearing stress

The concentrated load, $p = 67.6 \text{ t/roller}$, will be distributed on an area of $1.40 \text{ m} \times 1.00 \text{ m} = 1.40 \text{ m}^2$ at the center of thickness of cantilever than the bearing stress is

$$\sigma_c = \frac{P}{1.40 \text{ m}^2} = \frac{67,600 \text{ kg}}{14,000 \text{ cm}^2} = 4.8 \text{ kg/cm}^2 < 78 \text{ kg/cm}^2$$

(b) Stress analysis at A

Bending moment

Live load	Ml	= 67.6 t x 0.35m/1.40 m	= 16.9 t-m/m
Deal load	Md	= 0.60 x 1.40 x 1.00 x 2.4 x 0.30	= 0.60 t-m/m
	M		= 77.5 t-m/m

Shearing force

Live load	Ql	= 67.6 t/1.40 m	= 48.3 t/m
Deal load	Qd	= 0.60 x 1.40 x 1.00 x 2.4	= 2.0 t/m
	Q		= 50.3 t/m

Reinforcing bar arrangement and stress analysis is shown in Table 5.3.3.

As shown above the shearing stress is below the allowable shearing stress, however, to secure, the stirrup is provided.

Stirrup

Formula and notations shall be referred to Section 5.3.2 (2) side wall of the No. 3 intake.

$$V = 50.3 \text{ t}$$

$$V_c = \frac{1}{2} \times 10.4 \times 0.875 \times 100 \times 70 = 31.8 \text{ t}$$

$$V_s = 50.3 - 31.8 = 18.5 \text{ t}$$

$$A_w = \frac{18,500 \times 30}{2,340 \times 0.875 \times 70} = 3.9 \text{ cm}^2$$

∴ D16 x 5 Nos/m = 9.93 cm² @300 in the direction of axis of member.

(c) Stress analysis at B

Bending moment

Live load	Ml	=	67.6 t x 0.675m/1.40 m	=	32.6 t-m/m
Deal load	Md	=	0.60x1.40x1.00x2.4x0.625	=	1.26 t-m/m
	M			=	33.9 t-m/m

Shearing force (t.cus.m)

Live load	Nl	=	-67.6 t/1.40	=	48.3 t/m
Deal load	Nd	=	-(0.60 x 0.60 x 1.0 x 2.4 + 0.8 x 1.25 x 1.0 x 2.4)	=	-3.26 t/m
	N			=	-51.6 t/m

Reinforcing bar arrangement and stress analysis is shown in Table 5.3.3.

(d) Anchorage length of tension bar in wall

Conception, formula and notations shall be referred to Section 5.3.2 (2)

Anchorage of tension bar of No. 3 intake.

$$l_d = 1.3 \times \frac{2,000}{4 \times 19.5} \times 2.5 = 833 \text{ mm} \rightarrow 1.5 \text{ m}$$

(5) Connection part of conduit

Connection part of conduit from No. 1 intake and No. 2 intake is shown in figure attached to the beginning of this section. As seen in Section Y-Y, the top and bottom slab is thought of as a fixed beam supported by the side wall of conduit.

The design load is

$$w = \text{HWL } 209 - \text{EL } 150.0 = 59.0 \text{ m}$$

$$\text{Bending moment at the end } M = \frac{wl^2}{12} = \frac{59 \times 2.10^2}{12} = 21.68 \text{ t-m}$$

$$\text{Shearing force at fixed end } Q = \frac{wl}{2} = \frac{59 \times 2.10}{2} = 62.0 \text{ t}$$

Reinforcing bar arrangement and stress analysis is shown in Table 5.3.4.

As shown in table the shearing stress is nearly equal to the allowable shearing stress. Then the stirrup is provided.

Stirrup

Formula and notations shall be referred to Section 5.3.2 (2) side wall of the No. 3 intake.

$$V = 62.0 \text{ t}$$

$$V_c = \frac{1}{2} \times 5.2 \times 0.875 \times 100 \times 70 = 31.8$$

$$V_s = 62.0 - 31.8 = 30.2 \text{ t}$$

$$A_w = \frac{30,200 \times 30}{2,340 \times 0.875 \times 70} = 6.32 \text{ cm}^2$$

D16 x 5 Nos/m = 9.93 cm² @300 in the direction of axis of member.

(6) Overhung platform

Dead load	0.40 x 0.20 x 2.4	= 0.192 t/m
	0.20 x 2.40 x 2.4	= 1.152 t/m
	$\frac{1}{2} \times 0.80 \times 2.4 \times 2.4$	= 2.304 t/m
Live load	<u>300 kg/m² x 2.0</u>	= <u>0.600 t/m</u>
	Total	4.248 t/m
Bending moment	0.192 t/m x 2.20 m	= 0.422 t-m/m
	1.152 x 1.20	= 1.382 t-m/m
	2.304 x 0.80	= 1.843 t-m/m
	<u>0.600 x 1.0</u>	= <u>0.600 t-m/m</u>
	Total	4.247 t-m/m

Reinforcing bar arrangement and stress analysis is shown in Table 5.3.5.

5.3.4 Reinforcing bar arrangement of No. 1 intake

Profile, sectional plan and sections of No. 1 intake are shown in Fig.5.3.11 to Fig.5.3.14

(1) Conduit portion

Though some part of conduit is incased in mass concrete, the reinforcing bar arrangement for conduit is applied, whose details are stated in Section 2.4 Structural analysis of inclined waterway conduit of Part IV.

(2) Side wall

In the same manner as in the No. 3 and No. 2 intakes, the side wall of No. 1 intake tower is designed as a fixed beam, whose clear span is 2.10 m and thickness of wall is 1.25 m.

The design head is

$$W = \text{HWL.209} - \text{EL.166} = 43.0 \text{ m}$$

$$\text{Bending moment at the end} \quad M = \frac{wl^2}{12} = 15.8 \text{ t-m}$$

$$\text{Shearing force at the end} \quad Q = \frac{wl}{2} = 45.2 \text{ t}$$

Reinforcing bar arrangement and stress analysis is shown in Table 5.3.6.

As shown above the shearing stress is below the allowable shearing stress, however, the minimum stirrup D16 x 5 Nos/m = 9.93 cm² is provided.

(3) Anchorage of tension bar

Conception, formula and notations shall be referred to Section 5.3.2 (2) Anchorage of tension bar of No. 3 intake.

$$l_d = 1.3 \times \frac{880}{4 \times 19.5} \times 22 = 293 \text{ mm}$$

$$l > l_d + d = 30 \text{ cm} + 115 \text{ cm} = 145 \text{ cm} \rightarrow 2.0 \text{ m}$$

(4) Gate support

Conception, formulae and notations shall be referred to Section 5.3.2 (5) Gate support of No. 3 intake.

Details of the gate support of No. 1 intake are shown in Fig.5.3.15:

Water pressure on No. 1 intake gate	$H = \text{HWL209} = \text{ZC169} = 40 \text{ m}$
Size of gate	$A = 2.20 \text{ m} \times 2.20 \text{ m} = 4.84 \text{ m}^2$
Weight of gate	$W = 4.5 \text{ t}$
Number of roller	4 Nos.
Load per roller	$p = (40.0 \times 4.84 + 4.5 \cdot \cos 37.56^\circ) / 4 = 49.43 \text{ t}$
Line load just under the H-beam	$p = p/70 = 0.704 \text{ t/cm} = 744 \text{ kg/cm}^2$
Max. tensile stress of concrete	$\sigma_t = 0.33 \frac{p}{a} = 0.33 \times \frac{744}{25}$ $= 9.8 \text{ kg/cm}^2 < 10.4 \text{ kg/cm}^2$

As shown above the tensile stress of concrete is close to the allowable stress, the reinforcing bar is provided as in other intakes.

$$A_s = \frac{0.356\phi}{t_s} = \frac{0.356 \times 744}{2,340} = 0.113 \text{ cm}^2/\text{cm} = 11.3 \text{ cm}^2/\text{m}$$

$$D19 @ 150 = 19.1 \text{ cm}^2/\text{m}$$

$$\text{Anchorage length } l_d = \frac{\sigma_s}{4\tau_0} \phi = \frac{2,340}{4 \times 19.5} \times 19 = 570 \text{ mm} \rightarrow 600 \text{ mm}$$

(5) Overhung platform

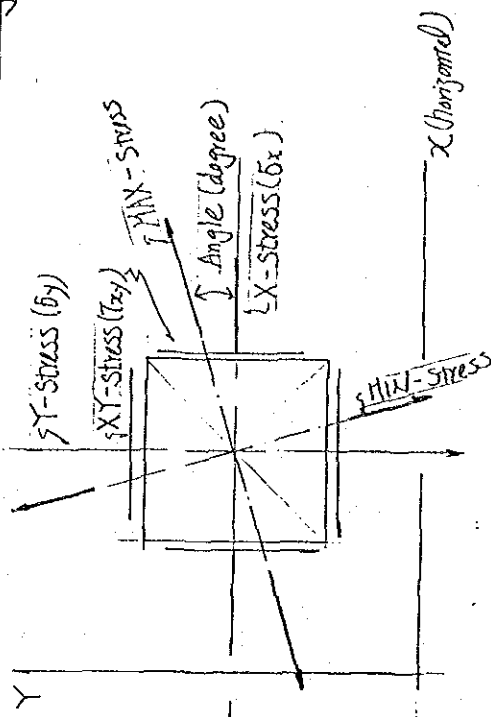
Overhung platform of No. 1 intake tower is just same as in No. 2 intake. Details of the overhung platform shall be referred to Section 5.3.3 (6).

Table 5.1.1 Results of FEM Analysis (Load Case 1)

***** MATERIAL DATA *****										

MAT NO. = 1	MASS DENSITY	2.500E+00	E (OR E(1))	2.550E+05	PO (OR PO(1))	2.000E-01	HEAT COEF	0.000E+00		
TYPE = 0	E(2) (OR AREA)	0.000E+00	PO(2) (OR MOMENT)	0.000E+00	G	0.000E+00	COHISION	0.000E+00		
	FRICTION	0.000E+00	SPRESS(X, AI)	0.000E+00	STRESS(Y, SI)	0.000E+00	STRESS(XY, MI)	0.000E+00		
	THICK(MJ)	0.000E+00	ANGLE	0.000E+00						
MAT NO. = 2	MASS DENSITY	2.700E+00	E (OR E(1))	5.500E+05	PO (OR PO(1))	2.000E-01	HEAT COEF	0.000E+00		
TYPE = 0	E(2) (OR AREA)	0.000E+00	PO(2) (OR MOMENT)	0.000E+00	G	0.000E+00	COHISION	0.000E+00		
	FRICTION	0.000E+00	SPRESS(X, AI)	0.000E+00	STRESS(Y, SI)	0.000E+00	STRESS(XY, MI)	0.000E+00		
	THICK(MJ)	0.000E+00	ANGLE	0.000E+00						

Explanation on "ELEMENT STRESS" in the following sheets.



- Notes:
1. Unit of stress --- Ton/m²
 2. - (minus) in X-stress, Y-stress, Max-stress and Min-stress indicate compressive stress.

STEP NO. = 1
 ELEMENT STRESS

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
1	1.000	1.000	-5.8558E+01	-2.3726E+02	-2.3580E-02	-5.8558E+01	-2.3726E+02	-0.01
2	3.000	1.000	-5.8459E+01	-2.3740E+02	-8.8313E-02	-5.8459E+01	-2.3740E+02	-0.03
3	5.000	1.000	-5.8193E+01	-2.3773E+02	-2.0534E-01	-5.8193E+01	-2.3773E+02	-0.07
4	8.875	1.000	-5.7684E+01	-2.3827E+02	-3.9286E-01	-5.7683E+01	-2.3827E+02	-0.12
5	8.625	1.000	-5.6823E+01	-2.3905E+02	-6.8854E-01	-5.6819E+01	-2.3905E+02	-0.22
6	10.375	1.000	-5.5363E+01	-2.4001E+02	-1.0709E+00	-5.5357E+01	-2.4002E+02	-0.33
7	12.375	1.000	-5.2009E+01	-2.4277E+02	-3.1333E+00	-5.1955E+01	-2.4283E+02	-0.94
8	14.875	1.000	-4.1483E+01	-2.3490E+02	-1.7135E+01	-3.9377E+01	-2.3541E+02	-5.02
9	1.000	3.000	-5.7245E+01	-2.3177E+02	-5.0796E-02	-5.7245E+01	-2.3177E+02	-0.02
10	3.000	3.000	-5.7224E+01	-2.3185E+02	-2.0166E-01	-5.7224E+01	-2.3185E+02	-0.07
11	5.000	3.000	-5.7130E+01	-2.3205E+02	-4.9478E-01	-5.7129E+01	-2.3205E+02	-0.16
12	6.875	3.000	-5.6901E+01	-2.3242E+02	-9.7004E-01	-5.6896E+01	-2.3243E+02	-0.32
13	8.625	3.000	-5.6497E+01	-2.3293E+02	-1.5455E+00	-5.6482E+01	-2.3295E+02	-0.53
14	10.375	3.000	-5.5938E+01	-2.3376E+02	-2.3376E+02	-5.5936E+01	-2.3380E+02	-0.88
15	12.375	3.000	-5.5913E+01	-2.3132E+02	-5.1754E+00	-5.5761E+01	-2.3148E+02	-1.69
16	14.875	3.000	-5.5743E+01	-2.2612E+02	1.1669E-01	-6.5748E+01	-2.3612E+02	0.04
17	1.000	5.000	-5.5890E+01	-2.2528E+02	-2.5718E-02	-5.5890E+01	-2.2528E+02	-0.01
18	3.000	5.000	-5.5966E+01	-2.2523E+02	-1.5019E-01	-5.5966E+01	-2.2523E+02	-0.05
19	5.000	5.000	-5.6171E+01	-2.2621E+02	-4.6237E-01	-5.6170E+01	-2.2622E+02	-0.16
20	6.875	5.000	-5.6342E+01	-2.2632E+02	-1.0564E+00	-5.6336E+01	-2.2633E+02	-0.36
21	8.625	5.000	-5.6484E+01	-2.2654E+02	-1.8003E+00	-5.6475E+01	-2.2656E+02	-0.51
22	10.375	5.000	-5.6300E+01	-2.2875E+02	-2.6152E+00	-5.6760E+01	-2.2879E+02	-0.88
23	12.375	5.000	-5.8452E+01	-2.1703E+02	-1.7103E+02	-5.8455E+01	-2.2802E+02	-0.58
24	14.875	5.000	-5.8078E+01	-2.3180E+02	2.6261E-01	-5.8078E+01	-2.3180E+02	0.09
25	1.000	6.750	-5.4587E+01	-2.2155E+02	5.0316E-02	-5.4587E+01	-2.2155E+02	0.02
26	3.000	6.750	-5.4812E+01	-2.2136E+02	6.3695E-02	-5.4812E+01	-2.2136E+02	0.02
27	5.000	6.750	-5.5233E+01	-2.2109E+02	-1.7398E-01	-5.5233E+01	-2.2109E+02	0.06
28	6.875	6.750	-5.5748E+01	-2.2095E+02	-7.2743E-01	-5.5745E+01	-2.2095E+02	-0.25
29	8.625	6.750	-5.6235E+01	-2.2110E+02	-1.4570E+00	-5.6222E+01	-2.2112E+02	-0.51
30	10.375	6.750	-5.6791E+01	-2.2197E+02	-1.8386E+00	-5.6793E+01	-2.2199E+02	-0.65
31	12.375	6.750	-5.6570E+01	-2.2424E+02	-1.6320E+00	-5.6554E+01	-2.2425E+02	-0.56
32	14.875	6.750	-5.5938E+01	-2.2746E+02	-5.8759E-01	-5.5936E+01	-2.2745E+02	-0.20
33	1.000	8.250	-5.3810E+01	-2.1763E+02	1.5084E-01	-5.3812E+01	-2.1763E+02	0.05
34	3.000	8.250	-5.3810E+01	-2.1781E+02	3.9355E-01	-5.3609E+01	-2.1731E+02	0.13
35	5.000	8.250	-5.4203E+01	-2.1678E+02	2.9588E-01	-5.4203E+01	-2.1678E+02	0.10
36	6.875	8.250	-5.4960E+01	-2.1632E+02	-1.7448E-01	-5.4962E+01	-2.1632E+02	-0.06
37	8.625	8.250	-5.5855E+01	-2.1643E+02	-9.7895E-01	-5.5879E+01	-2.1644E+02	-0.35
38	10.375	8.250	-5.5955E+01	-2.1757E+02	-1.7793E+00	-5.5916E+01	-2.1753E+02	-0.63
39	12.375	8.250	-5.5680E+01	-2.2043E+02	-2.1672E+02	-5.5551E+01	-2.2046E+02	-0.75
40	14.875	8.250	-5.4522E+01	-2.2428E+02	-1.2550E+00	-5.4442E+01	-2.2429E+02	-0.42
41	1.000	9.750	-5.1901E+01	-2.1368E+02	2.6324E-01	-5.1901E+01	-2.1368E+02	0.09
42	3.000	9.750	-5.2212E+01	-2.1343E+02	7.2467E-01	-5.2209E+01	-2.1344E+02	0.26
43	5.000	9.750	-5.2691E+01	-2.1260E+02	9.1203E-01	-5.2688E+01	-2.1260E+02	0.33
44	6.875	9.750	-5.3840E+01	-2.1174E+02	9.7812E-01	-5.3838E+01	-2.1174E+02	0.21
45	8.625	9.750	-5.4728E+01	-2.1141E+02	-3.5133E-01	-5.4727E+01	-2.1142E+02	-0.13
46	10.375	9.750	-5.5327E+01	-2.1275E+02	-1.8925E+00	-5.5304E+01	-2.1275E+02	-0.69
47	12.375	9.750	-5.4428E+01	-2.1181E+02	-2.8899E+00	-5.4383E+01	-2.1183E+02	-0.95
48	14.875	9.750	-5.4117E+01	-2.2158E+02	-1.9639E+00	-5.4094E+01	-2.2160E+02	-0.67
49	1.000	11.250	-5.0420E+01	-2.1030E+02	3.6125E-01	-5.0419E+01	-2.1030E+02	0.13
50	3.000	11.250	-5.0646E+01	-2.0976E+02	1.0612E+00	-5.0639E+01	-2.0977E+02	0.38

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
51	5.000	11.250	-5.1249E+01	-2.0863E+02	1.5864E+00	-5.1233E+01	-2.0865E+02	0.58
52	8.875	11.250	-5.2299E+01	-2.0717E+02	1.5210E+00	-5.2278E+01	-2.0718E+02	0.56
53	8.625	11.250	-5.3485E+01	-2.0619E+02	4.0229E-01	-5.3485E+01	-2.0619E+02	0.15
54	9.625	11.250	-5.4322E+01	-2.0604E+02	-1.3632E+00	-5.4380E+01	-2.0505E+02	-0.52
55	10.063	10.875	-5.4033E+01	-2.0584E+02	-1.5348E+00	-5.4018E+01	-2.0586E+02	-0.58
56	10.938	11.250	-5.4822E+01	-2.0800E+02	-2.5607E+00	-5.4778E+01	-2.0805E+02	-0.96
57	11.505	11.250	-5.3759E+01	-2.0774E+02	-4.9204E+00	-5.3601E+01	-2.0790E+02	-1.83
58	12.068	10.875	-5.3106E+01	-2.1164E+02	-2.9701E+00	-5.3050E+01	-2.1170E+02	-1.07
59	13.193	11.250	-5.0732E+01	-2.1558E+02	-4.0720E+00	-5.0831E+01	-2.1567E+02	-1.41
60	13.875	11.250	-5.0813E+01	-2.1559E+02	-1.5455E+00	-5.0793E+01	-2.1560E+02	-0.54
61	14.563	10.875	-5.3612E+01	-2.1774E+02	-5.8239E-02	-5.3612E+01	-2.1774E+02	-0.02
62	15.938	11.250	-6.3565E+01	-2.2259E+02	-4.1054E+00	-6.3459E+01	-2.2270E+02	-1.48
63	1.000	12.500	-4.9221E+01	-2.0741E+02	3.9788E-01	-4.9220E+01	-2.0741E+02	0.14
64	3.000	12.500	-4.9287E+01	-2.0688E+02	1.2369E+00	-4.9277E+01	-2.0687E+02	0.45
65	5.000	12.500	-4.9652E+01	-2.0656E+02	2.0800E+00	-4.9625E+01	-2.0559E+02	0.76
66	8.675	12.500	-5.0592E+01	-2.0350E+02	2.4553E+00	-5.0553E+01	-2.0354E+02	0.92
67	8.625	12.500	-5.2148E+01	-2.0136E+02	1.3913E+00	-5.2135E+01	-2.0137E+02	0.53
68	9.625	12.250	-5.2979E+01	-2.0099E+02	-6.7187E-01	-5.2976E+01	-2.0099E+02	-0.26
69	10.000	12.500	-5.3404E+01	-2.0072E+02	-9.2190E-01	-5.3399E+01	-2.0073E+02	-0.36
70	10.438	12.250	-5.2677E+01	-1.9942E+02	-1.8939E+00	-5.2653E+01	-1.9945E+02	-0.74
71	11.063	12.500	-5.4383E+01	-2.0248E+02	-3.5787E+00	-5.4297E+01	-2.0257E+02	-1.38
72	11.368	12.500	-5.3692E+01	-2.0236E+02	-6.4632E+00	-5.3612E+01	-2.0264E+02	-2.49
73	11.642	12.250	-5.3021E+01	-2.0479E+02	-4.8619E+00	-5.2955E+01	-2.0494E+02	-1.83
74	12.153	12.500	-5.1990E+01	-2.0832E+02	-7.7289E+00	-5.1809E+01	-2.0870E+02	-2.82
75	12.426	12.500	-4.8999E+01	-2.0757E+02	-8.0347E+00	-4.8993E+01	-2.0798E+02	-2.89
76	12.734	12.250	-5.0268E+01	-2.1371E+02	-4.3769E+00	-5.0151E+01	-2.1383E+02	-1.53
77	13.349	12.500	-4.4586E+01	-2.1679E+02	-5.7909E+00	-4.4391E+01	-2.1698E+02	-1.92
78	13.688	12.500	-3.9169E+01	-2.1543E+02	-1.7805E+00	-3.9145E+01	-2.1543E+02	-0.58
79	15.225	12.250	-3.2295E+01	-2.2151E+02	-3.1946E+00	-3.2235E+01	-2.2157E+02	1.08
80	14.813	12.500	-3.3238E+01	-2.1871E+02	7.8557E+00	-3.2923E+01	-2.1902E+02	2.36
81	15.156	12.500	-2.0912E+01	-2.1563E+02	1.4396E+01	-1.9954E+01	-2.1669E+02	4.21
82	15.459	12.250	-6.1949E+01	-2.1613E+02	1.8379E+01	-5.9788E+01	-2.1829E+02	6.70
83	16.094	12.500	2.1680E+00	-2.0478E+02	3.0705E+01	6.6277E+00	-2.0924E+02	6.26
84	1.000	13.625	-4.8303E+01	-2.0481E+02	3.7078E-01	-4.8302E+01	-2.0481E+02	0.14
85	3.000	13.625	-4.8143E+01	-2.0435E+02	1.2242E+00	-4.8133E+01	-2.0436E+02	0.45
86	5.000	13.625	-4.8078E+01	-2.0304E+02	2.3039E+00	-4.8043E+01	-2.0308E+02	0.85
87	6.875	13.625	-4.8598E+01	-2.0056E+02	3.1910E+00	-4.8531E+01	-2.0062E+02	1.20
88	8.525	13.625	-5.0070E+01	-1.9700E+02	2.7577E+00	-5.0018E+01	-1.9705E+02	1.07
89	9.750	13.313	-5.2032E+01	-1.9523E+02	-2.5398E-02	-5.2032E+01	-1.9523E+02	-0.01
90	10.250	13.625	-5.1805E+01	-1.9256E+02	1.1206E+00	-5.1896E+01	-1.9257E+02	0.48
91	10.875	13.625	-5.2806E+01	-1.9349E+02	-3.1201E+00	-5.2737E+01	-1.9356E+02	-1.27
92	11.525	13.625	-5.3455E+01	-1.9553E+02	-6.9906E+00	-5.3112E+01	-1.9587E+02	-2.81
93	12.035	13.625	-5.2564E+01	-1.9686E+02	-1.0425E+01	-5.1925E+01	-1.9960E+02	-4.06
94	12.583	13.625	-5.0955E+01	-2.0644E+02	-1.3554E+01	-4.9782E+01	-2.0761E+02	-4.84
95	13.198	13.625	-4.3279E+01	-2.1797E+02	-1.4969E+01	-4.2006E+01	-2.1924E+02	-4.95
96	13.875	13.625	-4.1430E+01	-2.2275E+02	-5.2556E+00	-4.1282E+01	-2.2742E+02	-1.62
97	14.625	13.625	-4.1670E+01	-2.2377E+02	-1.2074E+00	-4.1662E+01	-2.2338E+02	-0.38
98	15.313	13.625	-4.3515E+01	-2.1556E+02	-2.7274E+00	-4.3472E+01	-2.1560E+02	-0.91
99	15.938	13.625	-4.3671E+01	-1.9880E+02	-1.6353E+01	-4.1986E+01	-2.0050E+02	-5.95
100	1.000	14.775	-4.7596E+01	-2.0211E+02	2.7748E-01	-4.7596E+01	-2.0211E+02	0.10

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
101	3.000	14.775	-4.7191E+01	-2.0180E+02	9.9548E-01	-4.7185E+01	-2.0181E+02	0.37
102	5.000	14.775	-4.5609E+01	-2.0069E+02	2.1741E+00	-4.6530E+01	-2.0072E+02	0.81
103	6.875	14.775	-4.6306E+01	-1.9795E+02	3.5529E+00	-4.6218E+01	-1.9805E+02	1.38
104	8.825	14.775	-4.7371E+01	-1.9285E+02	4.7264E+00	-4.7264E+01	-1.9297E+02	1.58
105	9.750	14.775	-4.7923E+01	-1.8953E+02	3.0695E+00	-4.7856E+01	-1.8959E+02	1.24
106	10.000	14.512	-5.0098E+01	-1.8533E+02	2.3088E+00	-5.0098E+01	-1.8537E+02	0.98
107	10.875	14.775	-5.0874E+01	-1.8433E+02	-1.4799E+00	-5.0857E+01	-1.8435E+02	-0.84
108	11.525	14.775	-5.1483E+01	-1.8343E+02	-6.2139E+00	-5.1170E+01	-1.8373E+02	-2.69
109	12.095	14.775	-5.1700E+01	-1.8503E+02	-1.1453E+01	-5.0723E+01	-1.8501E+02	-4.87
110	12.583	14.775	-5.0112E+01	-1.9356E+02	-1.9438E+01	-4.7524E+01	-1.9615E+02	-7.58
111	13.046	14.905	-4.8490E+01	-2.0071E+02	-3.1589E+01	-4.2194E+01	-2.0700E+02	-11.27
112	13.875	15.039	-4.1014E+01	-2.6719E+02	6.6878E-01	-4.1012E+01	-2.6718E+02	0.17
113	13.875	14.513	-3.8504E+01	-2.3773E+02	-5.4540E+00	-3.8504E+01	-2.3788E+02	-1.57
114	15.313	14.513	-6.8242E+01	-2.0164E+02	1.0626E+01	-6.7401E+01	-2.0248E+02	4.53
115	15.938	14.508	-8.5097E+01	-2.0266E+02	1.1152E+01	-8.8012E+01	-2.0375E+02	5.56
116	1.000	15.875	-4.7274E+01	-1.9990E+02	1.5410E-01	-4.7274E+01	-1.9990E+02	0.06
117	3.000	15.875	-4.6714E+01	-1.9975E+02	6.5971E-01	-4.6711E+01	-1.9976E+02	0.25
118	5.000	15.875	-4.5614E+01	-1.9895E+02	1.7342E+00	-4.5595E+01	-1.9897E+02	0.85
119	6.875	15.875	-4.4514E+01	-1.9633E+02	3.5329E+00	-4.4322E+01	-1.9641E+02	1.33
120	8.825	15.875	-4.4747E+01	-1.9015E+02	5.0985E+00	-4.4588E+01	-1.9033E+02	2.01
121	9.750	15.488	-4.7131E+01	-1.8636E+02	3.1382E+00	-4.7060E+01	-1.8643E+02	1.29
122	10.250	15.875	-4.5483E+01	-1.7858E+02	5.1924E+00	-4.5281E+01	-1.7877E+02	2.23
123	10.875	15.675	-4.7261E+01	-1.7630E+02	-6.1915E-01	-4.7258E+01	-1.7630E+02	-0.27
124	11.525	15.675	-4.7930E+01	-1.7220E+02	-5.8604E+00	-4.7695E+01	-1.7448E+02	-2.69
125	12.035	15.675	-4.7281E+01	-1.6991E+02	-1.2589E+01	-4.6001E+01	-1.7119E+02	-5.80
126	12.583	15.675	-4.4435E+01	-1.6832E+02	-2.4765E-01	-3.9688E+01	-1.7309E+02	-10.90
127	13.018	15.769	-2.9807E+01	-1.6436E+02	4.8211E+01	-1.4317E+01	-1.7985E+02	-17.81
128	13.416	15.863	-5.7056E+01	-3.6700E+02	9.8756E+00	-5.6780E+01	-3.9727E+02	1.63
129	13.688	15.863	-6.5866E+01	-3.6382E+02	-9.0300E+00	-6.5633E+01	-3.5410E+02	-1.79
130	14.063	15.863	-7.5264E+01	-3.0551E+02	8.8469E+00	-7.4924E+01	-3.0585E+02	2.20
131	14.438	15.863	-7.2513E+01	-2.8164E+02	4.9614E+01	-6.1340E+01	-2.9231E+02	12.69
132	14.813	15.863	-8.0951E+01	-2.5590E+02	9.0779E+01	-4.2339E+01	-2.9459E+02	23.03
133	15.156	15.863	-1.0886E+02	-2.1137E+02	1.1401E+02	-3.5113E+01	-2.8512E+02	32.90
134	15.469	15.863	-1.2420E+02	-1.6061E+02	1.0856E+02	-4.0027E+01	-2.5478E+02	41.47
135	10.000	16.237	-4.4237E+01	-1.7358E+02	4.9530E+00	-4.4048E+01	-1.7377E+02	2.19
136	10.875	16.425	-4.5079E+01	-1.6905E+02	1.2377E+00	-4.5069E+01	-1.6906E+02	0.57
137	11.525	16.425	-4.6304E+01	-1.6084E+02	-5.6002E+00	-4.6031E+01	-1.6111E+02	-2.79
138	12.035	16.425	-4.8355E+01	-1.5369E+02	-1.4315E+01	-4.4971E+01	-1.5557E+02	-7.50
139	12.583	16.425	-4.7183E+01	-1.4213E+02	-2.8887E+01	-3.9085E+01	-1.5022E+02	-15.66
140	12.962	16.519	-5.1610E+01	-1.3511E+02	4.5137E+01	-3.1875E+01	-1.5484E+02	-23.62
141	13.303	16.612	-8.215E+01	-3.5355E+02	2.2775E+02	-8.0329E+01	-3.5794E+02	4.73
142	13.688	16.512	-9.2383E+01	-3.419E+02	1.7915E+01	-9.1627E+01	-3.4844E+02	4.01
143	14.063	16.612	-1.0657E+02	-3.4232E+02	2.4076E+01	-1.0414E+02	-3.4475E+02	5.77
144	14.438	16.612	-1.2161E+02	-3.524E+02	3.8972E+01	-1.1533E+02	-3.6352E+02	9.15
145	14.813	16.612	-1.3084E+02	-3.8355E+02	8.5709E+01	-1.0448E+02	-4.0960E+02	17.09
146	15.156	16.612	-1.7782E+02	-2.2937E+02	1.9003E+02	-1.1715E+01	-3.9537E+02	41.12
147	15.469	16.612	-4.433E+01	-2.5295E+01	6.1038E+01	2.8203E+01	-9.4933E+01	46.77
148	1.000	16.684	-4.7243E+01	-1.9727E+02	2.1023E-02	-4.7243E+01	-1.9727E+02	0.01
149	3.000	16.684	-4.6622E+01	-1.9728E+02	1.8570E-01	-4.6651E+01	-1.9728E+02	0.07
150	5.000	16.684	-4.5269E+01	-1.9631E+02	8.7919E-01	-4.5266E+01	-1.9691E+02	0.33

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
151	6.875	16.584	-4.3194E+01	-1.9486E+02	2.6899E+00	-4.3145E+01	-1.9492E+02	1.02
152	6.625	16.584	-4.1850E+01	-1.8795E+02	5.1452E+00	-4.1669E+01	-1.8813E+02	2.01
153	9.750	16.554	-4.2440E+01	-1.8288E+02	5.6797E+00	-4.2210E+01	-1.8311E+02	2.31
154	10.250	17.059	-4.0473E+01	-1.6929E+02	7.2812E+00	-4.0063E+01	-1.6970E+02	3.22
155	10.875	17.059	-4.3930E+01	-1.6999E+02	2.4827E+00	-4.3878E+01	-1.6304E+02	1.20
156	11.525	17.059	-4.7136E+01	-1.5051E+02	-3.4059E+00	-4.7024E+01	-1.5062E+02	-1.89
157	12.035	17.059	-5.0305E+01	-1.3872E+02	-1.1830E+01	-4.8750E+01	-1.4028E+02	-7.48
158	12.583	17.059	-5.5846E+01	-1.2373E+02	-2.3714E+01	-4.8368E+01	-1.3121E+02	-17.49
159	12.934	16.929	-1.1443E+02	-1.1443E+02	-3.5209E+01	-4.1320E+01	-1.3139E+02	-25.71
160	13.236	17.059	-8.6653E+01	-3.4572E+02	3.4044E+01	-8.2173E+01	-3.5115E+02	7.41
161	13.688	17.059	-9.6050E+01	-3.4872E+02	3.1604E+01	-9.2157E+01	-3.5261E+02	7.02
162	14.063	17.059	-1.0335E+02	-3.5928E+02	4.0365E+01	-9.7141E+01	-3.6549E+02	8.75
163	14.438	17.059	-1.0906E+02	-3.6637E+02	6.5730E+01	-9.4266E+01	-4.0116E+02	12.68
164	14.813	17.059	-1.1055E+02	-5.3079E+02	1.1249E+02	-8.2332E+01	-5.5900E+02	14.08
165	10.000	17.448	-3.9922E+01	-1.6712E+02	7.4208E+00	-3.9600E+01	-1.6755E+02	3.38
166	10.875	17.575	-4.3258E+01	-1.5854E+02	6.3001E+00	-4.2914E+01	-1.5899E+02	3.12
167	11.525	17.575	-4.8453E+01	-1.4248E+02	2.7084E+01	-4.8452E+01	-1.4248E+02	0.17
168	12.035	17.575	-5.3160E+01	-1.2850E+02	-6.9707E+00	-5.2521E+01	-1.2914E+02	-5.24
169	12.544	17.575	-5.9598E+01	-1.1216E+02	-1.6561E+01	-5.4815E+01	-1.1694E+02	-16.11
170	12.858	17.575	-8.7067E+01	-3.3719E+02	4.8974E+01	-7.7841E+01	-3.4702E+02	10.67
171	13.198	17.575	-8.9017E+01	-3.3719E+02	4.2609E+01	-8.1946E+01	-3.4580E+02	9.42
172	13.688	17.575	-9.2052E+01	-3.4745E+02	3.5301E+01	-8.7263E+01	-3.5225E+02	7.73
173	14.063	17.575	-8.3943E+01	-3.7078E+02	3.4215E+01	-7.9818E+01	-3.7480E+02	6.71
174	14.438	17.575	-6.0455E+01	-4.1859E+02	3.8665E+01	-5.8078E+01	-4.2275E+02	6.12
175	14.813	17.575	-5.0453E+00	-4.3531E+02	1.3984E+01	-4.5913E+00	-4.3576E+02	1.86
176	1.000	17.833	-4.7458E+01	-1.9411E+02	-1.2021E+01	-4.7458E+01	-1.9411E+02	-0.05
177	3.000	17.833	-4.7019E+01	-1.9424E+02	-3.3028E+01	-4.7019E+01	-1.9424E+02	-0.13
178	5.000	17.833	-4.5744E+01	-1.9429E+02	-2.8373E+01	-4.5773E+01	-1.9429E+02	-0.11
179	6.875	17.833	-4.3224E+01	-1.9342E+02	7.6336E+01	-4.3220E+01	-1.9342E+02	0.29
180	8.525	17.833	-3.9948E+01	-1.8658E+02	4.3270E+00	-3.9821E+01	-1.8679E+02	1.69
181	9.750	17.704	-3.9418E+01	-1.8101E+02	7.2239E+00	-3.9050E+01	-1.8137E+02	2.91
182	10.250	18.092	-3.8857E+01	-1.8693E+02	9.2683E+00	-3.8519E+01	-1.8704E+02	4.07
183	10.875	18.092	-4.2508E+01	-1.5556E+02	9.4803E+00	-4.1719E+01	-1.5635E+02	4.76
184	11.525	18.092	-4.8586E+01	-1.3483E+02	5.8778E+00	-4.8158E+01	-1.3528E+02	3.88
185	12.035	18.092	-5.5743E+01	-1.1947E+02	-1.4110E+00	-5.5711E+01	-1.1950E+02	-1.27
186	12.466	18.092	-6.0961E+01	-3.0383E+02	-7.7304E+00	-5.9609E+01	-1.0513E+02	-9.92
187	12.779	18.092	-6.3634E+01	-3.2867E+02	5.7303E+01	-7.1086E+01	-3.4141E+02	12.54
188	13.198	18.092	-9.2685E+01	-3.2523E+02	4.7576E+01	-8.3270E+01	-3.3459E+02	11.12
189	13.688	18.092	-8.9305E+01	-3.3109E+02	2.6311E+01	-8.6476E+01	-3.3392E+02	6.14
190	14.063	18.092	-7.6866E+01	-3.5748E+02	8.1419E+00	-7.5430E+01	-3.5771E+02	1.66
191	14.438	18.092	-5.0603E+01	-3.9522E+02	-1.5741E+01	-4.9885E+01	-3.9594E+02	-2.61
192	14.813	18.092	-1.9842E+01	-4.3258E+02	-2.4161E+01	-1.8434E+01	-4.3399E+02	-3.34
193	3.000	18.875	-4.7844E+01	-1.9114E+02	-1.7864E+01	-4.7843E+01	-1.9114E+02	-0.07
194	3.000	18.875	-4.7761E+01	-1.9125E+02	-5.8599E+01	-4.7758E+01	-1.9126E+02	-0.23
195	5.000	18.875	-4.7313E+01	-1.9148E+02	-1.0611E+00	-4.7306E+01	-1.9149E+02	-0.42
196	6.875	18.875	-4.5757E+01	-1.8131E+02	-1.1534E+00	-4.5747E+01	-1.8132E+02	-0.45
197	8.625	18.875	-4.1976E+01	-1.8801E+02	1.6124E+00	-4.1961E+01	-1.8803E+02	0.63
198	10.000	18.875	-3.7862E+01	-1.7544E+02	8.2566E+00	-3.7368E+01	-1.7593E+02	3.42
199	10.875	18.875	-3.8859E+01	-1.5298E+02	1.6035E+01	-3.6649E+01	-1.5519E+02	7.85
200	11.525	18.875	-4.5754E+01	-1.2767E+02	1.5995E+01	-4.2741E+01	-1.3069E+02	10.67

 ELEMENT STRESS
 STEP NO. 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
201	12.035	18.875	-5.251E+01	-1.0289E+02	1.1207E+01	-5.0133E+01	-1.0527E+02	11.99
202	12.349	18.613	-5.880E+01	-9.146E+01	-2.0481E+00	-5.8553E+01	-9.1591E+01	-3.56
203	12.738	18.813	-8.8619E+01	-8.1801E+02	7.2130E+01	-6.3865E+02	-3.3865E+02	15.97
204	13.324	18.725	-8.8285E+01	-2.8714E+02	3.9977E+01	-8.0551E+01	-2.9488E+02	10.95
205	13.781	18.675	-8.5839E+01	-3.0043E+02	1.1331E+01	-8.5251E+01	-3.0103E+02	3.02
206	14.124	18.625	-8.2303E+01	-3.2303E+02	-1.4987E+01	-8.1382E+01	-3.2396E+02	-3.55
207	14.501	18.577	-7.6226E+01	-3.6235E+02	-4.7297E+01	-7.8611E+01	-3.6998E+02	-9.15
208	14.849	18.533	-4.9488E+01	-4.5500E+02	7.8983E+01	-3.4629E+01	-4.5984E+02	10.64
209	1.000	19.750	-4.8179E+01	-1.8861E+02	-1.5447E+01	-4.8179E+01	-1.8861E+02	-0.06
210	3.000	19.750	-4.8478E+01	-1.8657E+02	-5.3210E+01	-4.8478E+01	-1.8662E+02	-0.22
211	5.000	19.750	-4.9082E+01	-1.8883E+02	-1.1522E+00	-4.9052E+01	-1.8884E+02	-0.47
212	6.875	19.750	-4.9507E+01	-1.8905E+02	-1.9091E+00	-4.9481E+01	-1.8908E+02	-0.78
213	8.625	19.750	-4.7860E+01	-1.8800E+02	-1.4748E+00	-4.7844E+01	-1.8802E+02	-0.60
214	10.000	19.750	-4.1702E+01	-1.8195E+02	4.4844E+00	-4.1559E+01	-1.8210E+02	1.83
215	10.875	19.750	-3.4734E+01	-1.6051E+02	1.9540E+01	-3.1768E+01	-1.6348E+02	8.63
216	11.525	19.750	-3.9384E+01	-1.2214E+02	3.0283E+01	-1.2214E+01	-1.3204E+02	18.10
217	11.983	19.750	-4.8769E+01	-9.0718E+01	2.1031E+01	-4.0030E+01	-9.9445E+01	22.53
218	12.470	20.075	-5.0219E+01	-2.7591E+02	5.7115E+01	-3.1769E+01	-2.9436E+02	15.37
219	13.030	19.675	-5.5803E+01	-2.4235E+02	4.4035E+01	-4.5931E+01	-2.5222E+02	12.64
220	13.625	19.438	-5.9460E+01	-2.4570E+02	1.1909E+01	-5.8702E+01	-2.4546E+02	3.84
221	14.017	19.278	-6.3148E+01	-2.6649E+02	-9.3006E+00	-6.2724E+01	-2.6692E+02	-2.61
222	14.344	19.141	-7.1738E+01	-2.9214E+02	-3.0623E+01	-6.7562E+01	-2.9632E+02	-7.76
223	14.655	19.012	-8.3281E+01	-3.3082E+02	-6.3376E+01	-6.7999E+01	-3.4610E+02	-13.56
224	14.956	18.886	-9.1868E+01	-4.1853E+02	-1.3241E+02	-4.4074E+01	-4.8432E+02	-19.71
225	1.000	20.500	-4.8367E+01	-1.8650E+02	-7.1312E-02	-4.8367E+01	-1.8650E+02	-0.03
226	3.000	20.500	-4.8989E+01	-1.8651E+02	-2.5801E-01	-4.8988E+01	-1.8651E+02	-0.11
227	5.000	20.500	-5.0527E+01	-1.8655E+02	-5.8887E-01	-5.0524E+01	-1.8655E+02	-0.25
228	6.875	20.500	-5.3436E+01	-1.8664E+02	-1.2305E+00	-5.3425E+01	-1.8665E+02	-0.53
229	8.625	20.500	-5.6844E+01	-1.8650E+02	-1.8139E+00	-5.6819E+01	-1.8653E+02	-0.80
230	10.000	20.500	-5.9485E+01	-1.8519E+02	-4.8970E-01	-5.9483E+01	-1.8519E+02	-0.21
231	10.875	20.500	-5.2415E+01	-1.7856E+02	7.6312E-00	-5.1955E+01	-1.7902E+02	3.45
232	11.525	20.500	-3.0608E+01	-1.3180E+02	3.7749E+01	-1.8079E+01	-1.4433E+02	18.36
233	11.870	20.500	-3.2907E+01	-6.9427E+01	3.9264E+01	-7.8651E+00	-9.4470E+01	32.53
234	12.110	20.413	5.2362E+01	-2.7586E+02	5.0271E+01	5.9899E+01	-2.8339E+02	8.52
235	12.392	20.725	6.7867E+01	-2.7667E+02	6.1514E+01	7.8520E+01	-2.8732E+02	9.83
236	13.000	20.650	1.0726E+02	-1.8325E+02	1.2498E+00	1.0727E+02	-1.8325E+02	0.25
237	13.613	20.388	3.8843E+01	-1.8694E+02	3.3400E+00	3.8892E+01	-1.8699E+02	0.85
238	14.037	20.051	2.2253E+00	-2.2114E+02	-2.0112E+01	4.0219E+00	-2.2193E+02	-5.10
239	14.361	19.797	-1.9612E+01	-2.4174E+02	3.4612E+01	-1.4343E+01	-2.4701E+02	-8.65
240	14.627	19.595	-3.3516E+01	-2.6548E+02	-5.4597E+01	-2.1308E+01	-2.7789E+02	-12.60
241	14.883	19.399	-5.4948E+01	-2.8613E+02	-8.2403E+01	-2.8858E+01	-3.1522E+02	-17.57
242	15.139	19.203	-1.1229E+02	-3.0537E+02	-1.5828E+02	-2.8524E+01	-3.8914E+02	-28.81
243	14.069	20.800	1.2750E+02	-1.2966E+02	-3.0107E+01	1.3074E+02	-2.1563E+02	-5.01
244	14.575	20.528	5.0016E+01	-1.9273E+02	-2.6914E+01	5.2964E+01	-1.9568E+02	-6.25
245	14.809	20.228	8.8563E+00	-2.1467E+02	-6.1555E+01	2.6966E+01	-2.3278E+02	-15.31
246	15.005	19.972	-6.0379E+00	-2.2654E+02	-8.6533E+01	-2.3865E+01	-2.5645E+02	-19.08
247	15.201	19.717	-2.9910E+01	-2.2737E+02	-1.0567E+02	2.1033E+01	-2.7231E+02	-23.04
248	15.398	19.461	-8.7646E+01	-1.7923E+02	-1.2458E+02	-7.0879E+01	-2.6617E+02	-34.91
249	15.024	20.815	-4.9935E+00	-1.8664E+02	-4.4032E+01	5.1173E+00	-1.8675E+02	-12.93
250	15.339	20.559	-2.0225E+01	-1.8588E+02	-5.8425E+01	-1.6645E+00	-2.0414E+02	-17.62

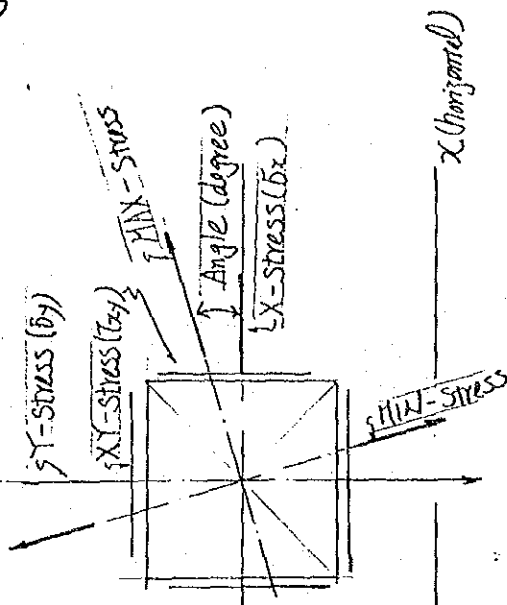
 ***** ELEMENT STRESS *****
 ***** STEP NO. = 1 *****

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
251	15.467	20.239	-2.6207E+01	-1.7766E+02	-9.4057E+01	1.8819E+01	-2.2269E+02	-25.58
252	15.591	19.941	-2.1494E+01	-1.4797E+02	-1.0364E+02	3.6680E+01	-2.0615E+02	-29.30
253	15.714	19.644	-2.2866E+01	-7.8397E+01	-7.4864E+01	-1.3049E+02	-1.3049E+02	-34.83
254	15.935	20.719	-1.2836E+02	-1.7292E+02	-2.3359E+01	-1.1836E+02	-1.8292E+02	-23.17
255	15.983	20.377	-8.9595E+01	-1.4008E+02	-4.3476E+01	-4.8826E+01	-1.6079E+02	-25.47
256	16.025	20.058	-3.9435E+01	-8.4972E+01	-4.5567E+01	-1.1255E+01	-1.1314E+02	-31.73
257	16.067	19.738	-3.2922E+01	-2.2875E+01	-2.4250E+01	-4.1988E+01	-3.1941E+01	-20.50
258	14.625	14.513	-5.1595E+01	-2.2610E+02	1.0905E+01	-5.0900E+01	-2.2678E+02	3.56
259	14.625	15.038	-5.4978E+01	-2.3186E+02	1.8435E+01	-5.3075E+01	-2.3376E+02	5.88
260	13.359	16.237	-7.3282E+01	-3.6883E+02	1.5968E+01	-7.2395E+01	-3.6775E+02	3.10
261	13.888	16.237	-8.1093E+01	-3.4908E+02	5.0605E+00	-8.0998E+01	-3.4918E+02	1.08
262	14.063	16.237	-9.1890E+01	-3.2975E+02	1.2971E+01	-9.1185E+01	-3.3046E+02	3.11
263	14.438	16.237	-9.1301E+01	-3.2504E+02	4.2070E+01	-8.3959E+01	-3.3238E+02	9.90
264	14.813	16.237	-8.1242E+01	-3.0386E+02	9.8271E+01	-8.4070E+01	-3.4104E+02	20.72
265	15.156	16.237	-8.7963E+01	-2.2234E+02	1.4859E+02	7.9201E+00	-3.1823E+02	32.83
266	15.459	16.237	-1.1929E+02	-1.2152E+02	1.2355E+02	7.8098E+00	-2.4930E+02	44.83
267	15.781	16.237	-9.8503E+01	-6.0143E+01	6.7857E+01	-8.8074E+00	-1.4938E+02	52.89
268	16.094	16.237	-8.4278E+01	-4.5909E+01	2.1182E+01	-3.6515E+01	-8.3672E+01	66.08
269	15.781	15.863	-1.5632E+02	-1.2177E+02	7.2126E+01	-6.4877E+01	-2.1321E+02	51.73
270	15.094	15.863	-1.6139E+02	-1.0269E+02	2.4570E+01	-9.3761E+01	-1.7032E+02	70.03
271	13.444	15.581	-5.1539E+01	-4.7220E+02	3.3667E+01	-4.8830E+01	-4.7490E+02	4.57
272	13.888	15.488	-3.4969E+01	-3.7175E+02	-2.4873E+01	-3.3141E+01	-3.7357E+02	-4.20
273	14.053	15.488	-2.8969E+01	-2.6642E+02	1.5893E+01	-2.7909E+01	-2.6748E+02	3.81
274	14.438	15.488	-3.8007E+01	-2.5101E+02	3.9644E+01	-3.0868E+01	-2.5815E+02	10.21
275	14.813	15.488	-7.8761E+01	-2.3188E+02	5.8502E+01	-5.8986E+01	-2.5168E+02	18.59
276	15.156	15.488	-1.2109E+02	-2.0480E+02	6.9887E+01	-8.1400E+01	-2.4449E+02	29.56
277	15.469	15.488	-1.7377E+02	-1.8335E+02	6.5802E+01	-1.1258E+02	-2.4453E+02	42.92
278	15.781	15.488	-2.0906E+02	-1.6181E+02	4.5231E+01	-1.3441E+02	-2.3647E+02	58.79
279	16.094	15.488	-2.3043E+02	-1.5383E+02	1.9311E+01	-1.4923E+02	-2.3504E+02	76.63
280	13.001	16.708	-5.8925E+01	-1.1702E+02	-3.7321E+01	-4.0680E+01	-1.3527E+02	-26.05
281	13.123	15.237	-4.3405E+01	-1.2679E+02	-5.0403E+01	-1.9686E+01	-1.5951E+02	-25.20
282	13.113	15.956	-4.5169E+01	-1.3981E+02	-4.9792E+01	-2.2823E+01	-1.5815E+02	-24.16
283	13.292	15.488	-2.3462E+01	-1.5068E+02	-5.3435E+01	-3.9961E+00	-1.7014E+02	-20.02
284	13.198	15.169	-5.0332E+01	-2.5816E+02	-4.5599E+01	-4.0767E+01	-2.6772E+02	-11.85
285	13.594	15.169	-4.5990E+01	-2.5707E+02	-3.5459E+00	-4.5931E+01	-2.5713E+02	-0.96
286	14.063	15.169	-4.5034E+01	-2.4097E+02	1.2890E+01	-4.4190E+01	-2.4181E+02	3.75
287	14.344	15.169	-4.5905E+01	-2.4219E+02	2.2741E+01	-4.7252E+01	-2.4484E+02	6.65
288	14.813	15.169	-5.6706E+01	-2.1070E+02	2.8519E+01	-5.1594E+01	-2.1582E+02	10.16
289	15.078	15.169	-6.9376E+01	-2.1367E+02	3.0642E+01	-6.3147E+01	-2.2010E+02	11.49
290	15.313	15.038	-7.3429E+01	-2.0003E+02	2.2468E+01	-6.9560E+01	-2.0930E+02	9.77
291	15.469	15.169	-8.0009E+01	-1.9328E+02	2.7786E+01	-7.3421E+01	-1.9721E+02	13.34
292	15.703	15.169	-9.0654E+01	-1.9328E+02	1.9971E+01	-8.6905E+01	-1.9703E+02	10.63
293	15.938	15.033	-8.0762E+01	-1.8227E+02	1.2543E+01	-7.9235E+01	-1.8380E+02	6.94
294	16.094	15.164	-9.6289E+01	-1.9006E+02	6.7038E+00	-9.5792E+01	-1.9054E+02	4.07
295	15.781	16.612	-2.1859E+01	-1.4765E+02	2.5701E+01	3.5105E+01	-2.8010E+01	27.27
296	16.094	16.612	-4.8899E+01	-8.6140E+01	7.4789E+00	4.9852E+01	-9.7674E+00	7.26
297	13.198	14.381	-4.7293E+01	-2.4042E+02	-2.2827E+01	-4.4631E+01	-2.4399E+02	-6.65

Table 5.1.2 Result of FEM Analysis (Load case 2)

***** * MATERIAL DATA * *****										
MAT NO. = 1	MASS DENSITY	2.400E+00	E (OR E(1))	2.550E+06	PO (OR PO(1))	2.000E-01	HEAT COEF	0.000E+00		
TYPE = 0	E(2) (OR AREA)	0.000E+00	PO(2) (OR MOMENT)	0.000E+00	(G)	0.000E+00	COHISION	0.000E+00		
	FRICITION	0.000E+00	STRESS(X, AI)	0.000E+00	STRESS(Y, SI)	0.000E+00	STRESS(XI, MI)	0.000E+00		
	THICK(MJ)	0.000E+00	ANGLE	0.000E+00						
MAT NO. = 2	MASS DENSITY	2.700E+00	E (OR E(1))	5.500E+05	PO (OR PO(1))	2.000E-01	HEAT COEF	0.000E+00		
TYPE = 0	E(2) (OR AREA)	0.000E+00	PO(2) (OR MOMENT)	0.000E+00	(G)	0.000E+00	COHISION	0.000E+00		
	FRICITION	0.000E+00	STRESS(X, AI)	0.000E+00	STRESS(Y, SI)	0.000E+00	STRESS(XI, MI)	0.000E+00		
	THICK(MJ)	0.000E+00	ANGLE	0.000E+00						

Explanation on "ELEMENT STRESS" in the following sheet



Notes: 1. Unit of stress -- Ton/m²

2. - (min) in X-Stress, Y-Stress, Max-Stress and Min-stress indicate the maximum stress.

 MATERIAL DATA

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-SRESS	Y-SRESS	XY-SRESS	MAX-SRESS	MIN-SRESS	ANGLE
1	1.000	1.000	-4.6806E+01	-2.1623E+02	1.3919E-01	-4.6806E+01	-2.1623E+02	0.05
2	3.000	1.000	-4.7346E+01	-2.1534E+02	3.8493E-01	-4.7346E+01	-2.1534E+02	0.13
3	5.000	1.000	-4.8298E+01	-2.1373E+02	5.3173E-01	-4.8298E+01	-2.1373E+02	0.18
4	6.875	1.000	-4.9337E+01	-2.1183E+02	5.1829E-01	-4.9337E+01	-2.1183E+02	0.18
5	8.625	1.000	-5.0745E+01	-2.1001E+02	2.9273E-01	-5.0745E+01	-2.1001E+02	0.10
6	10.375	1.000	-5.0388E+01	-2.0837E+02	-1.2948E-01	-5.0388E+01	-2.0837E+02	-0.05
7	12.375	1.000	-4.8756E+01	-2.0856E+02	-2.3271E+00	-4.8722E+01	-2.0860E+02	-0.83
8	14.875	1.000	-3.9788E+01	-1.9913E+02	-1.6281E+01	-3.8142E+01	-2.0078E+02	-5.77
9	1.000	3.000	-4.5288E+01	-2.1189E+02	4.3855E-01	-4.5288E+01	-2.1139E+02	0.15
10	3.000	3.000	-4.5882E+01	-2.1037E+02	1.2245E+00	-4.5873E+01	-2.1038E+02	0.43
11	5.000	3.000	-4.7027E+01	-2.0851E+02	1.7352E+00	-4.7003E+01	-2.0853E+02	0.62
12	6.875	3.000	-4.8395E+01	-2.0625E+02	1.8001E+00	-4.8375E+01	-2.0627E+02	0.65
13	8.625	3.000	-4.9741E+01	-2.0393E+02	1.3491E+00	-4.9729E+01	-2.0394E+02	0.50
14	10.375	3.000	-5.0978E+01	-2.0189E+02	1.6443E-01	-5.0978E+01	-2.0189E+02	0.06
15	12.375	3.000	-5.2716E+01	-1.9677E+02	-2.8291E+00	-5.2661E+01	-1.9682E+02	-1.12
16	14.875	3.000	-6.3546E+01	-1.9934E+02	9.6958E-01	-6.3539E+01	-1.9935E+02	0.41
17	1.000	5.000	-4.3481E+01	-2.0718E+02	7.9091E-01	-4.3477E+01	-2.0719E+02	0.28
18	3.000	5.000	-4.4232E+01	-2.0595E+02	2.2393E+00	-4.4201E+01	-2.0598E+02	0.79
19	5.000	5.000	-4.5693E+01	-2.0363E+02	3.2846E+00	-4.5601E+01	-2.0369E+02	1.19
20	6.875	5.000	-4.7511E+01	-2.0075E+02	3.6744E+00	-4.7423E+01	-2.0084E+02	1.37
21	8.625	5.000	-4.9569E+01	-1.9776E+02	3.3707E+00	-4.9487E+01	-1.9783E+02	1.30
22	10.375	5.000	-5.1893E+01	-1.9443E+02	2.3940E+00	-5.1850E+01	-1.9448E+02	0.98
23	12.375	5.000	-5.5570E+01	-1.9224E+02	2.2131E+00	-5.5534E+01	-1.9227E+02	0.93
24	14.875	5.000	-5.6803E+01	-1.9313E+02	1.7371E+00	-5.6785E+01	-1.9316E+02	0.75
25	1.000	6.750	-4.1742E+01	-2.0410E+02	1.1475E+00	-4.1734E+01	-2.0411E+02	0.40
26	3.000	6.750	-4.2583E+01	-2.0261E+02	3.2920E+00	-4.2521E+01	-2.0268E+02	1.18
27	5.000	6.750	-4.4259E+01	-1.9976E+02	4.9662E+00	-4.4101E+01	-1.9994E+02	1.88
28	6.875	6.750	-4.6485E+01	-1.9623E+02	5.8295E+00	-4.6258E+01	-1.9645E+02	2.23
29	8.625	6.750	-4.9029E+01	-1.9246E+02	5.6431E+00	-4.8791E+01	-1.9270E+02	2.33
30	10.375	6.750	-5.1889E+01	-1.8907E+02	5.3023E+00	-5.1679E+01	-1.8928E+02	2.21
31	12.375	6.750	-5.4241E+01	-1.8691E+02	4.1038E+00	-5.4114E+01	-1.8704E+02	1.77
32	14.875	6.750	-5.5398E+01	-1.8670E+02	1.7000E+00	-5.5376E+01	-1.8673E+02	0.74
33	1.000	8.250	-4.0126E+01	-2.0199E+02	1.4705E+00	-4.0113E+01	-2.0201E+02	0.52
34	3.000	8.250	-4.0989E+01	-2.0028E+02	4.2695E+00	-4.0874E+01	-2.0039E+02	1.53
35	5.000	8.250	-4.2754E+01	-1.9695E+02	6.5958E+00	-4.2472E+01	-1.9723E+02	2.44
36	6.875	8.250	-4.5203E+01	-1.9269E+02	7.9820E+00	-4.4772E+01	-1.9312E+02	3.09
37	8.625	8.250	-4.8025E+01	-1.8824E+02	8.3242E+00	-4.7533E+01	-1.8874E+02	3.39
38	10.375	8.250	-5.0963E+01	-1.8414E+02	7.6759E+00	-5.0522E+01	-1.8459E+02	3.29
39	12.375	8.250	-5.3765E+01	-1.8130E+02	5.5520E+00	-5.3524E+01	-1.8154E+02	2.49
40	14.875	8.250	-5.5279E+01	-1.8073E+02	1.8664E+00	-5.5251E+01	-1.8076E+02	0.85
41	1.000	9.750	-3.8541E+01	-2.0036E+02	1.7734E+00	-3.8521E+01	-2.0038E+02	0.63
42	3.000	9.750	-3.9307E+01	-1.9845E+02	5.2231E+00	-3.9136E+01	-1.9862E+02	1.88
43	5.000	9.750	-4.0987E+01	-1.9463E+02	8.2762E+00	-4.0542E+01	-1.9507E+02	3.07
44	6.875	9.750	-4.3475E+01	-1.8954E+02	1.0337E+01	-4.2747E+01	-1.9027E+02	4.03
45	8.625	9.750	-4.6534E+01	-1.8412E+02	1.0962E+01	-4.5666E+01	-1.8499E+02	4.53
46	10.375	9.750	-4.9689E+01	-1.7899E+02	1.0272E+01	-4.8878E+01	-1.7980E+02	4.51
47	12.375	9.750	-5.3013E+01	-1.7476E+02	7.6788E+00	-5.2531E+01	-1.7527E+02	3.59
48	14.875	9.750	-5.6432E+01	-1.7423E+02	2.8889E+00	-5.6387E+01	-1.7428E+02	1.11
49	1.000	11.250	-3.7213E+01	-1.9915E+02	2.0014E+00	-3.7188E+01	-1.9917E+02	0.71
50	3.000	11.250	-3.7718E+01	-1.9713E+02	5.9985E+00	-3.7493E+01	-1.9736E+02	2.15

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XI-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
51	5.000	11.250	-3.9014E+01	-1.9290E+02	9.8232E+00	-8.8389E+01	-1.9363E+02	3.64
52	6.875	11.250	-4.1293E+01	-1.8977E+02	-1.2707E+01	-4.0193E+01	-1.8977E+02	4.95
53	8.825	11.250	-4.4402E+01	-1.7987E+02	1.3930E+01	-4.2984E+01	-1.8129E+02	5.81
54	9.825	11.250	-4.5693E+01	-1.7588E+02	1.5228E+01	-4.4390E+01	-1.7764E+02	6.58
55	10.063	10.875	-4.8551E+01	-1.7357E+02	1.2210E+01	-4.7074E+01	-1.7484E+02	5.51
56	10.938	11.250	-4.8790E+01	-1.6922E+02	1.3582E+01	-4.7286E+01	-1.7142E+02	6.32
57	11.505	11.250	-5.0741E+01	-1.7041E+02	1.0706E+01	-4.9790E+01	-1.7136E+02	5.07
58	12.068	10.875	-5.1451E+01	-1.6748E+02	9.2723E+00	-5.0724E+01	-1.6822E+02	4.54
59	13.193	11.250	-5.1904E+01	-1.6681E+02	9.4520E+00	-5.1132E+01	-1.6758E+02	4.67
60	13.875	11.350	-5.5396E+01	-1.6768E+02	6.3041E+00	-5.5043E+01	-1.6804E+02	3.20
61	14.563	10.875	-5.5486E+01	-1.6302E+02	4.9323E+00	-5.5260E+01	-1.6325E+02	2.62
62	15.938	11.250	-7.0048E+01	-1.7103E+02	-1.3525E+00	-7.0030E+01	-1.7105E+02	-0.77
63	1.000	12.500	-3.6496E+01	-1.9635E+02	2.0855E+00	-3.6470E+01	-1.9838E+02	0.74
64	3.000	12.500	-3.6637E+01	-1.9200E+02	6.3724E+00	-3.6383E+01	-1.9652E+02	2.28
65	5.000	12.500	-3.7332E+01	-1.8523E+02	1.0804E+01	-3.6581E+01	-1.9275E+02	3.98
66	6.825	12.500	-3.9066E+01	-1.7707E+02	1.4620E+01	-3.7517E+01	-1.8670E+02	5.66
67	8.825	12.500	-4.2325E+01	-1.7292E+02	1.6522E+01	-4.0333E+01	-1.7907E+02	6.89
68	9.825	12.250	-4.4923E+01	-1.6966E+02	1.5348E+01	-4.3109E+01	-1.7474E+02	6.74
69	10.000	12.500	-4.3844E+01	-1.6966E+02	1.7774E+01	-4.1382E+01	-1.7215E+02	7.89
70	10.438	12.250	-4.7744E+01	-1.6573E+02	1.4807E+01	-4.5914E+01	-1.6756E+02	7.04
71	11.063	12.500	-4.8051E+01	-1.6410E+02	1.5505E+01	-4.6015E+01	-1.6613E+02	7.48
72	11.388	12.500	-4.8931E+01	-1.6242E+02	1.3139E+01	-4.5454E+01	-1.6579E+02	6.41
73	11.642	12.250	-4.8716E+01	-1.6231E+02	1.1779E+01	-4.7507E+01	-1.6352E+02	5.86
74	12.153	12.500	-4.9372E+01	-1.6241E+02	1.1713E+01	-4.8171E+01	-1.6261E+02	5.85
75	12.428	12.500	-4.8537E+01	-1.6220E+02	1.0128E+01	-4.7842E+01	-1.6310E+02	5.05
76	12.734	12.250	-5.0934E+01	-1.6293E+02	1.0765E+01	-4.9908E+01	-1.6396E+02	5.44
77	13.349	12.500	-4.6933E+01	-1.6404E+02	1.0406E+01	-4.8016E+01	-1.6496E+02	5.04
78	13.688	12.500	-4.5449E+01	-1.6317E+02	1.0202E+01	-4.2586E+01	-1.6403E+02	4.84
79	14.063	12.250	-5.4213E+01	-1.6255E+02	1.1888E+01	-5.2926E+01	-1.6424E+02	6.17
80	14.813	12.500	-3.7662E+01	-1.6020E+02	1.5920E+01	-3.5627E+01	-1.6223E+02	7.28
81	15.156	12.500	-2.3902E+01	-1.5676E+02	1.9668E+01	-2.1051E+01	-1.5961E+02	8.25
82	15.469	12.250	-6.6407E+01	-1.5647E+02	2.3328E+01	-6.0723E+01	-1.6215E+02	13.69
83	16.094	12.500	1.7858E+00	-1.4679E+02	3.5054E+01	9.6407E+00	-1.5465E+02	12.63
84	1.000	13.625	-3.6508E+01	-1.9766E+02	2.0349E+00	-3.6482E+01	-1.9768E+02	0.72
85	3.000	13.625	-3.6178E+01	-1.9586E+02	6.9392E+00	-3.5926E+01	-1.9611E+02	2.27
86	5.000	13.625	-3.5978E+01	-1.9160E+02	1.1178E+01	-3.5179E+01	-1.9240E+02	4.09
87	6.875	13.625	-3.6760E+01	-1.8460E+02	1.5894E+01	-3.5071E+01	-1.8629E+02	6.07
88	8.825	13.625	-3.5188E+01	-1.7444E+02	1.9215E+01	-3.6512E+01	-1.7712E+02	7.93
89	9.750	13.313	-4.3705E+01	-1.6913E+02	1.8067E+01	-4.1154E+01	-1.7168E+02	8.04
90	10.250	13.625	-4.2037E+01	-1.6154E+02	2.1582E+01	-3.8558E+01	-1.6532E+02	9.93
91	10.875	13.625	-4.5305E+01	-1.5968E+02	1.7135E+01	-4.2793E+01	-1.6220E+02	8.34
92	11.525	13.625	-4.8957E+01	-1.5599E+02	1.4671E+01	-4.5018E+01	-1.5793E+02	7.53
93	12.035	13.625	-4.8259E+01	-1.5466E+02	1.2083E+01	-4.8904E+01	-1.5602E+02	6.40
94	12.583	13.625	-4.6680E+01	-1.5598E+02	8.6651E+00	-4.7987E+01	-1.5668E+02	4.58
95	13.198	13.625	-4.5738E+01	-1.5371E+02	5.6933E+00	-4.5457E+01	-1.5998E+02	2.84
96	13.875	13.625	-4.5400E+01	-1.5285E+02	7.3152E+00	-4.4438E+01	-1.5931E+02	3.58
97	14.625	13.625	-4.6750E+01	-1.5822E+02	5.8743E+00	-4.6441E+01	-1.5853E+02	3.01
98	15.313	13.625	-4.8047E+01	-1.5156E+02	2.4586E+01	-4.8047E+01	-1.5156E+02	0.14
99	15.938	13.625	-4.7612E+01	-1.3670E+02	-1.6540E+01	-4.4576E+01	-1.3773E+02	-10.40
100	1.000	14.775	-3.7267E+01	-1.9884E+02	1.8400E+00	-3.7235E+01	-1.9886E+02	0.66

 MATERIAL DATA

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
101	3.000	14.775	-3.6390E+01	-1.9536E+02	5.8643E+00	-3.6174E+01	-1.9558E+02	2.11
102	5.000	14.775	-3.5056E+01	-1.9150E+02	1.9855E+01	-3.4306E+01	-1.9235E+02	3.95
103	6.875	14.775	-3.4309E+01	-1.8450E+02	1.5515E+01	-3.2514E+01	-1.8630E+02	6.20
104	8.625	14.775	-3.5757E+01	-1.7318E+02	2.0980E+01	-3.2826E+01	-1.7831E+02	8.49
105	9.750	14.775	-3.6204E+01	-1.6607E+02	2.4226E+01	-3.1832E+01	-1.7045E+02	10.23
106	10.000	14.512	-4.0735E+01	-1.5633E+02	2.2311E+01	-3.5578E+01	-1.6049E+02	10.55
107	10.875	14.775	-4.1235E+01	-1.5260E+02	2.1595E+01	-3.7195E+01	-1.5664E+02	10.60
108	11.525	14.775	-4.3223E+01	-1.4682E+02	1.8486E+01	-4.0120E+01	-1.5002E+02	9.83
109	12.035	14.775	-4.4700E+01	-1.4332E+02	1.4921E+01	-4.2492E+01	-1.4553E+02	8.42
110	12.583	14.775	-4.5263E+01	-1.4319E+02	9.3143E+00	-4.4385E+01	-1.4407E+02	5.39
111	13.046	14.906	-4.7701E+01	-1.4493E+02	-3.9788E+01	-4.7699E+01	-1.4493E+02	-0.23
112	13.875	15.038	-4.7437E+01	-1.7992E+02	1.7988E+01	-4.5582E+01	-1.8177E+02	6.70
113	13.875	14.513	-4.5528E+01	-1.6376E+02	9.7403E+00	-4.4731E+01	-1.6456E+02	4.68
114	15.313	14.513	-7.5515E+01	-1.3333E+02	1.3995E+01	-7.2306E+01	-1.3653E+02	12.92
115	15.938	14.508	-9.8097E+01	-1.3651E+02	1.2825E+01	-9.4209E+01	-1.4040E+02	16.87
116	1.000	15.675	-3.8532E+01	-1.9602E+02	1.5861E+00	-3.8516E+01	-1.9603E+02	0.58
117	3.000	15.675	-3.7262E+01	-1.8488E+02	5.1498E+00	-3.7094E+01	-1.9035E+02	1.87
118	5.000	15.675	-3.4930E+01	-1.9174E+02	9.9491E+00	-3.4301E+01	-1.9237E+02	3.62
119	6.875	15.675	-3.2631E+01	-1.8513E+02	1.5116E+01	-3.0947E+01	-1.8682E+02	5.97
120	8.625	15.675	-3.2484E+01	-1.7274E+02	2.2714E+01	-2.8697E+01	-1.7693E+02	8.97
121	9.750	15.488	-3.6038E+01	-1.6641E+02	2.3749E+01	-3.1817E+01	-1.6963E+02	10.08
122	10.250	15.675	-3.3099E+01	-1.5218E+02	2.7315E+01	-2.7103E+01	-1.5814E+02	12.32
123	10.875	15.675	-3.6701E+01	-1.4754E+02	2.3518E+01	-3.1918E+01	-1.5232E+02	11.50
124	11.525	15.675	-3.6628E+01	-1.3667E+02	2.0693E+01	-3.4444E+01	-1.4286E+02	11.33
125	12.035	15.675	-3.9682E+01	-1.3219E+02	1.6445E+01	-3.6845E+01	-1.3502E+02	9.79
126	12.583	15.675	-3.9676E+01	-1.2527E+02	9.0315E+00	-3.8929E+01	-1.2602E+02	5.31
127	13.018	15.769	-3.3660E+01	-1.1978E+02	8.3971E+00	-3.2750E+01	-1.2059E+02	-5.51
128	13.416	15.863	-1.6004E+02	-3.6450E+02	3.0559E+01	-1.5539E+02	-3.6905E+02	8.40
129	13.688	15.863	-1.7315E+02	-3.3789E+02	2.5059E+01	-1.6941E+02	-3.4163E+02	8.47
130	14.062	15.863	-1.8718E+02	-3.1097E+02	4.0254E+01	-1.7524E+02	-3.2291E+02	16.52
131	14.438	15.863	-1.9623E+02	-3.0227E+02	6.9509E+01	-1.6098E+02	-3.3652E+02	26.22
132	14.813	15.863	-2.1099E+02	-2.8580E+02	1.0615E+02	-1.3585E+02	-3.6094E+02	35.29
133	15.156	15.863	-2.4897E+02	-2.4893E+02	1.3001E+02	-1.1594E+02	-3.7596E+02	45.01
134	15.489	15.863	-2.7399E+02	-1.9302E+02	1.2272E+02	-1.0544E+02	-3.8437E+02	54.49
135	10.000	16.237	-3.2463E+01	-1.4984E+02	2.6783E+01	-2.6566E+01	-1.5586E+02	12.27
136	10.875	16.425	-3.2802E+01	-1.4303E+02	2.6979E+01	-2.6559E+01	-1.4928E+02	13.04
137	11.525	16.425	-3.5257E+01	-1.3116E+02	2.3240E+01	-2.9922E+01	-1.3650E+02	12.93
138	12.035	16.425	-3.7255E+01	-1.2105E+02	1.8058E+01	-3.3529E+01	-1.2478E+02	11.66
139	12.583	16.425	-3.9937E+01	-1.0788E+02	9.2688E+00	-3.8655E+01	-1.0913E+02	7.63
140	12.962	16.519	-4.6631E+01	-1.0075E+02	-7.5259E+01	-4.6671E+01	-1.0075E+02	-0.80
141	13.303	16.612	-1.7653E+02	-3.5995E+02	5.8205E+01	-1.5965E+02	-3.7686E+02	16.20
142	13.688	16.612	-1.9230E+02	-3.4391E+02	6.4114E+01	-1.6894E+02	-3.6827E+02	20.02
143	14.063	16.612	-2.1216E+02	-3.3634E+02	7.4263E+01	-1.7780E+02	-3.7289E+02	24.83
144	14.438	16.612	-2.3978E+02	-3.5659E+02	8.6017E+01	-1.9421E+02	-4.0215E+02	27.91
145	14.813	16.612	-2.7000E+02	-4.1070E+02	1.2278E+02	-1.9884E+02	-4.8186E+02	30.09
146	15.156	16.612	-3.8846E+02	-2.7118E+02	2.4045E+02	-8.2321E+01	-5.7731E+02	51.85
147	15.469	16.612	-2.1862E+02	-3.3988E+01	8.1222E+01	-3.3681E+00	-2.4943E+02	69.34
148	1.000	16.684	-4.0992E+01	-1.9470E+02	1.2220E+00	-4.0982E+01	-1.9471E+02	0.46
149	3.000	16.684	-3.9422E+01	-1.9396E+02	4.0405E+00	-3.9318E+01	-1.9407E+02	1.50
150	5.000	16.684	-3.6170E+01	-1.9175E+02	8.1643E+00	-3.5742E+01	-1.9218E+02	3.00

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
151	8.875	16.884	-3.1847E+01	-1.8636E+02	1.4418E+01	-3.0513E+01	-1.8770E+02	5.29
152	8.825	16.884	-2.8723E+01	-1.7388E+02	2.2277E+01	-2.5381E+01	-1.7723E+02	8.53
153	9.750	16.554	-2.8514E+01	-1.6939E+02	2.7548E+01	-2.3178E+01	-1.7067E+02	10.97
154	10.250	17.059	-2.5250E+01	-1.4833E+02	3.0130E+01	-1.8270E+01	-1.5531E+02	13.04
155	10.875	17.059	-2.9730E+01	-1.4017E+02	2.8539E+01	-2.2832E+01	-1.4711E+02	13.67
156	11.525	17.059	-3.1699E+01	-1.2461E+02	2.8300E+01	-2.1610E+01	-1.3167E+02	14.99
157	12.035	17.059	-3.6435E+01	-1.1180E+02	2.1693E+01	-3.0624E+01	-1.1741E+02	15.00
158	12.583	17.059	-4.1152E+01	-9.6841E+01	1.5297E+01	-3.7227E+01	-1.0077E+02	14.39
159	12.934	16.929	-4.5237E+01	-8.8879E+01	7.6966E+00	-4.4890E+01	-9.0225E+01	9.92
160	13.238	17.059	-1.7045E+02	-3.5740E+02	7.1799E+01	-1.4709E+02	-3.9079E+02	18.05
161	13.688	17.059	-1.7758E+02	-3.5547E+02	7.8532E+01	-1.4786E+02	-3.8518E+02	20.72
162	14.063	17.059	-1.8084E+02	-3.5004E+02	9.5862E+01	-1.4066E+02	-4.0022E+02	23.17
163	14.438	17.059	-1.8230E+02	-3.4379E+02	1.2442E+02	-1.2319E+02	-4.4410E+02	25.42
164	14.813	17.059	-1.7748E+02	-3.4327E+02	1.6777E+02	-1.1219E+02	-6.0856E+02	21.27
165	10.000	17.448	-2.5266E+01	-1.4840E+02	2.9665E+01	-1.8492E+01	-1.5517E+02	12.86
166	10.875	17.575	-2.6807E+01	-1.3799E+02	3.2509E+01	-1.8000E+01	-1.4680E+02	15.16
167	11.525	17.575	-3.1402E+01	-1.1979E+02	2.9712E+01	-2.2349E+01	-1.2685E+02	16.96
168	12.035	17.575	-3.4889E+01	-1.0519E+02	2.5566E+01	-2.6575E+01	-1.1351E+02	18.01
169	12.544	17.575	-3.9136E+01	-9.0239E+01	1.9939E+01	-3.2277E+01	-9.7094E+01	18.98
170	12.856	17.575	-1.6136E+02	-3.8167E+02	8.0945E+01	-1.3486E+02	-4.0819E+02	18.15
171	13.198	17.575	-1.6098E+02	-3.6983E+02	7.2703E+01	-1.3814E+02	-3.9264E+02	17.42
172	13.668	17.575	-1.5071E+02	-3.6069E+02	7.0113E+01	-1.2945E+02	-3.8195E+02	16.87
173	14.063	17.575	-1.2761E+02	-3.7573E+02	7.1089E+01	-1.0869E+02	-3.6467E+02	14.91
174	14.438	17.575	-8.4262E+01	-4.1260E+02	7.1797E+01	-6.9249E+01	-4.2762E+02	11.81
175	14.813	17.575	-2.9864E+00	-3.8823E+02	2.2158E+01	-1.7162E+00	-3.8950E+02	3.28
176	1.000	17.833	-4.4731E+01	-1.9280E+02	7.6178E+01	-4.4727E+01	-1.9280E+02	0.29
177	3.000	17.833	-4.3073E+01	-1.9247E+02	2.5539E+00	-4.3032E+01	-1.9252E+02	0.98
178	5.000	17.833	-3.9300E+01	-1.9134E+02	5.4140E+00	-3.9107E+01	-1.9153E+02	2.04
179	6.875	17.833	-3.3178E+01	-1.8811E+02	1.0558E+01	-3.2462E+01	-1.8882E+02	3.88
180	8.625	17.833	-2.6066E+01	-1.7682E+02	2.0036E+01	-2.3448E+01	-1.7944E+02	7.44
181	9.750	17.704	-2.2783E+01	-1.6793E+02	2.8115E+01	-1.7529E+01	-1.7321E+02	10.59
182	10.250	18.092	-1.8685E+01	-1.5052E+02	3.1304E+01	-1.1633E+01	-1.5758E+02	12.70
183	10.875	18.092	-2.3777E+01	-1.3774E+02	3.4844E+01	-1.3968E+01	-1.4755E+02	15.72
184	11.525	18.092	-2.8281E+01	-1.1461E+02	3.4103E+01	-1.6434E+01	-1.2645E+02	19.16
185	12.035	18.092	-3.3554E+01	-9.9014E+01	2.8925E+01	-2.2605E+01	-1.0996E+02	20.73
186	12.466	18.092	-3.5893E+01	-8.5185E+01	2.4508E+01	-2.5781E+01	-9.5297E+01	22.42
187	12.779	18.092	-1.5640E+02	-3.7579E+02	7.9877E+01	-1.3040E+02	-4.0179E+02	18.03
188	13.198	18.092	-1.5389E+02	-3.5479E+02	6.4823E+01	-1.13479E+02	-3.7389E+02	16.42
189	13.688	18.092	-1.3369E+02	-3.4519E+02	3.9948E+01	-1.2640E+02	-3.5248E+02	10.35
190	14.063	18.092	-1.0409E+02	-3.5966E+02	1.9317E+01	-1.0264E+02	-3.631E+02	4.29
191	14.438	18.092	-6.0295E+01	-3.7472E+02	9.6969E+00	-5.996E+01	-3.7502E+02	-1.76
192	14.813	18.092	-2.1985E+01	-3.6899E+02	2.1804E+01	-2.0820E+01	-3.7035E+02	-3.58
193	1.000	18.875	-4.9145E+01	-1.9059E+02	3.7924E+01	-4.9144E+01	-1.9059E+02	0.15
194	3.000	18.875	-4.7763E+01	-1.9049E+02	4.2745E+00	-4.7751E+01	-1.9050E+02	0.51
195	5.000	18.875	-4.4435E+01	-1.9012E+02	2.7629E+00	-4.4383E+01	-1.9017E+02	1.09
196	6.875	18.875	-3.8261E+01	-1.8865E+02	5.8801E+00	-3.831E+01	-1.8868E+02	2.24
197	8.625	18.875	-2.6098E+01	-1.8253E+02	1.4072E+01	-2.6826E+01	-1.8381E+02	5.16
198	10.000	18.875	-1.8266E+01	-1.6524E+02	2.7136E+01	-1.3416E+01	-1.7009E+02	10.13
199	10.875	18.875	-1.5096E+01	-1.3792E+02	3.9770E+01	-4.0784E+00	-1.4974E+02	18.55
200	11.525	18.875	-2.0994E+01	-1.0979E+02	4.1549E+01	-4.5955E+00	-1.2820E+02	21.55

 MATERIAL DATA

 ELEMENT STRESS
 STEP NO. = 1

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
201	12.035	18.875	-2.5598E+01	-8.4095E+01	3.7505E+01	-7.2812E+00	-1.0241E+02	26.02
202	12.349	18.613	-3.0895E+01	-7.2722E+01	2.4511E+01	-1.9588E+01	-8.4029E+01	24.76
203	12.736	18.813	-1.4719E+02	-3.5054E+02	7.8253E+01	-1.2056E+02	-3.7717E+02	18.79
204	13.324	18.725	-1.3995E+02	-3.0425E+02	3.6761E+01	-1.3210E+02	-3.1210E+02	12.05
205	13.781	18.675	-1.2374E+02	-3.0745E+02	2.3848E+00	-1.2371E+02	-3.0748E+02	0.74
206	14.144	18.625	-1.0754E+02	-3.1837E+02	-2.6833E+01	-1.0418E+02	-3.2173E+02	-7.14
207	14.501	18.577	-8.7303E+01	-3.3917E+02	-5.8611E+01	-7.4331E+01	-3.5214E+02	-12.48
208	14.849	18.533	-4.8068E+01	-3.9419E+02	-7.9171E+01	-3.0816E+01	-4.1144E+02	-12.29
209	1.000	19.750	-5.3379E+01	-1.8847E+02	1.3091E+01	-5.3379E+01	-1.8847E+02	0.06
210	3.000	19.750	-5.2428E+01	-1.8848E+02	4.4809E-01	-5.2428E+01	-1.8848E+02	0.19
211	5.000	19.750	-5.0128E+01	-1.8841E+02	9.3001E-01	-5.0122E+01	-1.8841E+02	0.39
212	5.875	19.750	-4.5500E+01	-1.8818E+02	2.1559E+00	-4.5468E+01	-1.8822E+02	0.87
213	8.625	19.750	-3.5511E+01	-1.8580E+02	6.4456E+00	-3.5235E+01	-1.8607E+02	2.45
214	10.000	19.750	-1.9298E+01	-1.7691E+02	1.9322E+01	-1.7197E+01	-1.7501E+02	6.54
215	10.875	19.750	-5.0593E+00	-1.4992E+02	3.9938E+01	5.2221E+00	-1.6020E+02	14.44
216	11.525	19.750	-7.8177E+00	-1.0516E+02	5.9333E+01	1.6084E+01	-1.2908E+02	23.94
217	11.983	19.750	-1.6969E+01	-7.1613E+01	4.3147E+01	6.7794E+00	-9.5362E+01	28.83
218	12.470	20.075	-1.0519E+02	-2.8980E+02	6.3258E+01	-8.5597E+01	-3.0939E+02	17.21
219	13.030	19.675	-1.1360E+02	-2.5053E+02	3.4842E+01	-1.0925E+02	-2.5888E+02	13.49
220	13.625	19.438	-1.1214E+02	-2.4651E+02	-5.2500E+00	-1.1193E+02	-2.4872E+02	-2.23
221	14.017	19.278	-1.1329E+02	-2.5896E+02	-3.0198E+01	-1.0727E+02	-2.5697E+02	-11.26
222	14.344	19.141	-1.1583E+02	-2.7506E+02	-5.4107E+01	-9.9180E+01	-2.9170E+02	-17.10
223	14.655	19.012	-1.1627E+02	-3.0353E+02	-8.5604E+01	-8.2902E+01	-3.3690E+02	-21.25
224	14.956	18.866	-1.0294E+02	-3.7545E+02	-1.3876E+02	-4.4719E+01	-4.3367E+02	-22.76
225	1.000	20.500	-5.7331E+01	-1.8849E+02	1.0218E+02	-5.7331E+01	-1.8849E+02	0.00
226	3.000	20.500	-5.8893E+01	-1.8649E+02	2.2116E+02	-5.8893E+01	-1.8649E+02	0.01
227	5.000	20.500	-5.5826E+01	-1.8647E+02	8.6012E+02	-5.5825E+01	-1.8647E+02	0.04
228	6.875	20.500	-5.4151E+01	-1.8656E+02	9.3748E+02	-5.4151E+01	-1.8656E+02	0.04
229	8.625	20.500	-4.8334E+01	-1.8596E+02	1.0575E+00	-4.8334E+01	-1.8597E+02	0.46
230	10.000	20.500	-3.9036E+01	-1.8374E+02	5.1573E+00	-3.8853E+01	-1.8392E+02	2.04
231	10.875	20.500	-1.7819E+01	-1.7507E+02	1.7974E+01	-1.5593E+01	-1.7709E+02	6.43
232	11.525	20.500	2.1320E+01	-1.1855E+02	5.7658E+01	4.2023E+01	-1.3928E+02	19.75
233	11.870	20.500	1.6319E+01	-4.7264E+01	6.1545E+01	5.3799E+01	-8.4744E+01	31.34
234	12.110	20.413	2.4190E+01	-2.8812E+02	4.3993E+01	3.0269E+01	-2.9419E+02	7.87
235	12.392	20.725	5.3123E+01	-2.9933E+02	6.4958E+01	6.4979E+01	-3.0279E+02	10.34
236	13.000	20.850	6.9688E+01	-1.8208E+02	-7.0017E+00	7.0622E+01	-1.8227E+02	-1.59
237	13.613	20.388	-1.3975E+01	-1.8570E+02	-5.6376E+00	-1.3990E+01	-1.8588E+02	-1.88
238	14.037	20.051	-5.9421E+01	-2.1293E+02	-3.2430E+01	-5.2855E+01	-2.1840E+02	-11.45
239	14.361	19.797	-8.5357E+01	-2.2525E+02	-4.9016E+01	-6.9893E+01	-2.4071E+02	-17.51
240	14.927	19.595	-1.0247E+02	-2.4267E+02	-7.1231E+01	-7.2635E+01	-2.7251E+02	-22.73
241	14.863	19.399	-1.2102E+02	-2.6375E+02	-1.0183E+02	-6.8037E+01	-3.1674E+02	-27.49
242	15.139	19.203	-1.5410E+02	-2.9409E+02	-1.7011E+02	-4.0142E+01	-4.0804E+02	-33.82
243	14.069	20.800	7.0953E+01	-2.0899E+02	-3.3222E+01	7.4516E+01	-2.1266E+02	-6.74
244	14.575	20.528	-1.1155E+01	-1.8740E+02	-2.7310E+01	-6.9605E+00	-2.19153E+02	-8.61
245	14.809	20.228	-6.2690E+01	-2.0344E+02	-6.3344E+01	-3.8442E+01	-2.2759E+02	-20.98
246	15.005	19.972	-8.8544E+01	-2.1077E+02	-8.4712E+01	-4.5266E+01	-2.5419E+02	-27.14
247	15.201	19.717	-1.1796E+02	-2.1857E+02	-1.1165E+02	-4.4314E+01	-2.8722E+02	-33.41
248	15.399	19.461	-1.7916E+02	-2.1542E+02	-1.5482E+02	-2.9389E+01	-3.3879E+02	-44.09
249	15.024	20.815	-4.9623E+01	-1.8687E+02	-3.7041E+01	-4.0171E+01	-1.9622E+02	-14.17
250	15.339	20.559	-7.7755E+01	-1.6331E+02	-4.6515E+01	-6.0183E+01	-2.0988E+02	-20.70

EL. NO.	X	Y	X-STRESS	Y-STRESS	XY-STRESS	MAX-STRESS	MIN-STRESS	ANGLE
251	15.467	20.239	-1.0527E+02	-1.7892E+02	-7.9475E+01	-5.3890E+01	-2.2820E+02	-32.88
252	15.591	19.941	-1.2954E+02	-1.5264E+02	-9.7991E+01	-4.2420E+01	-2.3976E+02	-41.64
253	15.714	19.644	-1.7097E+02	-9.5757E+01	-1.0415E+02	-2.2629E+01	-2.4410E+02	-54.93
254	15.935	20.719	-1.5244E+02	-1.7640E+02	-1.8148E+01	-1.4289E+02	-1.8620E+02	-28.51
255	15.983	20.377	-1.3714E+02	-1.5056E+02	-3.4338E+01	-1.0886E+02	-1.7884E+02	-39.47
256	16.025	20.058	-1.4992E+02	-1.0448E+02	-4.0861E+01	-8.0428E+01	-1.7395E+02	-58.54
257	16.067	19.738	-1.5358E+02	-4.8023E+01	-3.6355E+01	-3.0094E+02	-1.6429E+02	-73.59
258	14.825	14.513	-5.8015E+01	-1.5457E+02	-1.7505E+01	-5.4933E+01	-1.5765E+02	9.97
259	14.825	15.038	-6.1217E+01	-1.5701E+02	2.6432E+01	-5.4393E+01	-1.5383E+02	14.45
260	13.259	16.237	-1.7278E+02	-3.5411E+02	4.6141E+01	-1.6171E+02	-3.6555E+02	13.46
261	13.898	16.237	-1.8706E+02	-3.4016E+02	4.5023E+01	-1.7480E+02	-3.5242E+02	15.23
262	14.053	16.237	-2.0615E+02	-3.2806E+02	5.3174E+01	-1.8622E+02	-3.4799E+02	20.55
263	14.439	16.237	-2.1715E+02	-3.3502E+02	7.2690E+01	-1.8251E+02	-3.6967E+02	25.48
264	14.813	16.237	-2.1863E+02	-3.3270E+02	1.1905E+02	-1.4366E+02	-4.0767E+02	32.20
265	15.155	16.237	-2.2777E+02	-2.5970E+02	1.7437E+02	-8.8636E+01	-4.1883E+02	42.38
266	15.459	16.237	-2.7578E+02	-1.5065E+02	1.5598E+02	-4.5464E+01	-3.8196E+02	56.01
267	15.781	16.237	-2.5671E+02	-7.6611E+01	8.3703E+01	-4.3713E+01	-2.8961E+02	68.54
268	16.094	16.237	-2.4159E+02	-5.8304E+01	2.6259E+01	-5.4615E+01	-2.4528E+02	82.01
269	15.781	15.863	-3.0642E+02	-1.4935E+02	8.4570E+01	-1.2248E+02	-3.4330E+02	66.44
270	16.094	15.863	-3.1430E+02	-1.2660E+02	2.9005E+01	-1.2222E+02	-3.1868E+02	81.41
271	13.444	15.581	-1.5503E+02	-4.0293E+02	4.2282E+01	-1.4800E+02	-4.0941E+02	9.44
272	13.688	15.488	-1.3893E+02	-3.4395E+02	1.0641E+01	-1.3755E+02	-3.4435E+02	2.95
273	14.063	15.488	-1.4573E+02	-2.8637E+02	3.4055E+01	-1.3792E+02	-2.9418E+02	12.92
274	14.438	15.488	-1.6468E+02	-2.7726E+02	5.0697E+01	-1.4512E+02	-2.9671E+02	20.99
275	14.813	15.488	-2.0966E+02	-2.6295E+02	6.8171E+01	-1.6333E+02	-3.0961E+02	34.38
276	15.156	15.488	-2.5784E+02	-2.3872E+02	7.8683E+01	-1.6893E+02	-3.2743E+02	48.43
277	15.468	15.488	-3.1565E+02	-2.1744E+02	7.4967E+01	-1.7690E+02	-3.5608E+02	61.60
278	15.781	15.488	-3.5615E+02	-1.9475E+02	5.1458E+01	-1.7975E+02	-3.7116E+02	73.74
279	16.094	15.488	-3.8070E+02	-1.8595E+02	2.2430E+01	-1.8340E+02	-3.8325E+02	83.51
280	13.001	16.706	-4.5325E+01	-8.5232E+01	7.0576E+00	-4.4145E+01	-8.6443E+01	9.74
281	13.123	16.237	-4.2084E+01	-9.1169E+01	-6.1177E+00	-4.1333E+01	-9.1920E+01	-7.00
282	13.113	15.956	-4.2583E+01	-9.3166E+01	-7.8229E+00	-4.1401E+01	-9.4348E+01	-8.59
283	13.292	15.488	-2.6165E+01	-1.0380E+02	-1.4490E+01	-2.3549E+01	-1.0642E+02	-10.23
284	13.198	15.169	-4.2723E+01	-1.7003E+02	-4.9575E+00	-4.2574E+01	-1.7018E+02	-1.98
285	13.594	15.169	-4.7808E+01	-1.7131E+02	1.1634E+01	-4.6722E+01	-1.7239E+02	5.34
286	14.063	15.169	-5.1143E+01	-1.6424E+02	2.2910E+01	-4.6678E+01	-1.6870E+02	11.03
287	14.344	15.169	-5.7684E+01	-1.6587E+02	3.0266E+01	-4.9793E+01	-1.7376E+02	14.61
288	14.813	15.169	-6.5759E+01	-1.3964E+02	3.4276E+01	-5.2315E+01	-1.5309E+02	21.43
289	15.078	15.169	-7.9541E+01	-1.4308E+02	3.5733E+01	-6.3498E+01	-1.5913E+02	24.18
290	15.313	15.038	-8.1132E+01	-1.2949E+02	2.1336E+01	-6.8669E+01	-1.4195E+02	24.36
291	15.469	15.169	-9.1473E+01	-1.2173E+02	3.1579E+01	-7.1585E+01	-1.4162E+02	32.20
292	15.703	15.169	-1.0342E+02	-1.2471E+02	2.2963E+01	-8.8758E+01	-1.3998E+02	32.56
293	15.938	15.033	-8.9329E+01	-1.1270E+02	1.4622E+01	-8.2296E+01	-1.1973E+02	25.68
294	16.084	15.164	-1.0984E+02	-1.2224E+02	7.3864E+00	-1.0640E+02	-1.2569E+02	24.99
295	15.781	16.612	-1.3818E+02	-1.9532E+01	3.4275E+01	-1.4737E+02	-1.4737E+02	74.99
296	16.094	16.612	-1.0363E+02	-1.1639E+01	9.9017E+00	-1.0586E+01	-1.0469E+02	83.93
297	13.198	14.381	-4.6644E+01	-1.6458E+02	3.8993E+00	-4.6719E+01	-1.6471E+02	1.87

Fig. 5.3.11.

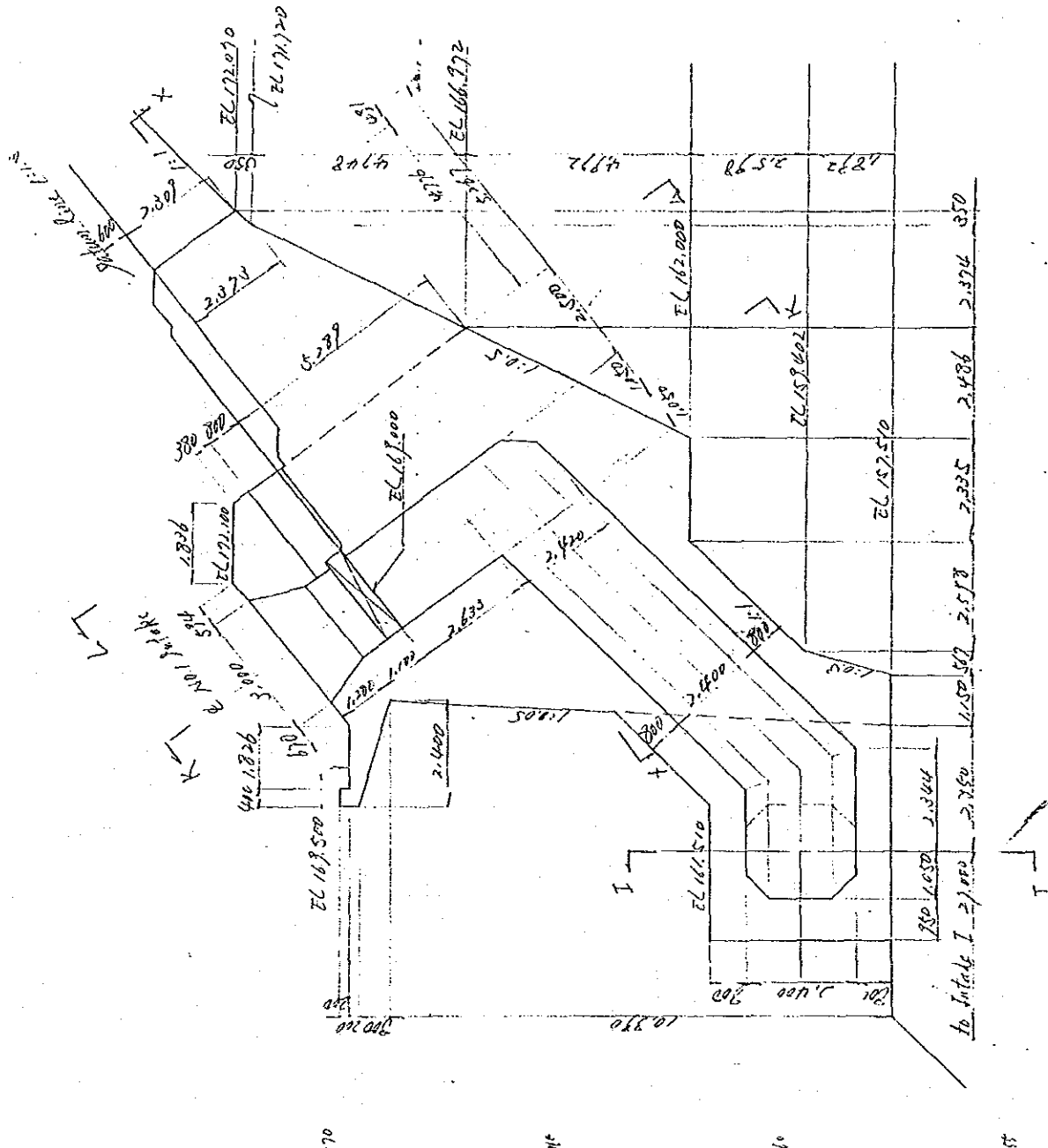


Fig. 5.3.12

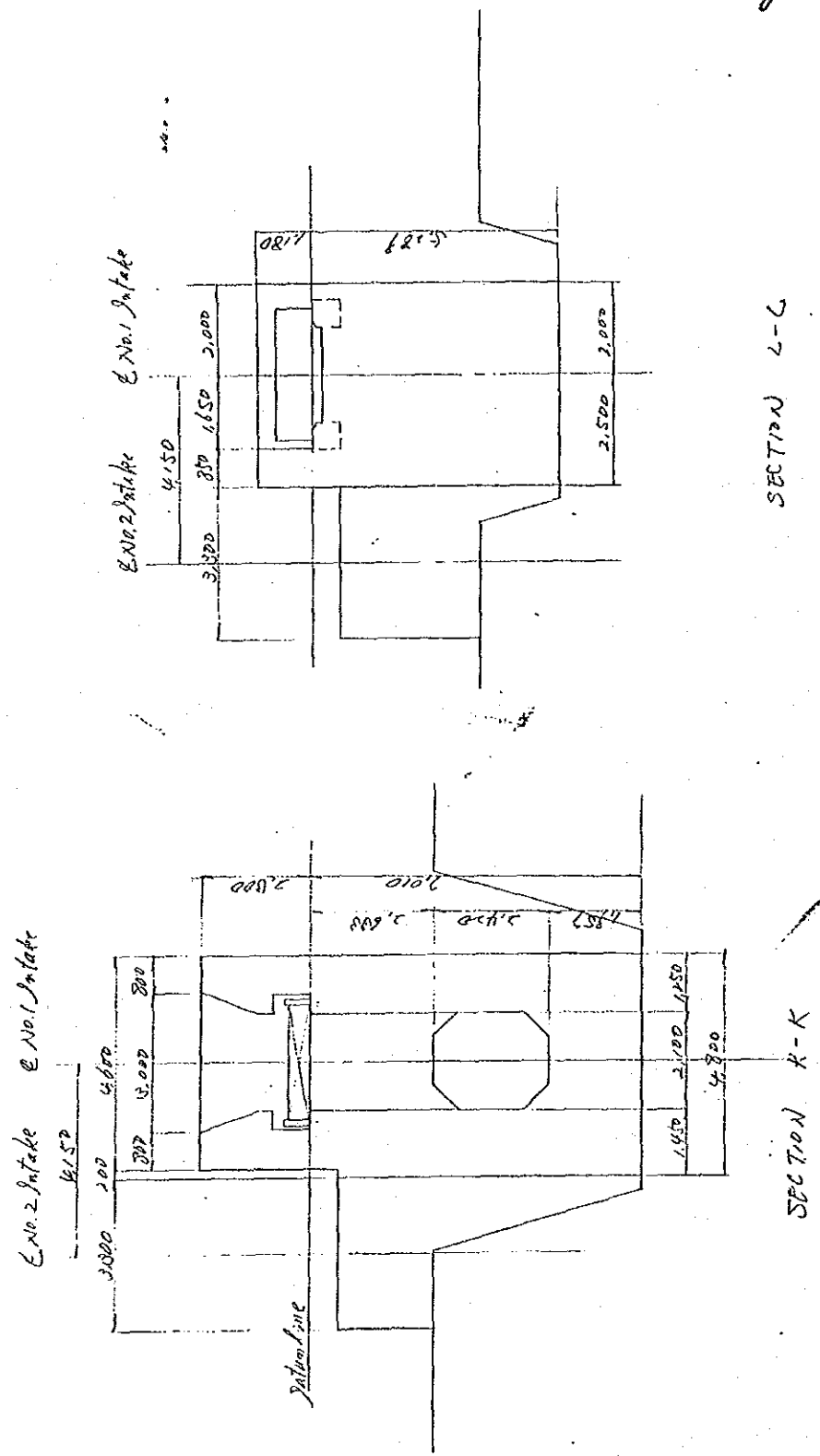
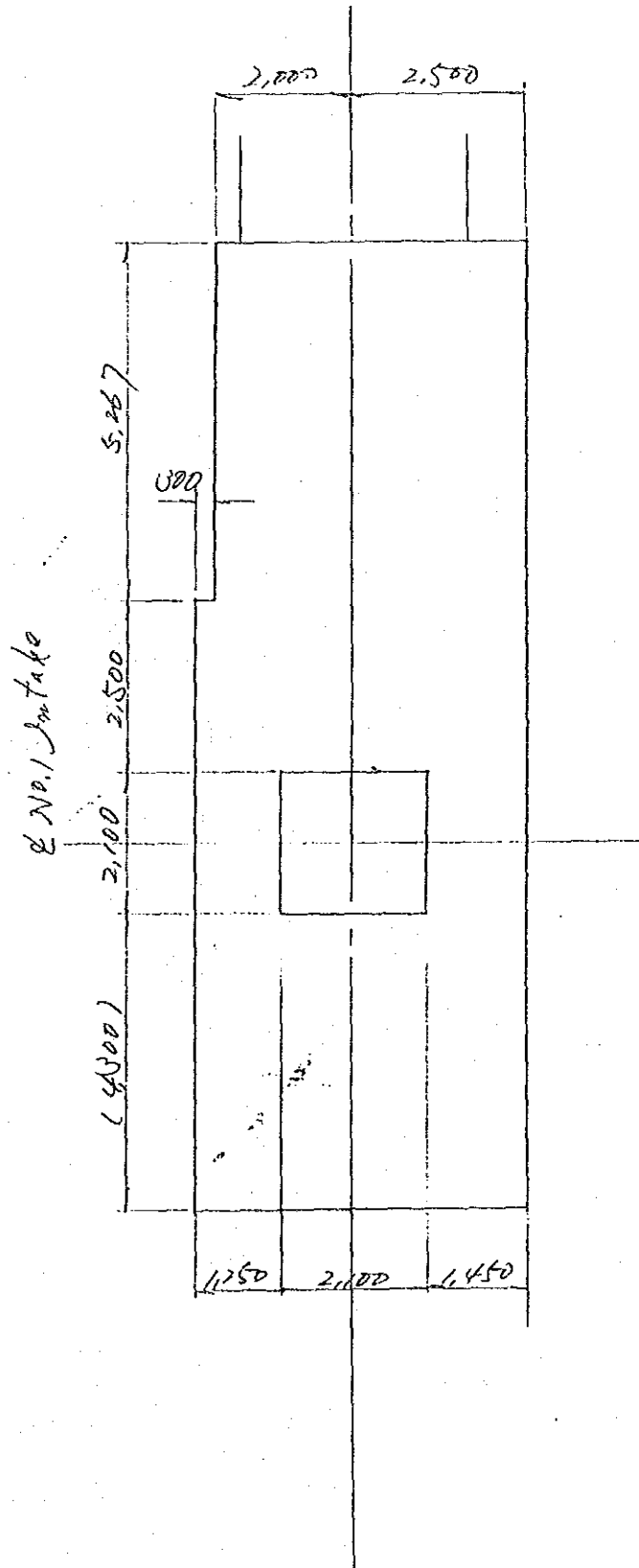
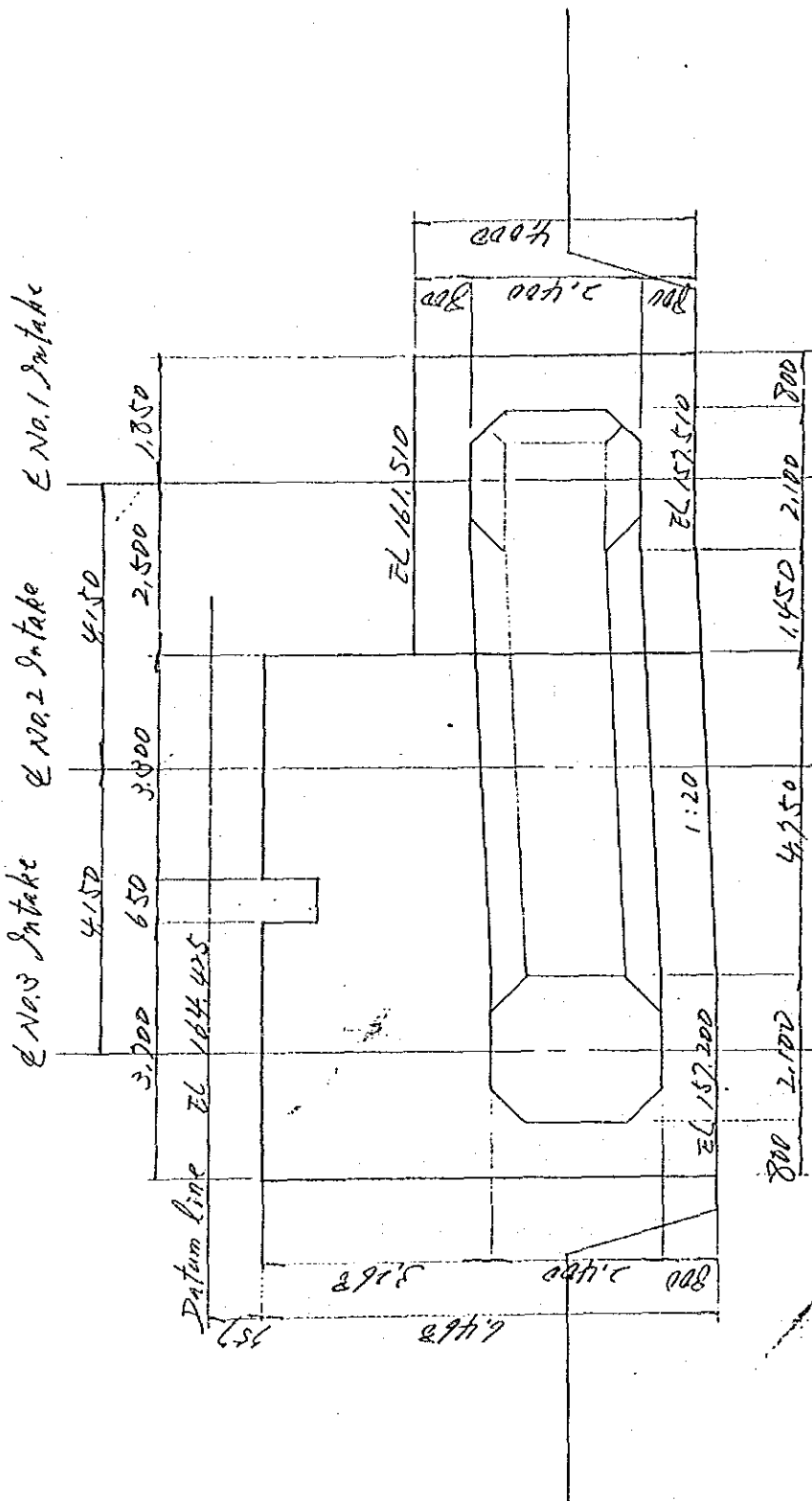


Fig. 5.3.13



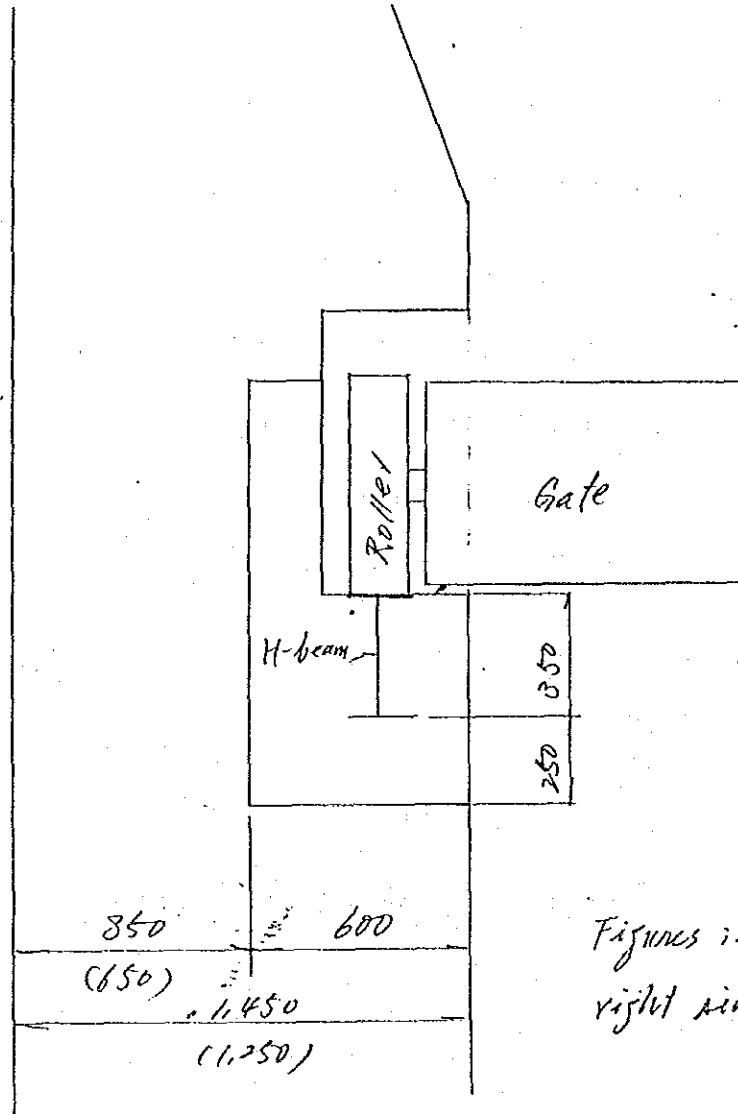
SECTIONAL PLAN X-X

Fig. 5.3.14.



SECTION I-I (Vertical)

Fig. 5.3.15



Figures in () is
right side

Gate support

Fig. 5.3.10

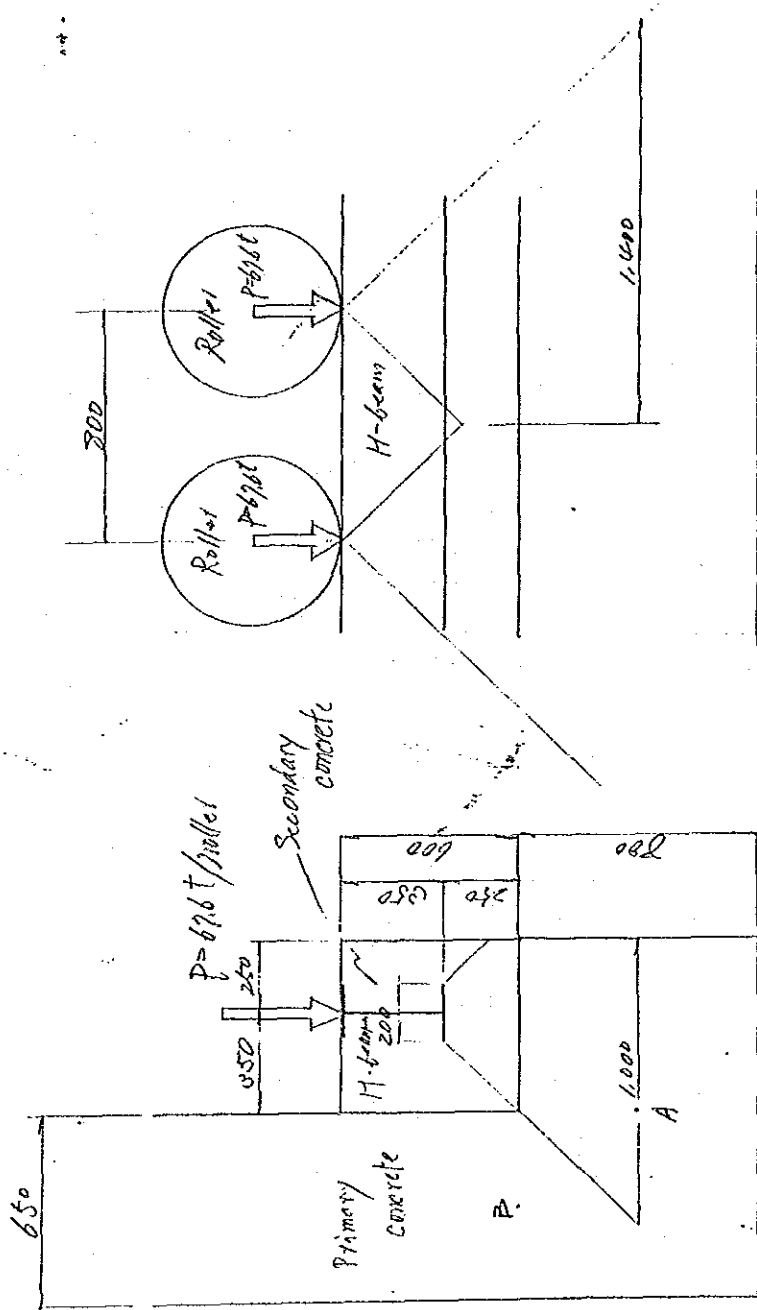


Table 5.1.3 AVERAGE SHEAR STRESS

	Line	Average Shear Stress (kg/cm ²)
Local case 1	④	$(2.3 + 4.3 + 4.6 + 2.4)/4 = 3.4$
	⑤	$(12.5 + 10.5 + 9.4 + 5.8)/4$
	⑥	$(-15.2 + 10.5 + 8.7 + 5.7 + 4.4)/5 = 2.8$
	⑦	$(5.7 + 4.8 + 2.6 + 0.8 - 1.5 - 2.4)/6 = 16.6$
	⑧	$(3.4 + 3.2 + 4.0 + 6.6 + 11.2)/5 = 5.7$
	⑨	$(19.0 + 14.9 + 11.4 + 7.0)/4 = 13.1$
	⑩	$(0.7 + 2.1 + 2.5 + 1.9)/4 = 1.8$
Local case 2	④	$(18.3 + 3.4 + 4.1 + 3.6)/4 = 3.2$
	⑤	$(15.4 + 11.1 + 7.9 + 4.7) = 9.8$
	⑥	$(-17.0 + 11.1 + 8.5 + 4.7 + 3.7)/5 = 2.2$
	⑦	$(8.0 + 6.5 + 4.0 + 2.0 - 1.0 - 2.2)/6 = 2.9$
	⑧	$(7.2 + 7.9 + 9.4 + 12.4 + 16.8)/5 = 10.7$
	⑨	$(24.0 + 17.4 + 13.0 + 7.9)/4 = 15.6$
	⑩	$(1.0 + 2.6 + 2.9 + 2.2)/4 = 2.2$

Table 5.3.1 Calculation of Internal Stress in Reinforced Concrete

Structure : Side wall of No. V Intake

Load condition	Member	Spot	Internal force				Sectional dimension					$M = M + N \cdot u$ (t.m)	$\frac{M'}{b \cdot d^2}$ (kg/cm ²)	$\frac{Q}{b \cdot d}$ (kg/cm ²)	
			Direction	M (t.m)	Q (t)	N (t)	b (cm)	h (cm)	u (cm)	d (cm)	d' (cm)				$\frac{d'}{d}$
	fixed beam End			26.1	74.6	-	170	145	-	105					

$f = \frac{M}{N} + u$	$\frac{f}{d}$	Sectional area of reinforcing bar		$\frac{A_s'}{A_s}$	n-p $= \frac{n \cdot A_s}{b \cdot d}$	Coeff. from Nomogram			Stress (kg/cm ²)				
		A_s (cm ²)	A_s' (cm ²)			C	S	Z = j	$\sigma_c = C \frac{M'}{b \cdot d^2}$	$\sigma_s = n \cdot S \frac{M'}{b \cdot d^2}$	$\tau = Z \frac{Q}{b \cdot d}$		
		322 @ 200 = 19835								j = 7/8	16.3	1.066	6.0

$n = \frac{E_s}{E_c} = 15$, Allowable stress : $\sigma_{ca} = 60 \times 1.3$ kg/cm², $\sigma_{sa} = 1800 \times 1.3$ kg/cm², $\tau_a = 8.0 \times 1.3$ kg/cm²
 $\tau_a = 2.340 = 10.4$
 For allowable stresses not specified herein, refer to

Table 5.3.2 Calculation of Internal Stress in Reinforced Concrete

Structure : Rigid side wall of No. 2 Intake

Load condition	Member	Internal force			Sectional dimension					$\frac{d'}{d}$	$M' = M + N \cdot u$ (t.m)	$\frac{M'}{b \cdot d^2}$ (kg/cm ²)	$\frac{Q}{b \cdot d}$ (kg/cm ²)
		Spot	M (t.m)	Q (t)	N (t)	b (cm)	h (cm)	a (cm)	d (cm)				
	Fixed beam End		21.3	60.9	-	100	125	-	115				

$f = \frac{M + u}{N}$	$\frac{f}{d}$	Sectional area of reinforcing bar		$\frac{A_s'}{A_s}$	n.p $= \frac{n \cdot A_s}{b \cdot d}$	Coeff. from Nomogram			Stress (kg/cm ²)			
		A_s (cm ²)	A_s' (cm ²)			C	S	Z = $\frac{1}{\gamma}$	$\sigma_c = C \frac{M'}{b \cdot d^2}$	$\sigma_s = n \cdot S \frac{M'}{b \cdot d^2}$	$\tau = Z \cdot \frac{Q}{b \cdot d}$	
		277 @ 20 = 11085								17.1	1027	6.0

$n = \frac{E_s}{E_c} = 15$, Allowable stress : $\sigma_{ca} = 60 \times 13 = 780$ kg/cm², $\sigma_{sa} = 1800 \times 13 = 23400$ kg/cm², $\tau_a = 10.4$

For allowable stresses not specified herein, refer to

Table 5.3.3 Calculation of Internal Stress in Reinforced Concrete

Structure : Gate Support of No. 2 Intake

Load condition	Member	Spot	Internal force				Sectional dimension					$\frac{d'}{d}$	$M' = M + N \cdot u$ (t.m)	$\frac{M'}{b \cdot d^2}$ (kg/cm ²)	$\frac{Q}{b \cdot d}$ (kg/cm ²)	
			Dirac-tion	M (t.m)	Q (t)	N (t)	b (cm)	h (cm)	u (cm)	d (cm)	d' (cm)					
	Center	A		17.5	50.3	-	180	80	-	70	-					
	Wall	B	0.96	33.9	-	-51.6	100	65		55	10					

$f = \frac{M}{N} + u$	$\frac{j}{d}$	Sectional area of reinforcing bar		$\frac{A_s'}{A_s}$	n-p $= \frac{n \cdot A_s}{b \cdot d}$	Coeff. from Nomogram			Stress (kg/cm ²)			
		A_s (cm ²)	A_s' (cm ²)			C	S	Z = $\frac{j}{j}$	$\sigma_c = C \frac{M'}{b \cdot d^2}$	$\sigma_s = n \cdot S \frac{M'}{b \cdot d^2}$	$\tau = Z \cdot \frac{Q}{b \cdot d}$	
		$25 \text{ @ } 100 = 25.335$							$j = 0.875$	28	1,088	8.2
		$25 \text{ @ } 100 = 50.670$	$25 \text{ @ } 100 = 50.670$						"	47	1,919	-

$n = \frac{E_s}{E_c} = 15$, Allowable stress : $\sigma_{ca} = 60 \times 13$ kg/cm², $\sigma_{sa} = 1,800 \times 1.3$ kg/cm², $\tau_a = 20 \times 1.3 = 26$ kg/cm²
 $\tau_a = 2,340 = 10.4$

For allowable stresses not specified herein, refer to

Table 5.3.6 Calculation of Internal Stress in Reinforced Concrete

Structure : Side wall of No. 1 intake

Load condition	Member	Spot	Internal force				Sectional dimension					$\frac{d'}{d}$	$M = M + N \cdot u$ (t.m)	$\frac{M'}{b \cdot d^2}$ (kg/cm ²)	$\frac{Q}{b \cdot d}$ (kg/cm ²)	
			Direction	M (t.m)	Q (t)	N (t)	b (cm)	h (cm)	u (cm)	d (cm)	d' (cm)					
	Fixed beam	End		15.8	45.2	-	180	125	-	115						

$f = \frac{M}{N} + u$	$\frac{f}{d}$	Sectional area of reinforcing bar		$\frac{A_s'}{A_s}$	n.p $= \frac{n \cdot A_s}{b \cdot d}$	Coeff. from Nomogram			Stress (kg/cm ²)			
		A_s (cm ²)	A_s' (cm ²)			C	S	Z = $\frac{1}{\gamma}$	$\sigma_c = C \frac{M'}{b \cdot d^2}$	$\sigma_s = nS \frac{M'}{b \cdot d^2}$	$\tau = Z \cdot \frac{Q}{b \cdot d}$	
		$2 \times 26 \times 200 = 19,335$						$\gamma = 0.875$		12.7	762	45

$n = \frac{E_s}{E_c} = 15$, Allowable stress : $\sigma_{ca} = 1021.3$ kg/cm², $\sigma_{sa} = 1800 \times 1.3$ kg/cm², $\tau_a = 7.740$ kg/cm², $\tau_a = 10.4$ kg/cm²

For allowable stresses not specified herein, refer to

Table 5.3.7 Calculation of Internal Stress in Reinforced Concrete

Structure : Connection part of conduit

Load condition	Member	Spot	Internal force				Sectional dimension				$\frac{d'}{d}$	$M' = M + N \cdot u$ (t.m)	$\frac{M'}{b \cdot d^2}$ (kg/cm ²)	$\frac{Q}{b \cdot d}$ (kg/cm ²)	
			Direc- tion	M (t.m)	Q (t)	N (t)	b (cm)	h (cm)	u (cm)	d (cm)					d' (cm)
	Fixed base	End		2/18	62.0	-	100	80	-	70					

$f = \frac{M}{N} + u$	$\frac{f}{d}$	Sectional area of reinforcing bar		$\frac{A_s'}{A_s}$	n.p $= \frac{n \cdot A_s}{b \cdot d}$	Coeff. from Nomogram			Stress (kg/cm ²)			
		A_s (cm ²)	A_s' (cm ²)			C	S	Z = $\frac{1}{\rho}$	$\sigma_c = C \frac{M'}{b \cdot d^2}$	$\sigma_s = n \cdot S \frac{M'}{b \cdot d^2}$	$\tau = Z \cdot \frac{Q}{b \cdot d}$	
		220.209 = 19,335								39	1147	10.1

$n = \frac{E_s}{E_c} = 15$. Allowable stress : $\sigma_{ca} = 1800 \times 13$ kg/cm² , $\sigma_{sa} = 2,340$ kg/cm² , $\tau_a = 10.4$ kg/cm²

For allowable stresses not specified herein, refer to

Table 5.3.5 Calculation of Internal Stress in Reinforced Concrete

Structure : Platform

Load condition	Member	Spot	Internal force				Sectional dimension				$\frac{d'}{d}$	$M = M + N \cdot u$ (t.m)	$\frac{M'}{b \cdot d^2}$ (kg/cm ²)	$\frac{Q}{b \cdot d}$ (kg/cm ²)	
			Direction	M (t.m)	Q (t)	N (t)	b (cm)	h (cm)	u (cm)	d (cm)					d' (cm)
		Top		4.25	4.25	-	100	100	-	90					

$f = \frac{M}{N} + u$	Sectional area of reinforcing bar		$\frac{As'}{As}$	n.p $= \frac{n \cdot As}{b \cdot d}$	Coeff. from Nomogram			Stress (kg/cm ²)		
	$\frac{f}{d}$	$\frac{As}{(cm^2)}$			As' (cm ²)	C	S	Z = $\frac{1}{j}$	$\sigma_c = C \frac{M'}{b \cdot d^2}$	$\sigma_s = n \cdot S \frac{M'}{b \cdot d^2}$
		119 @ 200 = 14325						6.0	350	0.5

$n = \frac{E_s}{E_c} = 15$; Allowable stress : $\sigma_{ca} = 60$ kg/cm² , $\sigma_{sa} = 11300$ kg/cm² , $\tau_a = 4.0$ kg/cm²

For allowable stresses not specified herein, refer to

Fill elevation 215.0m

F.W.L 212.5m

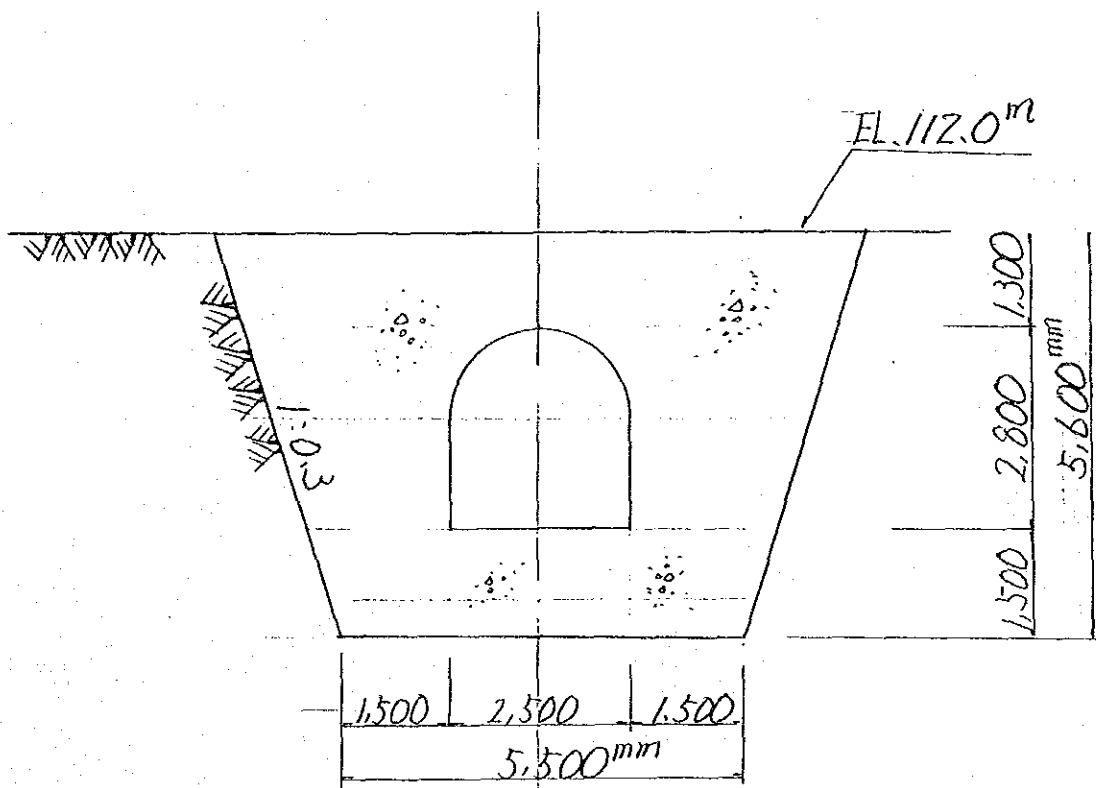
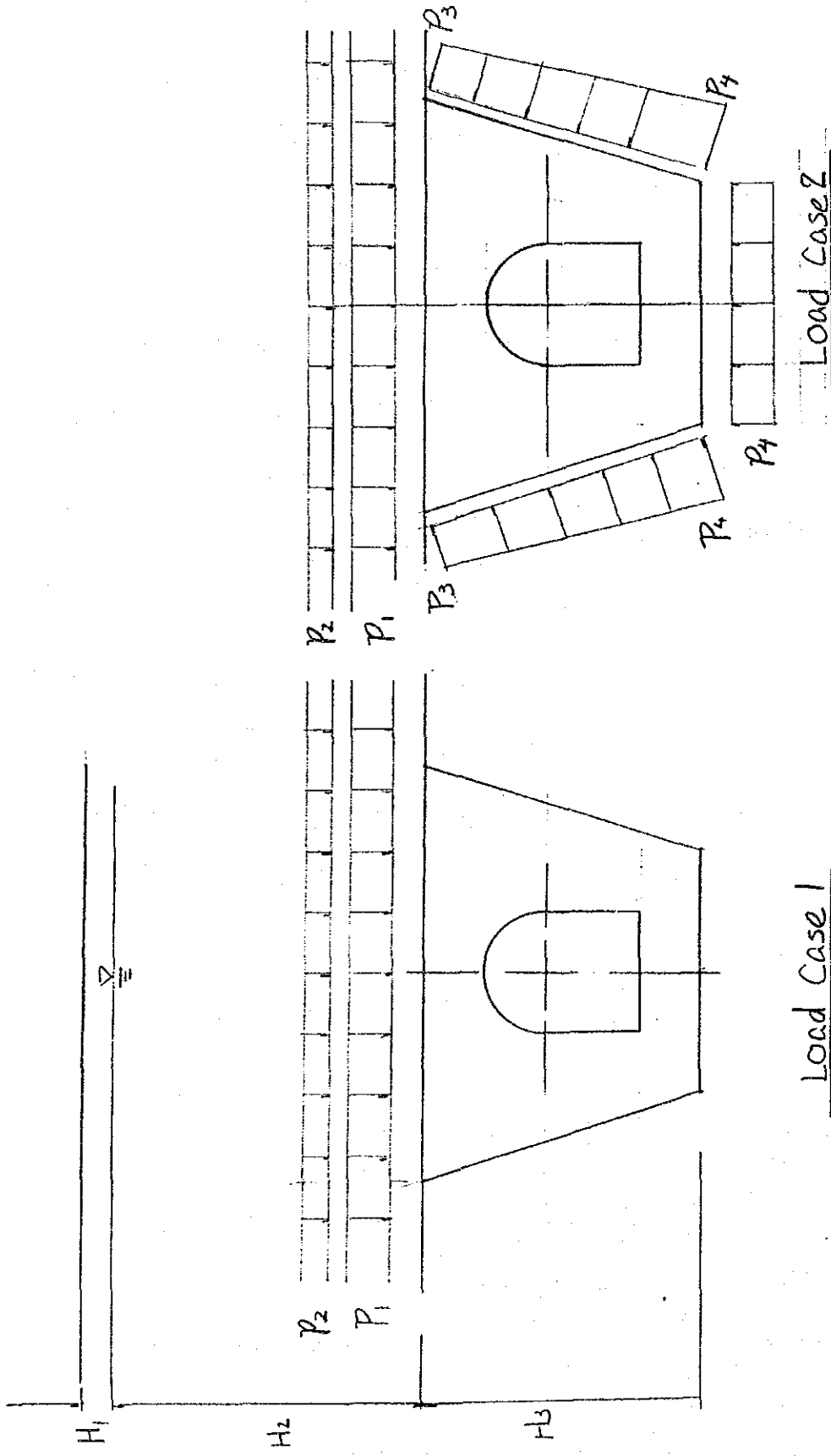
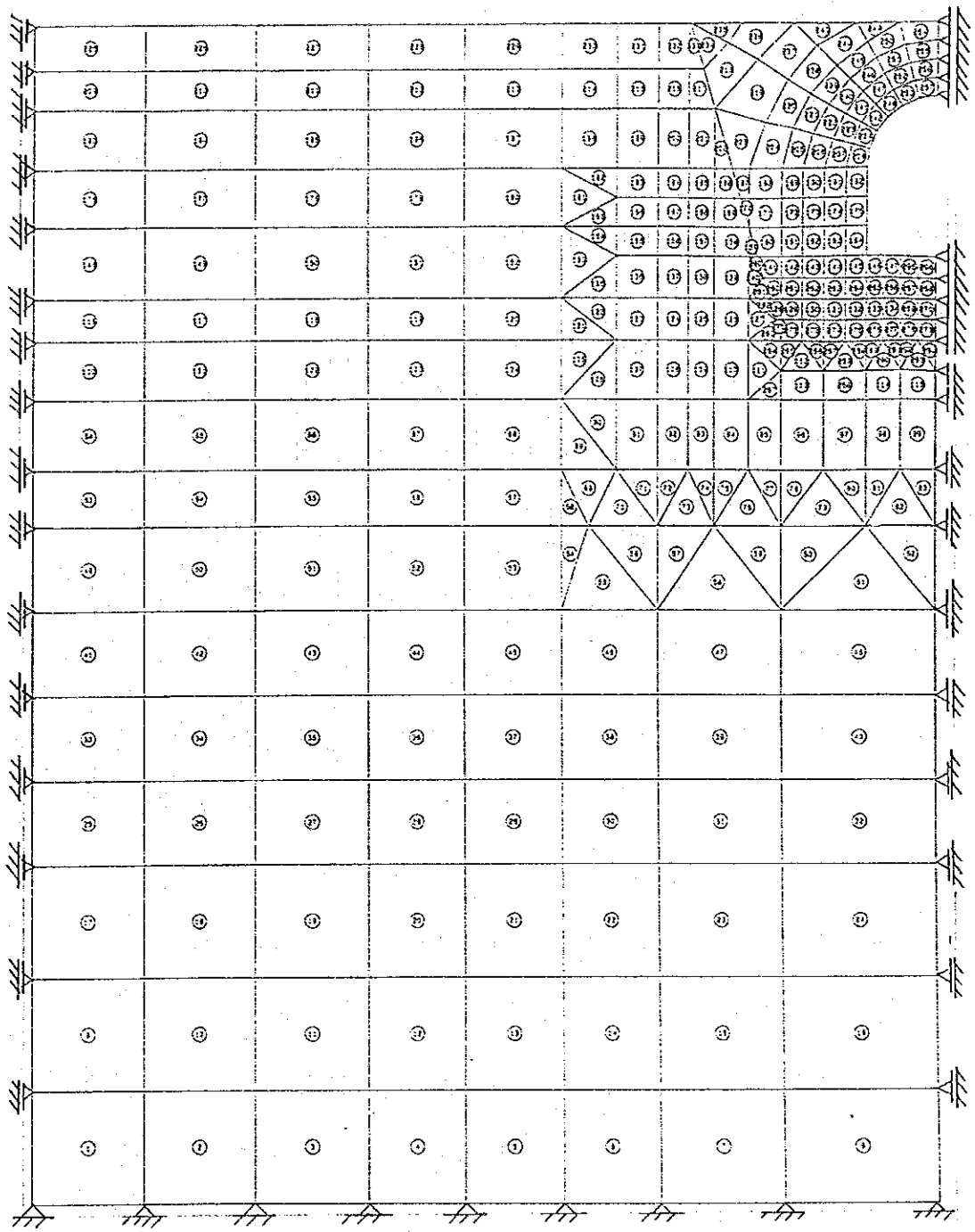


Fig. 5.1.1 Design Section of Gallery



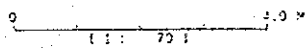
$$\begin{aligned}
 P_1 &= H_2 \times r_{\text{sat}} \\
 P_2 &= H_1 \times r_{\text{wet}} \\
 P_3 &= H_2 \times r_{\text{water}} \\
 P_4 &= (H_2 + H_3) \times r_{\text{water}}
 \end{aligned}$$

Fig. 5.12 Loading Conditions



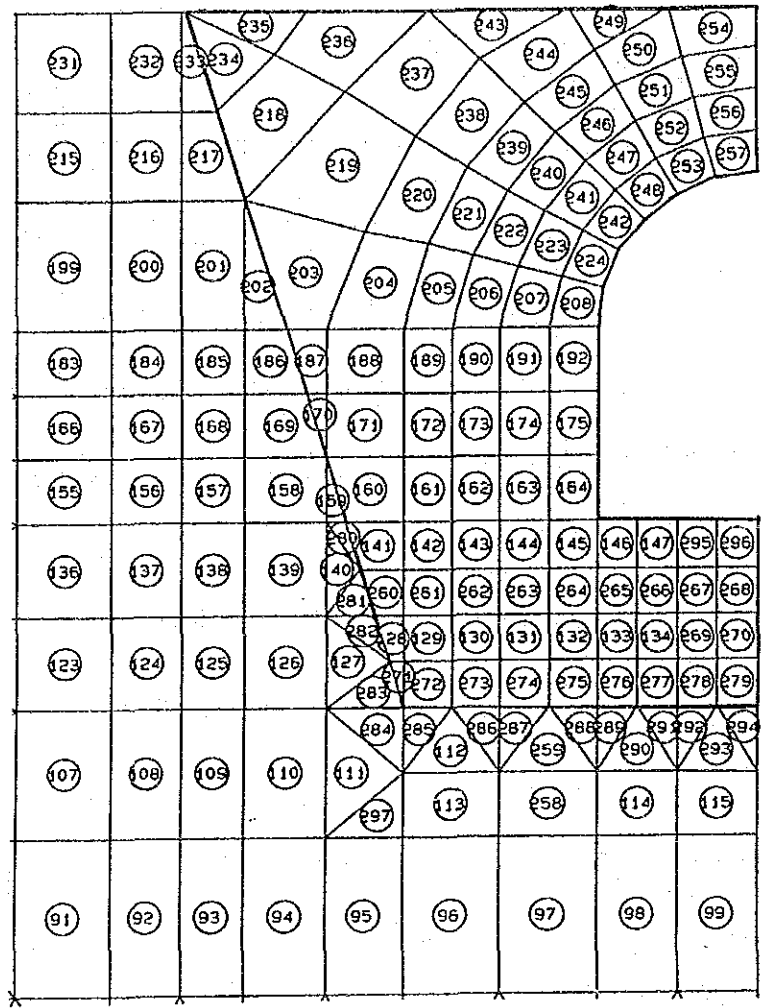
Note: ○ indicates element number.

FOR STRUCTURE



TOTAL ELEMENTS = 257
TOTAL NODES = 300

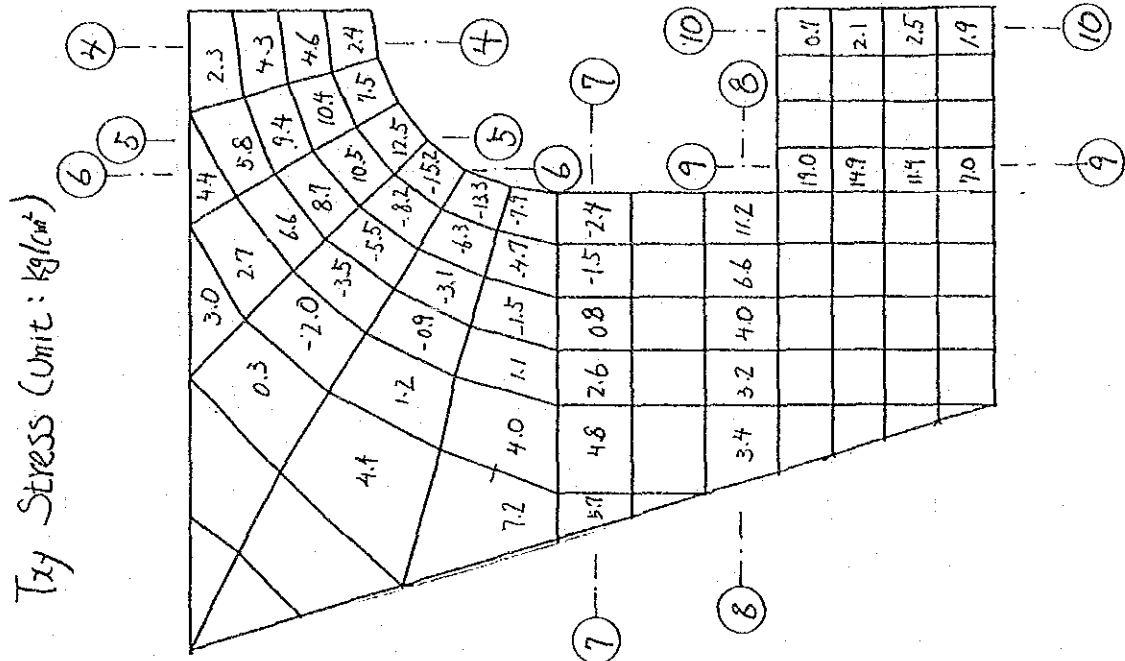
Fig. 5.13 FEM Model (1/2)



Close-up of the design section of gallery.

Fig. 5.13 FEM Model (2/2)

σ_x, σ_y Stress (Unit: kg/cm^2)



T_x, T_y Stress (Unit: kg/cm^2)

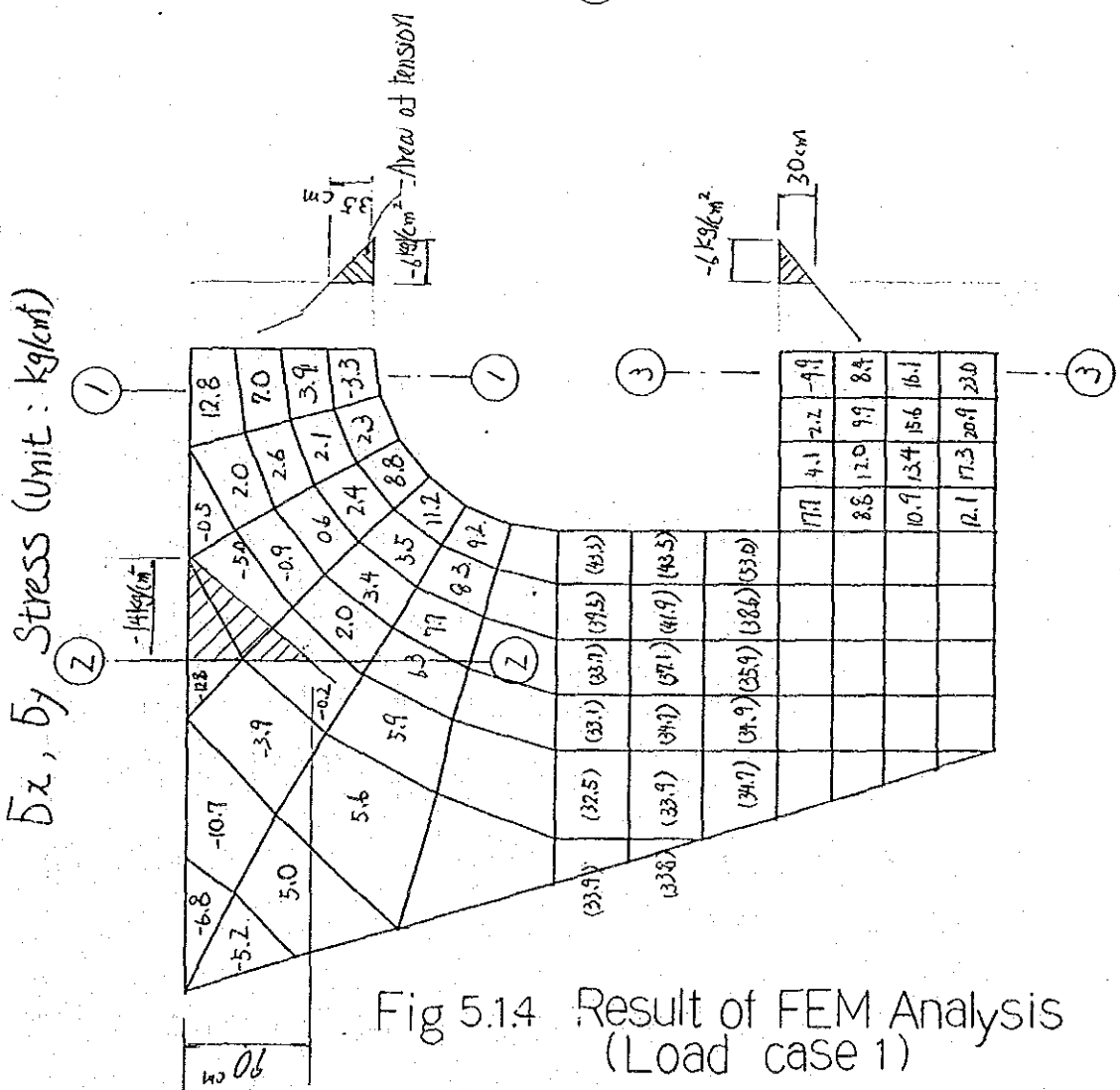
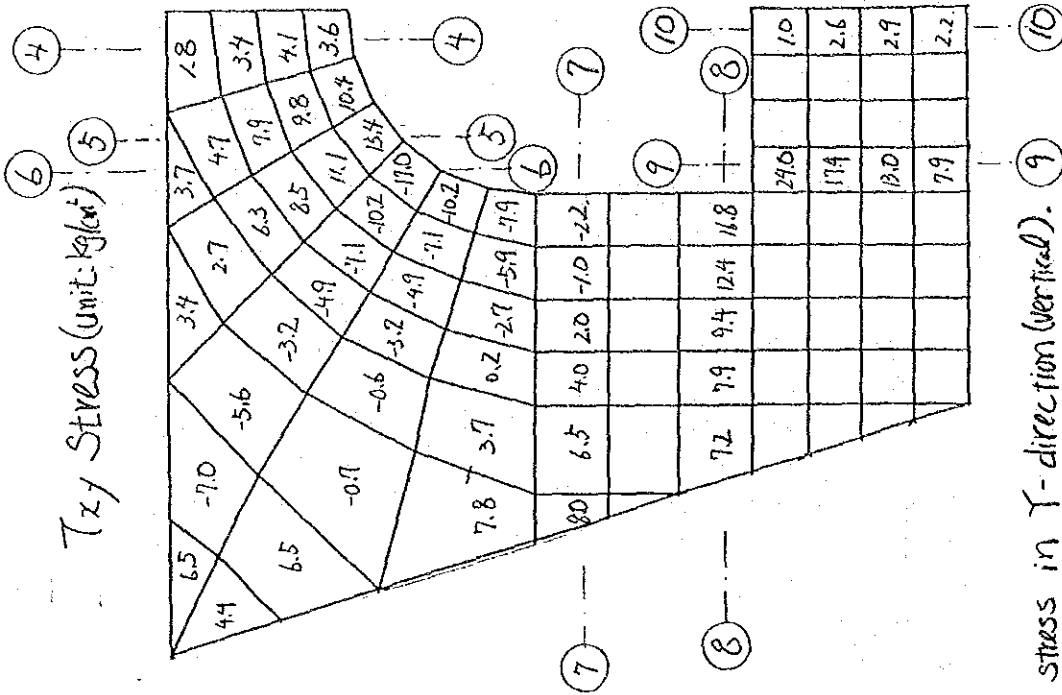
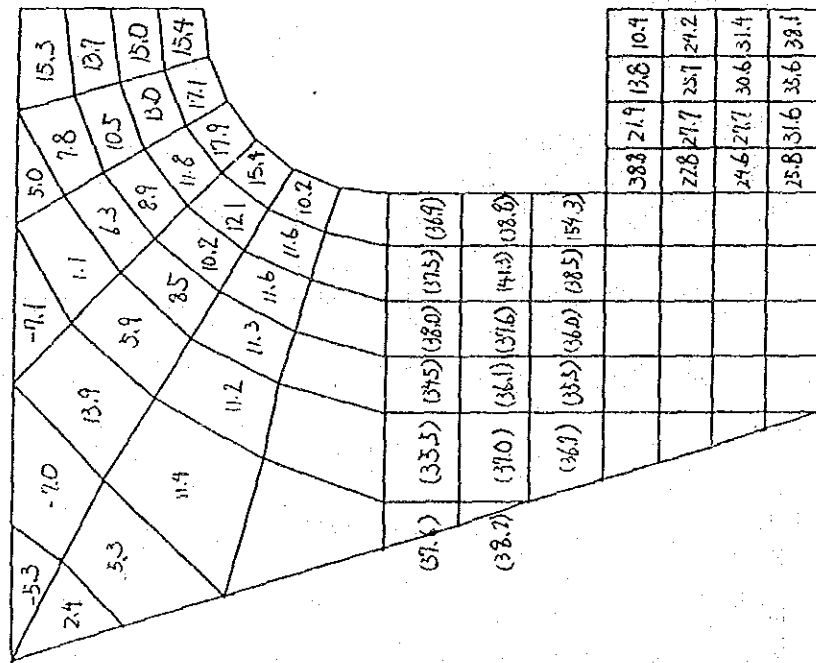


Fig 5.14 Result of FEM Analysis (Load case 1)

Note: Refer to the notes given in Table 4.2.

B_x, B_y Stress (unit: kg/cm²)



Notes: 1. Values in parentheses in B_x, B_y stress are stress in Y-direction (vertical). 9

2. - (minus) in B_x, B_y stress indicates tensile stress.

3. Regarding - (minus) in T_{xy} stress, refer the indication given in Table I.1 or I.2.

Fig 5.15 Result of FEM Analysis (Load case 2)

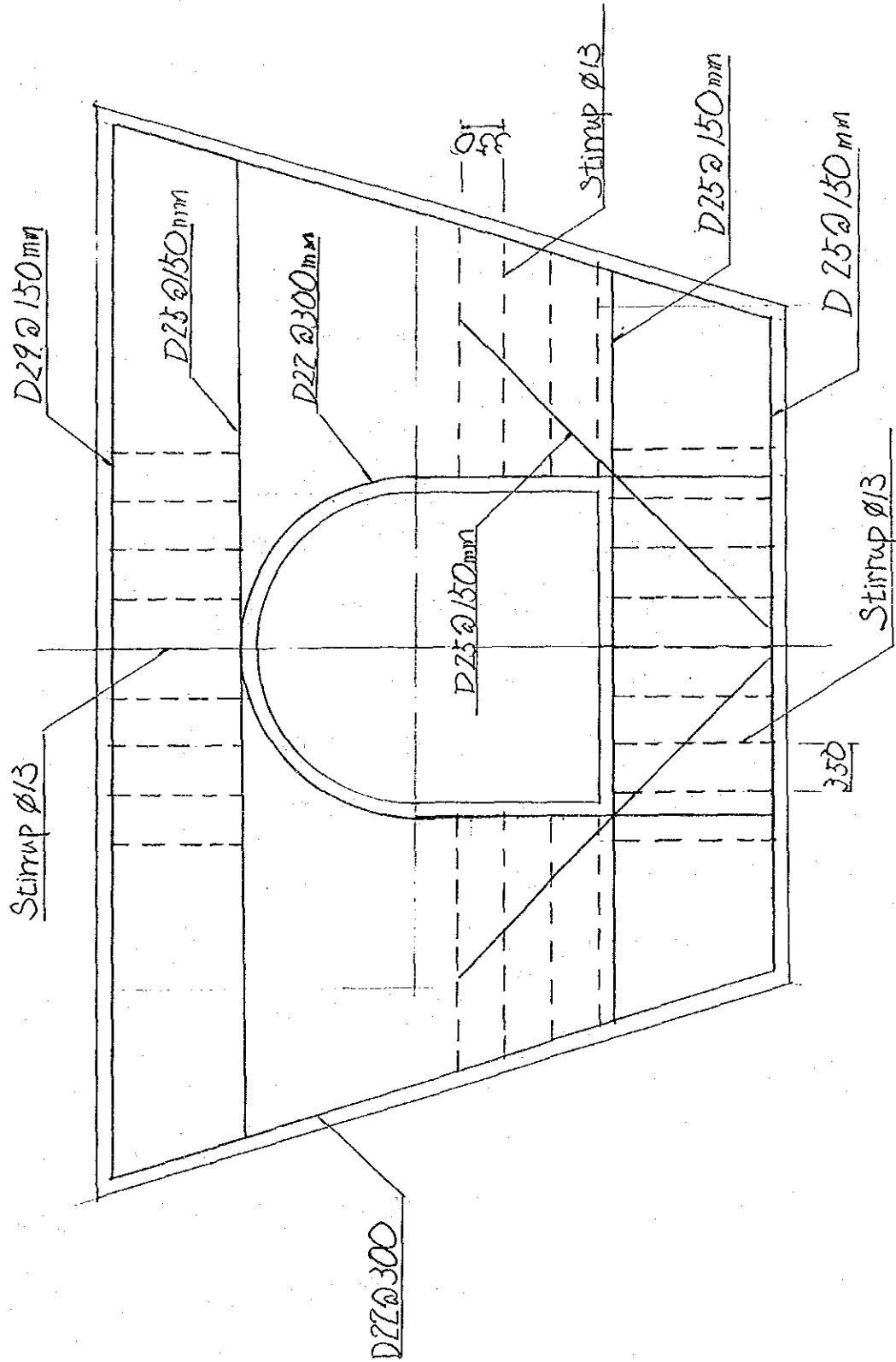
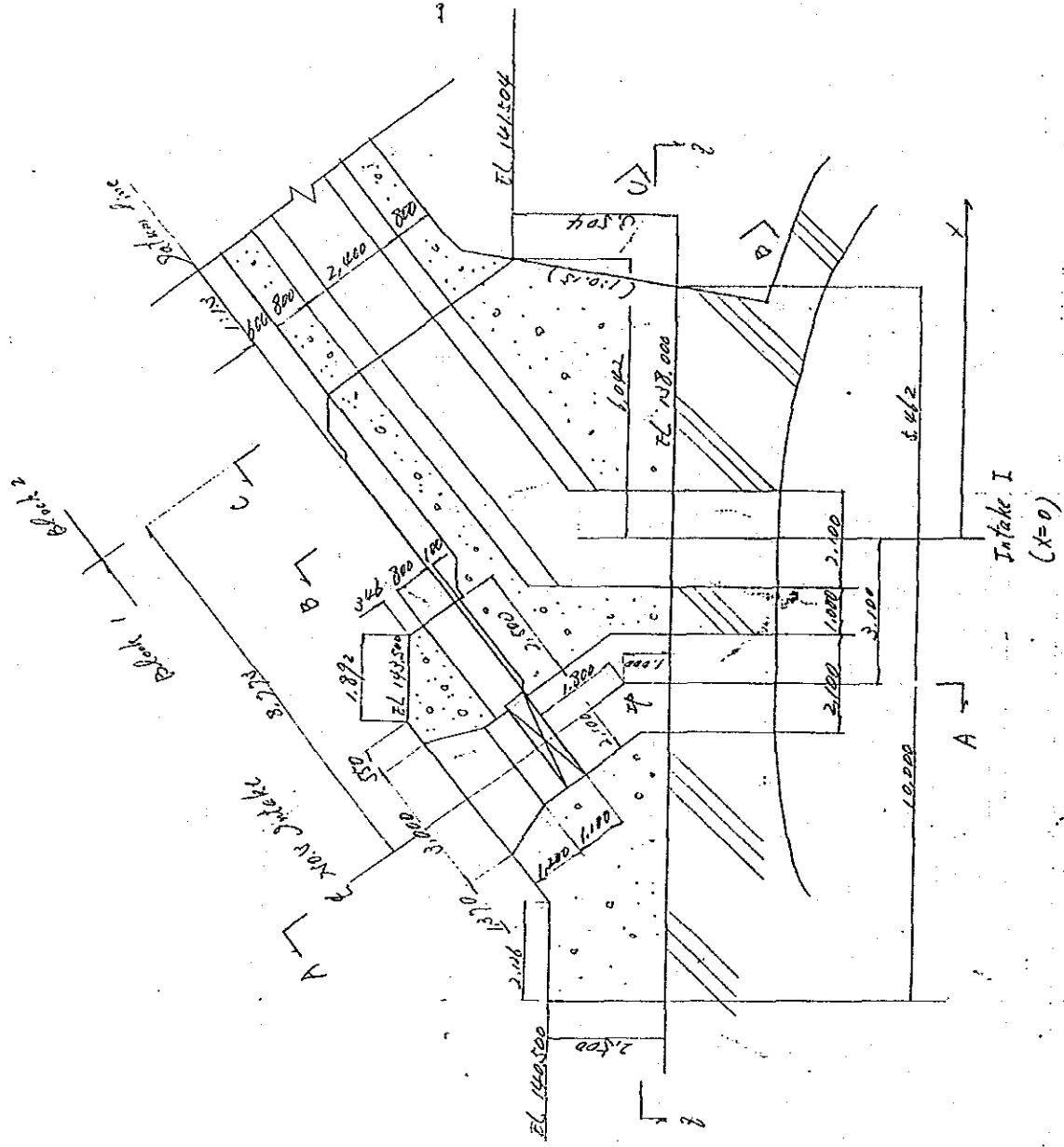


Fig. 5.1.6 Reinforcement Bars Arrangement

Fig. 5.3.1.



PROFILE OF BLOCK 1 along E. of No. 0 INTAKE

Fig. 5.3.2

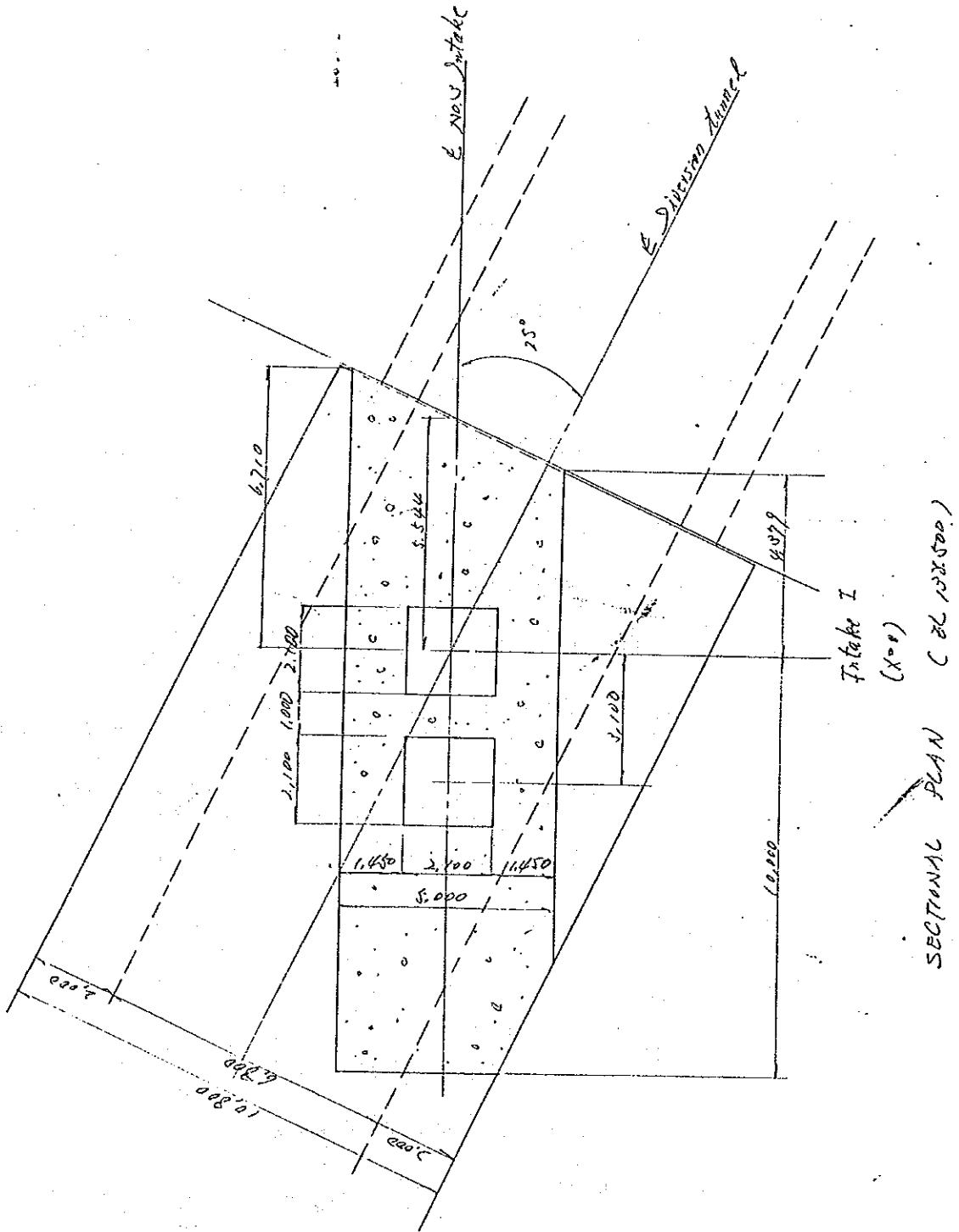
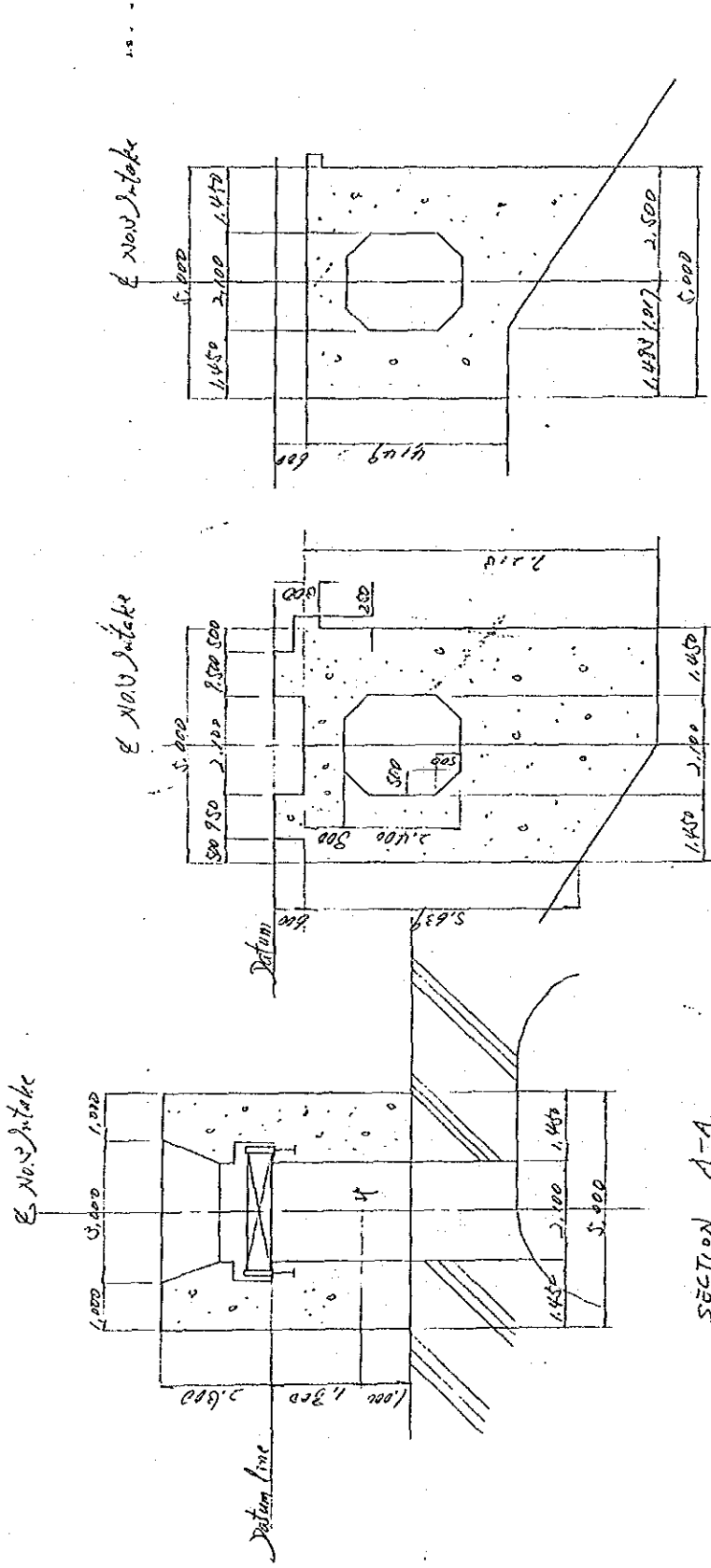


Fig. 5.3.3



SECTION C-C
(X = 6.042)

SECTION B-B
(X = 5.462)

SECTION A-A

Fig. 5.3.4

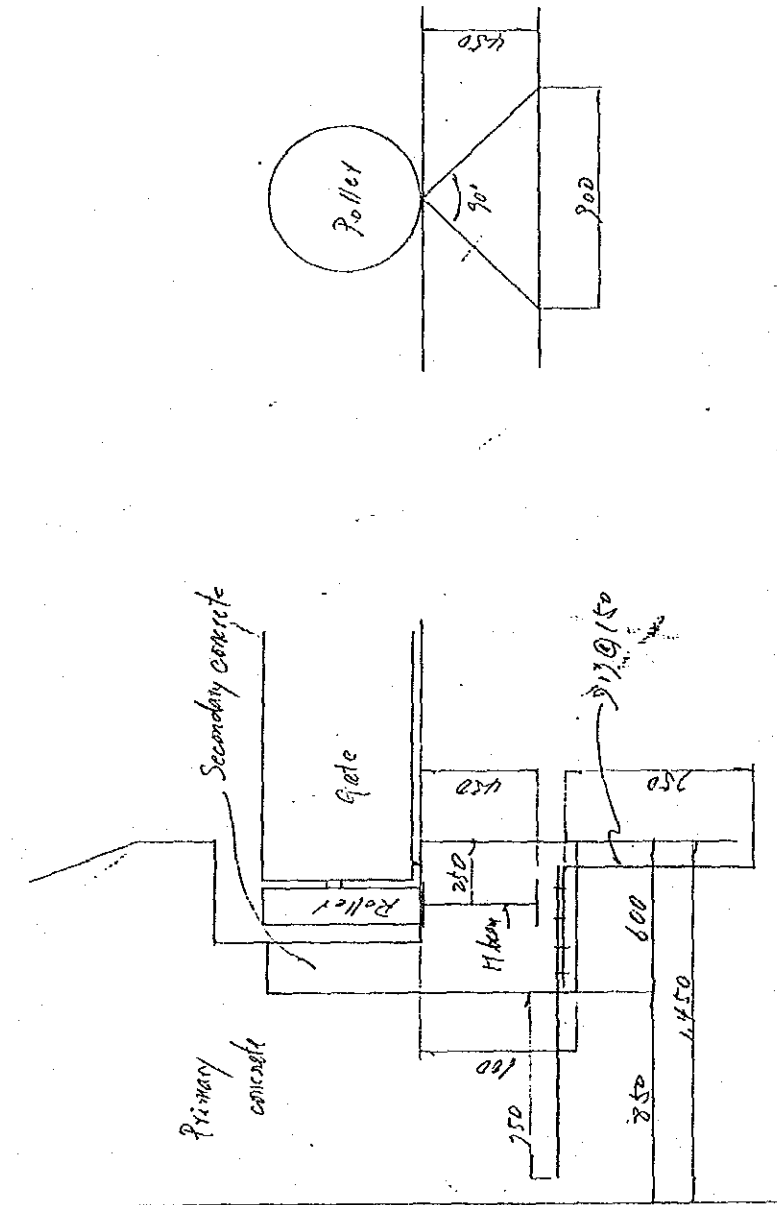
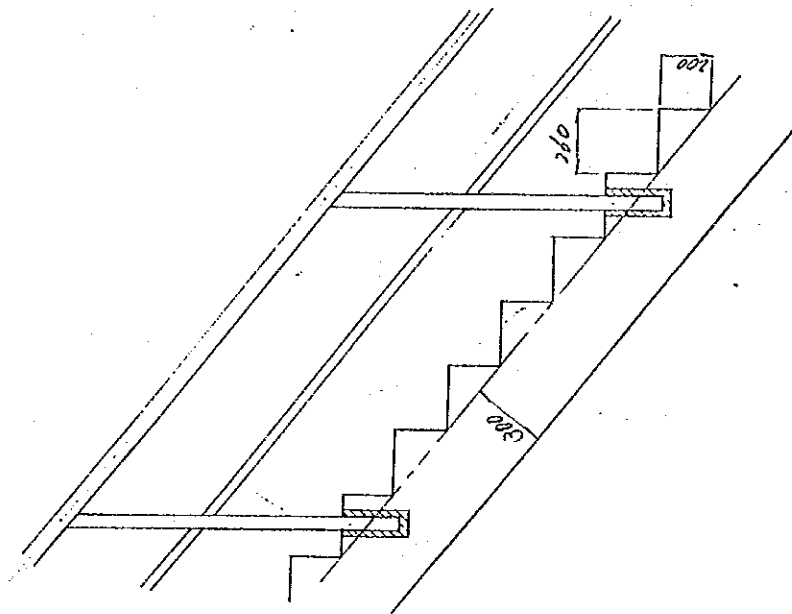


Fig. 5.3.5



VIEW X-X

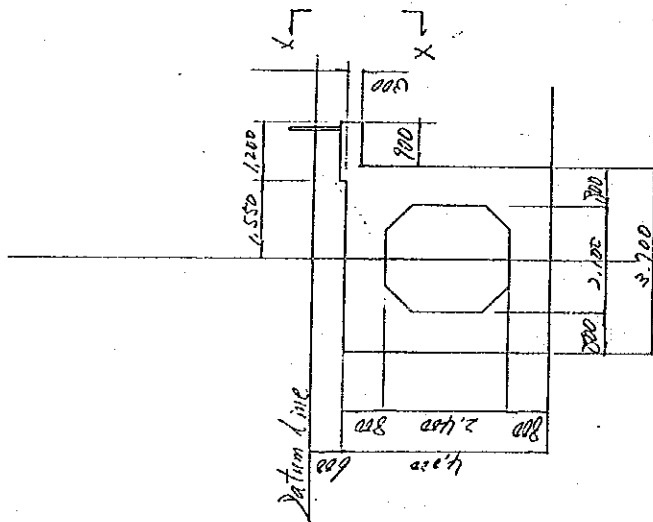
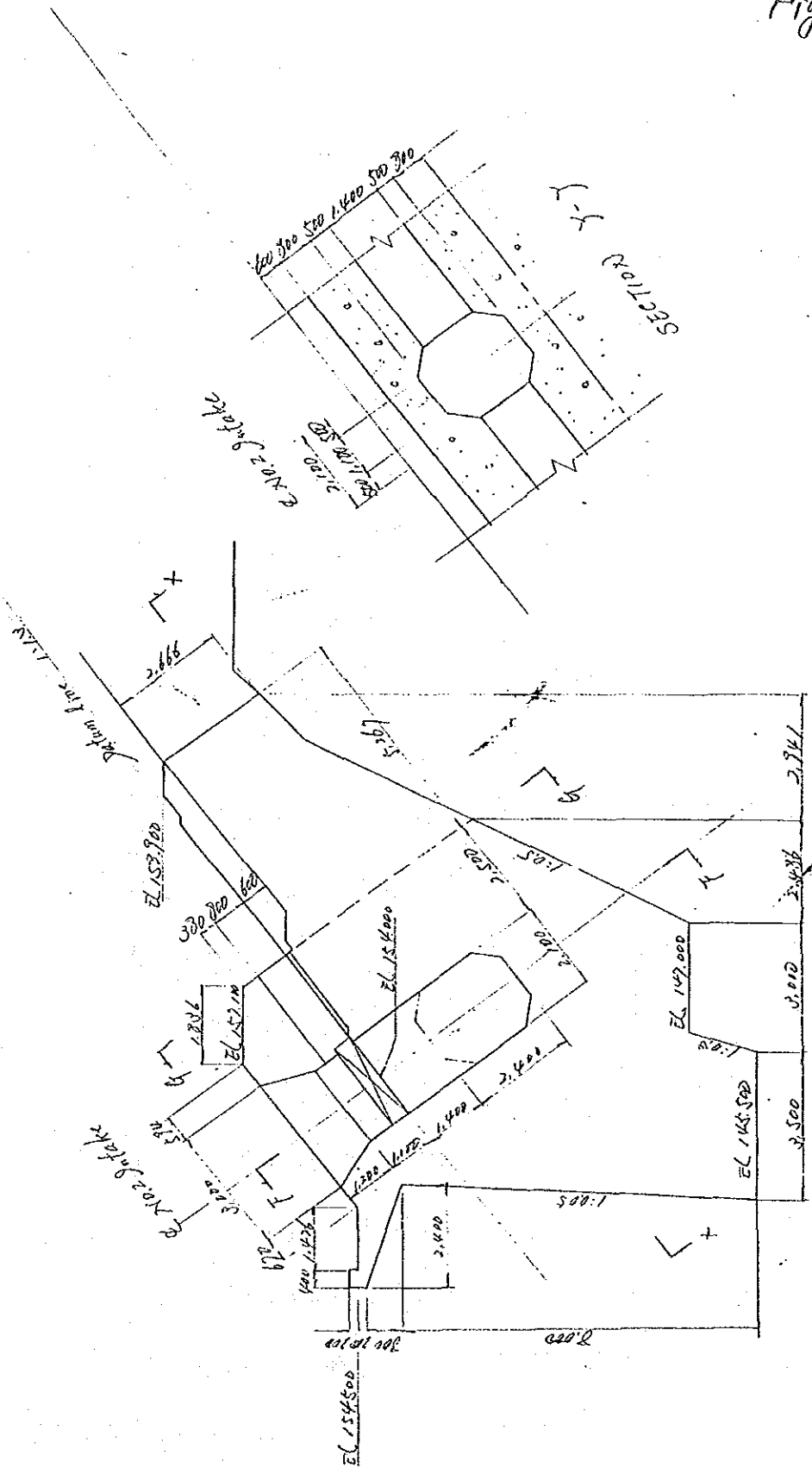


Fig. 5.3.6



PROFILE along E of No. 2 INTAKE

Fig. 5.3.7

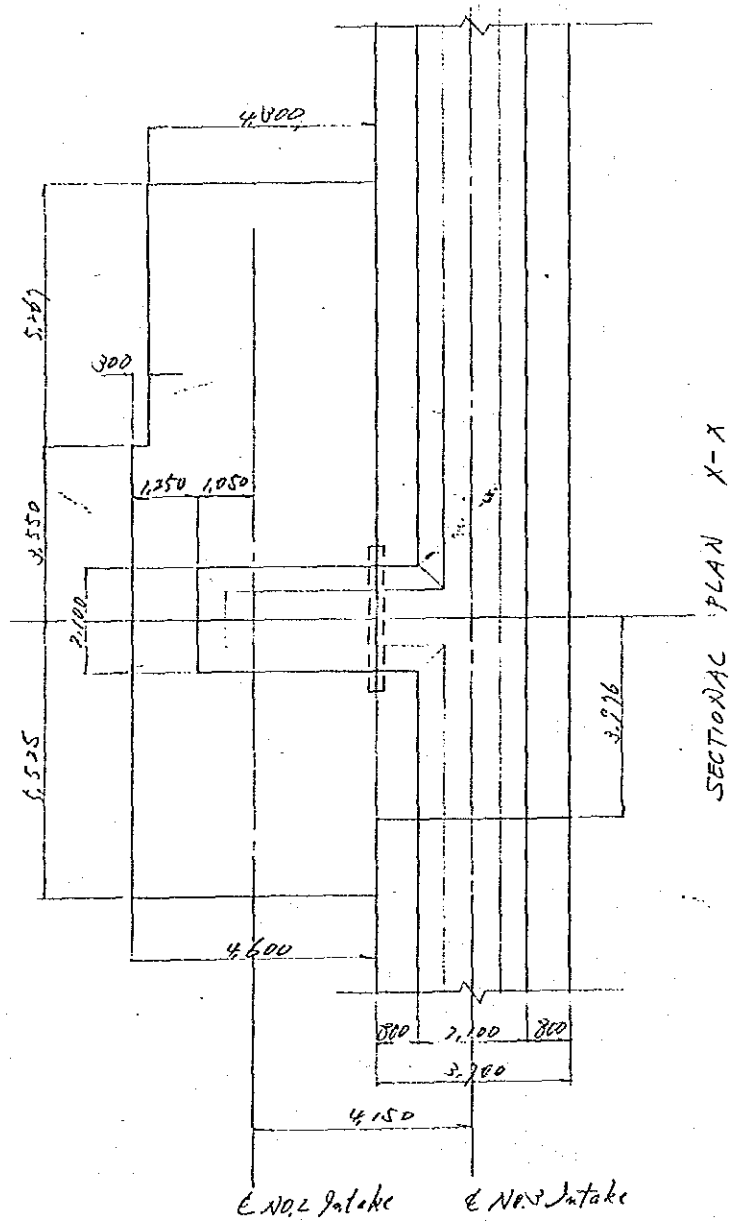
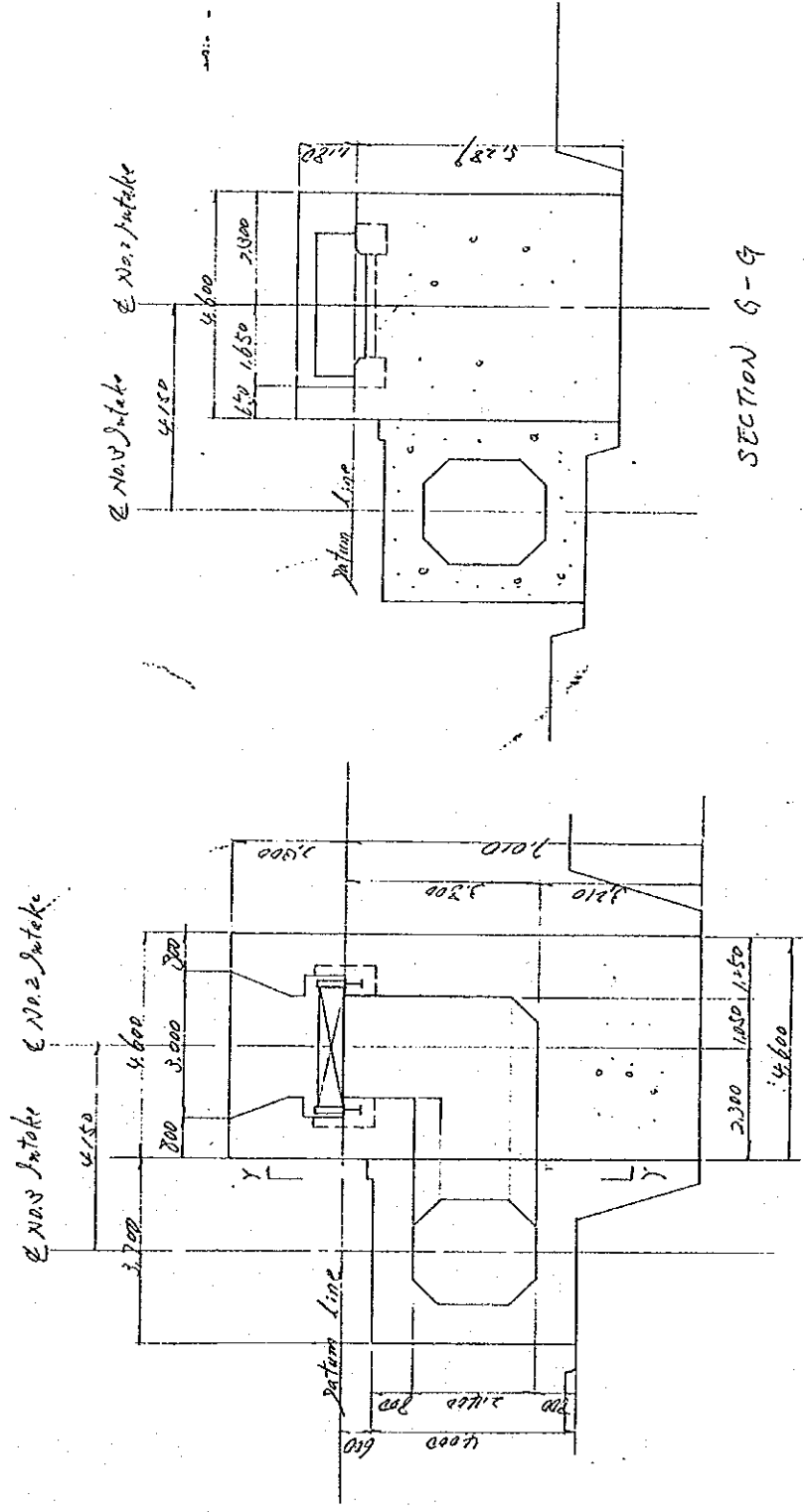


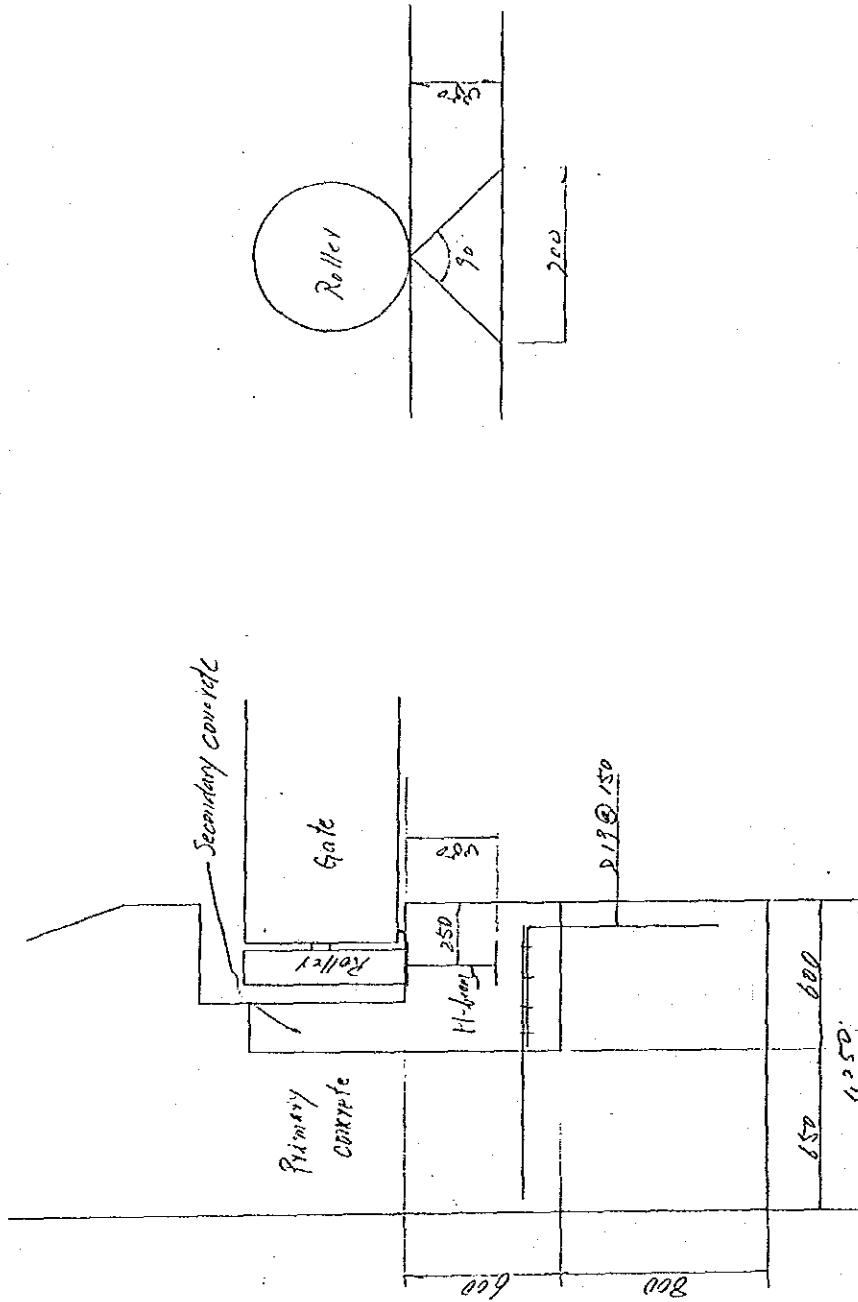
Fig 5.3.8



SECTION F-F

SECTION G-G

Fig. 5.3.9



Gate Support - Gate side

PART VI WORK QUANTITY CALCULATION

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Ref. Clause or Sub-clause
				Unit Price	Amount	Unit Price	Amount	
B2 Earthwork								
/01	Open-cut excavation, common	m3	38,300					T2.4.6
/02	Open-cut excavation, weathered rock	m3	7,700					T2.4.6
/03	Open-cut excavation, rock	m3	2,000					T2.4.6
/04	Excavation of sand and gravel	m3	750					T2.4.6
/05	Main cofferdam embankment, Zone 1 (core)	m3	21,500					T2.6.2
/06	Main cofferdam embankment, Zone 3 (coarse filter)	m3	9,700					T2.6.3
/07	Main cofferdam embankment, Zone 4 (rock)	m3	128,300					T2.6.4
/08	Main cofferdam embankment, Zone 5 (rock riprap)	m3	6,800					T2.6.5
/09	Surface course for main cofferdam crest (zone 6)	m2	1,520					T5.2.5
/10	Reinforcing bar	ton	116.4					T4.1.18
/11	Primary cofferdam, upstream	L.S.						T1.3.3

Subtotal of item B2

TOTAL OF ITEM B

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

**Volume calculation
for
Excavation of Main Cofferdam**

B.2. Volume calculation Sheet

Work Division : Excavation for Main Cofferdam

/ P 1 /		Volume of Excavation Common				/ O 2 /					
Section No.	Distance	Sectional area	Means area	Volume	Section No.	Distance	Sectional area	Means area	Volume		
	m	sq.m	sq.m	cu.m		m	sq.m	sq.m	cu.m		
Sta.0+9.000	.000	.000	.000	.000	Sta.0+9.000	.000	.000	.000	.000		
Sta.2	11.000	.000	.000	.000	Sta.2	11.000	.000	.000	.000		
Sta.4	20.000	.000	.000	.000	Sta.4	20.000	.000	.000	.000		
Sta.4+7.300	7.300	.000	.000	.000	Sta.4+7.300	7.300	.000	.000	.000		
Sta.6	12.700	.000	.000	.000	Sta.6	12.700	.000	.000	.000		
Sta.8	20.000	.000	.000	.000	Sta.8	20.000	.000	.000	.000		
Sta.10	20.000	200.000	100.000	2.000.000	Sta.10	20.000	32.000	16.000	320.000		
Sta.11+4.500	14.500	230.000	215.000	3.117.500	Sta.11+4.500	14.500	24.000	28.000	406.000		
Sta.12	5.500	320.000	275.000	1.512.500	Sta.12	5.500	25.000	24.500	134.750		
Sta.14	20.000	380.000	350.000	7.000.000	Sta.14	20.000	120.000	72.500	1.450.000		
Sta.15+7.366	17.366	330.000	355.000	6.164.930	Sta.15+7.366	17.366	96.000	108.000	1.875.528		
Sta.16	2.634	350.000	340.000	895.560	Sta.16	2.634	72.000	84.000	221.256		
Sta.16+5.800	5.800	330.000	340.000	1.972.000	Sta.16+5.800	5.800	48.000	60.000	348.000		
Sta.18	14.200	276.000	303.000	4.302.600	Sta.18	14.200	112.000	80.000	1.136.000		
Sta.19+7.700	17.700	270.000	273.000	4.832.100	Sta.19+7.700	17.700	48.000	80.000	1.416.000		
Sta.20	2.300	300.000	285.000	655.500	Sta.20	2.300	16.000	32.000	73.600		
Sta.22	20.000	200.000	250.000	5.000.000	Sta.22	20.000	8.000	12.000	240.000		
Sta.22+7.700	7.700	.000	100.000	770.000	Sta.22+7.700	7.700	.000	4.000	30.800		
Sta.24	12.300	.000	.000	.000	Sta.24	12.300	.000	.000	.000		
Sta.24+8.400	8.400	.000	.000	.000	Sta.24+8.400	8.400	.000	.000	.000		
	.000	.000	.000	.000		.000	.000	.000	.000		
Total Youlme (cu.m)				=	38,222.690	Total Youlme (cu.m)				=	7,651.934

B2/05/06

Volume calculation
of
Impervious Earth Core and Coarse Filter
for
Main Cofferdam

Volume calculation Sheet

Work Division EM/R EL 155.5 - 150.0

Section No.	Volume of Impervious earth core						Volume of Coarse filter					
	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m	Section No.	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m			
Sta. 0+9,000	9.000	.000	.000	.000	Sta. 0+9,000	9.000	.000	.000	.000			
Sta. 2	11.000	.000	.000	.000	Sta. 2	11.000	.000	.000	.000			
Sta. 4	20.000	.000	.000	.000	Sta. 4	20.000	.000	.000	.000			
Sta. 4+7,300	7.300	.000	.000	.000	Sta. 4+7,300	7.300	.000	.000	.000			
Sta. 6	12.700	.000	.000	.000	Sta. 6	12.700	.000	.000	.000			
Sta. 8	20.000	.000	.000	.000	Sta. 8	20.000	.000	.000	.000			
Sta. 10	20.000	25.000	12.500	250.000	Sta. 10	20.000	14.000	7.000	140.000			
Sta. 11+4,500	14.500	25.000	25.000	362.500	Sta. 11+4,500	14.500	14.000	14.000	203.000			
Sta. 12	5.500	25.000	25.000	137.500	Sta. 12	5.500	14.000	14.000	77.000			
Sta. 14	20.000	25.000	25.000	500.000	Sta. 14	20.000	14.000	14.000	280.000			
Sta. 15+7,366	17.366	25.000	25.000	434.150	Sta. 15+7,366	17.366	14.000	14.000	243.124			
Sta. 16	2.634	25.000	25.000	65.850	Sta. 16	2.634	14.000	14.000	36.876			
Sta. 16+5,800	5.800	25.000	25.000	145.000	Sta. 16+5,800	5.800	14.000	14.000	81.200			
Sta. 18	14.200	25.000	25.000	355.000	Sta. 18	14.200	14.000	14.000	198.800			
Sta. 19+7,700	17.700	25.000	25.000	442.500	Sta. 19+7,700	17.700	14.000	14.000	247.800			
Sta. 20	2.300	25.000	25.000	57.500	Sta. 20	2.300	14.000	14.000	32.200			
Sta. 22	20.000	25.000	25.000	500.000	Sta. 22	20.000	14.000	14.000	280.000			
Sta. 22+7,700	7.700	.000	12.500	96.250	Sta. 22+7,700	7.700	.000	7.000	53.900			
Sta. 24	12.300	.000	.000	.000	Sta. 24	12.300	.000	.000	.000			
Sta. 24+8,400	8.400	.000	.000	.000	Sta. 24+8,400	8.400	.000	.000	.000			
Total Volume (cu.m) =				3,346.250	Total Volume (cu.m) =				1,873.900			

Volume calculation Sheet

Work Division EM/R EL 150.0 - 140.0

Section No.	Volume of Impervious earth core				Volume of Coarse filter					
	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m	Section No.	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m	
Sta. 0+9,000	9,000	.000	.000	.000	Sta. 0+9,000	9,000	.000	.000	.000	
Sta. 2	11,000	.000	.000	.000	Sta. 2	11,000	.000	.000	.000	
Sta. 4	20,000	.000	.000	.000	Sta. 4	20,000	.000	.000	.000	
Sta. 4+7,300	7,300	.000	.000	.000	Sta. 4+7,300	7,300	.000	.000	.000	
Sta. 6	12,700	.000	.000	.000	Sta. 6	12,700	.000	.000	.000	
Sta. 8	20,000	.000	.000	.000	Sta. 8	20,000	.000	.000	.000	
Sta. 10	20,000	19,500	9,750	195,000	Sta. 10	20,000	11,000	5,500	110,000	
Sta. 11+4,500	14,500	42,000	30,750	445,875	Sta. 11+4,500	14,500	24,000	17,500	253,750	
Sta. 12	5,500	45,500	43,750	240,625	Sta. 12	5,500	26,000	25,000	137,500	
Sta. 14	20,000	70,100	57,800	1,156,000	Sta. 14	20,000	39,000	32,500	650,000	
Sta. 15+7,366	17,366	75,000	72,550	1,259,903	Sta. 15+7,366	17,366	40,000	39,500	685,957	
Sta. 16	2,634	75,000	75,000	197,550	Sta. 16	2,634	40,000	40,000	105,360	
Sta. 16+5,800	5,800	75,000	75,000	435,000	Sta. 16+5,800	5,800	40,000	40,000	232,000	
Sta. 18	14,200	75,000	75,000	1,065,000	Sta. 18	14,200	40,000	40,000	568,000	
Sta. 19+7,700	17,700	75,000	75,000	1,327,500	Sta. 19+7,700	17,700	40,000	40,000	708,000	
Sta. 20	2,300	75,000	75,000	172,500	Sta. 20	2,300	40,000	40,000	92,000	
Sta. 22	20,000	18,800	46,900	938,000	Sta. 22	20,000	12,000	26,000	520,000	
Sta. 22+7,700	7,700	.000	9,400	72,380	Sta. 22+7,700	7,700	.000	6,000	46,200	
Sta. 24	12,300	.000	.000	.000	Sta. 24	12,300	.000	.000	.000	
Sta. 24+8,400	8,400	.000	.000	.000	Sta. 24+8,400	8,400	.000	.000	.000	
Total Volume (cu.m)				=	Total Volume (cu.m)				=	
				7,505,333					4,108,767	

VI-1-17

Volume calculation Sheet

Work Divisior EM/R EL 140.0 - 130.0

Section No.	Distance m	Volume of Impervious earth core			Volume cu.m	Section No.	Distance m	Volume of Coarse filter			Volume cu.m
		Sectional area sq.m	Means area sq.m	Volume cu.m				Sectional area sq.m	Means area sq.m	Volume cu.m	
Sta. 0+9,000	9.000	.000	.000	.000	Sta. 0+9,000	9.000	.000	.000	.000		
Sta. 2	11.000	.000	.000	.000	Sta. 2	11.000	.000	.000	.000		
Sta. 4	20.000	.000	.000	.000	Sta. 4	20.000	.000	.000	.000		
Sta. 4+7,300	7.300	.000	.000	.000	Sta. 4+7,300	7.300	.000	.000	.000		
Sta. 6	12.700	.000	.000	.000	Sta. 6	12.700	.000	.000	.000		
Sta. 8	20.000	.000	.000	.000	Sta. 8	20.000	.000	.000	.000		
Sta. 10	20.000	.000	.000	.000	Sta. 10	20.000	.000	.000	.000		
Sta. 11+4,500	14.500	.000	.000	.000	Sta. 11+4,500	14.500	.000	.000	.000		
Sta. 12	5.500	.000	.000	.000	Sta. 12	5.500	.000	.000	.000		
Sta. 14	20.000	4.500	2.250	45.000	Sta. 14	20.000	5.000	2.500	50.000		
Sta. 15+7,366	17.366	107.500	56.000	972.496	Sta. 15+7,366	17.366	40.000	22.500	390.735		
Sta. 16	2.634	107.500	107.500	283.155	Sta. 16	2.634	40.000	40.000	105.360		
Sta. 16+5,800	5.800	107.500	107.500	623.500	Sta. 16+5,800	5.800	40.000	40.000	232.000		
Sta. 18	14.200	107.500	107.500	1,526.500	Sta. 18	14.200	40.000	40.000	568.000		
Sta. 19+7,700	17.700	95.600	101.550	1,797.435	Sta. 19+7,700	17.700	35.000	37.500	663.750		
Sta. 20	2.300	89.300	92.450	212.635	Sta. 20	2.300	34.000	34.500	79.350		
Sta. 22	20.000	.000	44.650	893.000	Sta. 22	20.000	.000	17.000	340.000		
Sta. 22+7,700	7.700	.000	.000	.000	Sta. 22+7,700	7.700	.000	.000	.000		
Sta. 24	12.300	.000	.000	.000	Sta. 24	12.300	.000	.000	.000		
Sta. 24+8,400	8.400	.000	.000	.000	Sta. 24+8,400	8.400	.000	.000	.000		
Total Vouleme (cu.m)				=	6,353.721	Total Vouleme (cu.m)				=	2,429.195

Volume calculation Sheet

Work Divisor EM/R EL 130.0 - 120.0

Section No.	Volume of Impervious earth core				Volume of Coarse filter				Volume
	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m	Section No.	Distance m	Sectional area sq.m	Means area sq.m	
Sta. 0+9,000	9,000	.000	.000	.000	Sta. 0+9,000	9,000	.000	.000	.000
Sta. 2	11,000	.000	.000	.000	Sta. 2	11,000	.000	.000	.000
Sta. 4	20,000	.000	.000	.000	Sta. 4	20,000	.000	.000	.000
Sta. 4+7,300	7,300	.000	.000	.000	Sta. 4+7,300	7,300	.000	.000	.000
Sta. 6	12,700	.000	.000	.000	Sta. 6	12,700	.000	.000	.000
Sta. 8	20,000	.000	.000	.000	Sta. 8	20,000	.000	.000	.000
Sta. 10	20,000	.000	.000	.000	Sta. 10	20,000	.000	.000	.000
Sta. 11+4,500	14,500	.000	.000	.000	Sta. 11+4,500	14,500	.000	.000	.000
Sta. 12	5,500	.000	.000	.000	Sta. 12	5,500	.000	.000	.000
Sta. 14	20,000	.000	.000	.000	Sta. 14	20,000	.000	.000	.000
Sta. 15+7,366	17,366	83,800	41,900	727,635	Sta. 15+7,366	17,366	23,000	11,500	199,709
Sta. 16	2,634	110,000	96,900	255,235	Sta. 16	2,634	32,000	27,500	72,435
Sta. 16+5,800	5,800	133,000	121,500	704,700	Sta. 16+5,800	5,800	37,500	34,750	201,550
Sta. 18	14,200	96,900	114,950	1,632,290	Sta. 18	14,200	29,000	33,250	472,150
Sta. 19+7,700	17,700	1,800	49,350	873,495	Sta. 19+7,700	17,700	3,000	16,000	283,200
Sta. 20	2,300	.000	.900	2,070	Sta. 20	2,300	.000	1,500	3,450
Sta. 22	20,000	.000	.000	.000	Sta. 22	20,000	.000	.000	.000
Sta. 22+7,700	7,700	.000	.000	.000	Sta. 22+7,700	7,700	.000	.000	.000
Sta. 24	12,300	.000	.000	.000	Sta. 24	12,300	.000	.000	.000
Sta. 24+8,400	8,400	.000	.000	.000	Sta. 24+8,400	8,400	.000	.000	.000
Total Volume (cu.m) =				4,195,425	Total Volume (cu.m) =				1,232,494

21,400.7 m³

9,649.4 m³

B2/c/

Volume calculation
of
Impervious Inner Shell of Random rock
for
Main Cofferdam

Volume calculation Sheet

Work Division EM/R EL 140.0 - 130.0 Work Division EM/R EL 130.0 - 120.0

Section No.	Volume of Inner shell of random rock				Volume of inner shell of random rock				
	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m	Section No.	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m
Sta. 0+9,000	9.000	.000	.000	.000	Sta. 0+9,000	9.000	.000	.000	.000
Sta. 2	11.000	.000	.000	.000	Sta. 2	11.000	.000	.000	.000
Sta. 4	20.000	.000	.000	.000	Sta. 4	20.000	.000	.000	.000
Sta. 4+7,300	7.300	.000	.000	.000	Sta. 4+7,300	7.300	.000	.000	.000
Sta. 6	12.700	.000	.000	.000	Sta. 6	12.700	.000	.000	.000
Sta. 8	20.000	.000	.000	.000	Sta. 8	20.000	.000	.000	.000
Sta. 10	20.000	.000	.000	.000	Sta. 10	20.000	.000	.000	.000
Sta. 11+4,500	14.500	.000	.000	.000	Sta. 11+4,500	14.500	.000	.000	.000
Sta. 12	5.500	87.800	43.900	241.450	Sta. 12	5.500	30.000	15.000	82.500
Sta. 14	20.000	429.000	258.400	5,168.000	Sta. 14	20.000	265.500	147.750	2,955.000
Sta. 15+7,366	17.366	845.000	637.000	11,062.142	Sta. 15+7,366	17.366	654.800	460.150	7,990.965
Sta. 16	2.634	696.000	770.500	2,029.497	Sta. 16	2.634	606.900	630.850	1,661.659
Sta. 16+5,800	5.800	644.800	670.400	3,888.320	Sta. 16+5,800	5.800	786.900	696.900	4,042.020
Sta. 18	14.200	707.500	676.150	9,601.330	Sta. 18	14.200	641.100	714.000	10,138.800
Sta. 19+7,700	17.700	448.000	577.750	10,226.175	Sta. 19+7,700	17.700	232.000	436.550	7,726.935
Sta. 20	2.300	419.900	433.950	998.085	Sta. 20	2.300	92.300	162.150	372.945
Sta. 22	20.000	.000	209.950	4,199.000	Sta. 22	20.000	.000	46.150	923.000
Sta. 22+7,700	7.700	.000	.000	.000	Sta. 22+7,700	7.700	.000	.000	.000
Sta. 24	12.300	.000	.000	.000	Sta. 24	12.300	.000	.000	.000
Sta. 24+8,400	8.400	.000	.000	.000	Sta. 24+8,400	8.400	.000	.000	.000
Total Volume (cu.m)				47,413.999	Total Volume (cu.m)				35,893.824

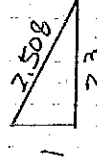
Volume calculation Sheet

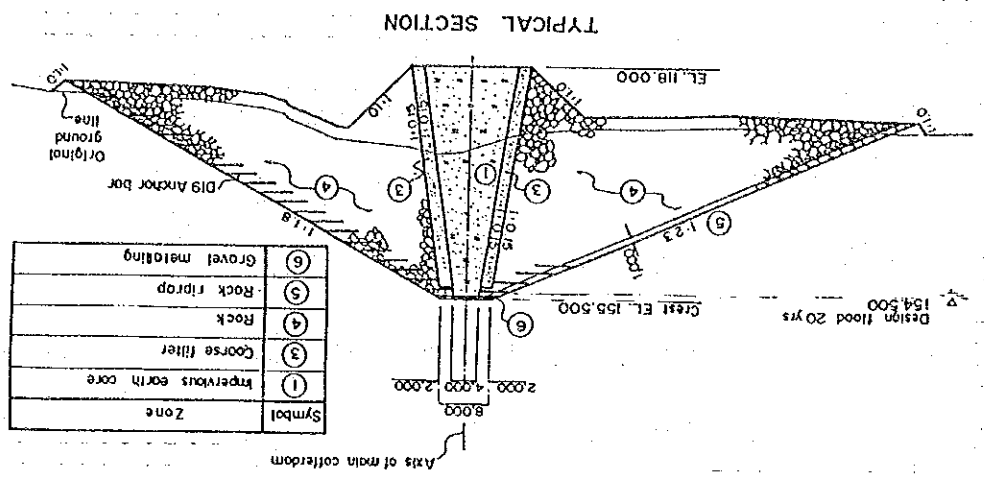
Work Divisor EM/R EL 120.0 - 110.0

Section No.	Volume of Inner shell of random rock				Volume of Inner shell of random rock				
	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m	Section No.	Distance m	Sectional area sq.m	Means area sq.m	Volume cu.m
Sta. 0+9,000	9.000	.000	.000	.000					
Sta. 2	11.000	.000	.000	.000					
Sta. 4	20.000	.000	.000	.000					
Sta. 4+7,300	7.300	.000	.000	.000					
Sta. 6	12.700	.000	.000	.000					
Sta. 8	20.000	.000	.000	.000					
Sta. 10	20.000	.000	.000	.000					
Sta. 11+4,500	14.500	.000	.000	.000					
Sta. 12	5.500	.000	.000	.000					
Sta. 14	20.000	.000	.000	.000					
Sta. 15+7,366	17.366	.000	.000	.000					
Sta. 16	2.634	.000	.000	.000					
Sta. 16+5,800	5.800	.000	.000	.000					
Sta. 18	14.200	30.000	15.000	213.000					
Sta. 19+7,700	17.700	.000	15.000	265.500					
Sta. 20	2.300	.000	.000	.000					
Sta. 22	20.000	.000	.000	.000					
Sta. 22+7,700	7.700	.000	.000	.000					
Sta. 24	12.300	.000	.000	.000					
Sta. 24+8,400	8.400	.000	.000	.000					
			.000	.000					
			.000	.000					
			.000	.000					
			.000	.000					
			.000	.000					
Total Volume (cu.m)				=	Total Volume (cu.m)				=
				478.500					

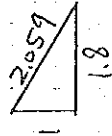
135,033.1 m³

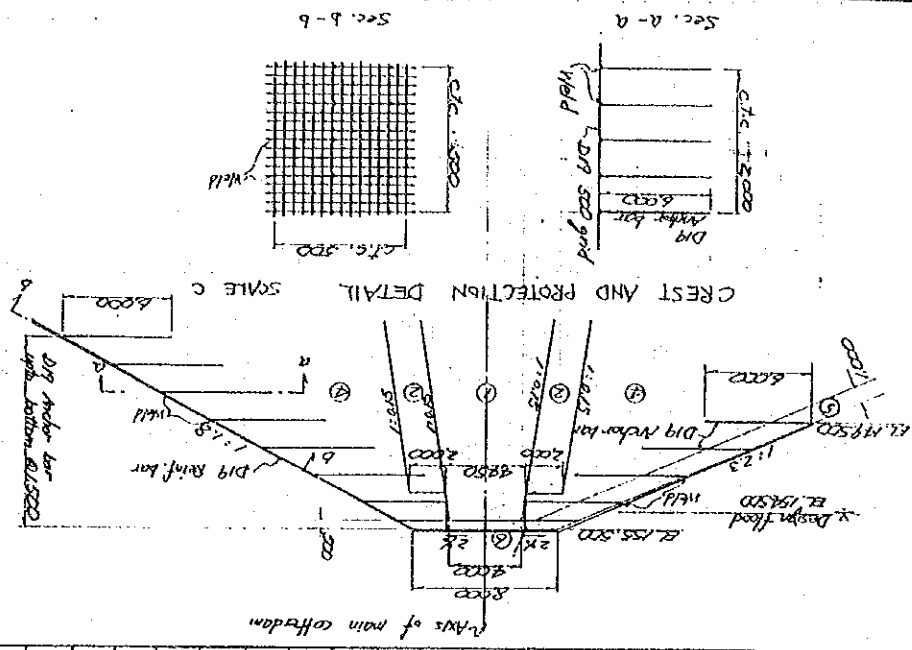
Working Division: Main Cofferdam

Description	Calculation Details	Unit	Quantity	Remarks
	/08 Main cofferdam embankment			
	Zone 5 (Rock riprap)			$2.508 / 2.3 = 1.087$
	by Planimeter $s = 1/600$			
	EL. 155.5 - 150.0	A		
	$54.2 \text{ cm}^2 \times 6^2 \times 1.087 = 2,121 \text{ m}^2$			
	EL. 150.0 - 140.0			
	$63.7 \times 6^2 \times 1.087 = 2,493$			
	EL. 140.0 - 130.0			
	$42.8 \times 6^2 \times 1.087 = 1,675$			
	EL. 130.0 - 120.0			
	$11.9 \times 6^2 \times 1.087 = 466$			
	Total			
	$(2,121 + 2,493 + 1,675 + 466) \times 1.0^m$	m^3	6,760	



Working Division: Main Cofferdam

Description	Calculation Details	Unit	Quantity	Remarks
/10				
Reinforcement bar (Protection of slope)				 $2.059 / 1.8 = 1.144$
a) Anchor bar $\phi 19$				
W/s slope area (by planimeter)				
	$58.4 \text{ cm}^2 \times 6^2 \times 1.087 = 2,285 \text{ m}^2$			
	$@ 1.5 \text{ m} \times 2.508 = 3.762 \text{ m}$			
	$2,285 \text{ m}^2 / (3.762 \times 2.0) = 304 \text{ nos.}$			
D/s slope area (-do-)				
	$149.6 \times 6^2 \times 1.144 = 6,161 \text{ m}^2$			
	$@ 1.5 \times 2.059 = 3,089 \text{ m}$			
	$6,161 / (3,089 \times 2.0) = 998 \text{ nos.}$			
	$(304 + 998) \times 6.0 \text{ m} \times 2.25 \text{ kg/m}$			
	$= 17,577$			
	$17,577 \times 1.1 = 19,400 \text{ kg}$	kg	19,400	
b) Protection bar $\phi 19$ @ 500 grid				
Crest of dam				
	$8.0 \text{ m} \times 168.2 \text{ m} = 1,346 \text{ m}^2$			
	$8.0 / 0.5 \times 168.2 + 168.2 / 0.5 \times 8.0$			
	$= 5,383 \text{ m}$			
	$5,383 \text{ m} / 1,346 \text{ m}^2 = 4.0 \text{ m/m}^2$			



Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	$W/S (EL.155.5 - EL.149.5)$			
	$2.285 m^2 \times 4.0 = 9.140 m$			
	$P/S (EL.155.5 - bottom)$			
	$6.161 m^2 \times 4.0 = 24.644 m^2$			
	Total			
	$(5383 + 9.140 + 24.644) \times 2.25$			
	$= 88,126 kg$			
	$88,126 \times 1.1 = 97,000 kg$	kg	97,000	
	Total of R. bar			
	$19,400 + 97,000 = 116,400 kg$	ton	116.4	

Item No.	Work	Unit	Quantity	Foregin Currency ()		Local Currency (Rs)		Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause	
C MAIN DAM								
C1 Earthwork								
/01	Clearing and stripping at main dam site, borrow area and quarry site							
	a) Main dam	m2	66,700					T2.2.3
	b) Quarry site	m2	53,000					T2.2.3
	c) Borrow area	m2	200,000					T2.2.3
	d) Reservoir area	m2	332,000					T2.2.3
/02	Excavation common, for foundation of main dam and in open-cut for core wall and drain channel	m3	191,000					T2.4.6
/03	Excavation sand and gravel, for foundation of main dam	m3	9,000					T2.4.6
/04	Excavation weathered rock, for							
	a) Main dam	m3	46,000					T2.4.6
	b) Right abutment	m3	48,200					T2.4.6
	c) Inspection tunnel	m3	2,200					T2.4.6
/05	Excavation rock, for							
	a) Main dam	m3	10,700					T2.4.6
	b) Right abutment	m3	95,800					T2.4.6
	c) Inspection tunnel	m3	1,500					T2.4.6
/06	Underground excavation, for							
	a) Inspection tunnel	m3	2,410					T2.5.6
	b) Grout tunnel No.1	m3	600					T2.5.6
	c) Grout tunnel No.2	m3	5,100					T2.5.6
/07	Trench excavation, all classes, for							
	a) Main dam	m3	11,300					T2.4.6
	b) Inspection tunnel	m3	60					T2.4.6

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause	
/08	Main dam embankment, Zone 1 (core), including hauling, placing and compaction	m3	242,900					T2.6.2
/09	Main dam embankment, Zone 2 (fine filter), including crushing, processing, hauling, placing and compaction	m3	68,800					T2.6.3
/10	Main dam embankment, Zone 3 (coarse filter), including hauling, placing and compaction	m3	63,200					T2.6.3
/11	Main dam embankment, Zone 4 (rock), including hauling, placing and compaction	m3	985,200					T2.6.4
/12	Main dam embankment, Zone 5 (riprap), including hauling, placing and compaction	m3	21,300					T2.6.5
/13	Surface course for main dam crest	m2	1,800					T5.2.5
/14	Compacted sand and gravel fill as base course for main dam crest	m3	300					T5.2.5
/15	Compacted gravel and cobble fill as subbase course for main dam crest	m3	530					T5.2.5
/16	Placing selected material for shoulder protection at dam crest	m3	2,230					T2.7.6
/17	Sod facing on cutting slope on right abutments	m2	2,300					T2.10.5

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
/18	Backfill with free drainage materials at portal portion of inspection tunnel	m3	30						T2.7.6
/19	Backfill with random material for drain ditch and pit of inspection tunnel	m3	10						T2.7.6
/20	Gravel bedding for foundation of cable duct	m3	20						T2.7.6
/21	Excavation for plug concrete for core foundation	m3	7,220						T2.5.6

Subtotal of item C1

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
C2	Drilling and Grouting for Foundation Treatment of Main Dam and Spillway, and Dam Rims								
/01	Drilling curtain grout-holes without core sampling								
	(a) Vertical hole								
	(i) Section from 0 to 30m in length	m	13,770						T3.12.1
	(ii) Section from 30m to 70m in length	m	7,280						T3.12.1
	(b) Inclined hole								
	(i) Section from 0 to 30m in length	m	1,570						T3.12.1
	(ii) Section from 30m to 70m in length	m	930						T3.12.1
/02	Drilling consolidation and blanket grout holes without sampling	m	5,050						T3.12.1
/03	Core drilling								
	(a) Vertical hole								
	(i) Section from 0 to 30m in length	m	450						T3.12.2
	(ii) Section more than 30m in length	m	420						T3.12.2
	(b) Inclined hole								
	(i) Section from 0 to 30m in length	m	1,290						T3.12.2
	(ii) Section more than 30m in length	m	1,840						T3.12.2
/04	Water pressure test in borehole								
	(a) Under a single pressure	time	5,520						T3.12.3
	(b) Under varied pressure	time	800						T3.12.3

Note: The Tenderer shall fill in J¥ or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
/05	Packer setting								
	(a) Depth not more than 9 m	lime	1,830						T3.12.4
	(b) Depth 10 m to 30 m	lime	2,380						T3.12.4
	(c) Depth more than 30 m	lime	2,120						T3.12.4
/06	Grouting	ton	1,300						T3.12.5
/07	Material								
	(a) Cement	ton	1,300						T3.12.6
	(b) Sand	ton	10						T3.12.6
	(c) Bentonite	ton	10						T3.12.6
/08	Backfill grouting								
	(a) Inspection tunnel	m3	20						T3.12.8
	(b) Grout tunnel No.1 (right abutment)	m3	10						T3.12.8
	(c) Grout tunnel No.2 (left abutment)	m3	120						T3.12.8
<u>Subtotal of item C2</u>									

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
C3	Concrete Work								
/01	Concrete, Class A, in blockout	m3	10						T4.1.18
/02	Concrete, Class B for drain ditch	m3	110						T4.1.18
/03	Concrete, Class C, in inspection gallery	m3	8,910						T4.1.18
/04	Concrete, Class C, in tunnel lining	m3	3,610						T4.1.18
/05	Concrete, Class C for gravity wall	m3	-						T4.1.18
/06	Backfill concrete, Class E, in dam foundation	m3	-						T4.1.18
/07	Concrete, Class E, plug concrete for core foundation	m3	7,220						T4.1.18
/08	Concrete, Class F for levelling concrete	m3	20						T4.1.18
/09	Form, F1 for items/01, /03, /04 and /05	m2	1,420						T4.1.18
/10	Form, F2 for items/01, /03, /05 and /06	m2	7,860						T4.1.18
/11	Reinforcing bar	ton	315						T4.1.18
/12	Shotcrete on cutting slope on right abutment	m2	4,910						T4.2.7
/13	Waterstop								
	a) Type "A"	m	700						T4.1.18
	b) Type "B"	m	470						T4.1.18
Subtotal of item C3									

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
C4	Measuring Apparatus								
/01	Provision, installation, test operation of strain gage type pore pressure meter, including preservation during construction	no.	79						T10.8.1
/02	Provision, installation, test operation of strain gage type earth pressure meter, including preservation during construction	set	4						T10.8.1
/03	Provision, installation, test operation of multi-layer settlement meter, including preservation during construction								
	1) No.1 (Sta. No. 16)	set	1						T10.8.1
	2) No.2 (Sta. No. 10)	set	1						T10.8.1
	Sub-total (/03)								
/04	Provision of surface displacement survey points including installation, testing and maintenance								
	1) Crest	pcs	8						T10.8.2
	2) Slope	pcs	24						T10.8.2
	Sub-total (/04)								
/05	Provision, installation and test operation and maintenance of leakage measuring facility (not including a triangular weir at the outlet of inspection tunnel)	LS.	-						T10.8.3

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause or Sub-clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs)		
/06	Provision of water level detector and indicator with gauging staff made of metal plate for reservoir including installation, testing and maintenance	L.S.							T10.8.4
/07	Provision, installation and test operation and maintenance of relay terminal box and cable								
	1) Relay terminal box	no.	5						T10.8.5
	2) Cable (Chloroprene cabtyre)	m	6,150						T10.8.5
	3) Cable (Chloroprene cabtyre-heavy dut	m	7,390						T10.8.5
	4) Cable (Multi core)	m	950						T10.8.5
	5) Converter	no.	1						T10.8.5
	Sub-total (/07)								
/08	Provision, installation and test operation and maintenance of recording and data processing system								
	1) Data acquisition controller	L.S.							T10.9.3
	2) Data processing system with periphei	L.S.							T10.9.3
	Sub-total (/08)								
/09	Installation of reference point for sediment monitoring	no.	8						T10.8.2
<u>Subtotal of item C4</u>									

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
C5	Drainage								
/01	Concrete pipe, 600mm dia.	m	20						T2.9.3
/02	P.V.C. pipe, 75mm dia.	m	110						T2.9.3
Subtotal of item C5									

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total	Ref. Clause
				Unit Price	Amount	Unit Price	Amount Equivalent (Rs) or Sub-clause		
C6	Miscellaneous Metalwork								
/01	V-notched narrow crested weir	m ²	0.9						T9.6.8
/02	Steel handrail, 35 mm dia. steel pipe of inspection gallery	m	280						T9.6.4
/03	Permanent steel support, H-150x150, for inspection tunnel and grout tunnel	ton	125						T2.5.6
/04	Grating for sump pit in inspection gallery	kg	220						T9.6.2
/05	Grating for drain ditch cover at entrance of inspection and grout tunnels	kg	180						T9.6.2
/06	Non-embedded metalwork for entrance c inspection and grout tunnels	kg	400						T9.6.2
/07	Dowel bars in inspection gallery	ton	10						T4.1.18
<u>Subtotal of item C6</u>									

Note: The Tenderer shall fill in JY or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.


Item No.	Work	Unit	Quantity	Foreign Currency ()		Local Currency (Rs)		Total Amount Equivalent (Rs) or Sub-clause	Ref. Clause
				Unit Price	Amount	Unit Price	Amount		
C7	Other Miscellaneous								
/01	Construction of concrete guard blocks on crest of dam including gravel bedding	no.	170						T5.2.7
/02	Bituminus coating for contraction joint for inspection tunnel, grout tunnels No.1 & No.2	m2	2,500						T4.1.18
/03	Gravel bedding (around portal of inspection tunnel)	m3	10						T2.7.6
/04	Gravel metaling (around portal of inspection tunnel)	m3	5						T2.7.6
/05	Base course (around portal of inspection tunnel)	m3	10						T5.2.5
/06	Sub-base course (around portal of inspection tunnel)	m3	20						T5.2.5
/07	Construction of lighting pole base	no.	20						T5.2.7
<u>Subtotal of item C7</u>									
TOTAL OF ITEMS									

Note: The Tenderer shall fill in J¥ or US\$ in brackets adjacent to "Foreign Currency" described above, which the Tenderer proposes to apply as the foreign currency in the Contract.

Working Division: MAIN DAM

Description	Calculation Details	Unit	Quantity	Remarks
C.I / O.I	Clean and stripping	m ²	66,628.821	
(A) - Dam	= 55,843.821			
	- Right Abutment = 10,785.0			
	Total = 66,628.821			
(b)	Quarry site (by planimeter)	m ²	53,000	
(c)	Borrow area (by planimeter)	m ²	200,000	

Working Division: Main Dam

Description	Calculation Details	Unit	Quantity	Remarks
/ 01 (d)	Creating of reservoir area upto EL. 1935 m			
1) Left side of Terre Rouge	$L = 1,970 \text{ m}$ slope length at dam site = 140 m $140.0 \times \frac{1}{2} \times 1,970 = 137,900 \text{ m}^2$			
2) Right side of Terre Rouge	$L = 1,700 \text{ m}$ slope length = 105 m $1050 \times \frac{1}{2} \times 1,700 = 89,250 \text{ m}^2$			
3) Left side of Profonde river	$L = 1,050 \text{ m}$ slope length = 80 m $80.0 \times \frac{1}{2} \times 1,050 = 42,000 \text{ m}^2$			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	4) Right side of Profonde river			
	L = 1,320 m			
	slope length = 95 m			
	$95.0 \times \frac{1}{2} \times 1,320 = 62,700 \text{ m}^2$			
	total of area			
	$13,790.00 + 89,250 + 42,000 + 62,700$			
	$= 331,850 \text{ m}^2$	m ²	332,000	