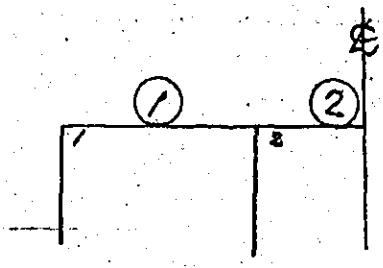
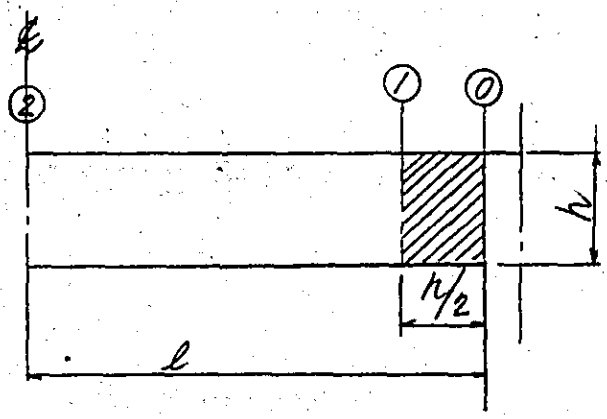
(2) Calculation of shearing stress



(a) Summary of shearing stresses

For examining Section 0, shearing stress at Section 1. is used

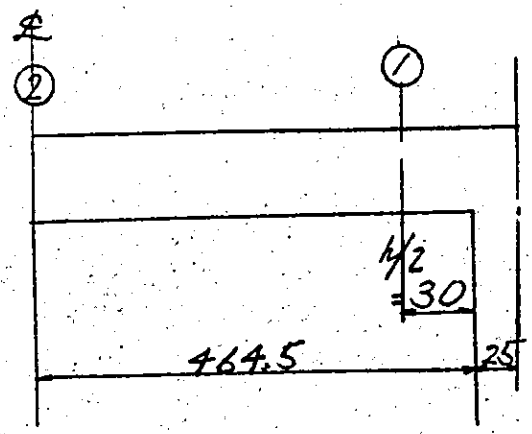


	①				②			
	Left support	CO.	Right support	CO.	Left support	CO.	Right support	CO.
⓪	13.44		-18.80		16.46			
①	12.73	6	-17.89	6	15.74	6		
②	-2.73		-2.73		0			
○								
○								

(Note) CO. - Combination

(b) Shearing stress

(i) Shearing stress caused by bending



(ii) Shearing stress of the member of uniform height

$$\tau = \frac{S}{b.d}$$

$$\tau_1 = \frac{17.69 \times 10^3}{50 \times 51.7} = 6.84\ ^{kg/cm^2} > 3.9\ ^{kg/cm^2}$$

$$\tau_2 = \frac{2.73 \times 10^3}{50 \times 51.7} = 1.06\ \text{"} < \text{"}$$

(iii) Therefore..

[Refer viaduct of platfrom] VP2

Therefore

- Stirrup

  Use - D13 - 1 sets in 15 cm c/c

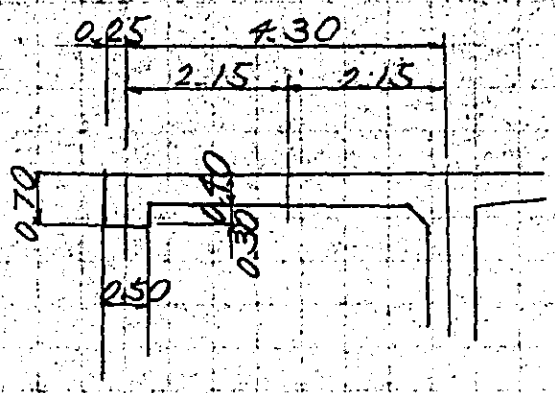
- Bar arrangement in axial direction

  Use D25 - 1 bars (one side)

Calculation of Intermediate longitudinal beam

1. load calculations

1.) Dead load



span

$l = 10.00^{m}$

Distributed loads

Slad $2.5^{t/m^3} \times 0.40 \times 2.40 = 2.400^{t/m}$

pavemet $1.1' \times 0.05 \times 2.40 = 0.132''$

longitudinal beam $2.5^{t/m^3} \times 0.50 \times 0.30 = 0.375''$

$Wd_1 = 2.91^{t/m}$

2) Pedestrian load (People load)

$w = 0.350^{t/m^2}$

$Wd_2 = 0.35 \times 2.40 = 0.84^{t/m}$

3) Dead load + Pedestrian load

$Wd = 2.91 + 0.84 = 3.75^{t/m}$

2. Calculation of stress

Calculation is made based on the assumption that both supporting slab ends are rigid.

1) Calculation of at the support point moment

$$M = -\frac{1}{12} w l^2$$

(Dead load) $M = -\frac{1}{12} \times 2.91 \times 10.00^2 = -29.25^{t\cdot m}$

(Dead + pedestrion) load $M = -\frac{1}{12} \times 3.75 \times 10.00^2 = -31.25^{"}$

2) Calculation of at the span center moment

$$M = \frac{1}{24} w l^2$$

(D + P) load $M = \frac{1}{24} \times 3.75 \times 10.00 = 15.63^{t\cdot m}$

3) Calculation of shearing force

$l/2$ point

$$S = \frac{1}{2} wl - wx$$

$$= \frac{1}{2} \times 3.75 \times 10.00 - 3.75 \times 0.60 = 16.50^{t}$$

3. Allowable stress, Safe against cracking

$$\alpha = \frac{(31.25 - 29.25)}{31.25} = 0.22 < 0.25$$

Hence, $\sigma_{sad} = 1200^{kg/cm^2}$

Caculation of stress

	at the support point		at the span center moment	
M (tm)	-24.25	-31.25	15.63	
N (t)				
S (t)				
b (cm)	50		50	
h (cm)	70		70	
d (cm)	61.1		64.3	
d' (cm)	8.9		5.9	
As (cm^2)	D32 - 5 2 = 55.59		D32 - 5 = 39.71	
p	0.01820		0.01235	
As' (cm^2)				
p'				
$e = M/N$ (cm)				
$e = M/N + u$ (cm)				
$e = M/N - u$ (cm)				
e/h				
d/e				
d'/h				
d'/d				
~~M/bd^2~~ (kg/cm^2)	12.99	16.74	7.56	
k				
c				
j				
$1/Lc$	4.69		5.22	
$1/Ls$	66		95	
$\beta = \sigma s/\sigma c$				
σc (kg/cm^2)		78.5	39.5	
σs (kg/cm^2)	860	1110	720	
τ (kg/cm^2)				
σsa (kg/cm^2)	1200	1800	1800	
σca (kg/cm^2)		90	90	
τa (kg/cm^2)				
~~Nomogram~~ number	M-1	〃	〃	
Combination	D	D+P	D+P	

4. Required minimum cross section of re-bars

(i) At the top of support point

$$As = \frac{M}{\sigma sa \cdot j \cdot d} \times \frac{4}{3}$$

$$= \frac{24.25 \times 10^5}{1200 \times 0.875 \times 61.4} \times \frac{4}{3} = 50.15^{cm^2}$$

Hence D32 - 7 = $55.59^{cm^2} > 50.15^{cm^2}$

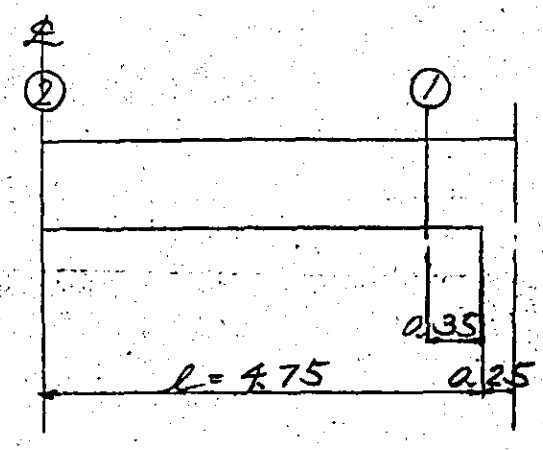
(ii) At the span center point

$$As = \frac{15.63 \times 10^5}{1800 \times 0.875 \times 64.1} \times \frac{4}{3} = 20.64^{cm^2}$$

Hence D32 - 5 = $39.71^{cm^2} > 20.64^{cm^2}$

5. Shearing stress

(a) Shearing stress caused by bending



(b) Shearing stress of the member of uniform height

$$\tau = \frac{S}{b \cdot d}$$

$$\tau_1 = \frac{16.50 \times 10^3}{50 \times 61.4} = 5.37 \text{ kg/cm}^2 > 3.9 \text{ kg/cm}^2$$

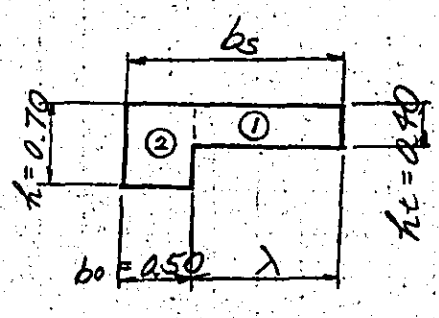
(c) Calculation of Torsional moment

i) Torsional moment caused by the Dead load

slab	$2.5^{t/m^3} \times 0.40 \times 1.90$	$= 1.90^{t/m}$
pavemet	$1.1^{'} \times 0.05 \times 1.90$	$= 0.10^{"}$
	total	$= 2.00^{t/m}$

$$M_T = 2.00 \times 1.200 \times 10.00 \times 1/2 = 12.00^{tm}$$

ii) Torsional moment, beared by longicendinal beam



Effective width

$b_s = b_o + \lambda t$

$\lambda t = 3 \cdot h_t$

$= 3 \times 0.40 = 1.20^{m}$

$b_s = 0.50 + 1.20 = 1.70^{m}$

$h = 0.70^{m}$

Calculation of distribution ratio

	a	b	a/b	k	$I_t = k \cdot a \cdot b^3$ (m⁴)
①	1.20	0.40	3.000	0.263	$0.263 \times 1.20 \times 0.40^3 = 0.020120$
②	0.70	0.50	1.400	0.186	$0.186 \times 0.70 \times 0.50^3 = 0.016275$
total					0.03640

Torsional moment beared by the beam

- Front face of column

$$M_{T1} = 12.00 \times \frac{0.016275}{0.03640} \times \frac{4.75}{5.00} = 5.10^{tm}$$

- At the h/2 point

$$M_{T2} = 12.00 \times \frac{0.016275}{0.03640} \times \frac{4.90}{5.00} = 4.72^{tm}$$

iii) Shearing stress caused by corsion

Shearing stress caused by corsion is calculation followed the equation.

$$\tau_t = \frac{Mt}{It} \cdot b \cdot \eta$$

b : Shorter side length

a : longer side length

k : Table-40.2

(a) Front face of column

$Mt_1 = 5.10^{tm}$

$a = 70^{cm}$ $b = 50^{cm}$

$\frac{a}{b} = \frac{70}{50} = 1.40$ $\eta = 0.818$

$$\tau_{t1} = \frac{5.10 \times 10^5}{3.640 \times 10^6} \times 50 \times 0.818 = 5.73 \ kg/cm^2$$

(b) At the h/2 point

$Mt_2 = 4.72^{tm}$

$a = 70^{cm}$ $b = 50^{cm}$

$\frac{a}{b} = \frac{70}{50} = 1.40$ $\eta = 0.818$

$$\tau_{t2} = \frac{4.72 \times 10^5}{3.640 \times 10^6} \times 50 \times 0.818 = 5.30 \ kg/cm^2$$

iv) Combined shearing shress

Combined allowable shearing stress

$$\tau_a = 17 \times 1.3 = 22.1 \text{ kg/cm}^2$$

Combined shearing stress

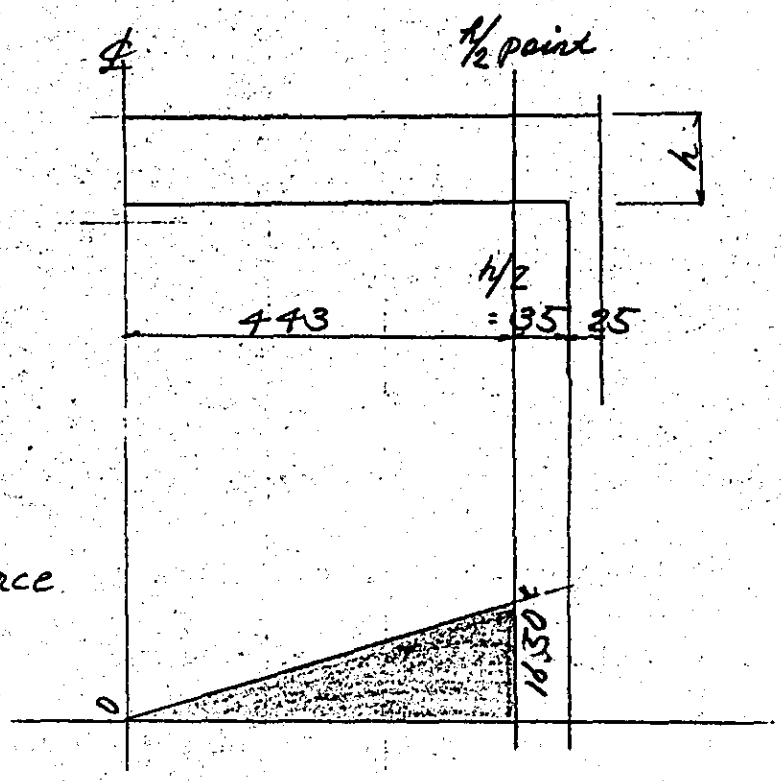
$$\tau_1 = 5.37 + 5.30 = 10.67 \text{ kg/cm}^2 < 22.1 \text{ kg/cm}^2$$

$$\tau_2 = 0 + 0 = 0 <$$

Calculated as above, diagonal tension re-bars are examined.

(b) Calculation of diagonal tension re-bars

(a.) Shearing stress caused by bending



(i) Shearing stress beared by concrete

$$Sc = 1/2 \cdot \tau c \cdot b \cdot d$$

where τc : $3.9\ kg/cm^2$

b : Width of member (cm)

d : Effective height of member at the examining section.

$$Sc1 = 1/2 \times 3.9 \times 50 \times 61.4 \times 10^{-3} = 5.99^t$$

(b) Shearing force beared by stirrup

Arrange stirrups D13- 1 sets in 15.0 cm c-c

Torsional shearing stress

$$\tau_{se} = \frac{M_t \cdot S}{0.8 \cdot A_w \cdot b_1 \cdot h_1} \times \frac{a_1}{b_1}$$

Where

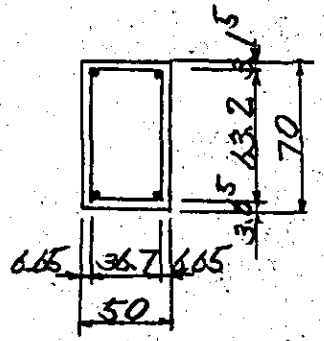
M_t : Torsional moment (cm)

S : c-c distance of stirrup (cm)

A_w : Gross cross Section of coupled stirrups (cm^2)

b_1, h_1 : length of short long side of stirrup

・(i) At h/2 point



$M_{te} = 4.72^{cm}$

$S = 15.0^{cm}$

$A_w = 1.267 \times 2 = 2.53^{cm^2}$

$h = 63.2^{cm}$

$b = 36.7^{cm}$

$$\tau_{se} = \frac{4.72 \times 10^5 \times 15}{0.8 \times 2.53 \times 36.7 \times 63.2} = 1510^{kg/cm^2} < 1800^{kg/cm^2}$$

Bending Shear beared by stirrup

In the case When Combined with corsional moment, allowable shearing stress is as 20 percent increased.

$$\sigma_{sa} = 1800 \times 1.2 = 2160 \text{ kg/cm}^2$$

$$S_v = \frac{(\sigma_{sa} - \sigma_{st}) \cdot A_v \cdot d}{1.15 \cdot \Delta}$$

(i) At h/2 point

$$(2160 - 1510) = 650 \text{ kg/cm}^2 < 1800 \text{ kg/cm}^2$$

$$d = 61.4 \text{ cm}$$

$$S_v = \frac{650 \times 253 \times 61.4}{1.15 \times 15 \times 10^3} = 5.85^t$$

(c) Shear beared by evened bar

$$F_b = \frac{\sigma_{sa} \cdot A_s \cdot d(\sin\theta + \cos\theta)}{\Delta}$$

$$\sigma_{sa} = 1800 \text{ kg/cm}^2$$

$$A_s = D32 - 2 = 15.88 \text{ cm}^2$$

$$\theta = \sin\theta + \cos\theta = 45°$$

$$F_b = \frac{1800 \times 15.88 \times 61.4 \times 1.414}{1.15 \times 100 \times 10^3} = 21.58^t$$

(i) total shear

$$\Sigma S_R = S_c + S_a + S_b$$

$$\Sigma S_R = 5.26 + 5.85 + 21.58$$

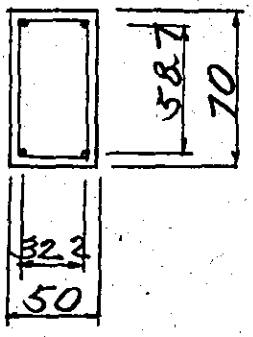
$$= 32.69^t \quad > S = 16.50^t$$

(d) Calculation of axial re-bar arrangement, resisting corsional moment

Required re-bar arrangemet is calculated followed the equation.

$$As = \frac{Mt \cdot (b_1 + h_1)}{0.8 \cdot \sigma_{sa} \cdot b_1 \cdot h_1}$$

(i) Front face of column



$Mt_1 = 5.10^{tm}$

$\sigma_{sa} = 1\,800\ kg/cm^2$

$b_1 = 32.2^{cm}$

$h_1 = 58.7^{cm}$

$$As = \frac{6.80 \times 10^5 \times (32.2 + 58.7)}{0.8 \times 1800 \times 32.2 \times 58.7} = 22.71^{cm^2}$$

Required cross section of re-bars arranged at shorter side

$$As_{b1} = 22.71 \times \frac{32.2}{2(32.2 + 58.7)} = 4.02^{cm^2}$$

(ii) Required cross section of re-bars arranged at longer side

$$Ash_1 = 22.71 \times \frac{58.7}{2 \times (32.2 + 58.7)} = 7.33 \text{ cm}^2$$

(iii) Top and Bottom

Minimum section of re-bars

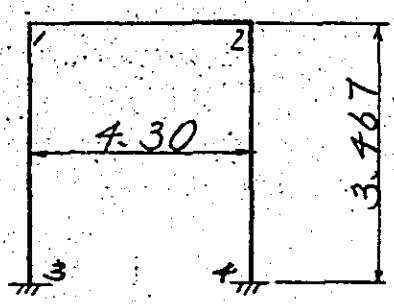
$$As = D22 - 2 = 7.74 \text{ cm}^2 > 7.33 \text{ cm}^2$$

Side (one side)

§5. Rigid fram analysis on transversal section ①-① of elevated structure

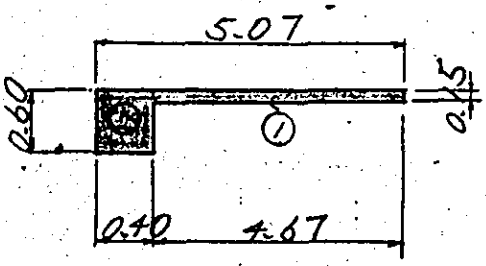
(1) Basic calculation

1. Axis of Rahmen (Rigid frame)



2. Cross sectional area / of inertia of area of members

(1) Upper beam (Member 1-2)



	b (m)	h (m)	A (m²)	y (m)	A·y (m³)
①	4.67	0.15	0.701	0.075	0.05258
②	0.40	0.60	0.240	0.300	0.07200
Σ			0.941		0.12458

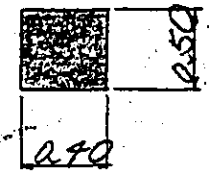
$$y = \frac{0.12458}{0.941} = 0.132^{m}$$

	$b^{(m)}$	$h^{(m)}$	$A^{(m^2)}$	$y_0^{(m)}$	$I_0^{(m^4)}$	$A \cdot y_0^2 (m^4)$	$I_0 + A \cdot y_0^2 (m^4)$
①	4.67	0.15	0.701	0.057	0.00131	0.00228	0.00359
②	0.40	0.60	0.241	0.168	0.00720	0.00680	0.01400
Σ			0.941		0.00851	0.00908	0.01759

Cross sectional area $A = 0.941\ m^2$

Moment of inertia of area $I = 0.01759\ m^4$

(2) Column (Member 1-3, 2-4)



$A = 0.40 \times 0.50 = 0.200\ m^2$

$I = 1/12 \times 0.40 \times 0.50^3 = 0.00208\ m^4$

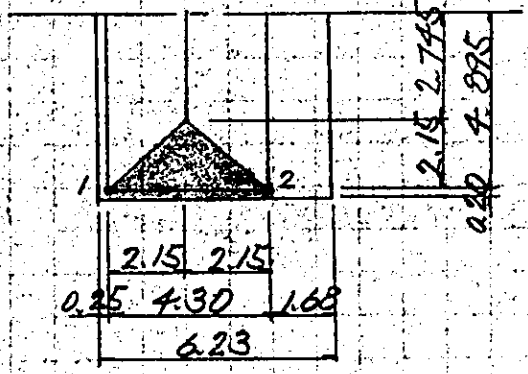
(3) axial height

$h_1 = 3.599 - 0.132 = 3.467\ m$

[2] Load calculation

1. Dead load

(1) Upper member



a) Uniformly distributed load

Slab $2.5^{t/m^3} \times 0.15 = 0.375^{t/m^2}$

pavmet $1.1^{t/m^2} \times 0.05 = 0.055^{t/m^2}$

$w = 0.43^{t/m^2}$

$wd_1 = 0.43^{t/m^2} \times 0.20 = 0.09^{t/m}$

$wd_2 = 0.43^{t/m^2} \times (0.20 + 2.15) = 1.01^{t/m}$

b). Linear load

cross beam $2.5^{t/m^3} \times 0.40 \times 0.45 = 0.45^{t/m}$

Haunch of slab $2.5^{t/m^3} \times 0.30 \times 0.10 \times 1/2 = 0.04^{t/m}$

$wd_3 = 0.49^{t/m}$

2) Concentrated load acting panel point

Panel point 1

- Uniformly distribated load

  $0.43\ t/m^2 \times 0.25 \times 5.095 = 0.55^t$

- Uniformly distributed load

  $0.43\ t/m^2 \times (2.745 + 4.895) \times 1/2 \times 2.15 = 3.53^t$

- Haunch of slab

  $2.5\ t/m^3 \times 0.30 \times 0.10 \times 1/2 \times 4.395 = 0.16^t$

- Longiudinal beam

  $2.5^t \times 0.50 \times 0.45 \times 4.695 = 2.64^t$

- Cross beam

  $2.5^t \times 0.40 \times 0.45 \times 0.25 = 0.11^t$

- Reduction of column part

  $-2.5^t \times 0.40 \times 0.50 \times (0.60 - 0.15) = -0.23^t$

- Shed load reaction $= 13.00^t$

$P_1 = 19.76^t$

Panel point 2

- Uniformly distribated load
  (same as panel point 1) = 0.35 t
- Uniformly distributed load
  ( ) = 3.53 t
- Pavement load
  $1.1\ t/m^3 \times 0.05 \times 1.43 \times 5.095$ = 0.40 "
- Cantilever slab
  $2.5\ t/m^3 \times (0.15+0.25) \times 1/2 \times 1.43 \times 5.095$ = 3.64 "
- Longitudinal beam (point 1) = 2.64 "
- Haunch of slab (") = 0.16 "
- cross beam (") = 0.11 "
- Reduction of column part (") = -0.23
- Shed load reaction (") = 10.00 "

P_2 = 20.80 t

(2) Own weight of column

$q = 2.5\ t/m^3 \times 0.40 \times 0.50 = 0.50\ t/m$

2. Pedestrian load (People load)

$w = 0.35\ t/m^2$

(1) Upper member (Refer [2] / (1))

a) Uniformly distributed load

$wd_1 = 0.35\ t/m^2 \times 0.20 = 0.07\ t/m$

$wd_2 = 0.35\ " \times (0.20 + 2.15) = 0.82\ "$

b) Concentrated load acting at panel point

(1) Panel point 1

Uniformly distributed load

$0.35\ t/m^2 \times 0.20 \times 5.095 = 0.45\ t$

Uniformly distributed load

$0.35\ " \times (2.745 + 4.895) \times 1/2 \times 2.15 = 2.87\ "$

$P_1 = 3.32\ t$

(2) Panel point 2

Uniformly distributed load $= 3.32\ t$

Uniformly distributed load

$0.35\ t/m^2 \times 1.43 \times 5.095 = 2.55\ "$

$P_2 = 5.87\ t$

3. Temperature change and Drying contraction

Temperature change -------- ±10°C

Drying contraction -------- −15°C

Hence,

Temperature rise ------- +10°C

Temperature drop + Drying contraction

-------- −25°C

4. Seismic load from dead load (K_H=0.15)

Horizontal force acting at upper member (Panel point 1.2)

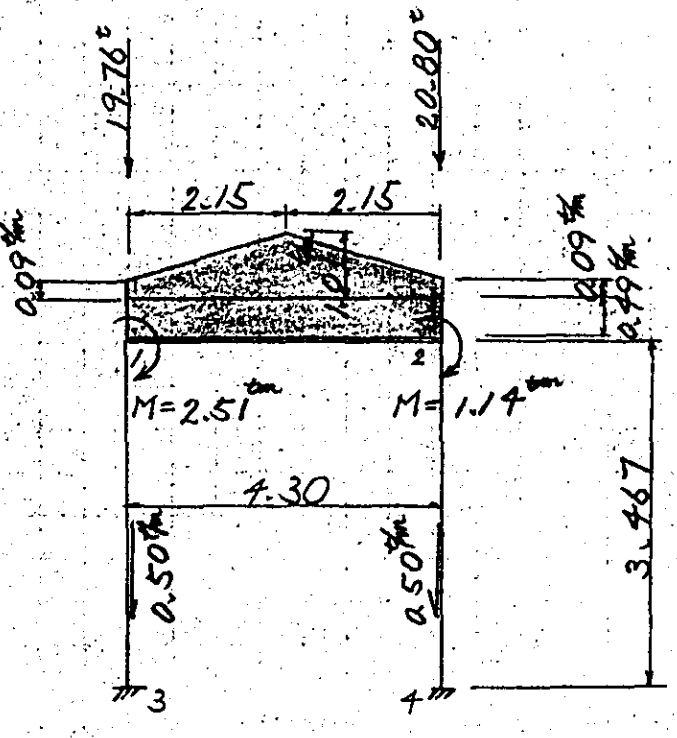
$(0.09 + 1.01)^{t/m} \times 1/2 \times 2.15 \times 2$	= 2.37^t
$0.49^{t/m} \times 4.30$	= 2.11^t
$19.78^t + 20.80^t$	= 40.56^t
$0.21^{t/m^2} \times 6.23 \times (4.895 + 0.20)$	= 6.67^t
$0.50^{t/m} \times 3.467 \times 1/2 \times 2$	= 1.73^t
total	= 53.44^t

$H = 53.44 \times 0.10 = 5.34^t$

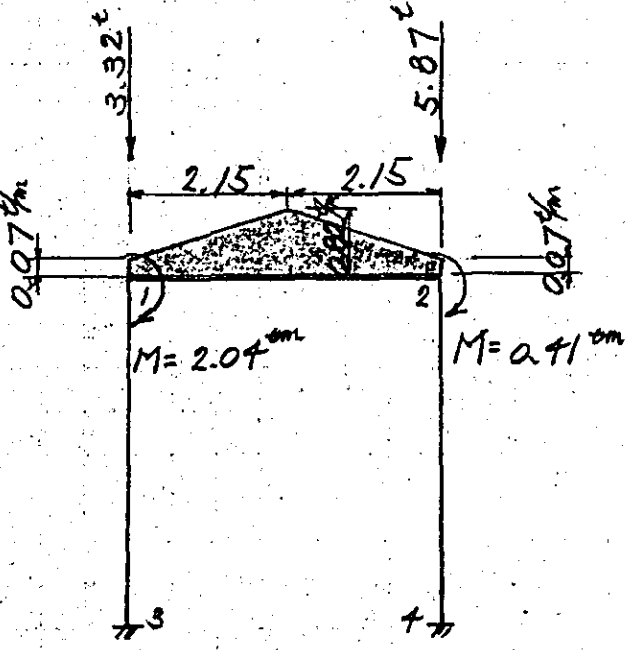
$H_1 = H_2 = 5.34 \times 1/2 = 2.67^t$

(3) loading diagram

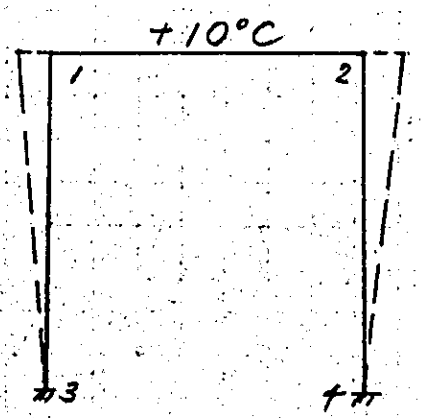
1. case 1 Dead load



2. case 2 Pedestrian load (People load)

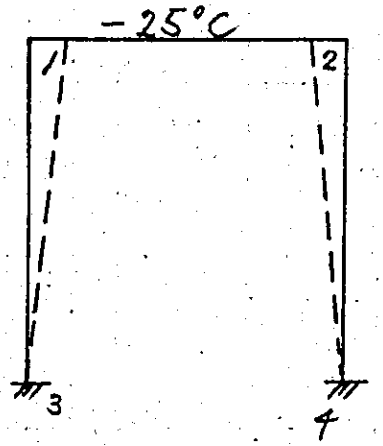


3. case 3 Temperature rise



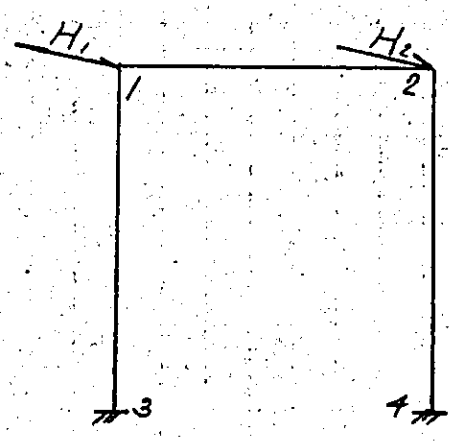
4. case 4 Temperature drop

+ Drying contraction



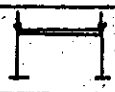
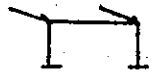
S. case 5 Seismic load from dead load

$H_1 = H_2 = 2.67^t$



[9] Combination of loads

1. Basic load

Case Number	Kind of load	Loading Pattern
1	Dead load	
2	Pedestrian load	
3	Temperature rise	+10°C
4	Temperature drop + Drying contraction	−25°C
5	Seismic load from dead load	

2. Combined loads

case number	Combination of loads	α
6	1 + 2	1.0000
7	1 + 3	0.8696
8	1 + 4	〃
9	1 + 5	0.6667
10	1 − 5	〃

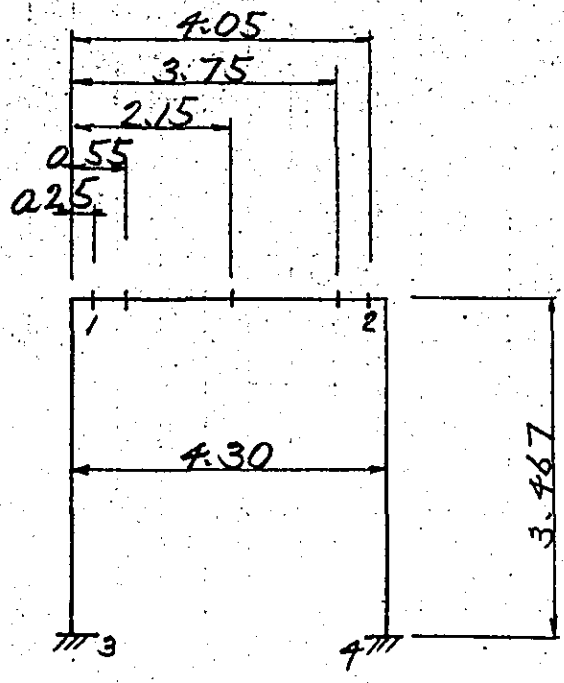
3. Critical cases

No. 1 case 1 crack

No. 2 case 6 ~ 10 synthetic

No. 3 case 9. 10 footing

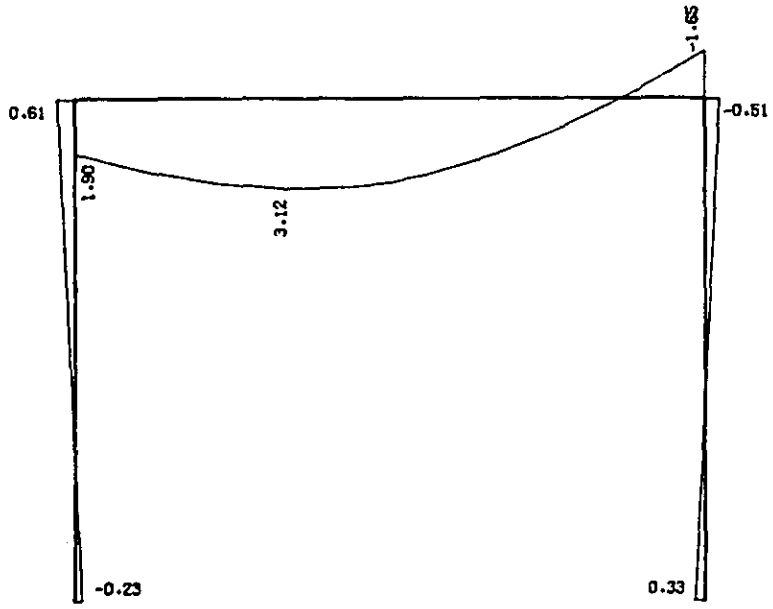
9. Point for stress calcalation



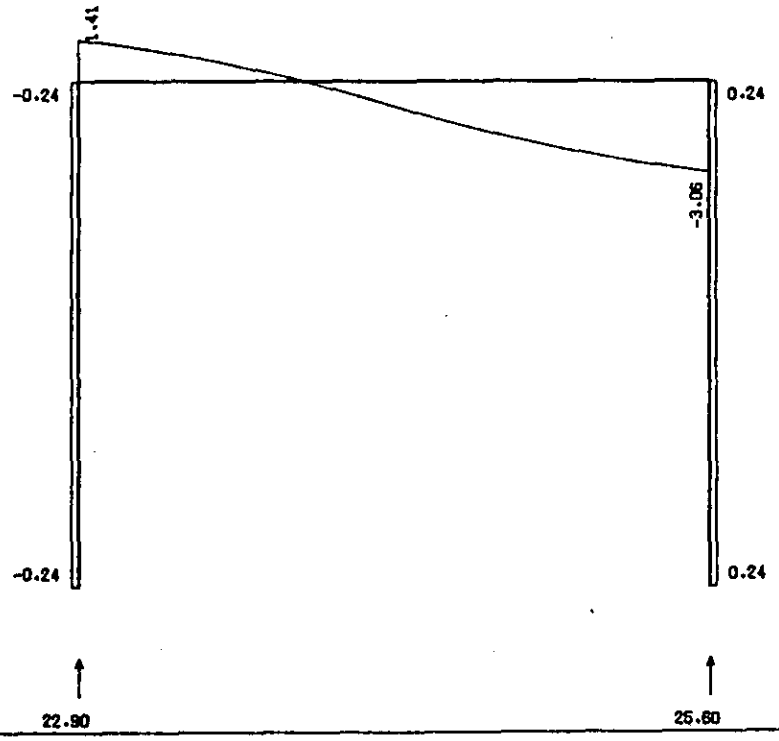
VIADUCT OF PLATFORM (CENTRAL) C-1

CASE 1 (DEAD LOAD)

BENDING MOMENT



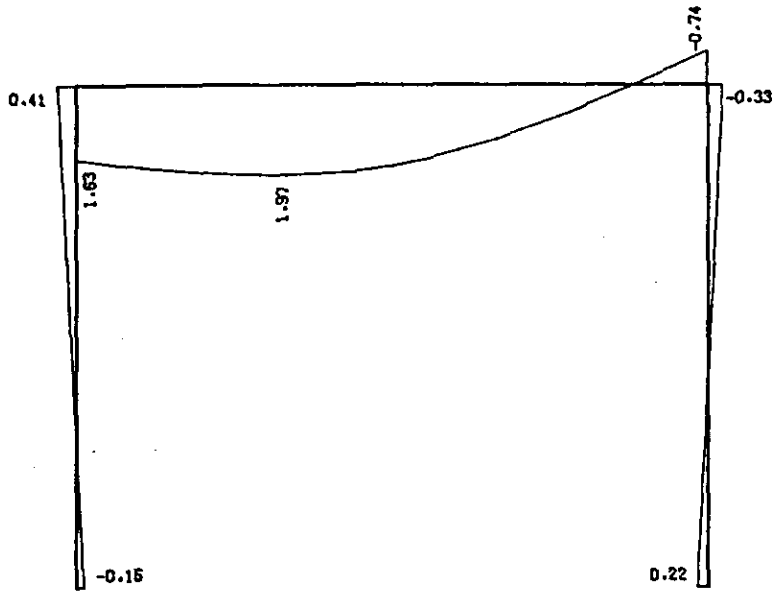
SHEARING FORCE



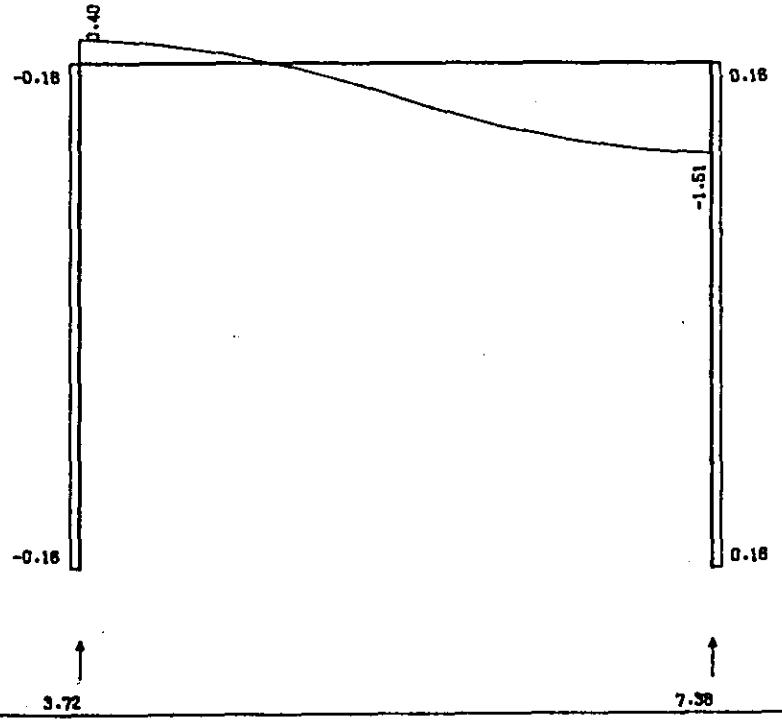
VIADUCT OF PLATFORM (CENTRAL) C-1

CASE 2 (PEDESTRIANS LOAD)

BENDING MOMENT



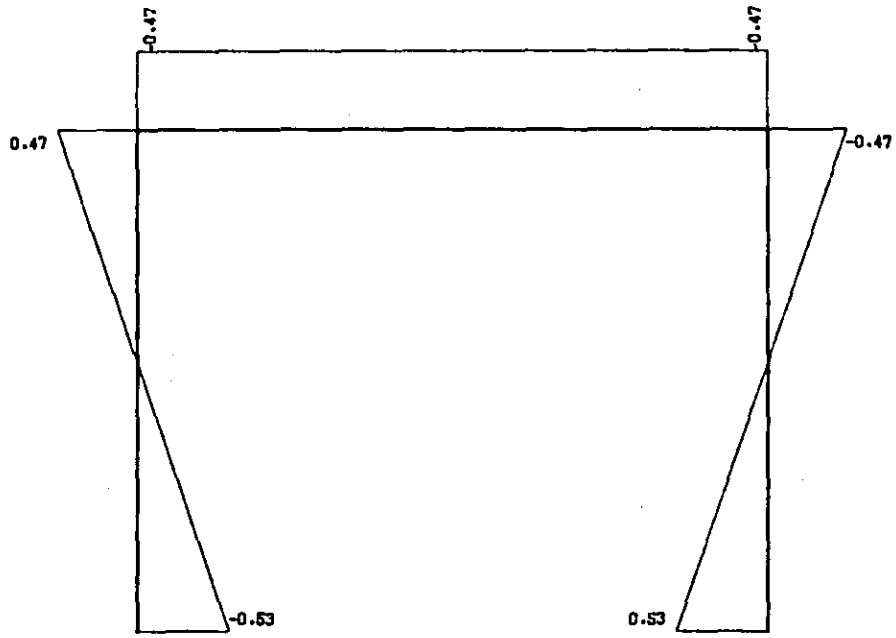
SHEARING FORCE



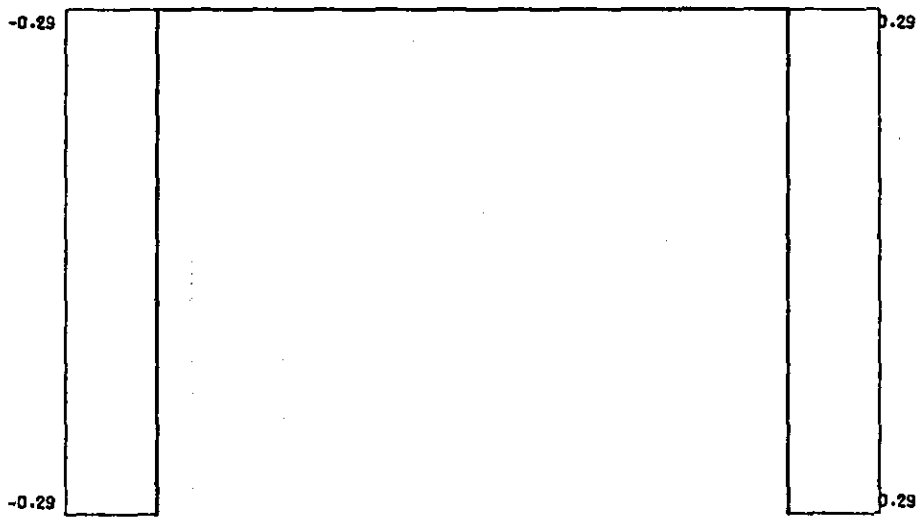
VIADUCT OF PLATFORM (CENTRAL) C-1

CASE 3 (TEMPERATURE)

BENDING MOMENT



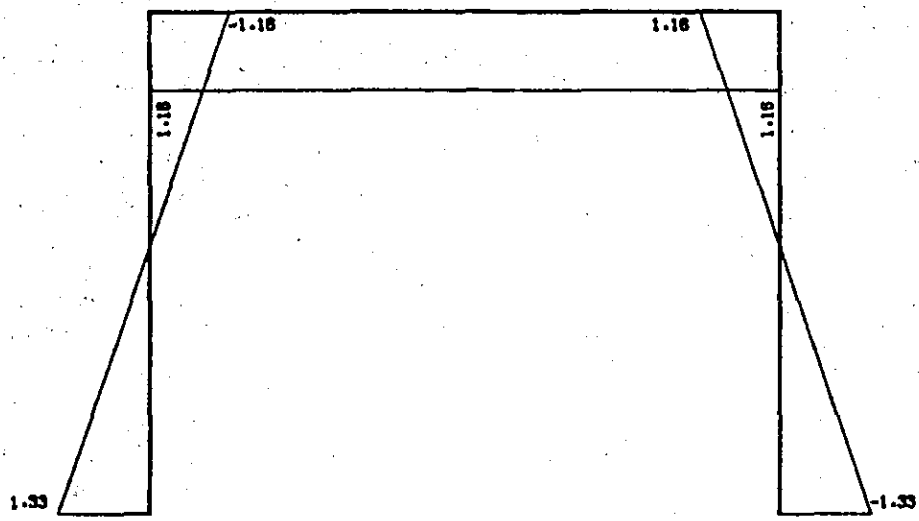
SHEARING FORCE



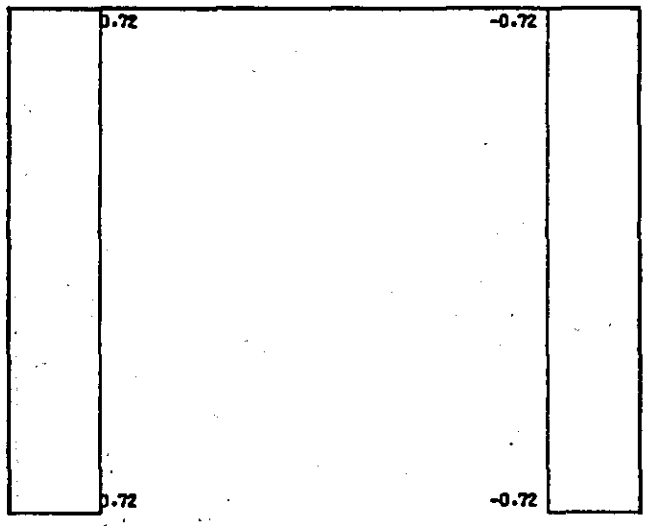
VIADUCT OF PLATFORM (CENTRAL) C-1

CASE 4 (TEMPERATURE + SCHRINKAGE)

BENDING MOMENT



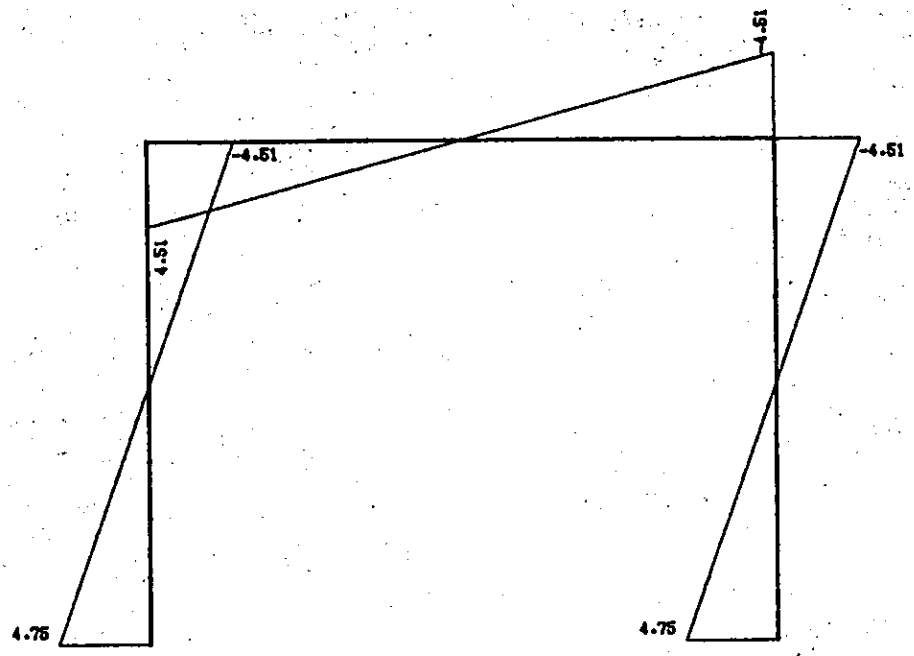
SHEARING FORCE



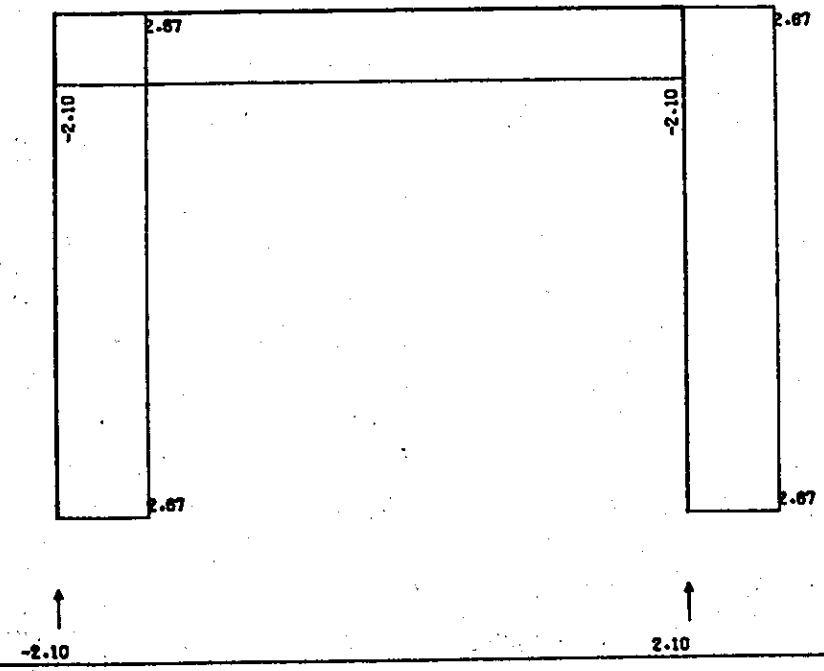
VIADUCT OF PLATFORM (CENTRAL) C-1

CASE 5 (SEISMIC LOAD)

BENDING MOMENT



SHEARING FORCE



INPUT DATA

```
=== INPUT DATA ===                                                    CRC-FANSY  V6.3
     5   10        20        30        40        50        60        70        80    CARD NUMBER
.....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
TITLE     VIADUCT OF PLATFORM (CENTRAL) C-1                                          1
PLOT            1         2                    6.0                                 2
TYPE1-1-1 L=4.3       H=3.467    H1=0.941,0.01759    H2-3=0.2,0.00208                 3
          P=2.7E+6,1.0E-5     S=0                                                    4
POINT     1 0.25        0.55       2.15       3.75       4.05                       5
PICKUP          1     1     1                                                       6
                2     1     6    10                                                 7
                3     1     9    10                                                 8
LOAD            1       CASE  1 (DEAD LOAD)                                        9
J               1                 -19.76     -2.51                                10
                2                 -20.8      -1.14                                11
D               1  2 2-0.09       -1.01      2.15       -1.01      -0.09      2.15  12
DL              1    2-0.49                                                       13
                2    2-0.5                                      3                 14
END                                                                               15
LOAD            2       CASE  2 (PEDESTRIANS LOAD)                                16
J               1                 -3.32      -2.04                                17
                2                 -5.87      -0.41                                18
D               1  2 2-0.07       -0.82      2.15       -0.82      -0.07      2.15  19
END                                                                               20
LOAD            3       CASE  3 (TEMPERATURE)                                     21
T               1        10.0                                                     22
END                                                                               23
LOAD            4       CASE  4 (TEMPERATURE + SCHRINKAGE)                        24
T               1       -25.0                                                     25
END                                                                               26
LOAD            5       CASE  5 (SEISMIC LOAD)                                    27
J               1        2.67                                      2              28
END                                                                               29
MT2       6                 1    2                                                30
          70.8696           1    3                                                31
          80.8696           1    4                                                32
          90.6667           1    5                                                33
         100.6667           1   -5                                                34
FINISH                                                                            35
```

TIILE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

CONTROL DATA

METHOD	STRUCTURE	J.RENUMBER	M.RENUMBER	S.F. DIS.	UNI.SPRING	STAN.STIF.	BARA	SKEW MEM.
DIS	*RAHMEN*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*

LOAD TIILE

LOAD 1 CASE 1 (DEAD LOAD)
LOAD 2 CASE 2 (PEDESTRIANS LOAD)
LOAD 3 CASE 3 (TEMPERATURE)
LOAD 4 CASE 4 (TEMPERATURE + SCHRINKAGE)
LOAD 5 CASE 5 (SEISMIC LOAD)

MIX 6 CASE 6 (1+2)
MIX 7 CASE 7 (1+3)
MIX 8 CASE 8 (1+4)
MIX 9 CASE 9 (1+5)
MIX 10 CASE 10 (1-5)

PICK UP LOAD CASE

PICK 1 1
PICK 2 6 7 8 9 10
PICK 3 9 10

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

JOINT DATA

JOINT NUMBER 4

ZAHYO(M) JOINT	X	Y
1	0.0000	3.4670
2	4.3000	3.4670
3	0.0000	0.0000
4	4.3000	0.0000

MEMBER DATA

MEMBER NUMBER 3

MEMBER	ITAN	JTAN	CONNECT.	ITAN	JTAN	LENGTH	A	I	AES	KO(BANE)	PRO.NUM
1	1	2		FIX	FIX	4.3000	.94100	.0175900			1
2	1	3		FIX	FIX	3.4670	.20000	.0020800			1
3	2	4		FIX	FIX	3.4670	.20000	.0020800			1

PROPERTY DATA

PROPERTY NUMBER 1

PROPERTY	E	G	EPS
1	2.700E+06	0.	1.000E-05

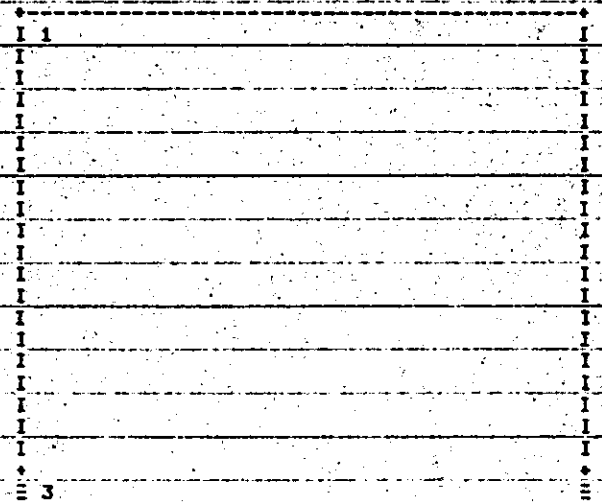
SUPPORT DATA

SUPPORT NUMBER 2

SUPPORT	SUPPORT-JYOKEN	X	Y	THET Z	X(BANE)	Y(BANE)	THET Z(BANE)
3		FIX	FIX	FIX	0.0	0.0	0.0
4		FIX	FIX	FIX	0.0	0.0	0.0

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

STRUCTURAL FIGURE



TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

MOVE DATA

MEMBER	GOIKI ITAN	GOIKI JTAN	POINT 1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	.....	.....	.250	.550	2.150	3.750	4.050									
2	.....	.....														
3	.....	.....														

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

LOAD DATA

	M/J	NAME	D	W1	W2	L1	L2
LOAD - 1		CASE 1 (DEAD LOAD)					
MEMBER	1	LINEAR	Y	-.090	-1.010	0.000	2.150
		LINEAR	Y	-1.010	-.090	2.150	0.000
		LINEAR	Y	-.490	-.490	0.000	0.000
	2	LINEAR	Y	-.500	-.500	0.000	0.000
	3	LINEAR	Y	-.500	-.500	0.000	0.000
JOINT	1	JOINTLOAD	Y	-19.760			
		JOINTLOAD	Z	-2.510			
	2	JOINTLOAD	Y	-20.800			
		JOINTLOAD	Z	-1.140			
LOAD - 2		CASE 2 (PEDESTRIANS LOAD)					
MEMBER	1	LINEAR	Y	-.070	-.820	0.000	2.150
		LINEAR	Y	-.820	-.070	2.150	0.000
JOINT	1	JOINTLOAD	Y	-3.320			
		JOINTLOAD	Z	-2.040			
	2	JOINTLOAD	Y	-5.870			
		JOINTLOAD	Z	-.410			
LOAD - 3		CASE 3 (TEMPERATURE)					
MEMBER	1	TEMP		10.0(DO)			
LOAD - 4		CASE 4 (TEMPERATURE + SCHRINKAGE)					
MEMBER	1	TEMP		-25.0(DO)			
LOAD - 5		CASE 5 (SEISMIC LOAD)					
JOINT	1	JOINTLOAD	X	2.670			
	2	JOINTLOAD	X	2.670			

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

MIX DATA

MIX NUMBER 5

LOAD	SS	N	S1	K1	S2	K2	S3	K3	S4	K4	S5	K5	S6	K6	S7	K7	S8	K8
6	1.0000	2	1.0000	1	1.0000	2												
7	.8696	2	1.0000	1	1.0000	3												
8	.8696	2	1.0000	1	1.0000	4												
9	.6667	2	1.0000	1	1.0000	5												
10	.6667	2	1.0000	1	-1.0000	5												

PICK UP

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 1

MOMENT MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	1.902	1.410	-.242
1	.250	(1)	2.235	1.252	-.242
2	.550	(1)	2.578	1.027	-.242
3	2.150	(1)	2.885	-.826	-.242
4	3.750	(1)	-.064	-2.678	-.242
5	4.050	(1)	-.902	-2.903	-.242
JTAN	4.300	(1)	-1.649	-3.062	-.242
MAX	1.433	(1)	3.117	.139	-.242
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	.608	-.242	-21.170
JTAN	3.467	(1)	-.229	-.242	-22.904
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-.509	.242	-23.862
JTAN	3.467	(1)	.329	.242	-25.595

MOMENT MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	1.902	1.410	-.242
1	.250	(1)	2.235	1.252	-.242
2	.550	(1)	2.578	1.027	-.242
3	2.150	(1)	2.885	-.826	-.242
4	3.750	(1)	-.064	-2.678	-.242
5	4.050	(1)	-.902	-2.903	-.242
JTAN	4.300	(1)	-1.649	-3.062	-.242
MAX	1.433	(1)	3.117	.139	-.242
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	.608	-.242	-21.170
JTAN	3.467	(1)	-.229	-.242	-22.904
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-.509	.242	-23.862
JTAN	3.467	(1)	.329	.242	-25.595

001

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 1

SHEAR MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	1.902	1.410	-.242
1	.250	(1)	2.235	1.252	-.242
2	.550	(1)	2.578	1.027	-.242
3	2.150	(1)	2.885	-.826	-.242
4	3.750	(1)	-.064	-2.678	-.242
5	4.050	(1)	-.902	-2.903	-.242
JTAN	4.300	(1)	-1.649	-3.062	-.242
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	.608	-.242	-21.170
JTAN	3.467	(1)	-.229	-.242	-22.904
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-.509	.242	-23.862
JTAN	3.467	(1)	.329	.242	-25.595

SHEAR MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	1.902	1.410	-.242
1	.250	(1)	2.235	1.252	-.242
2	.550	(1)	2.578	1.027	-.242
3	2.150	(1)	2.885	-.826	-.242
4	3.750	(1)	-.064	-2.678	-.242
5	4.050	(1)	-.902	-2.903	-.242
JTAN	4.300	(1)	-1.649	-3.062	-.242
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	.608	-.242	-21.170
JTAN	3.467	(1)	-.229	-.242	-22.904
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-.509	.242	-23.862
JTAN	3.467	(1)	.329	.242	-25.595

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 1

AXIAL MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	1.902	1.410	-.242
1	.250	(1)	2.235	1.252	-.242
2	.550	(1)	2.578	1.027	-.242
3	2.150	(1)	2.885	-.826	-.242
4	3.750	(1)	-.064	-2.678	-.242
5	4.050	(1)	-.902	-2.903	-.242
JTAN	4.300	(1)	-1.649	-3.062	-.242
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	.608	-.242	-21.170
JTAN	3.467	(1)	-.229	-.242	-22.904
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-.509	.242	-23.862
JTAN	3.467	(1)	.329	.242	-25.595

AXIAL MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	1.902	1.410	-.242
1	.250	(1)	2.235	1.252	-.242
2	.550	(1)	2.578	1.027	-.242
3	2.150	(1)	2.885	-.826	-.242
4	3.750	(1)	-.064	-2.678	-.242
5	4.050	(1)	-.902	-2.903	-.242
JTAN	4.300	(1)	-1.649	-3.062	-.242
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	.608	-.242	-21.170
JTAN	3.467	(1)	-.229	-.242	-22.904
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-.509	.242	-23.862
JTAN	3.467	(1)	.329	.242	-25.595

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 2

MOMENT MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	4.273	-.458	-.161
1	.250	(9)	4.146	-.563	-.161
2	.550	(6)	4.409	1.340	-.403
3	2.150	(6)	4.644	-1.378	-.403
4	3.750	(10)	2.194	-.387	-.161
5	4.050	(10)	2.054	-.538	-.161
JTAN	4.300	(10)	1.906	-.643	-.161
MAX	1.433	(6)	5.083	.085	-.403
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(10)	3.411	-1.941	-15.512
JTAN	3.467	(9)	3.013	1.619	-13.872
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	2.666	-1.619	-14.511
JTAN	3.467	(9)	3.385	1.941	-18.462

MOMENT MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(10)	-1.738	2.338	-.161
1	.250	(10)	-1.166	2.233	-.161
2	.550	(10)	-.518	2.082	-.161
3	2.150	(9)	1.923	-1.948	-.161
4	3.750	(9)	-2.280	-3.183	-.161
5	4.050	(9)	-3.258	-3.334	-.161
JTAN	4.300	(9)	-4.105	-3.439	-.161
MAX	2.150	(9)	1.923	-1.948	-.161
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-2.600	1.619	-12.716
JTAN	3.467	(10)	-3.319	-1.941	-16.668
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	-3.345	1.941	-17.306
JTAN	3.467	(10)	-2.947	-1.619	-15.666

TITLE. VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 2

SHEAR MAXIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(10)	-1.738	2.338	-.161
1	.250	(10)	-1.166	2.233	-.161
2	.550	(10)	-.518	2.082	-.161
3	2.150	(10)	1.923	.847	-.161
4	3.750	(10)	2.194	-.387	-.161
5	4.050	(10)	2.054	-.538	-.161
JTAN	4.300	(10)	1.906	-.643	-.161
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(9)	-2.600	1.619	-12.716
JTAN	3.467	(9)	3.013	1.619	-13.872
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(9)	-3.345	1.941	-17.306
JTAN	3.467	(9)	3.365	1.941	-18.462

SHEAR MINIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(9)	4.273	-.458	-.161
1	.250	(9)	4.146	-.563	-.161
2	.550	(9)	3.955	-.713	-.161
3	2.150	(9)	1.923	-1.948	-.161
4	3.750	(6)	.000	-4.096	-.403
5	4.050	(6)	-1.273	-4.384	-.403
JTAN	4.300	(6)	-2.394	-4.571	-.403
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(10)	3.411	-1.941	-15.512
JTAN	3.467	(10)	-3.319	-1.941	-16.668
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(10)	2.666	-1.619	-14.511
JTAN	3.467	(10)	-2.947	-1.619	-15.666

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 2

AXIAL MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(8)	2.666	1.226	.417
1	.250	(8)	2.955	1.089	.417
2	.550	(8)	3.254	.893	.417
3	2.150	(8)	3.520	-.718	.417
4	3.750	(8)	.956	-2.329	.417
5	4.050	(8)	.227	-2.525	.417
JTAN	4.300	(8)	-.422	-2.662	.417
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-2.600	1.619	-12.716
JTAN	3.467	(9)	3.013	1.619	-13.872
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	2.666	-1.619	-14.511
JTAN	3.467	(10)	-2.947	-1.619	-15.666

AXIAL MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(7)	1.249	1.226	-.461
1	.250	(7)	1.539	1.089	-.461
2	.550	(7)	1.837	.893	-.461
3	2.150	(7)	2.104	-.718	-.461
4	3.750	(7)	-.461	-2.329	-.461
5	4.050	(7)	-1.190	-2.525	-.461
JTAN	4.300	(7)	-1.838	-2.662	-.461
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(6)	1.019	-.403	-24.895
JTAN	3.467	(6)	-.377	-.403	-26.628
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(6)	-.844	.403	-31.241
JTAN	3.467	(6)	.553	.403	-32.974

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 3

MOMENT MAXIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(9)	4.273	-.458	-.161
1	.250	(9)	4.146	-.563	-.161
2	.550	(9)	3.955	-.713	-.161
3	2.150	(9)	1.923	-1.948	-.161
4	3.750	(10)	2.194	-.387	-.161
5	4.050	(10)	2.054	-.538	-.161
JTAN	4.300	(10)	1.906	-.643	-.161
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(10)	3.411	-1.941	-15.512
JTAN	3.467	(9)	3.013	1.619	-13.872
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(10)	2.666	-1.619	-14.511
JTAN	3.467	(9)	3.385	1.941	-18.462

MOMENT MINIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(10)	-1.738	2.338	-.161
1	.250	(10)	-1.166	2.233	-.161
2	.550	(10)	-.518	2.082	-.161
3	2.150	(9)	1.923	-1.948	-.161
4	3.750	(9)	-2.280	-3.183	-.161
5	4.050	(9)	-3.258	-3.334	-.161
JTAN	4.300	(9)	-4.105	-3.439	-.161
MAX	2.150	(9)	1.923	-1.948	-.161
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(9)	-2.600	1.619	-12.716
JTAN	3.467	(10)	-3.319	-1.941	-16.668
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(9)	-3.345	1.941	-17.306
JTAN	3.467	(10)	-2.947	-1.619	-15.666

IITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY V6.3

PICK UP 3

SHEAR MAXIMUM

	-----L---	-CASE-	-----M---	-----Q---	-----N---
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(10)	-1.738	2.338	-.161
1	.250	(10)	-1.166	2.233	-.161
2	.550	(10)	-.518	2.082	-.161
3	2.150	(10)	1.923	.847	-.161
4	3.750	(10)	2.194	-.387	-.161
5	4.050	(10)	2.054	-.538	-.161
JTAN	4.300	(10)	1.906	-.643	-.161
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(9)	-2.600	1.619	-12.716
JTAN	3.467	(9)	3.013	1.619	-13.872
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(9)	-3.345	1.941	-17.306
JTAN	3.467	(9)	3.385	1.941	-18.462

SHEAR MINIMUM

	-----L---	-CASE-	-----M---	-----Q---	-----N---
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(9)	4.273	-.458	-.161
1	.250	(9)	4.146	-.563	-.161
2	.550	(9)	3.955	-.713	-.161
3	2.150	(9)	1.923	-1.948	-.161
4	3.750	(9)	-2.280	-3.183	-.161
5	4.050	(9)	-3.258	-3.334	-.161
JTAN	4.300	(9)	-4.105	-3.439	-.161
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(10)	3.411	-1.941	-15.512
JTAN	3.467	(10)	-3.319	-1.941	-16.668
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(10)	2.666	-1.619	-14.511
JTAN	3.467	(10)	-2.947	-1.619	-15.666

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-1 CRC-FANSY #6.3

PICK UP 3

AXIAL MAXIMUM

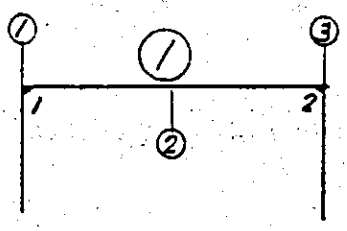
	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(9)	4.273	-.458	-.161
1	.250	(9)	4.146	-.563	-.161
2	.550	(9)	3.955	-.713	-.161
3	2.150	(9)	1.923	-1.948	-.161
4	3.750	(9)	-2.280	-3.183	-.161
5	4.050	(9)	-3.258	-3.334	-.161
JTAN	4.300	(9)	-4.105	-3.439	-.161
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-2.600	1.619	-12.716
JTAN	3.467	(9)	3.013	1.619	-13.872
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	2.666	-1.619	-14.511
JTAN	3.467	(10)	-2.947	-1.619	-15.666

AXIAL MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(10)	-1.738	2.338	-.161
1	.250	(10)	-1.166	2.233	-.161
2	.550	(10)	-.518	2.082	-.161
3	2.150	(10)	1.923	.847	-.161
4	3.750	(10)	2.194	-.387	-.161
5	4.050	(10)	2.054	-.538	-.161
JTAN	4.300	(10)	1.906	-.643	-.161
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(10)	3.411	-1.941	-15.512
JTAN	3.467	(10)	-3.319	-1.941	-16.668
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	-3.345	1.941	-17.306
JTAN	3.467	(9)	3.385	1.941	-18.462

[6] Calculation of upper beam

1. Stress calculation of upper beam



(a) Summary of stresses

(i) At the support point

Pick up No 2

		①	CO.	③	CO.
Combined Stress	Top	-1.74	10	-4.11	9
	Bottom	4.27	9	2.05	10
Dead load		——		-1.25	1

(ii) Span moment

		①	
		②	CO.
Combined Stress	Bottom	4.64	6

(Note 1) Dead load is of Pick-up No. 1

(Note 2) CO. — combination

(b) Allowable seress for upper beam, safe against cracking

(i) At the support point 2

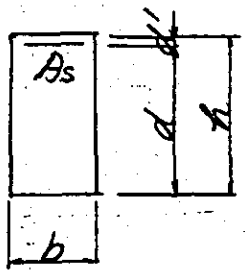
Dead load	M_d	$= -1.65^{t\cdot m}$ (case 1)
Pedestrian load	M_p	$= -0.75^{\cdot}$ (case 2)
	ΣM	$= -2.40^{t\cdot m}$

$$\alpha = \frac{0.75}{2.40} = 0.31 > 0.25$$

Hence, $\sigma_{sa} = 1000\ ^{kg}/_{cm^2}$

(C) Cross section used for stress calculation

(i) Cross section at the support point



$b = 50^{cm}$

$h = 60^{\circ}$

$d' = 2.5 + 1.0 + 3.2 + 1.3 = 8.0^{cm}$

$d = 60 - 8.0 = 52.0^{cm}$

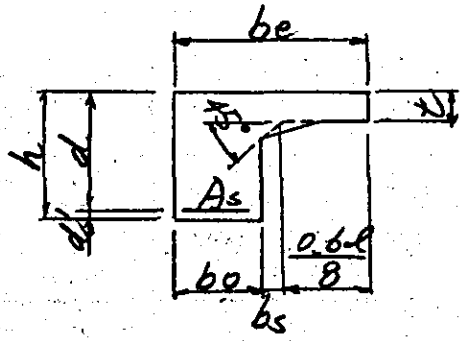
(ii) Cross section at the span center point

Effective width of T-beam at compression fibre

$$be = b_o + b_s + \frac{0.6}{8}\ell$$

$$be_1 = 0.40 + 0.10 + \frac{0.6}{8} \times 4.30$$

$$= 0.82^{m}$$



$b_o = 40^{cm}$

$h = 60^{\circ}$

$d' = 3.0 + 1.3 + 1.3 = 5.6^{cm}$

$d = 60 - 5.6 = 54.4^{cm}$

$t = 15^{cm}$

(d) Calculation of bending stress

	① ③	① ③	②	
M (tm)	-1.65	-4.11	4.64	
N (t)				
S (t)				
b (cm)	40		82	
h (cm)	60		60	
d (cm)	52		54.4	
d' (cm)	8.0		5.6	
As (cm²)	D25-4 = 20.27		D25-4 = 20.27	
p	0.00975		0.00454	
As' (cm²)			t = 15 d = 0.275	
p'				
e = M/N (cm)				
e = M/N + u (cm)				
e = M/N − u (cm)				
e/h				
d/e				
d'/h				
d'/d				
M/bd² (kg/cm²)	1.53	3.80	1.91	
k			0.309	
c				
j			0.899	
1/Lc	5.61			
1/Ls	119			
β = σs/σc				
σc (kg/cm²)		21.3	13.9	
σs (kg/cm²)	180	450	470	
τ (kg/cm²)				
σsa (kg/cm²)	1000	1800	〃	
σca (kg/cm²)		90	〃	
τa (kg/cm²)				
Nomogram number	M-1	〃	M-47.48	
combination	D	D+P	〃	

(e) Required minimum cross section of re-bars

(i) At the top of support point

$$As = \frac{M}{\sigma sa \cdot j \cdot d} \times \frac{4}{3}$$

$$= \frac{4.11 \times 10^5}{1800 \times 0.875 \times 52.0} \times \frac{4}{3} = 6.69 \text{ cm}^2$$

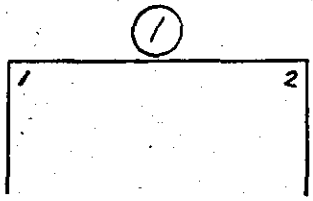
Hence D25 - 4 = 20.27 cm^2 > 6.69 cm^2

(ii) At the span center point

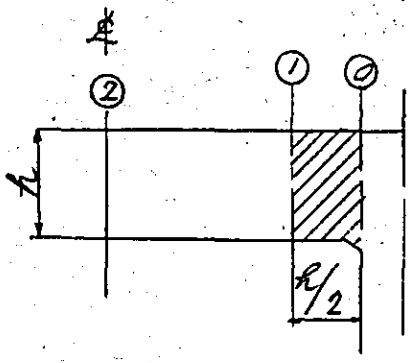
$$As = \frac{4.64 \times 10^5}{1800 \times 0.875 \times 54.4} \times \frac{4}{3} = 7.22 \text{ cm}^2$$

Hence D25 - 4 = 20.27 cm^2 > 7.22 cm^2

2. Shearing stress of upper beam



(1) Summary of shearing stress



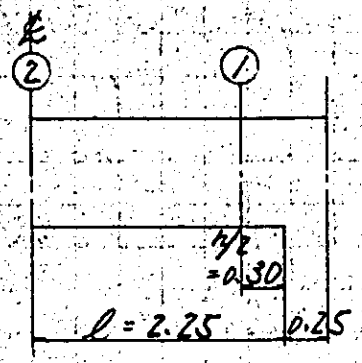
For the design of crass section of beam end, the value of shearing stress at ℓ/2 point is applied.

	①			
	Left support	CO.	Right support	CO.
⓪	2.23	10	-4.38	6
①	2.08		-4.10	
②	0.85		-1.38	

(Note) CO. — combination

(2) Shearing stress

(a) Shearing stress caused by bending



(i) Shearing stress of the member of uniform height

$$\tau = \frac{S}{b \cdot d}$$

$$\tau_1 = \frac{9.10 \times 10^3}{50 \times 52.0} = 1.58 \text{ kg/cm}^2 < 3.9 \text{ kg/cm}^2$$

$$\tau_2 = \frac{1.38 \times 10^3}{50 \times 52.0} = 0.53 \text{ "} < \text{ " } \text{"}$$

Calculations for diagonal Re. bars and stirrups are not required because the concrete area is sufficient to the shearing stress.

a) ctc. distance of stirrup

There fore

Arrange stirrups D13 - 1 sets in 25.0 cm ctc

(b) Re - bars in axial direction

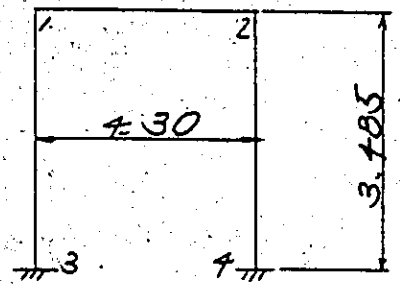
Side (one side)

As - D16 - 1 bars

§6. Rigid fram analysis on transversal section ②-② of elevated structure

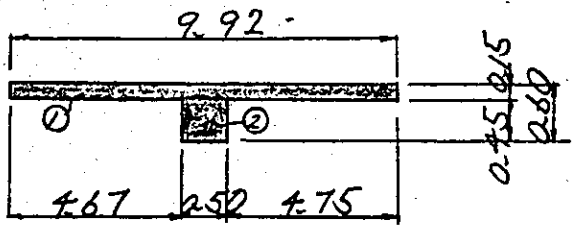
(1) Basic calculation

1. Axis of Rahmen (Rigid frame)



2. Cross sectional area / Moment of inertia of area of members

(1) upper beam (Member 1-2)



	b (m)	h (m)	A (m²)	y (m)	A·y (m³)
①	9.92	0.15	1.488	0.075	0.11160
②	0.50	0.45	0.225	0.375	0.08438
Σ			1.713		0.19598

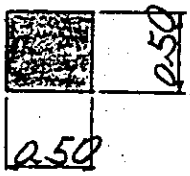
$$y = \frac{0.19598}{1.713} = 0.114^{m}$$

	$b^{(m)}$	$h^{(m)}$	$A^{(m^2)}$	$y_0^{(m)}$	$I_0^{(m^4)}$	$A \cdot y_0^2 (m^4)$	$I_0 + A \cdot y_0^2 (m^4)$
①	9.92	0.15	1.488	0.039	0.00279	0.00226	0.00505
②	0.50	0.45	0.225	0.261	0.00380	0.01533	0.01913
Σ			1.713		0.00659	0.01759	0.02418

Cross sectional area $A = 1.713\ m^2$

Moment of inertia of area $I = 0.02418\ m^4$

(2) Column (Member 1-3, 2-4)



$A = 0.50 \times 0.50 = 0.250\ m^2$

$I = 1/12 \times 0.50 \times 0.50^3 = 0.00521\ m^4$

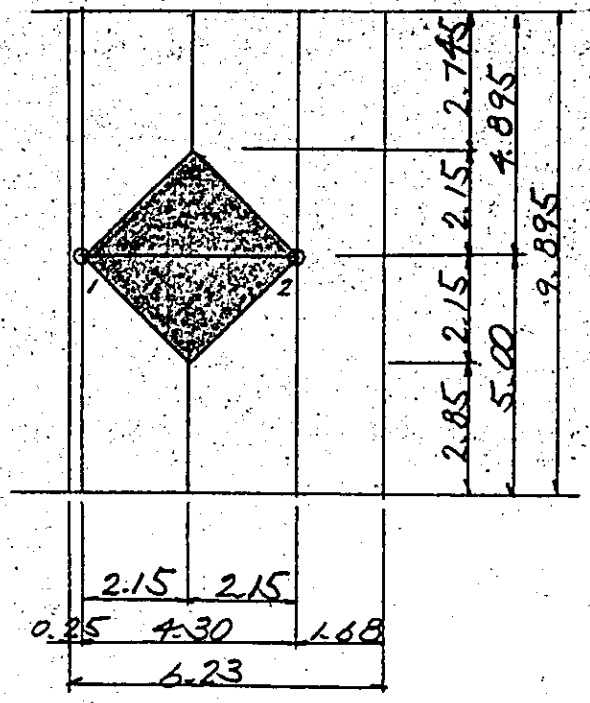
(3) axial height

$h1 = 3.599 - 0.114 = 3.485\ m$

[2] Load calculation

1. Dead load

(1) Upper member



a) Uniformly distributed load

Slab $2.5^{t/m^3} \times 0.15 = 0.375^{t/m^2}$

Pavement $1.1^{"} \times 0.05 = 0.055^{"}$

$wd = 0.43^{t/m^2}$

$wd1 = 0.43^{t/m^2} \times 2.15 \times 2 = 1.85^{t/m}$

b) linear load

cross beam $2.5^{t/m^3} \times 0.50 \times 0.45 = 0.563^{t/m}$

Haunch of slab $2.5 \times 0.30 \times 0.10 \times 1/2 \times 2 = 0.075^{t}$

$Wd_2 = 0.64^{t/m}$

c) concentrated load acting at panel point

Panel point 1

- Uniformly distributed load

$0.43^{t/m^2} \times 0.25 \times 9.895 = 1.06^{t}$

- Uniformly distributed load

$0.43^{t/m^2} (2.745 + 4.895) \times 1/2 \times 2.15 = 3.53^{t}$

- Uniformly distributed load

$0.43^{t/m^2} \times (2.85 + 5.00) \times 1/2 \times 2.15 = 3.63^{t}$

- Haunch of slab

$2.5^{t/m^3} \times 0.30 \times 0.10 \times 1/2 \times 8.795 = 0.33^{t}$

- longitudinal beam

$2.5^{t/m^3} \times 0.50 \times 0.45 \times 9.895 = 5.57^{t}$

- Reduction of linear load

  $-0.64^{t/m} \times 0.25$ $= -0.16^{t}$

- Reduction of column part

  $-2.5^{t/m^3} \times 0.50 \times 0.50 \times (0.15 - 0.114) = -0.02^{t}$

- Shed load reaction $= 23.00^{t}$

$P_1 = 36.94^{t}$

Panel point 2

- Uniformly distributed load

  $1.06^{t} + 3.53^{t} + 3.63$ $= 8.22^{t}$

- Cantilever slab

  $2.5^{t/m^3} \times (0.15 + 0.25) \times 1/2 \times 1.43 \times 9.895 = 7.07^{t}$

- Pavmet load

  $1.1^{t/m^3} \times 0.05 \times 1.43 \times 9.895$ $= 0.78^{t}$

- Haunch of slab (same as panel point1) $= 0.33^{t}$

- longitudinal beam (") $= 5.57^{t}$

- Reduction of linear load

  (") $= -0.16^{t}$

- Reduction of column part

  (") $= -0.02^{t}$

- Shed load reaction = 20.00 t

$P_2 = 41.79$ t

d) Own weight of column

$q = 2.5\ t/m^3 \times 0.50 \times 0.50 = 0.63\ t/m$

2. Pedestrian load (People load)

$w = 0.35\ t/m^2$

(1) Upper member

a) Uniformly distributed load

$Wd_1 = 0.35\ t/m^2 \times 2.15 \times 2 = 1.51\ t/m$

2) Concentrated load acting at panel point

Panel point 1

- Uniformly distributed load

  $0.35\ t/m^2 \times 0.25 \times 9.895 = 0.87\ t$

- Uniformly distributed load

  $0.35\ t/m^2 (2.745 + 4.895) \times 1/2 \times 2.15 = 2.87\ t$

- Uniformly distributed load

  $0.35\ t/m^2 \times (2.85 + 5.00) \times 1/2 \times 2.15 = 2.95\ t$

$P_1 = 6.69\ t$

Panel point 2

- Uniformly distributed load $2.87 + 2.95 = 5.82\ t$
- (") $0.35\ t/m^2 \times 1.68 \times 9.895 = 5.82\ t$

$P_2 = 11.64\ t$

3 Temperature change and Drying contraction

Temperature change -------- ±10°C

Drying contraction -------- −15°C

Hence,

Temperature rise -------- +10°C

Temperature drop + Drying contraction

-------- −25°C

4 Seismic load from dead load (KH=0.1)

Harizontal force acting at upper member

(Panel point 1, 2)

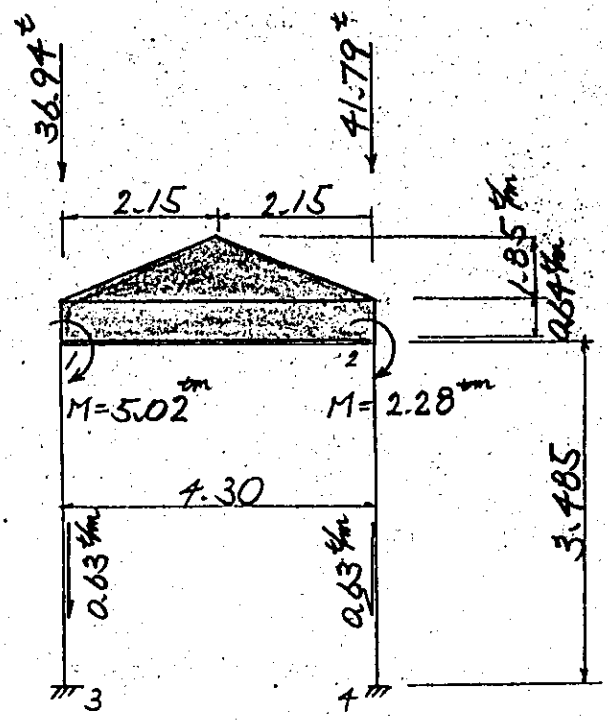
$1.85^{t/m} \times 2.15 \times 1/2 \times 2$	=	3.98^{t}
$0.64' \times 4.30$	=	2.75'
$36.94^{t} + 41.79$	=	78.73'
$0.21^{t/m^2} \times 6.23 \times 9.895$	=	12.95'
$0.63^{t/m} \times 3.405 \times 1/2 \times 2$	=	2.20'
total	=	100.61^{t}

$H = 100.61 \times 0.10 = 10.06^{t}$

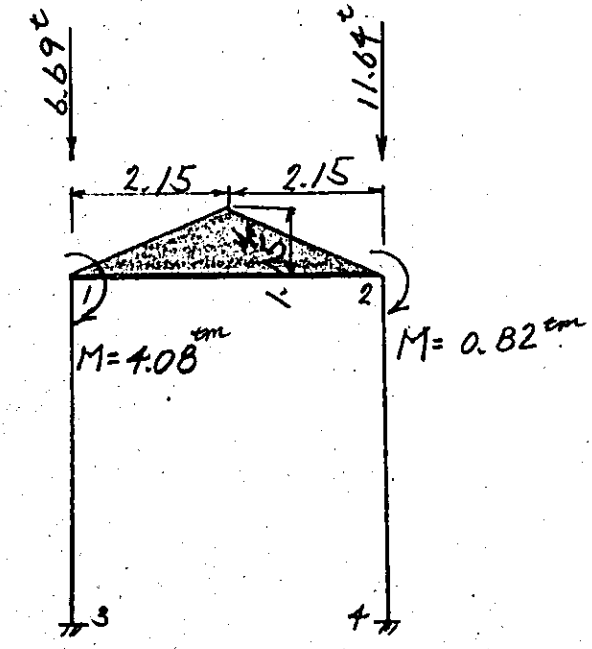
$H_1 = H_2 = 10.06 \times 1/2 = 5.03^{t}$

(3) Loading diagram

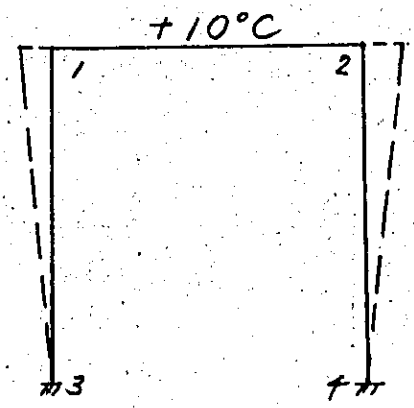
1. case 1 Dead Load



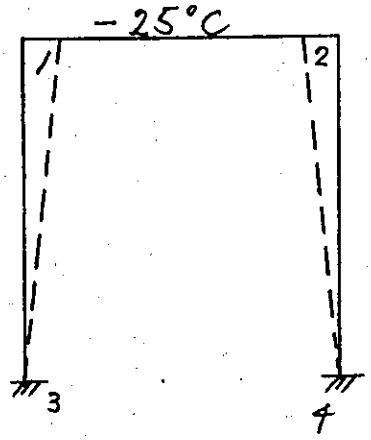
2. case 2 Pedestrian load (People load)



3. case 3 Temperature rise

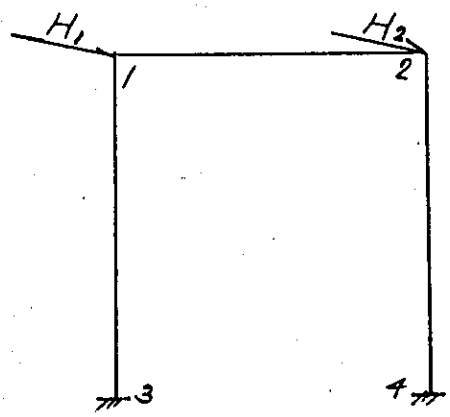


4. case 4 Temperature drop
+ Drying contraction



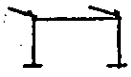
5. case 5 Seismic load from dead ~~load~~

$H_1 = H_2 = 5.03^t$



[7] Combination of loads

1. Basic load

Case Number	Kind of load	Loading Pattern
1	Dead load	
2	Pedestrian load	
3	Temperature rise	+10°C
4	Temperature drop + Drying contraction	−25°C
5	Seismic load from dead load	

2. Combined loads

case nomber	Combination of loads	λ
6	1 + 2	1.0000
7	1 + 3	0.8696
8	1 + 4	〃
9	1 + 5	0.6667
10	1 − 5	〃

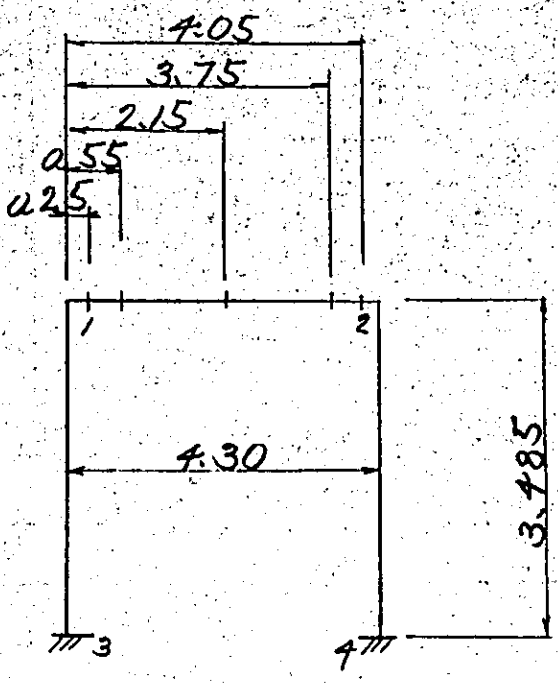
3. Critical cases

No. 1 case 1. crack

No. 2 case 6 ~ 10 synthetic

No. 3 case 9. 10 footing

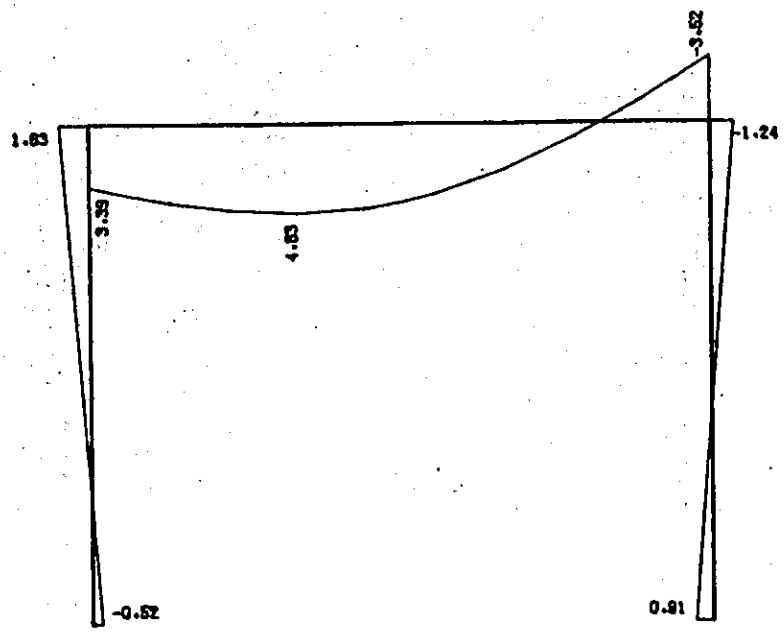
9. Point for stress calculation



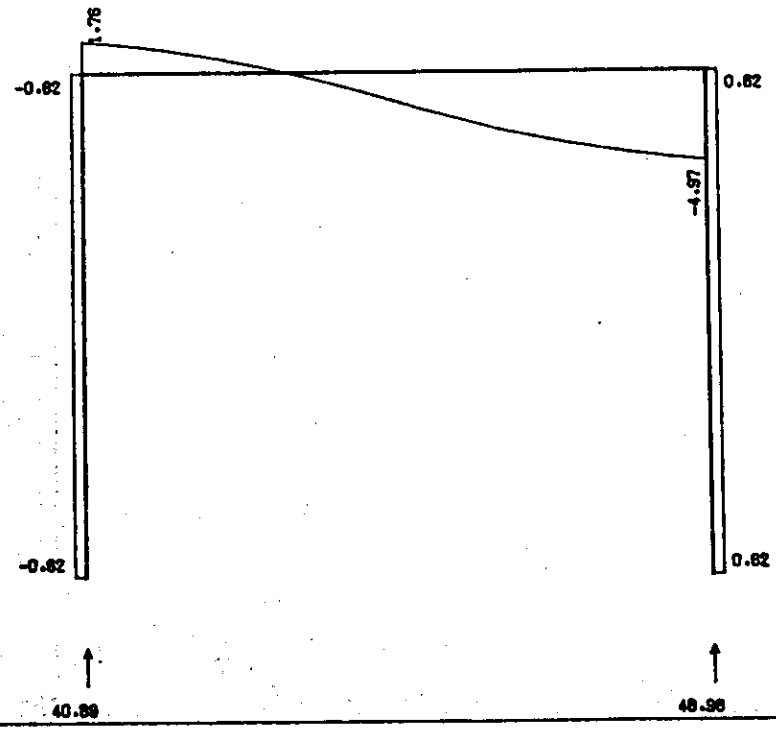
VIADUCT OF PLATFORM (CENTRAL) C-2

CASE 1 (DEAD LOAD)

BENDING MOMENT



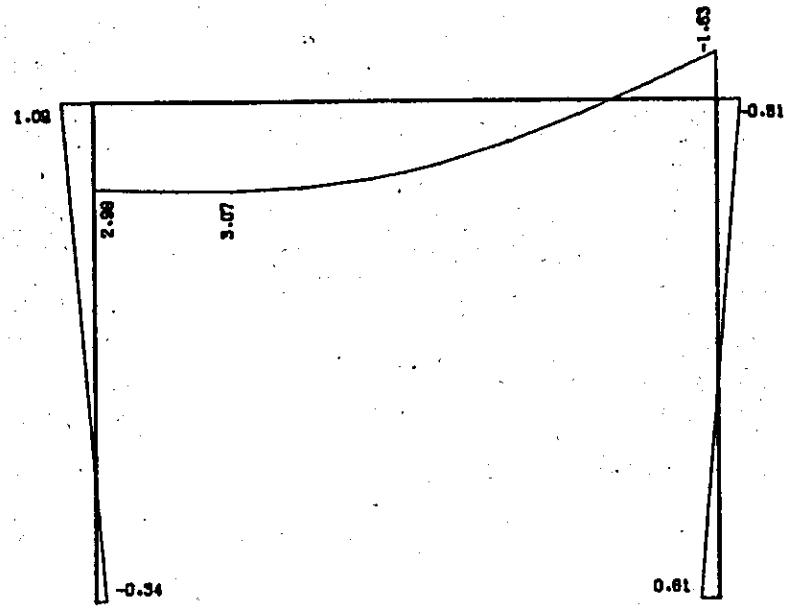
SHEARING FORCE



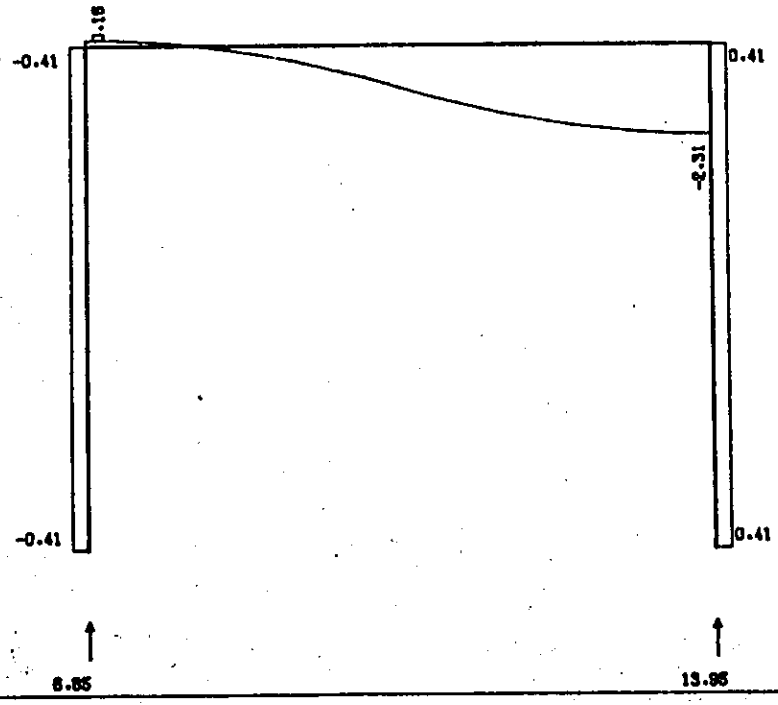
VIADUCT OF PLATFORM (CENTRAL) C-2

CASE 2 (PEDESTRIANS LOAD)

BENDING MOMENT



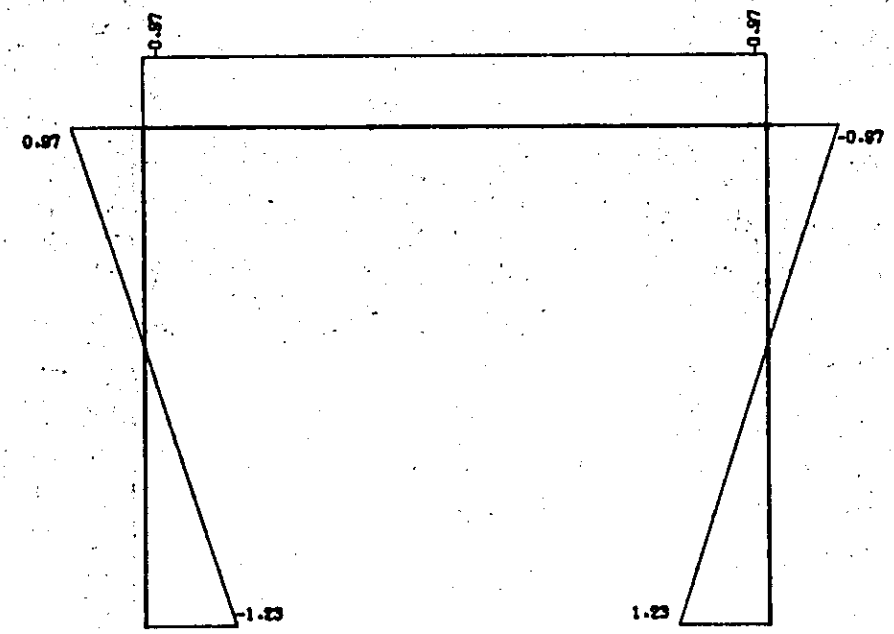
SHEARING FORCE



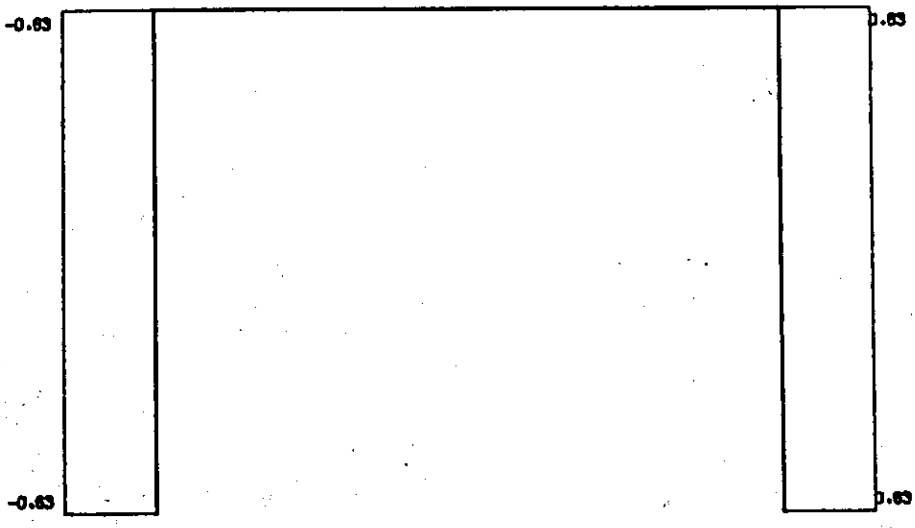
VIADUCT OF PLATFORM (CENTRAL) C-2

CASE 3 (TEMPERATURE)

BENDING MOMENT



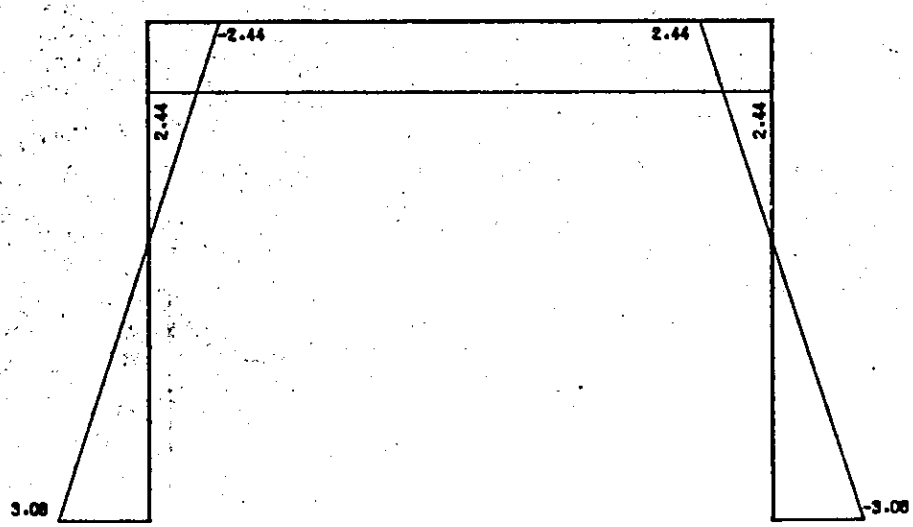
SHEARING FORCE



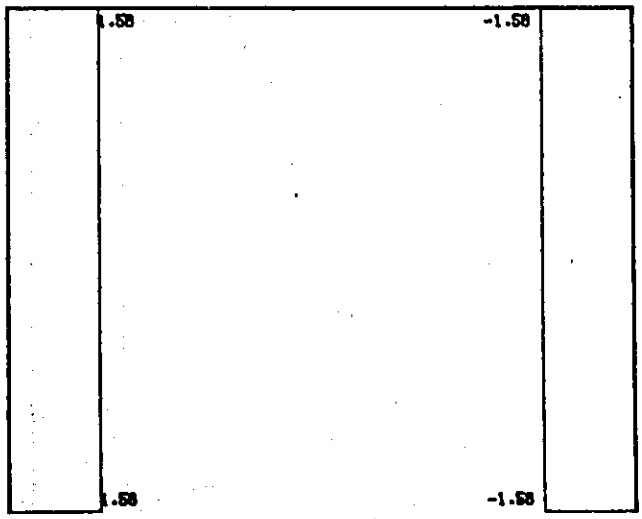
VIADUCT OF PLATFORM (CENTRAL) C-2

CASE 4 (TEMPERATURE + SCHRINKAGE)

BENDING MOMENT



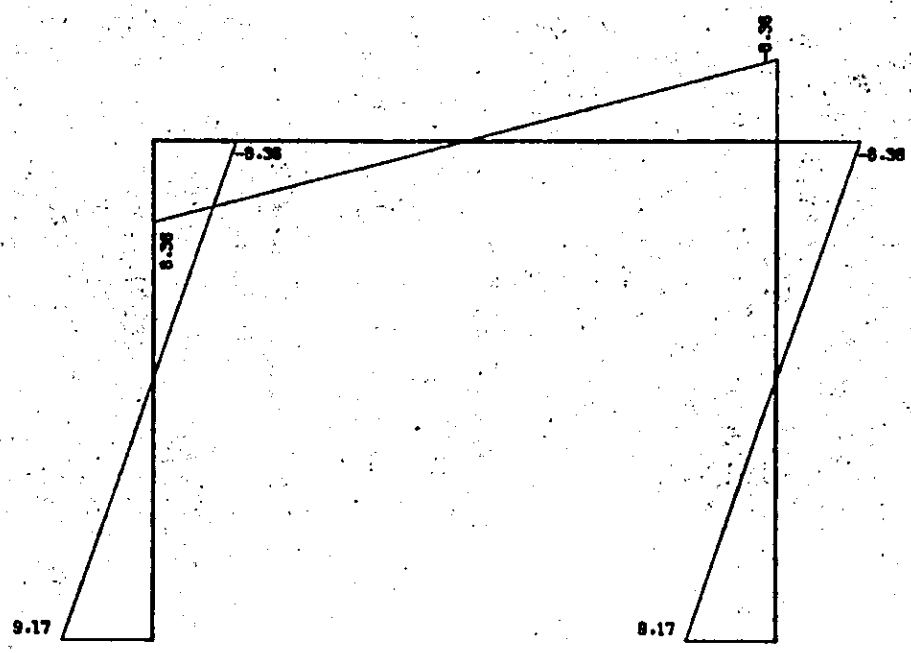
SHEARING FORCE



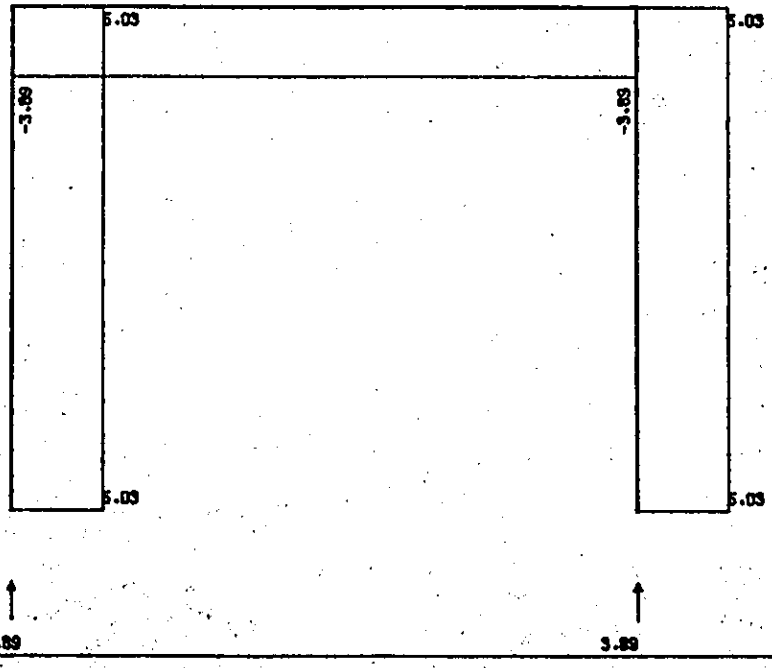
VIADUCT OF PLATFORM (CENTRAL) C-2

CASE 5 (SEISMIC LOAD)

BENDING MOMENT



SHEARING FORCE



INPUT DATA

```
=== INPUT DATA ===                                                    CRC-FANSY  V6.3
     5   10        20        30        40        50        60        70        80   CARD NUMBER
.....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
TITLE     VIADUCT OF PLATFORM (CENTRAL) C-2                                          1
PLOT            1         2                   6.0                                  2
TYPE1-1-1 L=4.3  H=3.485  M1=1.713,0.02418  M2-3=0.25,0.00521                       3
          P=2.7E+6,1.0E-5  S=0                                                       4
POINT     1 0.25      0.55      2.15      3.75      4.05                           5
PICKUP          1    1    1                                                        6
                2    1    6   10                                                   7
                3    1    9   10                                                   8
LOAD            1     CASE  1 (DEAD LOAD)                                         9
J               1                -36.94    -5.02                                 10
                2                -41.79    -2.28                                 11
DL              1   2-1.85       2.15      2.15                                  12
                1   2-0.64                                                       13
                2   2-0.63                                        3              14
END                                                                              15
LOAD            2     CASE  2 (PEDESTRIANS LOAD)                                 16
J               1                -6.69     -4.08                                 17
                2                -11.64    -0.82                                 18
DL              1   2-1.15       2.15      2.15                                  19
END                                                                              20
LOAD            3     CASE  3 (TEMPERATURE)                                      21
T               1      10.0                                                      22
END                                                                              23
LOAD            4     CASE  4 (TEMPERATURE + SCHRINKAGE)                         24
T               1     -25.0                                                      25
END                                                                              26
LOAD            5     CASE  5 (SEISMIC LOAD)                                     27
J               1      5.03                                        2             28
END                                                                              29
MT2       6              1   2                                                   30
          70.8696        1   3                                                   31
          80.8696        1   4                                                   32
          90.6667        1   5                                                   33
         100.6667        1  -5                                                   34
FINISH                                                                           35
```

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

CONTROL DATA

METHOD	STRUCTURE	J.RENUMBER	M.RENUMBER	S.F. DIS.	UNI.SPRING	STAN.STIF.	BARA	SKEW MEM.
DIS	*RAHMEN*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*

LOAD TITLE

LOAD 1 CASE 1 (DEAD LOAD)
LOAD 2 CASE 2 (PEDESTRIANS LOAD)
LOAD 3 CASE 3 (TEMPERATURE)
LOAD 4 CASE 4 (TEMPERATURE + SCHRINKAGE)
LOAD 5 CASE 5 (SEISMIC LOAD)

MIX 6 CASE 6 (1+2)
MIX 7 CASE 7 (1+3)
MIX 8 CASE 8 (1+4)
MIX 9 CASE 9 (1+5)
MIX 10 CASE 10 (1-5)

PICK UP LOAD CASE

PICK 1 1
PICK 2 6 7 8 9 10
PICK 3 9 10

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

JOINT DATA

JOINT NUMBER 4

ZAHYO(M) JOINT	X	Y
1	0.0000	3.4850
2	4.3000	3.4850
3	0.0000	0.0000
4	4.3000	0.0000

MEMBER DATA

MEMBER NUMBER 3

MEMBER	ITAN	JTAN	CONNECT. ITAN	JTAN	LENGTH	A	I	AES	KO(BANE)	PRO.NUM
1	1	2	FIX	FIX	4.3000	1.71300	.0241800			1
2	1	3	FIX	FIX	3.4850	.25000	.0052100			1
3	2	4	FIX	FIX	3.4850	.25000	.0052100			1

PROPERTY DATA

PROPERTY NUMBER 1

PROPERTY	E	G	EPS
1	2.700E+06	0.	1.000E-05

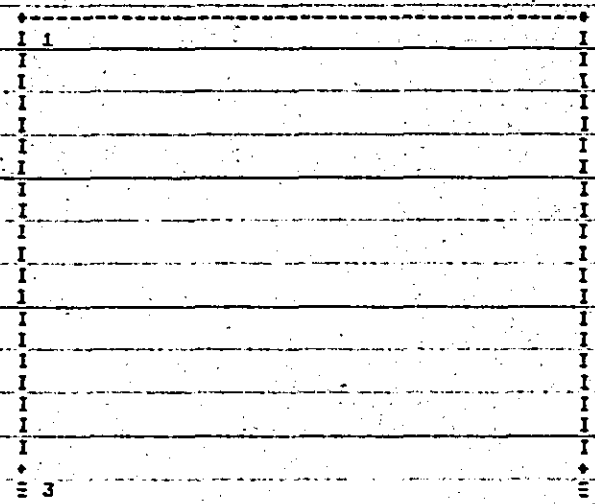
SUPPORT DATA

SUPPORT NUMBER 2

SUPPORT	SUPPORT-JYOKEN	X	Y	THET Z	X(BANE)	Y(BANE)	THET Z(BANE)
3		FIX	FIX	FIX	0.0	0.0	0.0
4		FIX	FIX	FIX	0.0	0.0	0.0

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

STRUCTURAL FIGURE



TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

MOVE DATA

MEMBER	GOIKI ITAN	GOIKI JTAN	POINT 1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	.....	.....	.250	.550	2.150	3.750	4.050									
2	.....	.....														
3	.....	.....														

TITLE..VIADUCI OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

LOAD DATA

	M/J	NAME	D	W1	W2	L1	L2
LOAD - 1		CASE 1 (DEAD LOAD)					
MEMBER	1	LINEAR	Y	0.000	-1.850	0.000	2.150
		LINEAR	Y	-1.850	0.000	2.150	0.000
		LINEAR	Y	-.640	-.640	0.000	0.000
	2	LINEAR	Y	-.630	-.630	0.000	0.000
	3	LINEAR	Y	-.630	-.630	0.000	0.000
JOINT	1	JOINTLOAD	Y	-36.940			
		JOINTLOAD	Z	-5.020			
	2	JOINTLOAD	Y	-41.790			
		JOINTLOAD	Z	-2.280			
LOAD - 2		CASE 2 (PEDESTRIANS LOAD)					
MEMBER	1	LINEAR	Y	0.000	-1.150	0.000	2.150
		LINEAR	Y	-1.150	0.000	2.150	0.000
JOINT	1	JOINTLOAD	Y	-6.690			
		JOINTLOAD	Z	-4.080			
	2	JOINTLOAD	Y	-11.640			
		JOINTLOAD	Z	-.820			
LOAD - 3		CASE 3 (TEMPERATURE)					
MEMBER	1	TEMP		10.0(DO)			
LOAD - 4		CASE 4 (TEMPERATURE + SCHRINKAGE)					
MEMBER	1	TEMP		-25.0(DO)			
LOAD - 5		CASE 5 (SEISMIC LOAD)					
JOINT	1	JOINTLOAD	X	5.030			
	2	JOINTLOAD	X	5.030			

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

MIX DATA

MIX NUMBER 5

LOAD	SS	N	S1	K1	S2	K2	S3	K3	S4	K4	S5	K5	S6	K6	S7	K7	S8	K8
6	1.0000	2	1.0000	1	1.0000	2												
7	.6696	2	1.0000	1	1.0000	3												
8	.6696	2	1.0000	1	1.0000	4												
9	.6667	2	1.0000	1	1.0000	5												
10	.6667	2	1.0000	1	-1.0000	5												

PICK UP

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 1

MOMENT MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1	(1 - 2) G ==				
ITAN	0.000	(1)	3.393	1.757	-.617
1	.250	(1)	3.810	1.570	-.617
2	.550	(1)	4.238	1.274	-.617
3	2.150	(1)	4.265	-1.608	-.617
4	3.750	(1)	-.908	-4.491	-.617
5	4.050	(1)	-2.302	-4.786	-.617
JTAN	4.300	(1)	-3.523	-4.973	-.617
MAX	1.433	(1)	4.831	-.045	-.617
== MEMBER 2	(1 - 3) C ==				
ITAN	0.000	(1)	1.627	-.617	-38.697
JTAN	3.485	(1)	-.524	-.617	-40.892
== MEMBER 3	(2 - 4) C ==				
ITAN	0.000	(1)	-1.243	.617	-46.763
JTAN	3.485	(1)	.909	.617	-48.959

MOMENT MINIMUM

	L	CASE	M	Q	N
== MEMBER 1	(1 - 2) G ==				
ITAN	0.000	(1)	3.393	1.757	-.617
1	.250	(1)	3.810	1.570	-.617
2	.550	(1)	4.238	1.274	-.617
3	2.150	(1)	4.265	-1.608	-.617
4	3.750	(1)	-.908	-4.491	-.617
5	4.050	(1)	-2.302	-4.786	-.617
JTAN	4.300	(1)	-3.523	-4.973	-.617
MAX	1.433	(1)	4.831	-.045	-.617
== MEMBER 2	(1 - 3) C ==				
ITAN	0.000	(1)	1.627	-.617	-38.697
JTAN	3.485	(1)	-.524	-.617	-40.892
== MEMBER 3	(2 - 4) C ==				
ITAN	0.000	(1)	-1.243	.617	-46.763
JTAN	3.485	(1)	.909	.617	-48.959

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 1

SHEAR MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	3.393	1.757	-.617
1	.250	(1)	3.810	1.570	-.617
2	.550	(1)	4.238	1.274	-.617
3	2.150	(1)	4.265	-1.608	-.617
4	3.750	(1)	-.908	-4.491	-.617
5	4.050	(1)	-2.302	-4.786	-.617
JTAN	4.300	(1)	-3.523	-4.973	-.617
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	1.627	-.617	-38.697
JTAN	3.485	(1)	-.524	-.617	-40.892
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-1.243	.617	-46.763
JTAN	3.485	(1)	.909	.617	-48.959

SHEAR MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(1)	3.393	1.757	-.617
1	.250	(1)	3.810	1.570	-.617
2	.550	(1)	4.238	1.274	-.617
3	2.150	(1)	4.265	-1.608	-.617
4	3.750	(1)	-.908	-4.491	-.617
5	4.050	(1)	-2.302	-4.786	-.617
JTAN	4.300	(1)	-3.523	-4.973	-.617
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(1)	1.627	-.617	-38.697
JTAN	3.485	(1)	-.524	-.617	-40.892
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(1)	-1.243	.617	-46.763
JTAN	3.485	(1)	.909	.617	-48.959

TITLE, VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 1

AXIAL MAXIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(1)	3.393	1.757	-.617
1	.250	(1)	3.810	1.570	-.617
2	.550	(1)	4.238	1.274	-.617
3	2.150	(1)	4.265	-1.608	-.617
4	3.750	(1)	-.908	-4.491	-.617
5	4.050	(1)	-2.302	-4.786	-.617
JTAN	4.300	(1)	-3.523	-4.973	-.617
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(1)	1.627	-.617	-38.697
JTAN	3.485	(1)	-.524	-.617	-40.892
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(1)	-1.243	.617	-46.763
JTAN	3.485	(1)	.909	.617	-48.959

AXIAL MINIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(1)	3.393	1.757	-.617
1	.250	(1)	3.810	1.570	-.617
2	.550	(1)	4.238	1.274	-.617
3	2.150	(1)	4.265	-1.608	-.617
4	3.750	(1)	-.908	-4.491	-.617
5	4.050	(1)	-2.302	-4.786	-.617
JTAN	4.300	(1)	-3.523	-4.973	-.617
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(1)	1.627	-.617	-38.697
JTAN	3.485	(1)	-.524	-.617	-40.892
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(1)	-1.243	.617	-46.763
JTAN	3.485	(1)	.909	.617	-48.959

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 2

MOMENT MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	7.833	-1.420	-.412
1	.250	(9)	7.463	-1.545	-.412
2	.550	(6)	7.305	1.354	-1.026
3	2.150	(6)	6.717	-2.684	-1.026
4	3.750	(10)	3.541	-.403	-.412
5	4.050	(10)	3.389	-.599	-.412
JTAN	4.300	(10)	3.223	-.724	-.412
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(10)	6.656	-3.765	-28.390
JTAN	3.485	(9)	5.766	2.942	-24.671
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	4.743	-2.942	-28.585
JTAN	3.485	(9)	6.721	3.765	-35.232

MOMENT MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(10)	-3.310	3.762	-.412
1	.250	(10)	-2.384	3.638	-.412
2	.550	(10)	-1.321	3.441	-.412
3	2.150	(9)	2.843	-3.664	-.412
4	3.750	(9)	-4.752	-5.585	-.412
5	4.050	(9)	-6.458	-5.782	-.412
JTAN	4.300	(9)	-7.920	-5.907	-.412
MAX	2.150	(9)	2.843	-3.664	-.412
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-4.487	2.942	-23.208
JTAN	3.485	(10)	-6.465	-3.765	-29.854
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	-6.400	3.765	-33.768
JTAN	3.485	(10)	-5.510	-2.942	-30.049

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 2

SHEAR MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(10)	-3.310	3.762	-.412
1	.250	(10)	-2.384	3.638	-.412
2	.550	(10)	-1.321	3.441	-.412
3	2.150	(10)	2.843	1.519	-.412
4	3.750	(10)	3.541	-.403	-.412
5	4.050	(10)	3.389	-.599	-.412
JTAN	4.300	(10)	3.223	-.724	-.412
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-4.487	2.942	-23.208
JTAN	3.485	(9)	5.766	2.942	-24.671
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	-6.400	3.765	-33.768
JTAN	3.485	(9)	6.721	3.765	-35.232

SHEAR MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(9)	7.833	-1.420	-.412
1	.250	(9)	7.463	-1.545	-.412
2	.550	(9)	6.972	-1.742	-.412
3	2.150	(9)	2.843	-3.664	-.412
4	3.750	(6)	-1.284	-6.722	-1.026
5	4.050	(6)	-3.358	-7.081	-1.026
JTAN	4.300	(6)	-5.155	-7.285	-1.026
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(10)	6.656	-3.765	-28.390
JTAN	3.485	(10)	-6.465	-3.765	-29.854
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	4.743	-2.942	-28.585
JTAN	3.485	(10)	-5.510	-2.942	-30.049

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 2

AXIAL MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(8)	5.058	1.527	.840
1	.250	(8)	5.431	1.365	.840
2	.550	(8)	5.803	1.108	.840
3	2.150	(8)	5.826	-1.399	.840
4	3.750	(8)	1.328	-3.905	.840
5	4.050	(8)	-.116	-4.162	.840
JTAN	4.300	(8)	-.946	-4.325	.840
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-4.487	2.942	-23.208
JTAN	3.485	(9)	5.766	2.942	-24.671
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	4.743	-2.942	-28.585
JTAN	3.485	(10)	-5.510	-2.942	-30.049

AXIAL MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(7)	2.103	1.527	-1.088
1	.250	(7)	2.466	1.365	-1.088
2	.550	(7)	2.838	1.108	-1.088
3	2.150	(7)	2.861	-1.399	-1.088
4	3.750	(7)	-1.637	-3.905	-1.088
5	4.050	(7)	-2.849	-4.162	-1.088
JTAN	4.300	(7)	-3.910	-4.325	-1.088
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(6)	2.714	-1.026	-45.547
JTAN	3.485	(6)	-.861	-1.026	-47.742
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(6)	-2.055	1.026	-60.715
JTAN	3.485	(6)	1.520	1.026	-62.911

TITLE.,VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 3

MOMENT MAXIMUM

= = MEMBER 1 (1 - 2) G = =	L	CASE	M	Q	N
ITAN	0.000	(9)	7.833	-1.420	-.412
1	.250	(9)	7.463	-1.545	-.412
2	.550	(9)	6.972	-1.742	-.412
3	2.150	(9)	2.843	-3.664	-.412
4	3.750	(10)	3.541	-.403	-.412
5	4.050	(10)	3.389	-.599	-.412
JTAN	4.300	(10)	3.223	-.724	-.412
MAX	2.150	(9)	2.843	-3.664	-.412

= = MEMBER 2 (1 - 3) C = =	L	CASE	M	Q	N
ITAN	0.000	(10)	6.656	-3.765	-28.390
JTAN	3.485	(9)	5.766	2.942	-24.671

= = MEMBER 3 (2 - 4) C = =	L	CASE	M	Q	N
ITAN	0.000	(10)	4.743	-2.942	-28.585
JTAN	3.485	(9)	6.721	3.765	-35.232

MOMENT MINIMUM

= = MEMBER 1 (1 - 2) G = =	L	CASE	M	Q	N
ITAN	0.000	(10)	-3.310	3.762	-.412
1	.250	(10)	-2.384	3.638	-.412
2	.550	(10)	-1.321	3.441	-.412
3	2.150	(9)	2.843	-3.664	-.412
4	3.750	(9)	-4.752	-5.585	-.412
5	4.050	(9)	-6.458	-5.782	-.412
JTAN	4.300	(9)	-7.920	-5.907	-.412
MAX	2.150	(9)	2.843	-3.664	-.412

= = MEMBER 2 (1 - 3) C = =	L	CASE	M	Q	N
ITAN	0.000	(9)	-4.487	2.942	-23.208
JTAN	3.485	(10)	-6.465	-3.765	-29.854

= = MEMBER 3 (2 - 4) C = =	L	CASE	M	Q	N
ITAN	0.000	(9)	-6.400	3.765	-33.768
JTAN	3.485	(10)	-5.510	-2.942	-30.049

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 3

SHEAR MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(10)	-3.310	3.762	-.412
1	.250	(10)	-2.384	3.638	-.412
2	.550	(10)	-1.321	3.441	-.412
3	2.150	(10)	2.843	1.519	-.412
4	3.750	(10)	3.541	-.403	-.412
5	4.050	(10)	3.389	-.599	-.412
JTAN	4.300	(10)	3.223	-.724	-.412
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	-4.487	2.942	-23.208
JTAN	3.485	(9)	5.706	2.942	-24.671
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	-6.400	3.765	-33.768
JTAN	3.485	(9)	6.721	3.765	-35.232

SHEAR MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	7.833	-1.420	-.412
1	.250	(9)	7.463	-1.545	-.412
2	.550	(9)	6.972	-1.742	-.412
3	2.150	(9)	2.843	-3.664	-.412
4	3.750	(9)	-4.752	-5.585	-.412
5	4.050	(9)	-6.458	-5.782	-.412
JTAN	4.300	(9)	-7.920	-5.907	-.412
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(10)	6.656	-3.765	-28.390
JTAN	3.485	(10)	-6.465	-3.765	-29.854
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	4.743	-2.942	-28.585
JTAN	3.485	(10)	-5.510	-2.942	-30.049

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-2 CRC-FANSY V6.3

PICK UP 3

AXIAL MAXIMUM

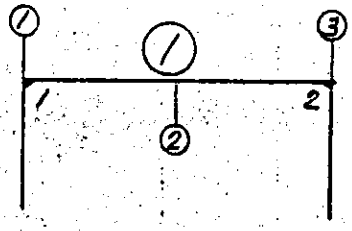
	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(9)	7.833	-1.420	-.412
1	.250	(9)	7.463	-1.545	-.412
2	.550	(9)	6.972	-1.742	-.412
3	2.150	(9)	2.843	-3.664	-.412
4	3.750	(9)	-4.752	-5.585	-.412
5	4.050	(9)	-6.458	-5.782	-.412
JTAN	4.300	(9)	-7.920	-5.907	-.412
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(9)	-4.487	2.942	-23.208
JTAN	3.485	(9)	5.766	2.942	-24.671
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(10)	4.743	-2.942	-28.585
JTAN	3.485	(10)	-5.510	-2.942	-30.049

AXIAL MINIMUM

	L	CASE	M	Q	N
= = MEMBER 1 (1 - 2) G = =					
ITAN	0.000	(10)	-3.310	3.762	-.412
1	.250	(10)	-2.384	3.638	-.412
2	.550	(18)	-1.321	3.441	-.412
3	2.150	(10)	2.843	1.519	-.412
4	3.750	(10)	3.541	-.403	-.412
5	4.050	(10)	3.389	-.599	-.412
JTAN	4.300	(10)	3.223	-.724	-.412
= = MEMBER 2 (1 - 3) C = =					
ITAN	0.000	(10)	6.656	-3.765	-28.390
JTAN	3.485	(10)	-6.465	-3.765	-29.854
= = MEMBER 3 (2 - 4) C = =					
ITAN	0.000	(9)	-6.400	3.765	-33.768
JTAN	3.485	(9)	6.721	3.765	-35.232

[6] Calculation of upper beam

1. Stress calculation of upper beam



(a) Summary of stresses

(i) At the support point

Pick up No 2

		①	CO.	③	CO.
Combined Stress	Top	-3.31	10	-7.92	9
	Bottom	7.83	9	3.39	10
Dead load				-3.52	1

(ii) Span moment

		②	CO.
Combined Stress	Bottom	6.72	8

(Note 1) Dead load is of Pick-up No. 1

(Note 2) CO. — combination

(b) Allowable stress for upper beam, safe against cracking

(i) At the support point 2

Dead load $M_d = -3.52^{tm}$ (case 1)

Pedestrian load $M_p = -1.63^{\cdot}$ (case 2)

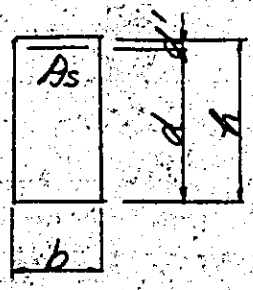
$\Sigma M = -5.15^{tm}$

$$\alpha = \frac{1.63}{5.15} = 0.32 > 0.25$$

Hence, $\sigma_{sa} = 1,000\ ^{kg}/_{cm^2}$

(C) Crass section used for stress calculation

(i) Cross section at the support point



$b = 50^{cm}$

$h = 60^{\cdot}$

$d' = 2.5 + 1.0 + 3.2 + 1.3 = 8.0^{cm}$

$d = 60 - 8.0 = 52.0^{cm}$

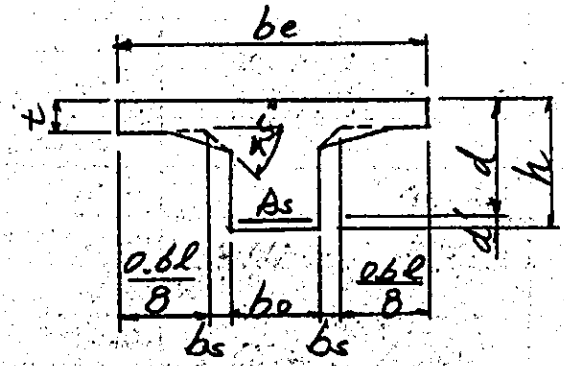
(ii) Cross section at the span center point

Effective width of T-beam at compression fibre

$$be = b_o + 2\left(bs + \frac{0.6}{8} \cdot \ell\right)$$

$$be_1 = 0.50 + 2 \times \left(0.10 + \frac{0.60}{8} \times 4.30\right)$$

$$= 1.35^{m}$$



$b_o = 50^{cm}$

$h = 60^{\cdot}$

$d' = 3.0 + 1.3 + 1.3 = 5.6^{cm}$

$d = 60 - 5.6 = 54.4^{cm}$

$t = 15^{cm}$

(d) Calculation of bending stress

	① ③	① ③	① ②	
M (tm)	-3.52	-7.92	6.72	
N (t)				
S (t)				
b (cm)	50		135	
h (cm)	60		60	
d (cm)	52.0		54.4	
d' (cm)	8.0		5.6	
As (cm²)	D25-5 = 25.34		D25-5 = 25.34	
p	0.00975		2.00321	
As' (cm²)			t=15 d=0.276	
p'				
e=M/N (cm)				
e=M/N+u (cm)				
e=M/N-u (cm)				
e/h				
d/e				
d'/h				
d'/d				
~~M~~ Ne/bd²(kg/cm²)	2.60	5.86	1.68	
k				
c				
j				
1/Lc	5.6		8.03	
1/Ls	11.9		31.9	
β=σs/σc				
σc (kg/cm²)		32.8	13.5	
σs (kg/cm²)	310	700	540	
τ (kg/cm²)				
σsa (kg/cm²)	1,000	1,800	〃	
σca (kg/cm²)		90	〃	
τa (kg/cm²)				
Nomogram number	M-1	〃	M-11 M-1	
combination	D	D+P	〃	

(e) Required minimum cross section of re-bars

(i) At the top of support point

$$As = \frac{M}{Rsa \cdot j \cdot d} \times \frac{4}{3}$$

$$= \frac{-7.92 \times 10^5}{1800 \times 0.875 \times 52.0} \times \frac{4}{3} = 12.89^{cm^2}$$

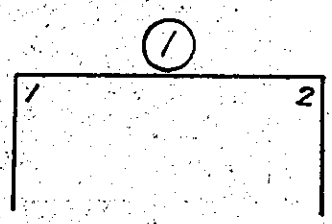
Hence D25 - 5 = $25.34^{cm^2} > 12.89^{cm^2}$

(ii) At the span center point

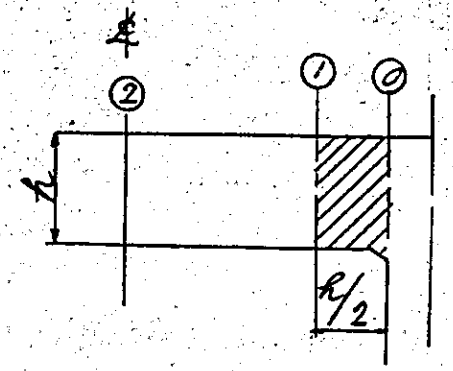
$$As = \frac{6.72 \times 10^5}{1800 \times 0.875 \times 54.4} \times \frac{4}{3} = 10.46^{cm^2}$$

Hence D25 - 5 = $25.34^{cm^2} > 10.46^{cm^2}$

2. Shearing stress of upper beam



(1) Summary of shearing stress



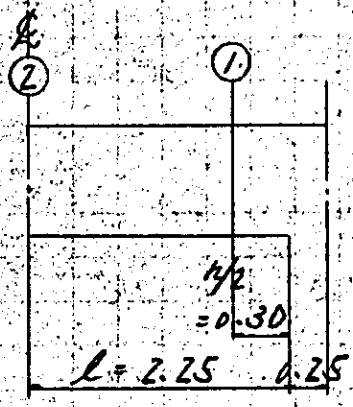
For the design of cross section of beam end, the value of shearing stress at h/2 point is applied.

	①			
	Left support	CO.	Right support	CO.
⓪	3.84	10	-7.08	6
①	3.44		-6.72	
②	1.52		-2.68	

(Note) CO. — combination

(2) Shearing stress

(a) Shearing stress caused by bending



(i) Shearing stress of the member of uniform height

$$\tau = \frac{S}{b \cdot d}$$

$$\tau_1 = \frac{6.72 \times 10^3}{50 \times 52.0} = 2.58 \ ^{kg/cm^2} < 3.9 \ ^{kg/cm^2}$$

$$\tau_2 = \frac{2.68 \times 10^3}{50 \times 52.0} = 1.03 \ " < " \ "$$

Calculations for diagonal Re. bars and stirrups are not required because the concrete area is sufficient to the shearing stress.

(a) ctc. distance of stirrup

Therefore

Arrange stirrups D13 - 1 sets in 25.0 cm ctc

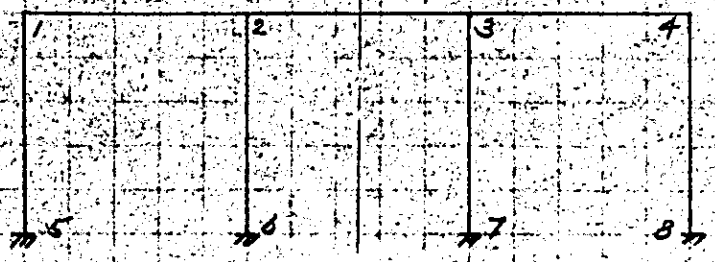
(b) Re - bars in axial direction

side (one side)

As = D16 - 1 bars

§7. Calculation of column

1) Rahmen (Rigid frame) calculation in railway protile

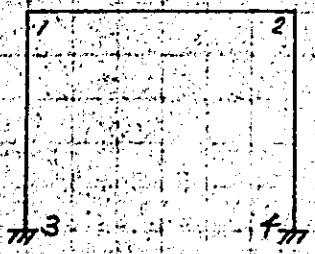


Critical cases No 2

Member	M (tm)	N (t)	case number
1 — 5	8.77	27.02	6
5 — 1	7.64	18.45	8
2 — 6	−8.17	41.93	8
6 — 2	5.25	32.46	10

(Refer the result of computer analysis on stress calculation)

2) ①-① Rahmen (Rigid frame) calculation in the direction of railway cross section



Critical cases No 2

Member	M (tm)	N (t)	case number
1 — 3	3.41	15.51	10
4 — 2	3.39	18.46	9

3) ②-② Rahmen (Rigid frame) calculation in the direction of railway cross section

Member	M (tm)	N (t)	case number
1 - 3	6.66	28.39	10
2 - 4	6.72	35.23	9

critical cases No 2

Stress calculation

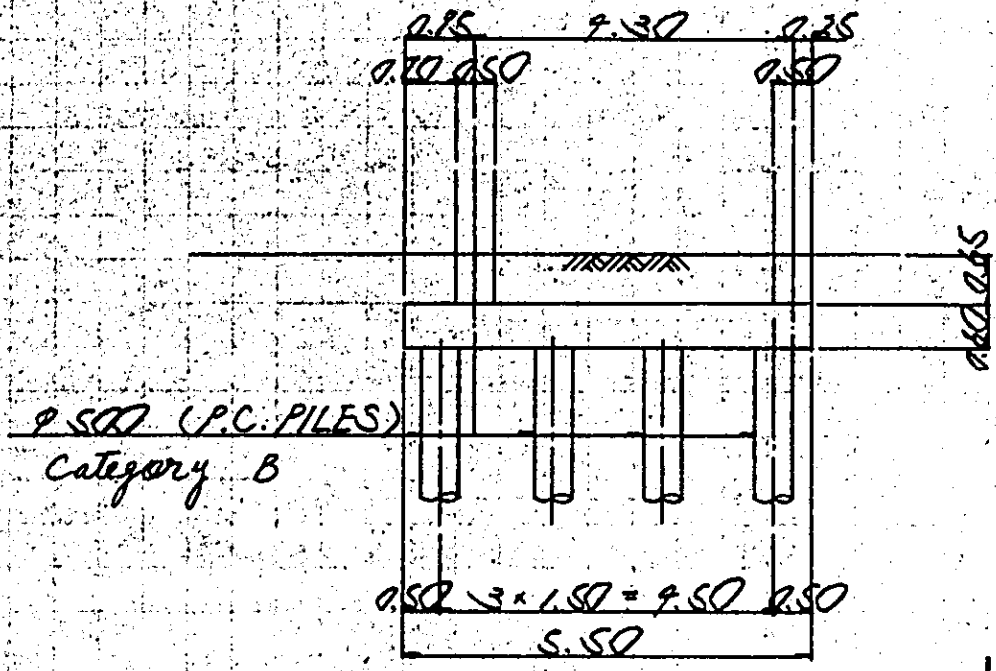
Rahmen in railway profile

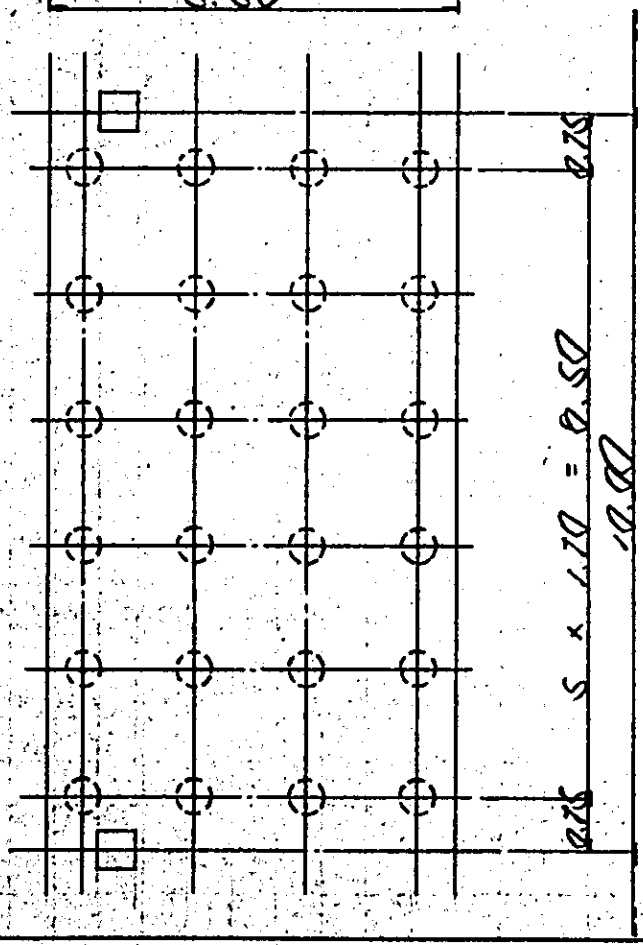
	1—5	5—1		2—6	6—2	
M (tm)	8.77	7.64		-8.17	5.25	
N (t)	27.02	18.45		41.93	32.46	
S (t)						
b (cm)	50			50		
h (cm)	40			50		
d (cm)	33.9			43.9		
d' (cm)	6.1			6.1		
As (cm²)	025-4=20.27			025-4=20.27		
p	0.01014			0.00811		
As' (cm²)						
p'						
e=M/N (cm)	32.46	41.41		19.48	16.17	
e=M/N+u (cm)						
e=M/N−u (cm)						
e/h	0.811	1.035		0.390	0.323	
d/e						
d'/h				0.122	0.122	
d'/d	0.153	0.153				
Ne/bd²(kg/cm²)	13.51	9.23		16.77	12.98	
k	0.455	0.424		0.642	0.725	
c	0.197	0.157		0.375	0.438	
j						
1/Lc						
1/Ls						
β=σs/σc						
σc (kg/cm²)	68.5	58.7		44.8	29.7	
σs (kg/cm²)	890	880		250	90	
τ (kg/cm²)						
σsa (kg/cm²)	1800			1800		
σca (kg/cm²)	90			90		
τa (kg/cm²)						
Nomogram number	MN-5.6.7	〃		MN-5.6.7	〃	
combination	D+P	D+T		D+T	D+S	

	①-①Rahmen in the direction of railway cross section		②-②Rahmen in the direction of railway cross section		
	1—3	4—2	1—3	2—4	
M (tm)	3.41	3.39	6.66	6.72	
N (t)	15.51	18.46	28.39	35.23	
S (t)					
b (cm)	40		50		
h (cm)	50		50		
d (cm)	43.9		43.9		
d' (cm)	6.1		6.1		
As (cm²)	025 - 4 = 20.27		025 - 4 = 20.27		
p	0.01014		0.00811		
As' (cm²)					
p'					
e = M/N (cm)	21.99	18.36	23.46	19.07	
e = M/N + u (cm)					
e = M/N − u (cm)					
e/h	0.440	0.367	0.469	0.381	
d/e					
d'/h	0.122	0.122	0.122	0.122	
d'/d					
Ne/bd² (kg/cm²)	7.76	9.23	11.36	14.09	
k	0.617	0.686	0.573	0.650	
c	0.367	0.426	0.318	0.381	
j					
1/Lc					
1/Ls					
β = σs/σc					
σc (kg/cm²)	21.2	21.7	35.7	36.9	
σs (kg/cm²)	130	90	280	190	
τ (kg/cm²)					
σsa (kg/cm²)	1800		1800		
σca (kg/cm²)	90		90		
τa (kg/cm²)					
Nomogram number	MN-5.6.7	〃	〃	〃	
combination	D+S	〃	〃	〃	

§8. Basic criteria for calculation

1.) Configulation and dimension





2) Stairway reaction

(1) Dead load

Pavement	$1.1^{t/m^3} \times 0.05 \times 3.00 \times 10.72$	$= 1.77^t$
"	$1.1 \times 0.05 \times 3.30 \times 1.43$	$= 0.26$ "
slab	$2.5 \times 0.477 \times 3.30 \times (4.95 + 3.964)$	$= 32.87$ "
"	$2.5 \times 0.40 \times 3.30 \times (0.856 + 0.87)$	$= 5.70$ "
"	$2.5 \times 3.30 \times 0.336 \times 0.75 \times 1/2$	$= 1.04$ "
"	$2.5 \times 0.596 \times 1.50 \times 3.30$	$= 7.38$ "
step	$2.5 \times 0.33 \times 0.165 \times 1/2 \times 3.00 \times 29$	$= 5.92$ "
handrail	$2.5 \times 0.15 \times 1.10 \times 4.92 \times 2$	$= 4.06$ "
"	$2.5 \times 0.15 \times 0.87 \times 3.575 \times 2$	$= 2.33$ "
"	$2.5 \times 0.15 \times (1.10 + 3.575) \times 1/2 \times 4.92 \times 2$	$= 8.63$ "
	Total	$= 69.96^t$

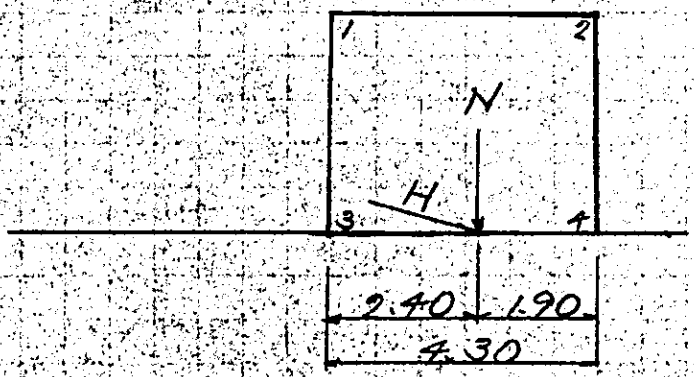
(2) Pedestrian load (People load)

$0.35^{t/m^2} \times (3.00 \times 10.72 + 3.30 \times 1.43) = 12.91^t$

calculation for Seismic load

$0.21^{t/m^2} \times (3.00 \times 10.72 + 3.30 \times 1.43) = 7.74^t$

3) Horizontal force and reaction acting at foundation



- Dead load reaction

$$R_3 = 69.96 \times 1/2 \times \frac{1.90}{4.30} = 15.46^t$$

$$R_4 = \text{"} \times \text{"} \times \frac{2.40}{4.30} = 19.52^t$$

- Pedestrian load

$$R_3 = 12.91 \times 1/2 \times \frac{1.90}{4.30} = 2.85^t$$

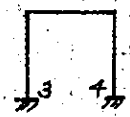
$$R_4 = \text{"} \times \text{"} \times \frac{2.40}{4.30} = 3.60^t$$

- Horizontal force of half portion of column and stairway

$$H_3 = (15.46^t + 2.85 \times \frac{0.21}{0.35} + 2.5^{t/m^3} \times 0.50 \times 0.50 \times 5.101 \times 1/2) \times 0.10 = 1.98^t$$

$$H_4 = (19.52^t + 3.60 \times \frac{0.21}{0.35} + 2.5^{t/m^3} \times 0.50 \times 10.00 \times 5.101 \times 1/2) \times 0.10 = 5.36^t$$

9) Stress at the bottom of calumn



- Ordinary case (Dead load + Earth pressure) $\alpha = 1.00$ case 9

$$\begin{cases} M_3 = -2.28 \text{ tm} \\ N_3 = 76.41 + 15.46 = 91.87 \text{ t} \\ H_3 = -0.88 \text{ t} \end{cases}$$

$$\begin{cases} M_4 = -60.49 \text{ tm} \\ N_4 = 153.76 + 19.52 = 173.28 \text{ t} \\ H_4 = -50.45 \text{ t} \end{cases}$$

- Ordinary case + Temporary case (Dead load + Pedestrian load + Earth pressure) $\alpha = 1.00$ case 10

$$\begin{cases} M_3 = -4.31 \text{ tm} \\ N_3 = 98.40 + 15.46 + 2.85 = 116.71 \text{ t} \\ H_3 = -1.68 \text{ t} \end{cases}$$

$$\begin{cases} M_4 = -110.82 \text{ tm} \\ N_4 = 178.19 + 19.52 + 3.60 = 201.31 \text{ t} \\ H_4 = -83.70 \text{ t} \end{cases}$$

· Earthquake case (Dead load + Seismic load + Earth pressure) $\alpha = 1.50$ case 13

$$\begin{cases} M_3 = 1.87 \times 1.5 = 2.81 \text{ tm} \\ N_3 = 45.27 \times 1.5 + 15.46 = 83.37 \text{ t} \\ H_3 = 0.80 \times 1.5 + 1.88 = 3.08 \text{ "} \end{cases}$$

$$\begin{cases} M_4 = -6.50 \times 1.5 = -9.75 \text{ tm} \\ N_4 = 108.19 \times 1.5 + 19.52 = 181.81 \text{ t} \\ H_4 = -30.51 \times 1.5 + 5.36 = -51.13 \text{ "} \end{cases}$$

· Earthquak case (Dead load + Seismic load + Earth pressure) $\alpha = 1.50$ case 14

$$\begin{cases} M_3 = -5.77 \times 1.5 = -8.66 \text{ tm} \\ N_3 = 57.63 \times 1.5 + 15.46 = 101.91 \text{ t} \\ H_3 = -2.32 \times 1.5 - 1.88 = -5.36 \text{ "} \end{cases}$$

$$\begin{cases} M_4 = -98.60 \times 1.5 = -147.90 \text{ tm} \\ N_4 = 95.83 \times 1.5 + 19.52 = 163.27 \text{ t} \\ H_4 = -57.36 \times 1.5 - 5.36 = -91.40 \text{ "} \end{cases}$$

Stability calculation

	Allowable supporting power	case	Pmax	Pmin	Hmax
Ordinary	49 t	9	22.72 t	11.10 t	2.14 t
Ordinary + Temporary	73 t	10	23.34 t	14.89 t	3.56 t
Earthquak	98 t	14	25.85 t	7.98 t	4.13 t

Analysis on the body of pile

$(\beta = 0.214^{m-1})$

- Ordinary + Temporary

$H = 3.56^{t}$

$M = 0.322 \times \frac{H}{\beta} = 0.322 \times \frac{3.56}{0.214} = 5.36^{tm}$

$N_{max} = 21.53^{t}$ (ΔN considered)

$N_{min} = 16.69^{t}$ (" ")

- Earthquak

$H = 4.13^{t}$

$M = 0.322 \times \frac{4.13}{0.214} = 6.21^{tm}$

$N_{max} = 25.85^{t}$ (ΔN considered)

$N_{min} = 9.51^{t}$ (" ")

According to the "Interaction curve", φ500 PC kind B is employed.

5) Allowable stress, safe against cracking

(i) Bottom side

$$M_d + M_P + M_{EP_2} = 160.64^{tm}$$

$$M_P + M_{EP_2} = 160.64 - 80.51 = 80.13^{tm}$$

$$\alpha = \frac{80.13}{160.64} = 0.50 > 0.25$$

$$\therefore \sigma_{sa} = 1400^{kg/cm^2}$$

(ii) Top side

$$M_d + M_P + M_{EP_2} = -85.73^{tm}$$

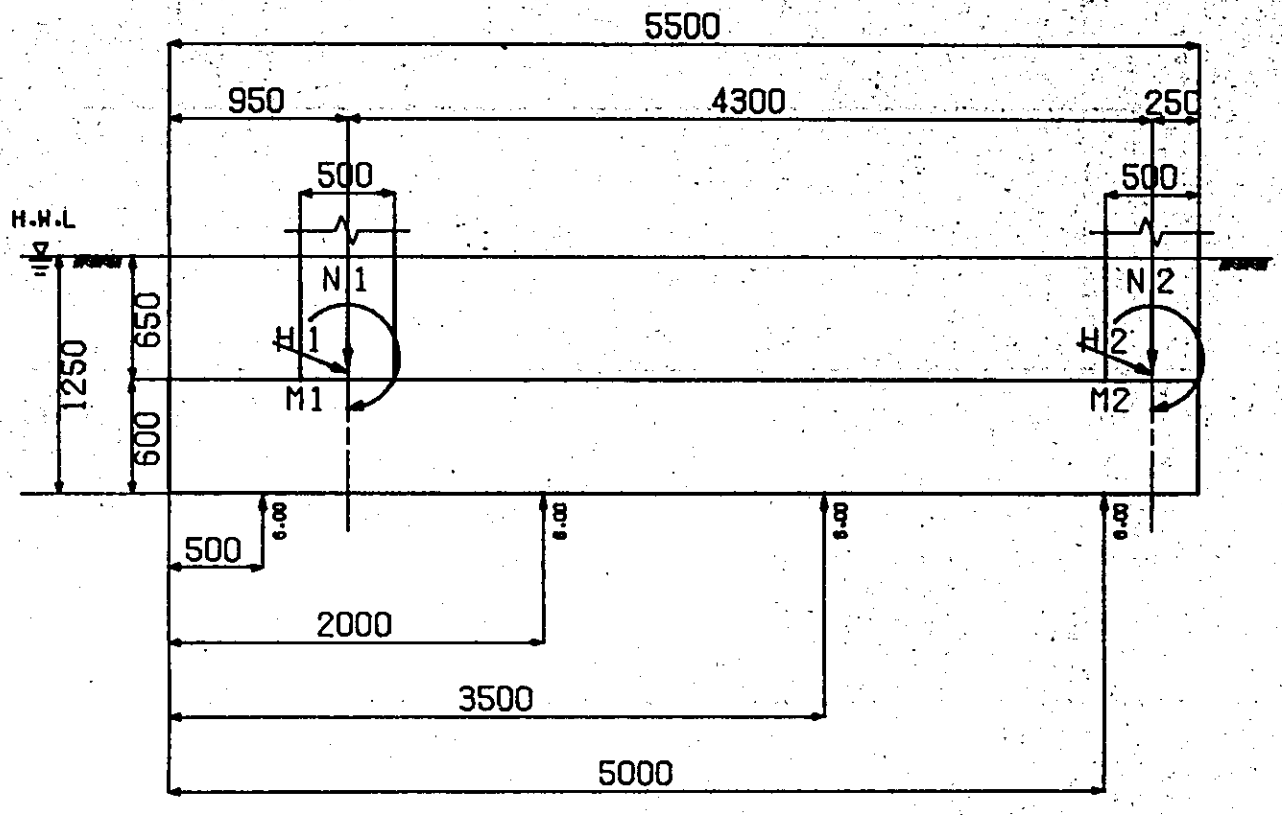
$$M_P + M_{EP_2} = -85.73 - (-79.54) = -6.19^{tm}$$

$$\alpha = \frac{6.19}{85.73} = 0.07 < 0.25$$

$$\therefore \sigma_{sa} = 1600^{kg/cm^2}$$

6) Stress diagram

PLATFORM (CENTRAL)



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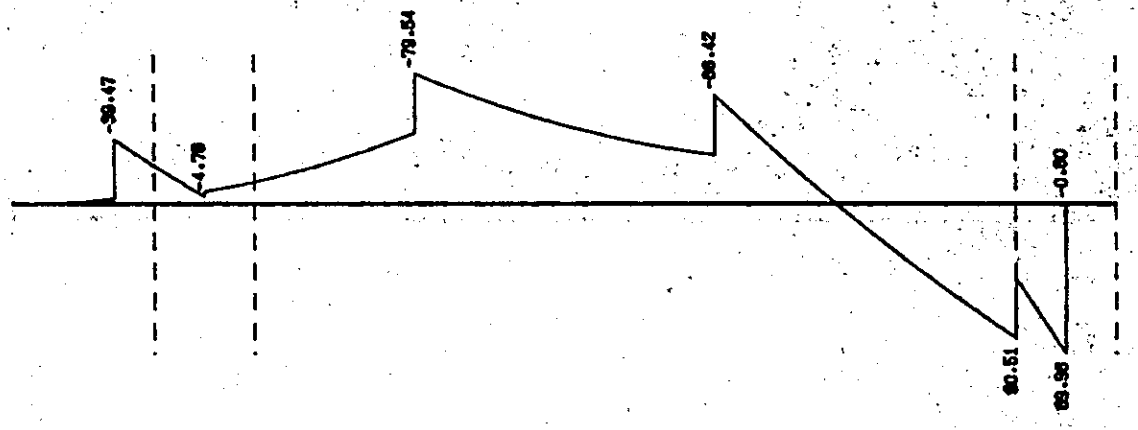
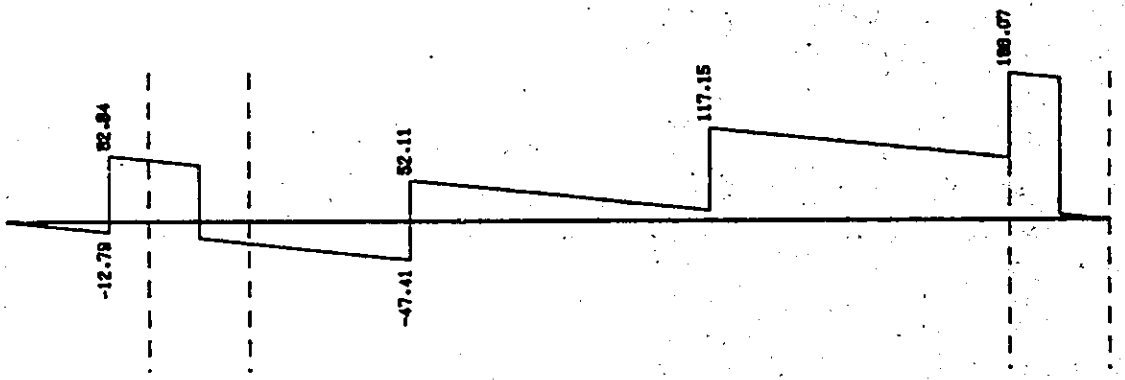
PLATFORM (CENTRAL)

CASE-9

BENDING MOMENT



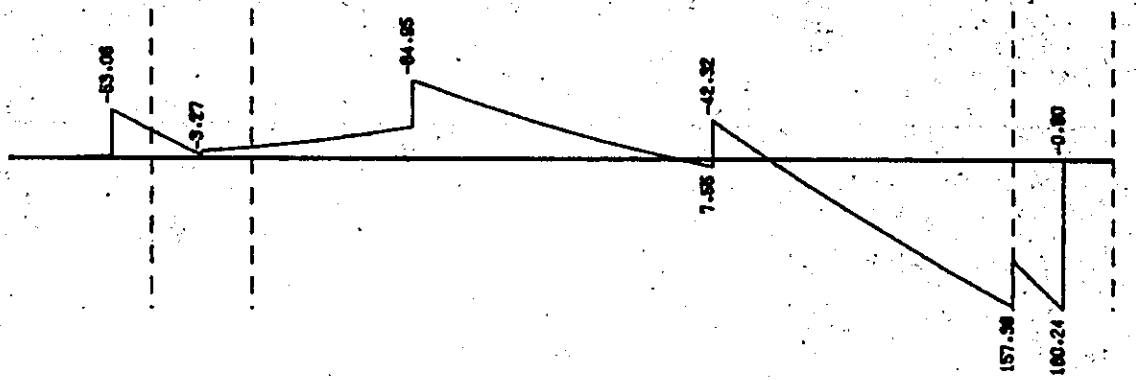
SHEARING FORCE



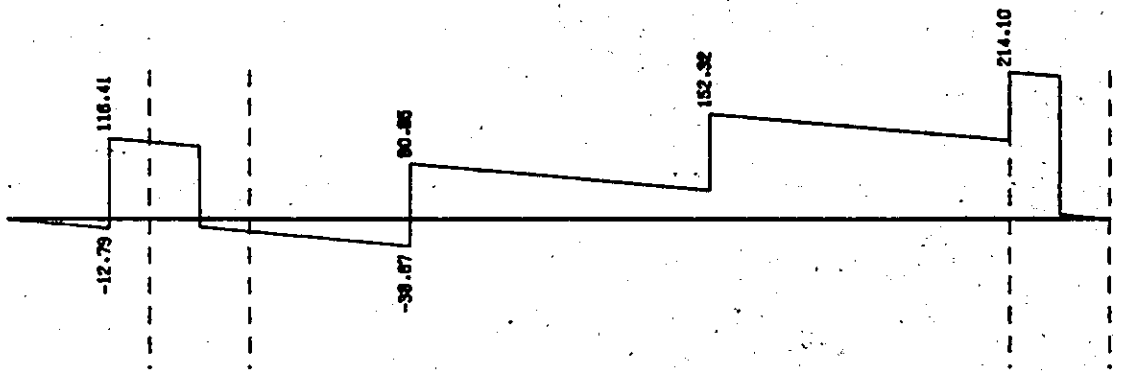
PLATFORM (CENTRAL)

CASE-10

BENDING MOMENT



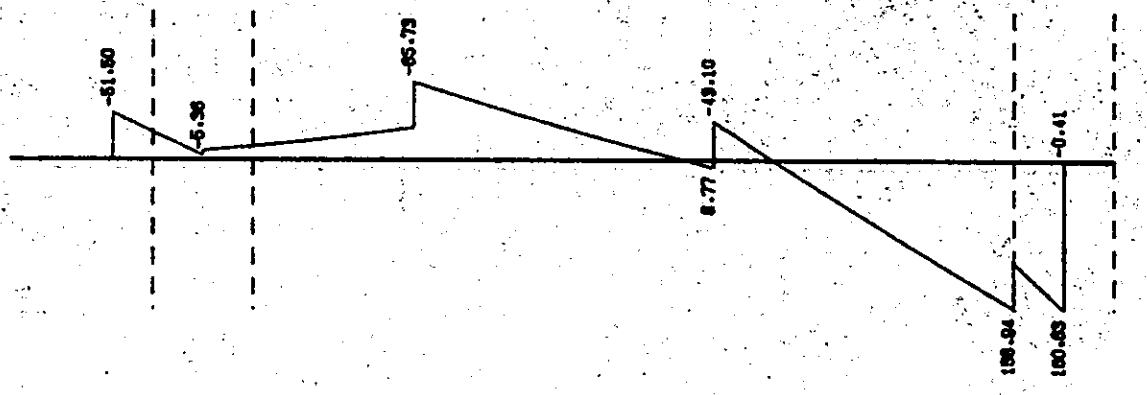
SHEARING FORCE



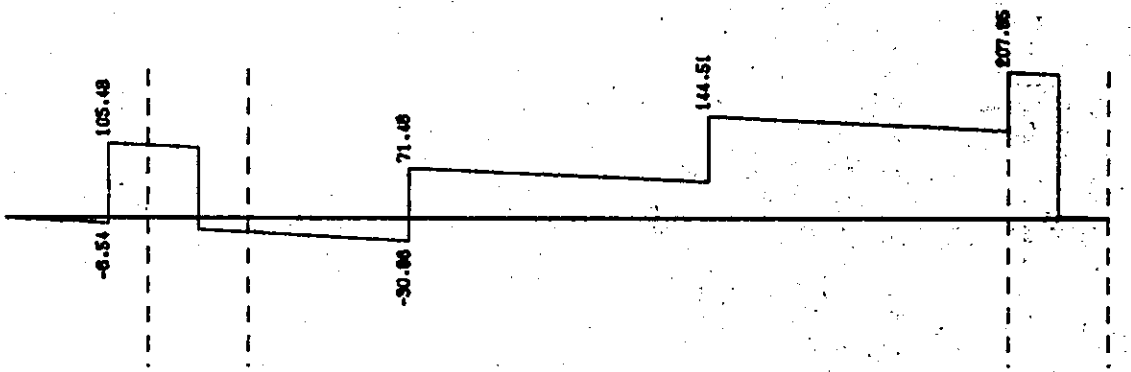
PLATFORM (CENTRAL)

CASE-10

BENDING MOMENT



SHEARING FORCE



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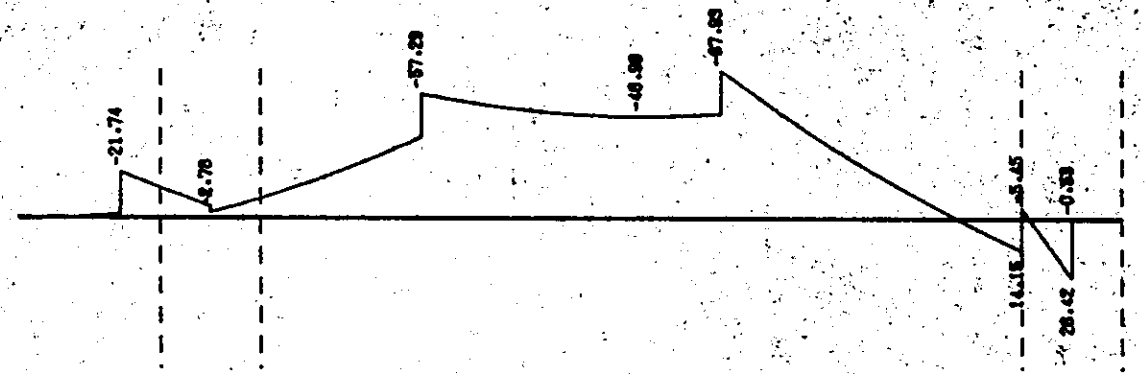
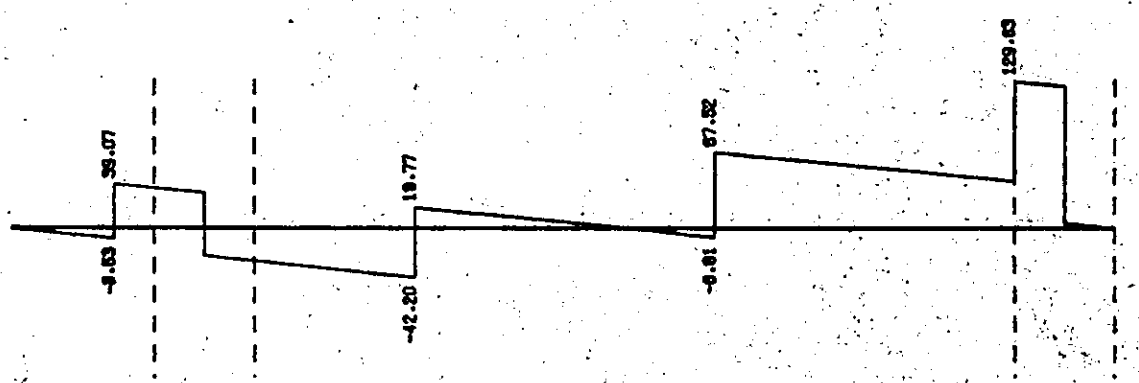
PLATFORM (CENTRAL)

CASE-13

BENDING MOMENT



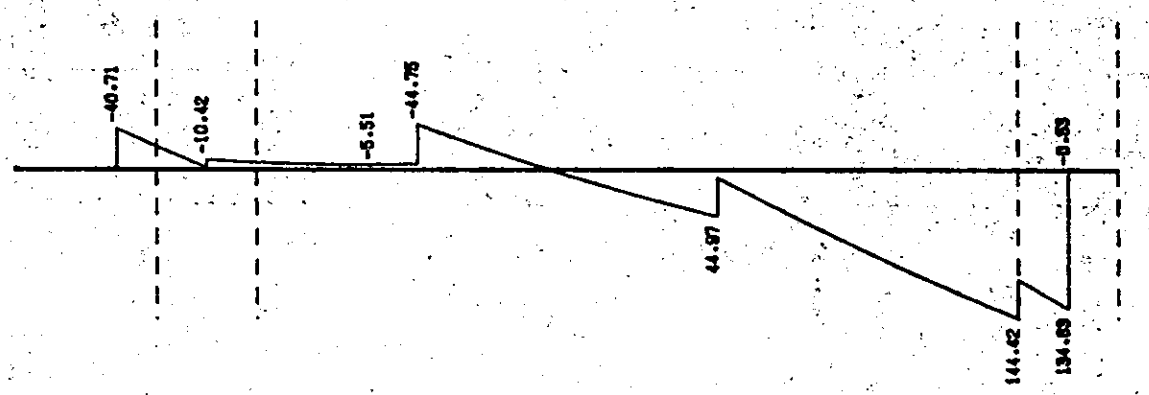
SHEARING FORCE



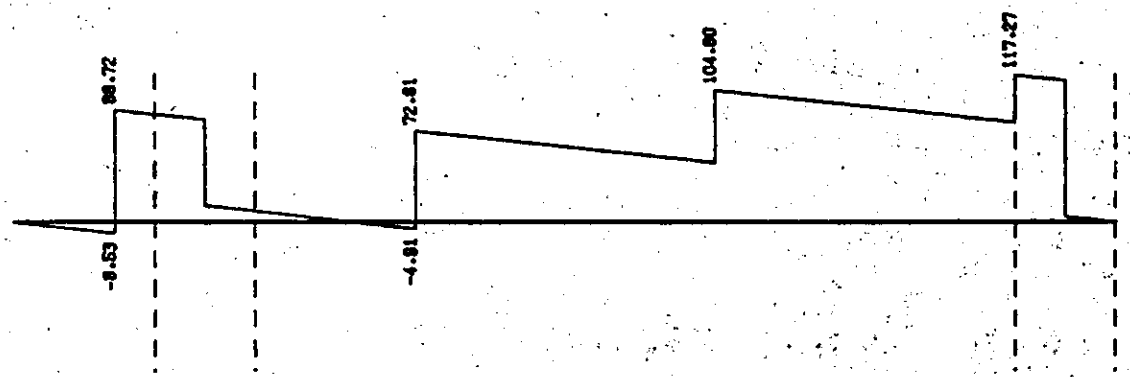
PLATFORM (CENTRAL)

CASE-14

BENDING MOMENT



SHEARING FORCE



INPUT DATA

```
===INPUT DATA CARD IMAGE===                                                    CARD
--------1--------2--------3--------4--------5--------6--------7--------8     NUMBER
TITLE     PLATFORM (CENTRAL)                                                     1
CONST          2   4      5.5         0     0.65     1.25        0    0.028     2
                0.6   0        0         0      5.5        0      2.5           3
                0.6   0        0         0     10.0        0      1.8           4
SWITCH         2   0   1    1   1    1   0    1   0    1   0                    5
COLC        0.95     5.25                                                      6
COLB         0.5      0.5                                                      7
COLH         0.5     10.0                                                      8
KUI         22.0      0.5 0.0025530  3500000       70      150        0        9
KL           0.5      2.0       3.5      5.0                                  10
KN             6        6         6        6                                  11
POINT   2    1.5      4.7                                                      12
FORCE   1   -2.28   -60.49                                                     13
      9 1   -0.88   -50.45                                                     14
    1.0 1   91.87   173.28                                                     15
FORCE   2   -4.31  -110.82                                                     16
     10 2   -1.68   -83.70                                                     17
    1.0 1  116.71   201.31                                                     18
FORCE   3   -4.31  -110.82                                                     19
     10 2   -1.68   -83.70                                                     20
    1.0 0  116.71   201.31                                                     21
FORCE   4    2.81    -9.75                                                     22
     13 3    3.08   -51.13                                                     23
    1.5 1   83.37   161.81                                                     24
FORCE   5   -8.66  -147.90                                                     25
     14 3   -5.36   -91.40                                                     26
    1.5 1  101.91   163.27                                                     27
PICKUP  1   1   1                                                             28
        2   2   5                                                             29
FINISH                                                                        30
```

PLATFORM (CENTRAL)

1) INPUT

•SWITCH

A) KISO =	2	G) FURYOKU =	0
B) KH =	0	H) E-ANTEI2=	1
C) DELTA-H =	1	I) SUPPORT =	0
D) KANSAN =	1	J) E-DANMEN=	1
E) E-ANTEI1=	1	K) OUTPUT =	0
F) PLOT =	1		

HASHIRA =	2 (HON)	KUI =	4 (HON)
HASHIRA TAKASA=	0.000 (M)	OOSYA TAKASA=	0.650 (M)
KOU-SUII =	1.250 (M)	TEI-SUII =	0.000 (M)
SUIHEI SHINDO =	0.028	TANIJYURYO (CONC) =	2.500 (T/M**3)
ZENCHO =	5.500 (M)	TANIJYURYO (ISUCHI)=	1.800 (T/M**3)

•KISO

FH1 =	0.600 (M)	BFH1 =	0.600 (M)
FH2 =	0.000 (M)	BFH2 =	0.000 (M)
SR1 =	0.000 (M)	BSR1 =	0.000 (M)
SR2 =	5.500 (M)	BSR2 =	10.000 (M)
SR3 =	0.000 (M)	BSR3 =	0.000 (M)

•HASHIRA

HASHIRA CHUSHIN	HASHIRA HABA	HASHIRA OKUYUKI
0.950	0.500	0.500
5.250	0.500	10.000

PLATFORM (CENTRAL)

•KUI

KUICHO = 22.000 (M) KUIKEI = 0.500 (M)

I = 0.002553 (M**4) E = 0.350E+07 (T/M**2)

KH1 = 70.000 (T/M**3) KUITOU HENIRYOU= 0.000 (M)

KH2 = 150.000 (T/M**3)

KUI CHUSHIN	KUI HONSU
0.500	6.000
2.000	6.000
3.500	6.000
5.000	6.000

2) LOAD

•CONCRETE

W = 82.50 (T) H = 2.31 (T) Y = 0.300 (M)

•DOSHA

W = 58.21 (T) H = 1.63 (T) Y = 0.925 (M)

•FURYOKU

W1= 68.75 (T)
W2= 0.00 (T)

PICK UP

PLATFORM (CENTRAL)

*** PICKUP - 1 *** (9)

C	L	CASE	MOMENT MAXIMUM M	MOMENT MAXIMUM S	CASE	MOMENT MINIMUM M	MOMENT MINIMUM S
	0.000	(9)	0.000	0.000	(9)	0.000	0.000
	0.500	(9)	-3.198	-12.792	(9)	-3.198	-12.792
	0.500	(9)	-39.469	82.836	(9)	-39.469	82.836
	0.700	(9)	-23.413	77.720	(9)	-23.413	77.720
*	0.950	(9)	-4.783	71.324	(9)	-4.783	71.324
*	0.950	(9)	-7.591	-20.546	(9)	-7.591	-20.546
	1.200	(9)	-13.527	-26.942	(9)	-13.527	-26.942
	1.500	(9)	-22.761	-34.617	(9)	-22.761	-34.617
	2.000	(9)	-43.267	-47.408	(9)	-43.267	-47.408
	2.000	(9)	-79.538	52.110	(9)	-79.538	52.110
	3.500	(9)	-30.153	13.736	(9)	-30.153	13.736
	3.500	(9)	-66.424	117.146	(9)	-66.424	117.146
	4.700	(9)	55.731	86.446	(9)	55.731	86.446
	5.000	(9)	80.513	78.771	(9)	80.513	78.771
	5.000	(9)	80.513	78.771	(9)	80.513	78.771
	5.000	(9)	44.242	186.072	(9)	44.242	186.072
*	5.250	(9)	89.961	179.676	(9)	89.961	179.676
*	5.250	(9)	-0.799	6.396	(9)	-0.799	6.396
	5.500	(9)	0.000	0.000	(9)	0.000	0.000
	5.500	(9)	0.000	0.000	(9)	0.000	0.000

PLATFORM (CENTRAL)

C	L	SHEARING MAXIMUM CASE	M	S	SHEARING MINIMUM CASE	M	S
	0.000	(9)	0.000	0.000	(9)	0.000	0.000
	0.500	(9)	-3.198	-12.792	(9)	-3.198	-12.792
	0.500	(9)	-39.469	82.836	(9)	-39.469	82.836
	0.700	(9)	-23.413	77.720	(9)	-23.413	77.720
*	0.950	(9)	-4.783	71.324	(9)	-4.783	71.324
*	0.950	(9)	-7.591	-20.546	(9)	-7.591	-20.546
	1.200	(9)	-13.527	-26.942	(9)	-13.527	-26.942
	1.500	(9)	-22.761	-34.617	(9)	-22.761	-34.617
	2.000	(9)	-43.267	-47.408	(9)	-43.267	-47.408
	2.000	(9)	-79.538	52.110	(9)	-79.538	52.110
	3.500	(9)	-30.153	13.736	(9)	-30.153	13.736
	3.500	(9)	-66.424	117.146	(9)	-66.424	117.146
	4.700	(9)	55.731	86.446	(9)	55.731	86.446
	5.000	(9)	80.513	78.771	(9)	80.513	78.771
	5.000	(9)	80.513	78.771	(9)	80.513	78.771
	5.000	(9)	44.242	186.072	(9)	44.242	186.072
*	5.250	(9)	89.961	179.676	(9)	89.961	179.676
*	5.250	(9)	-0.799	6.396	(9)	-0.799	6.396
	5.500	(9)	0.000	0.008	(9)	0.000	0.008
	5.500	(9)	0.000	0.000	(9)	0.000	0.000

PLATFORM (CENTRAL)

*** PICKUP - 2 *** (10, 10, 13, 14)

C	L	MOMENT MAXIMUM CASE	M	S	MOMENT MINIMUM CASE	M	S
	0.000	(10)	0.000	0.000	(13)	0.000	0.000
	0.500	(10)	-1.635	-6.542	(10)	-3.198	-12.792
	0.500	(13)	-21.740	39.074	(10)	-53.063	116.414
	0.700	(13)	-14.266	35.663	(10)	-39.667	102.860
*	0.950	(14)	-2.508	81.047	(13)	-5.884	31.399
*	0.950	(13)	-2.778	-24.289	(10)	-10.678	-17.120
	1.200	(14)	-7.708	8.736	(10)	-15.367	-20.391
	1.500	(14)	-5.855	3.619	(10)	-22.073	-24.316
	2.000	(14)	-6.177	-4.909	(13)	-37.683	-42.197
	2.008	(14)	-44.751	72.607	(10)	-85.732	71.478
	3.500	(14)	44.972	47.023	(13)	-48.325	-6.814
	3.500	(14)	6.398	104.804	(13)	-67.933	67.516
	4.700	(10)	122.045	121.619	(13)	0.806	47.049
	5.000	(10)	158.942	124.881	(13)	14.153	41.933
	5.000	(10)	158.942	124.881	(13)	14.153	41.933
	5.080	(10)	109.077	207.852	(13)	-5.455	129.627
*	5.250	(10)	160.631	204.581	(13)	26.419	125.363
*	5.250	(10)	-0.409	3.271	(10)	-0.799	6.396
	5.500	(14)	0.000	0.000	(13)	0.000	0.000
	5.500	(14)	0.000	0.000	(13)	0.000	0.000

PLATFORM (CENTRAL)

C	L	SHEARING MAXIMUM CASE	SHEARING MAXIMUM M	SHEARING MAXIMUM S	SHEARING MINIMUM CASE	SHEARING MINIMUM M	SHEARING MINIMUM S
	0.000	(18)	0.000	0.000 (18)	0.000	0.000	
	0.500	(10)	-1.635	-6.542 (18)	-3.198	-12.792	
	0.500	(10)	-53.063	116.414 (13)	-21.740	39.074	
	0.700	(10)	-30.292	111.298 (13)	-14.266	35.663	
*	0.950	(10)	-3.267	104.902 (13)	-5.884	31.399	
*	0.950	(14)	-10.425	13.000 (13)	-2.778	-24.289	
	1.200	(14)	-7.708	8.736 (13)	-9.383	-28.552	
	1.500	(14)	-5.855	3.619 (13)	-18.717	-33.669	
	2.000	(14)	-6.177	-4.909 (13)	-37.683	-42.197	
	2.000	(10)	-84.951	80.853 (13)	-57.291	18.769	
	3.500	(18)	6.766	51.853 (13)	-48.325	-6.814	
	3.500	(18)	-42.317	152.319 (13)	-67.933	67.516	
	4.700	(10)	120.889	128.606 (13)	0.806	47.849	
	5.000	(10)	158.942	124.881 (13)	14.153	41.933	
	5.000	(10)	158.942	124.881 (13)	14.153	41.933	
	5.000	(10)	107.515	214.102 (14)	105.843	117.267	
*	5.250	(10)	160.241	207.706 (14)	134.627	113.003	
*	5.250	(10)	-0.799	6.396 (10)	-0.489	3.271	
	5.500	(10)	0.000	0.000 (10)	0.000	0.000	
	5.500	(10)	0.000	0.000 (13)	0.000	0.000	

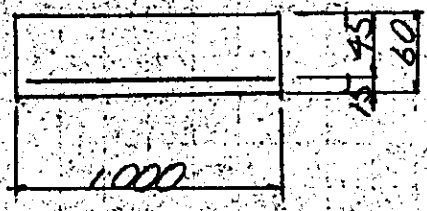
PLATFORM (CENTRAL)

CASE	V MAX	V MIN	DELTA H
9	17.883	15.938	-2.139
10	21.534	16.693	-3.557
10	18.670	13.828	-3.557
13	21.924	11.900	-2.098
14	24.312	9.512	-4.128

1. Stress calculation

(1) Bottom side

$M = 160.63^{tm}$



$A_s = D25 - 20^{cm}$ etc.

$= 5.067 \times \frac{1000}{20} = 253.35^{cm^2}$

$$p = \frac{253.35}{1000 \times 45} = 0.00563$$

From the Nomagram M-1,

$1/L_c = 6.72$ $\quad$ $1/L_s = 201$

$\sigma_c = 53.3^{kg/cm^2} < 90^{kg/cm^2}$

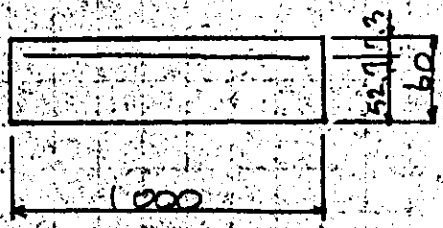
$\sigma_s = 1590^{"} < 1800^{"}$

Check, safe against cracking

$M = 80.51^{tm}$

$\sigma_s = 800^{kg/cm^2} < 1400^{kg/cm^2}$

(ii) Top side



$M = -85.73^{tm}$

$A_s = D19 - 20^{cm}\ c/c$

$= 2.865 \times \frac{1000}{20} = 143.25^{cm^2}$

$p = \frac{143.25}{1000 \times 527} = 0.00272$

From the Nomogram M-1,

$l/L_c = 8.80$ $\quad l/L_s = 400$

$\sigma_c = 27.2^{kg/cm^2} < 90^{kg/cm^2}$

$\sigma_s = 1230^{"} < 1800^{"}$

Check, safe against cracking

$M = -79.54^{tm}$

$\sigma_s = 1150^{kg/cm^2} < 1600^{kg/cm^2}$

2. Shearing stress

h/2 point from column front

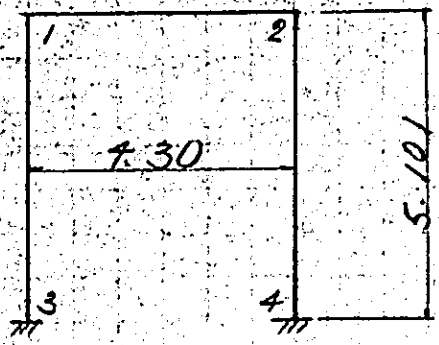
$S = 47.05^{t}$

$$\tau = \frac{47.05 \times 10^{3}}{1000 \times 45} = 1.05 \ {}^{kg/cm^2} < 3.9 \ {}^{kg/cm^2}$$

§9. Calculation for the transversal wall

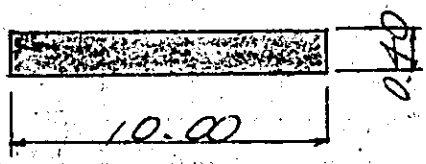
(1) Basic calculation

1. Axis of Rahmen (Rigid frame)



2. Cross sectional area / Moment of inertia of area of member

(1) Intermediate Slab (member 1 - 2)



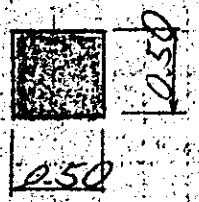
Cross sectional area

$$A = 10.00 \times 0.40 = 4.000\ m^2$$

Moment of inertia of area

$$I = 1/12 \times 10.00 \times 0.40^3 = 0.05333\ m^4$$

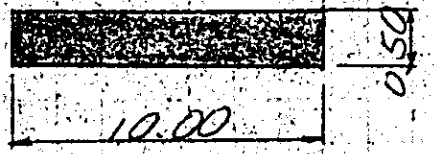
(2) Column (Member 1 - 3)



$A = 0.50 \times 0.50 = 0.250\ m^2$

$I = 1/12 \times 0.50 \times 0.50^3 = 0.00521\ m^4$

(3) Wall (Member 2 - 4)



$A = 10.00 \times 0.50 = 5.000\ m^2$

$I = 1/12 \times 10.00 \times 0.50^3 = 0.10417\ m^4$

[2] Load calculation

1. Dead load

(1) Intermediate member

(a) Linear load

Slab $2.5^{t/m^3} \times 0.40 \times 10.00 = 10.00^{t/m}$

Pavement $1.1 \times 0.05 \times 10.00 = 0.55$

$w = 10.55^{t/m}$

(b) Concentrated load acting at panel point

Panel point 1

Longitudinal beam

$2.5^{t/m^3} \times (0.70 + 0.30) \times 0.25 \times 10.00 = 6.25^{t}$

Pavement $1.1 \times 0.05 \times 0.25 \times 10.00 = 0.14$

Upper member, reter $= 48.96$

$P_1 = 55.35^{t}$

Panel point 2

Cantilever slab

$2.5^{t/m^3} \times (0.20 + 0.40) \times 1/2 \times 2.53 \times 10.00 = 18.98^{t}$

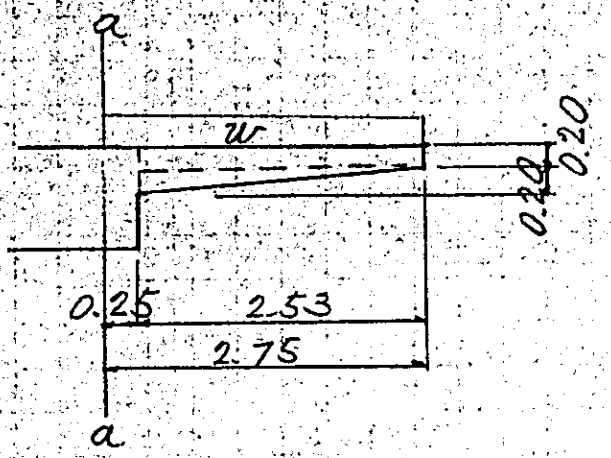
Hauch of slab $2.5 \times 0.30 \times 0.30 \times 1/2 \times 10.00 = 1.13$

pavement $1.1^{t/m^3} \times 0.05 \times 2.75 \times 10.00 = 1.51^{t}$

Upper member refer $= 40.86^{t}$

$P_2 = 62.48^{t}$

Moment from cantilever slab



$M_{a-a} = (1.1^{t/m^3} \times 0.05 \times 2.75 \times 1.375 + 2.5^{t/m^3} \times 0.20 \times 2.53 \times 1.515 + 2.5^{t/m^3} \times 0.20 \times 2.53 \times 1/2 \times 1.093) \times 10.00 = 28.16^{t\cdot m}$

Own weight of column

$q_1 = 2.5^{t/m^3} \times 0.50 \times 0.50 = 0.63^{t/m}$

Own weight of wall

$q_2 = 2.5 \times 0.50 \times 10.00 = 12.50^{t/m}$

2. Pedestrian load (People load)

$w = 0.35\ t/m^2$

a) linear load

$w = 0.35 \times 10.00 = 3.50\ t/m$

b) concentrated load acting at panel point

1) Panel point 1

· Uniformly distributed load

$0.35\ t/m^2 \times 0.25 \times 9.50 = 0.83^t$

· Upper member refer $= 13.95^t$

$P_1 = 14.78^t$

2) panel point 2

· Uniformly distributed load

$0.35\ t/m^2 \times 2.78 \times 10.00 = 9.73^t$

· Upper member refer $= 6.85^t$

$P_2 = 16.58^t$

Moment from cantilever slab

$M_{a-a} = 0.35\ t/m^2 \times 2.75 \times 1.375 \times 10.00 = 13.23^{tm}$

3. Earth pressure

Referred the coulomb

- Normal case

$\phi = 30^\circ \quad \delta = \frac{\phi}{2} = 15^\circ, \quad \alpha = 0$

$C = 0.301$

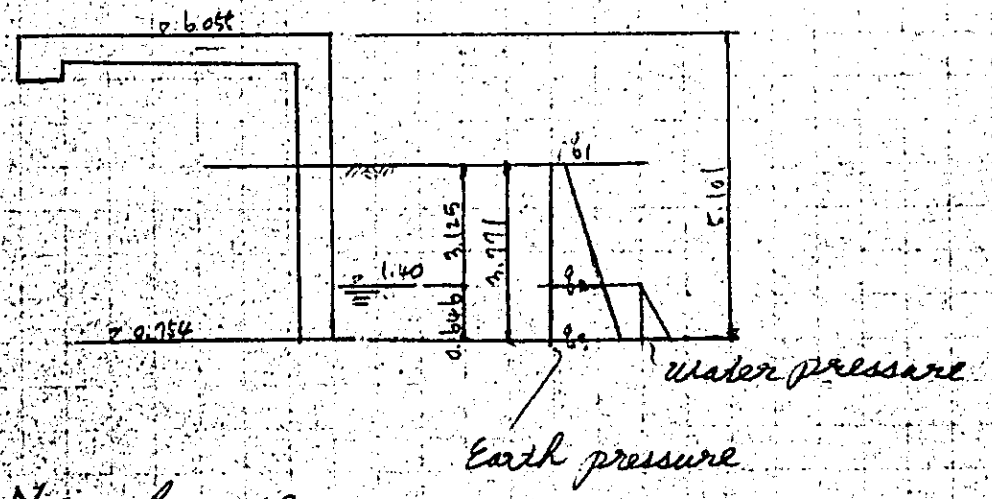
- Earthquake case

$\phi = 30^\circ, \quad \delta = 0$

$\theta = \tan^{-1} 0.1 = 5.71^\circ$

$$C = \frac{\cos^2(30 - 5.71)}{\cos^2 5.71^\circ \left\{ 1 + \sqrt{\frac{\sin 30^\circ \cdot \sin(30 - 5.71)}{\cos 5.71^\circ}} \right\}^2}$$

$$= \frac{0.9115^2}{0.9950^2 \left\{ 1 + \sqrt{\frac{0.5 \times 0.4114}{0.9950}} \right\}^2} = 0.397$$



- Normal case

$W = 1.00\ t/m^2$

$q_1 = \gamma \cdot h \cdot C$

$= 1.00 \times 0.301 \times 10.00 = 3.01\ t/m$

$q_2 = 3.01 + 1.8 \times 3.125 \times 0.301 \times 10.00 = 19.94$ "

$q_3 = 19.94 + 0.8 \times 0.646 \times 0.301 \times 10.00$

$+ 1.00 \times 0.646 \times 10.00 = 27.96$ "

- Temporary case

$W = 1.00 + 3.00 = 4.00\ t/m^2$

$q_1 = 4.00 \times 0.301 \times 10.00 = 12.04\ t/m$

$q_2 = 12.04 + 1.8 \times 3.125 \times 0.301 \times 10.00 = 28.97$ "

$q_3 = 28.97 + 0.8 \times 0.646 \times 0.301 \times 10.00$

$+ 1.00 \times 0.646 \times 10.00 = 36.99$ "

- Earthquake case

$W = 1.00\ t/m^2$

$g_1 = 1.00 \times 0.397 \times 10.00 = 3.97\ t/m$

$g_2 = 3.97 + 1.8 \times 3.125 \times 0.397 \times 10.00 = 26.30$

$g_3 = 26.30 + 0.8 \times 0.646 \times 0.397 \times 10.00 + 1.00 \times 0.646 \times 10.00 = 34.81\ t/m$

4. Temperature change and Drying contraction

Temperature change -------- ±10°C

Drying contraction -------- −15°C

Hence,

Temperature rise ------- +10°C

Temperature drop + Drying contraction

-------- −25°C

5 Seismic load from dead load (kH=0.10)

upper slab	$2.5\,t/m^3 \times 0.40 \times 3.80 \times 10.00$	$= 38.00^t$
Pedestrian load	$0.21\,t/m^2 \times 7.33 \times 10.00$	$= 15.39^{"}$
Pavemet	$2.1\,t/m^3 \times 0.05 \times 7.33 \times 10.00$	$= 4.03^{"}$
longitudinal beam	$2.5\,t/m^3 \times 0.50 \times 0.70 \times 10.00$	$= 8.75^{"}$
Cantilever slab	$2.5^{"} \times (0.20+0.40) \times 1/2 \times 2.53 \times 10.00$	$= 18.98^{"}$
Haunch of slab	$2.5^{"} \times 0.30 \times 0.30 \times 1/2 \times 10.00$	$= 1.13^{"}$
column	$2.5^{"} \times 0.50 \times 0.50 \times 2.05l$	$= 1.28^{"}$
wall	$2.5^{"} \times 0.50 \times 2.75l \times 10.00$	$= 34.39^{"}$
column half of upper	$2.5^{"} \times 0.50 \times 0.50 \times 1.743 \times 2$	$= 2.18^{"}$
	total	$= 124.13^t$

$$H_1 = 124.13 \times 0.10 = 12.41^t$$

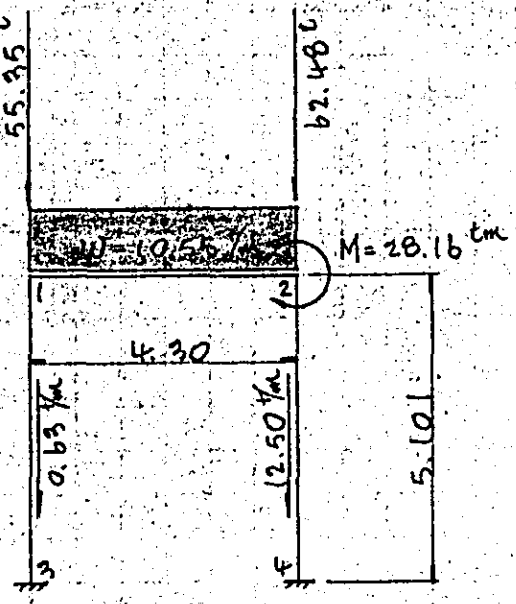
Upper member reter $H_2 = 10.06^{"}$

$$\Sigma H = 22.47^t$$

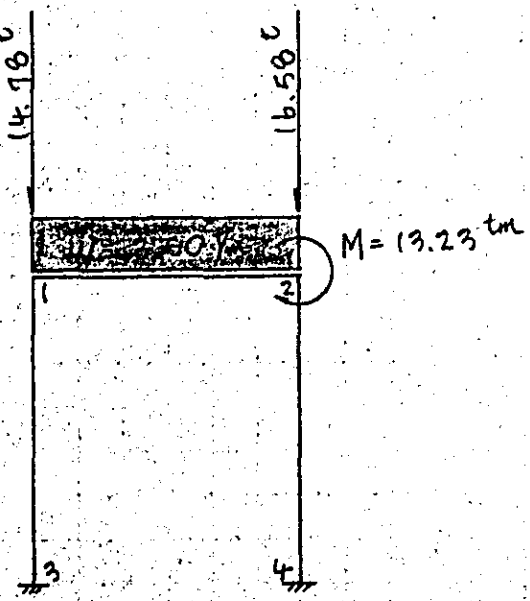
$$H = 22.47 \times 1/2 = 11.24^t$$

[3] loading diagram

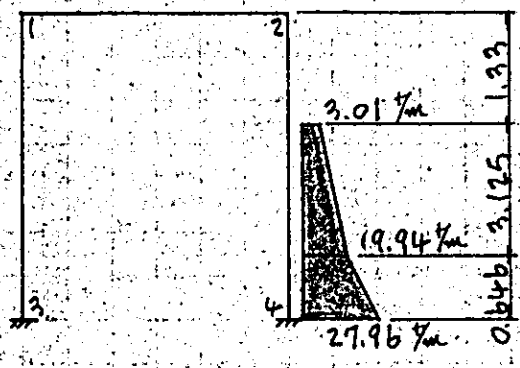
1. case 1. DEAD LOAD



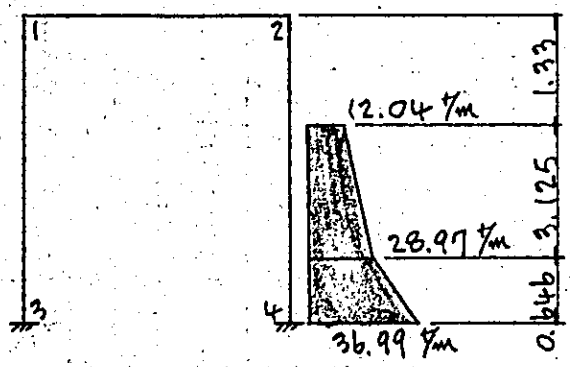
2. case 2 PEDESTRIAN LOAD (PEOPLE LOAD)



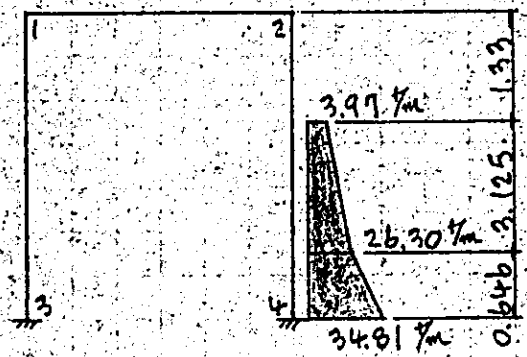
3. Case 3 EARTH PRESSURE (1)



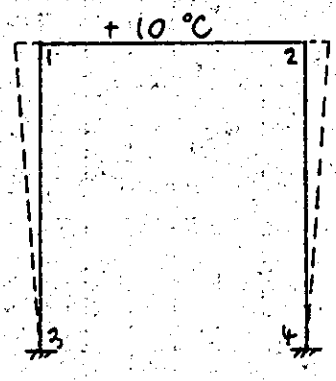
4. Case 4 EARTH PRESSURE (2)



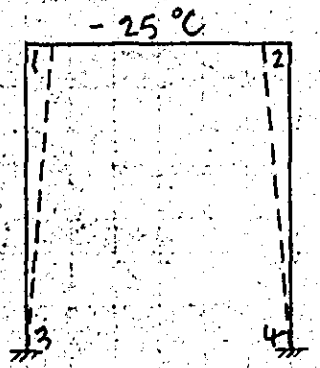
5. Case 5 EARTH PRESSURE (3)



6. Case 6. TEMPERATURE RISE

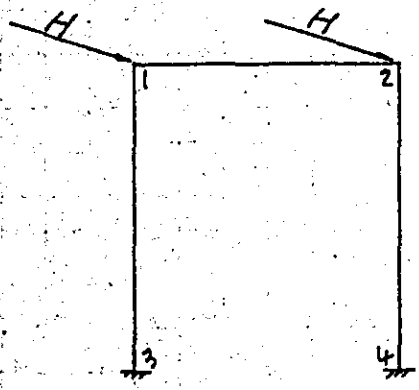


7. case 7 TEMPERATURE DROP
+ DRYING CONTRACTION



8. case 8 SEISMIC LOAD FROM DEAD LOAD

$H = 11.24^{t}$



(9) Combination of loads

1. Basic load

Case Number	Kind of load	loading pattern
1	D (Dead Load)	
2	PE (Pedestrians Load)	
3	EA (Earth Pressure) (1)	
4	〃 (2)	
5	〃 (3)	
6	TE (Temperature)	+ 10 °C
7	TE+S (Temperature + Schrinkage)	- 25 °C
8	S (Seismic Load)	

2. Combined loads

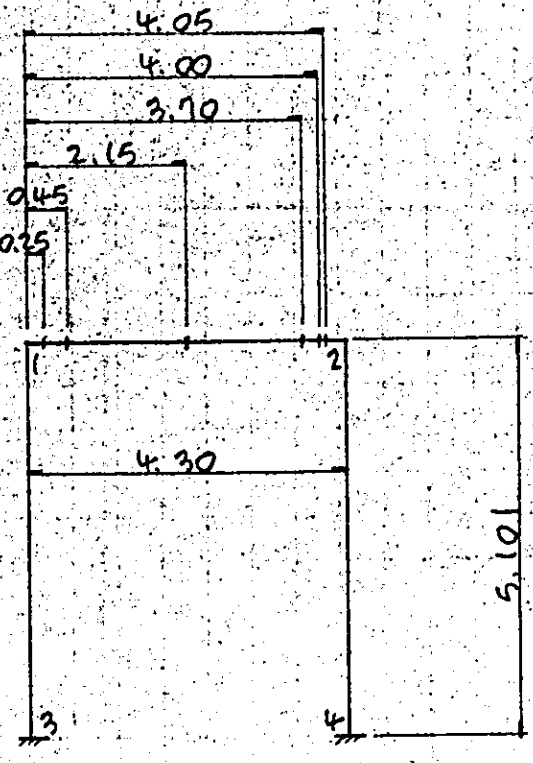
case number	combination of loads	L
9	1 + 3	1.0000
10	1 + 2 + 4	〃
11	1 + 3 + 6	0.8696
12	1 + 3 + 7	〃
13	1 + 5 + 8	0.6667
14	1 + 5 − 8	〃

3. Critical cases

No.1 case 9 crack

No.2 case 10 ~ 14 Synthetic

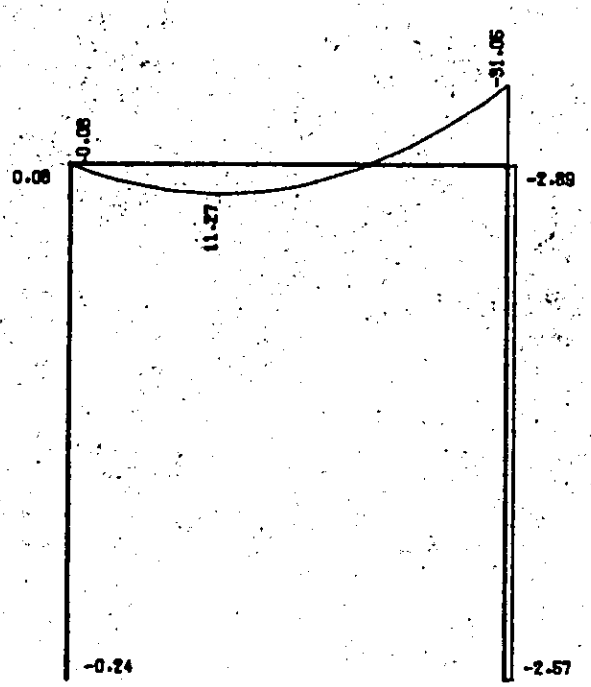
4. Point for stress calculation



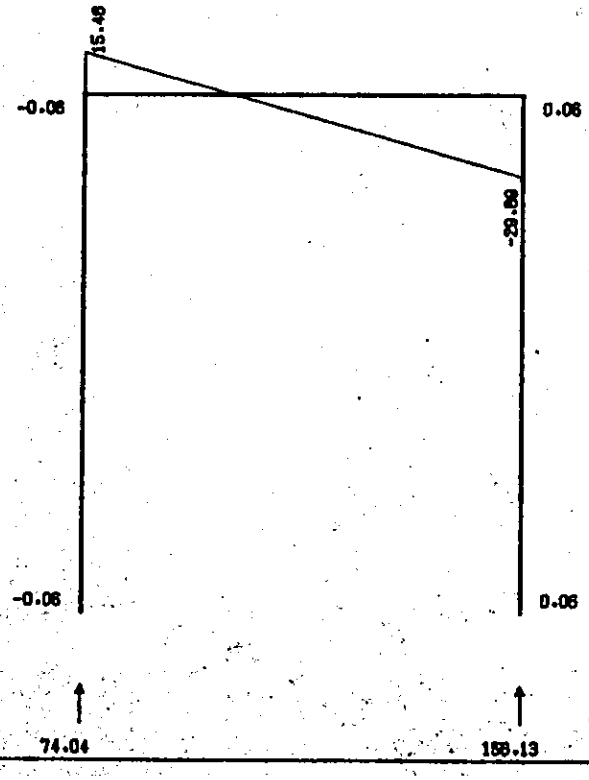
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 1 (DEAD LOAD)

BENDING MOMENT



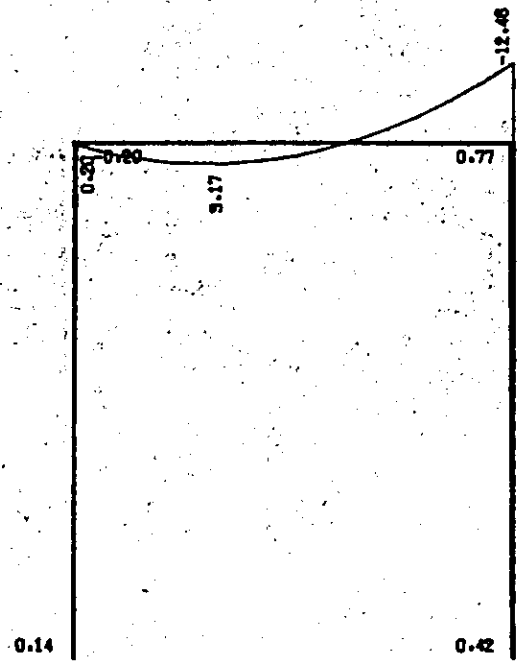
SHEARING FORCE



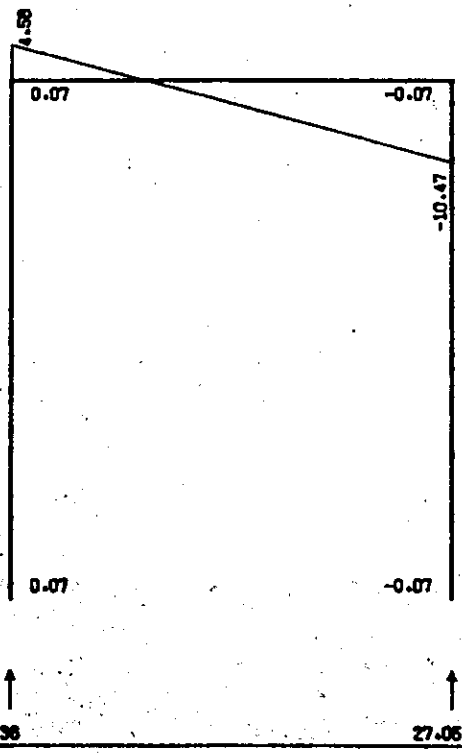
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 2 (PEDESTRIANS LOAD)

BENDING MOMENT



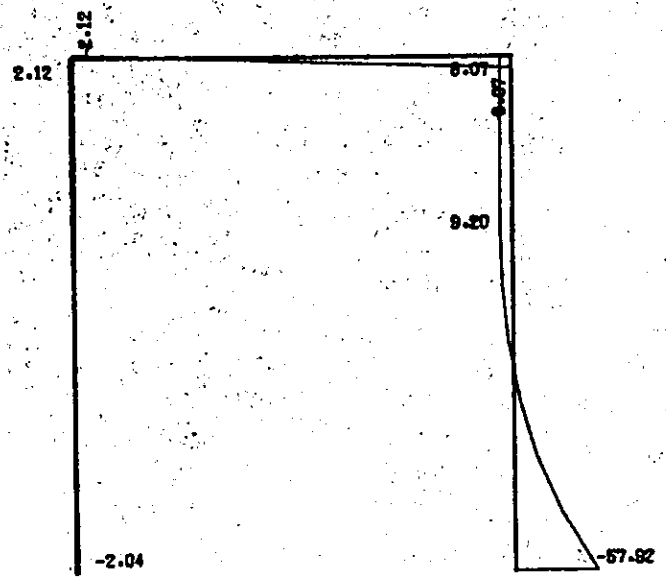
SHEARING FORCE



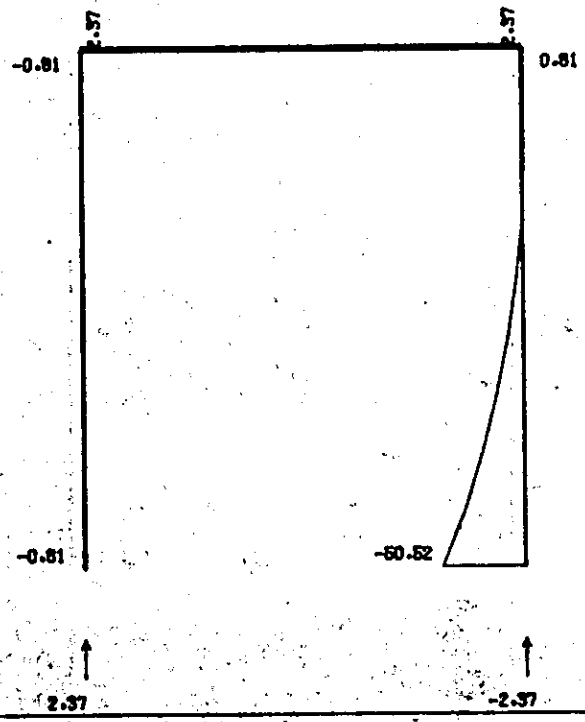
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 3 (EARTH PRESSURE 1)

BENDING MOMENT



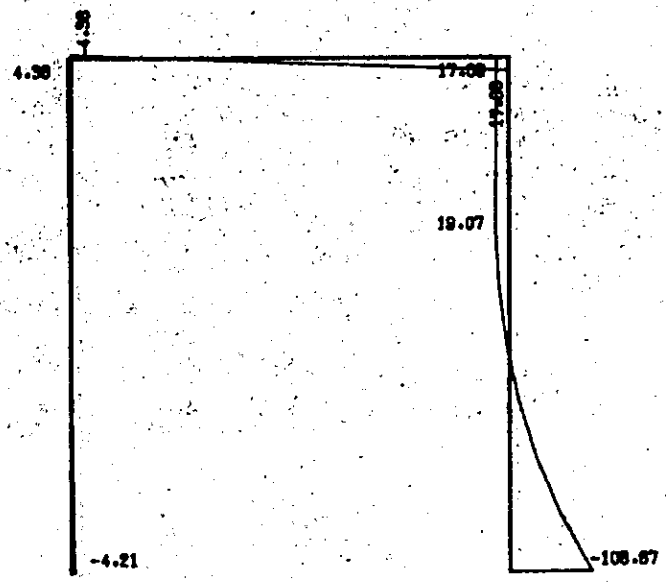
SHEARING FORCE



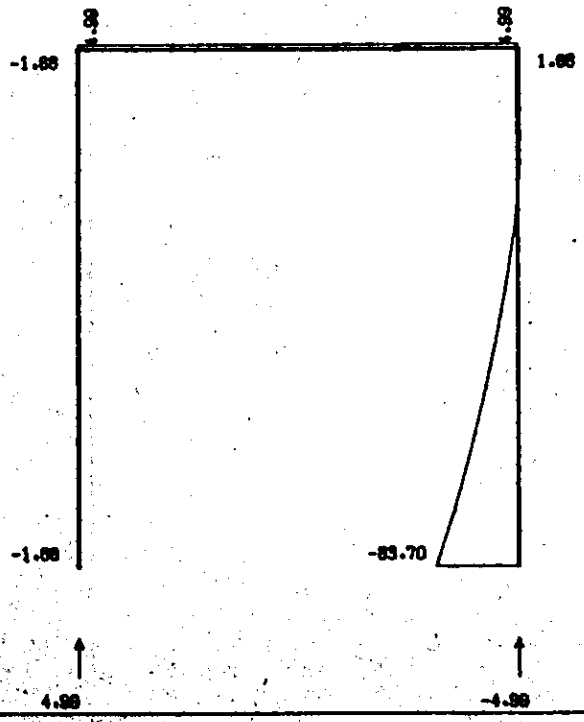
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 4 (EARTH PRESSURE 2)

BENDING MOMENT



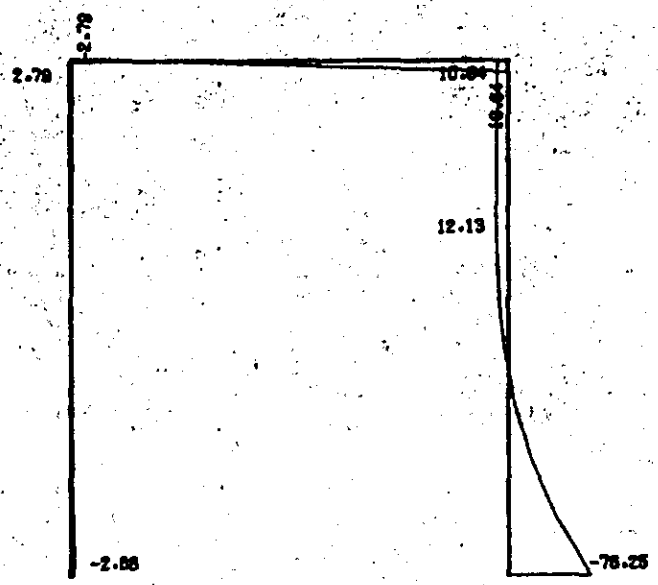
SHEARING FORCE



VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 5 (EARTH PRESSURE 3)

BENDING MOMENT



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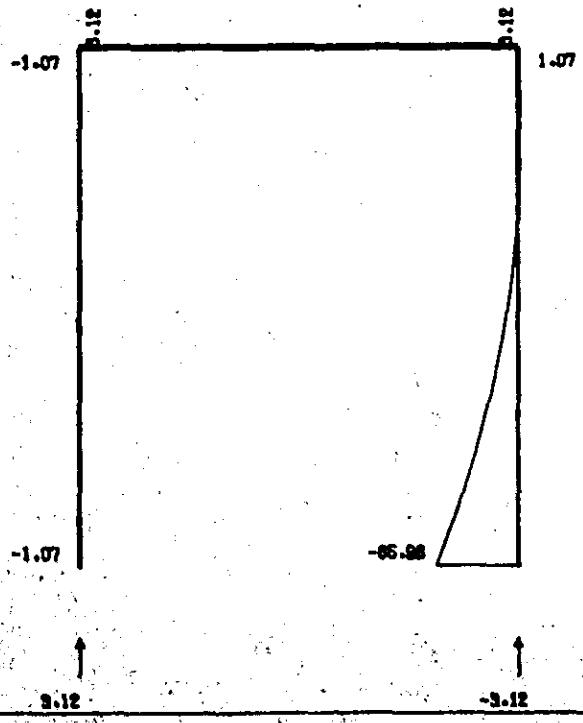
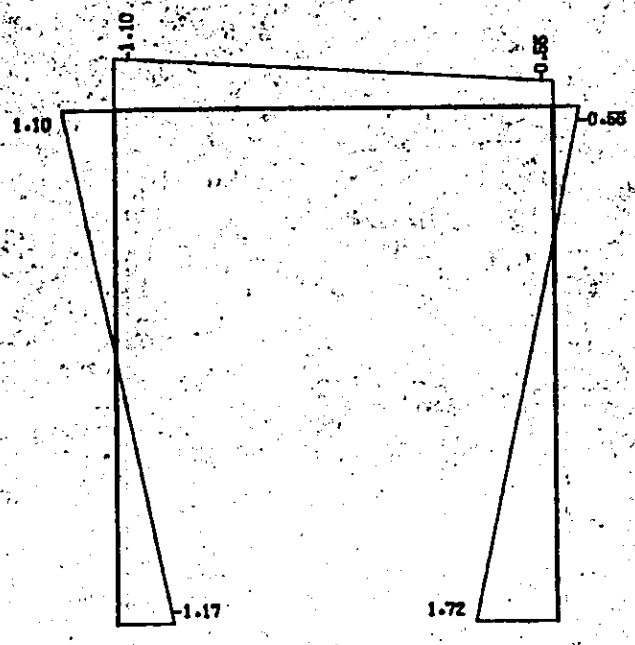


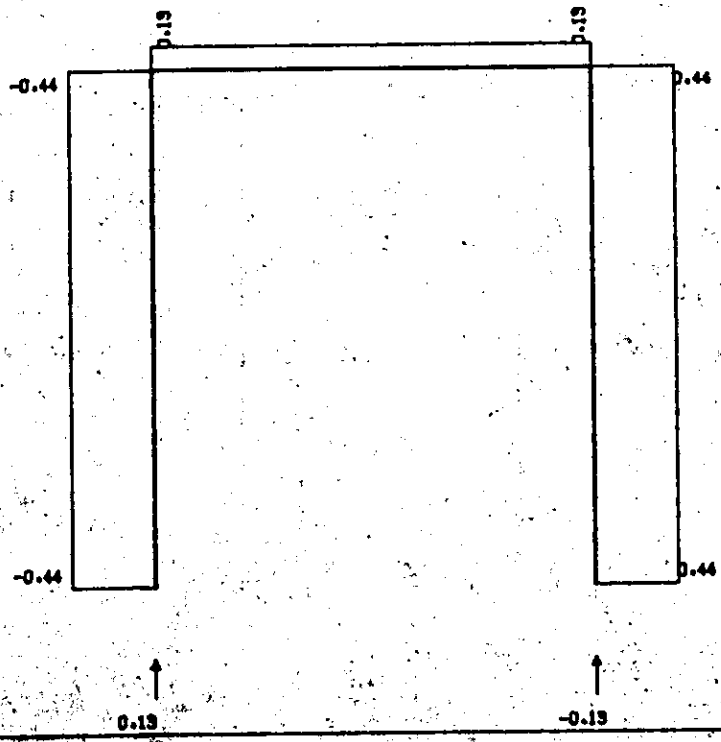
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 6 (TEMPERATURE)

BENDING MOMENT



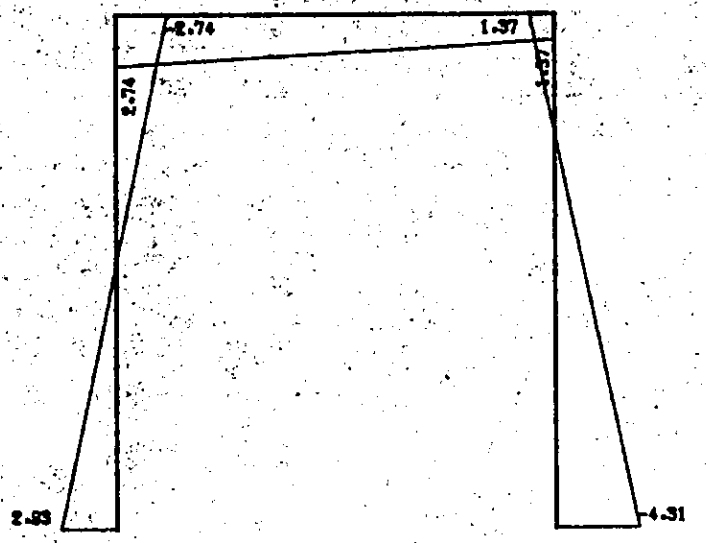
SHEARING FORCE



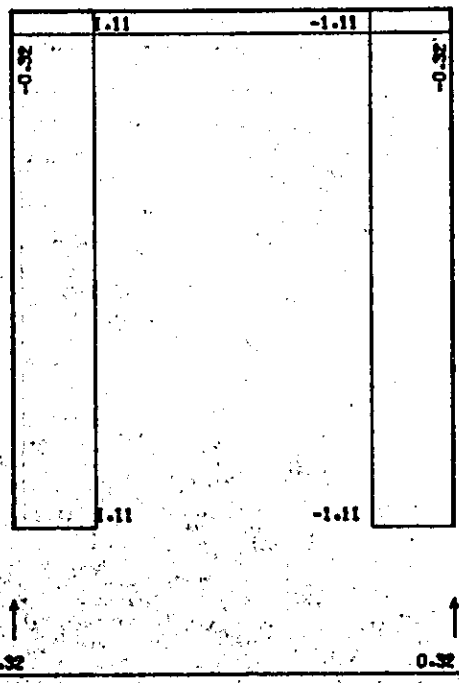
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE 7 (TEMPERATURE + SCHRINKAGE)

BENDING MOMENT



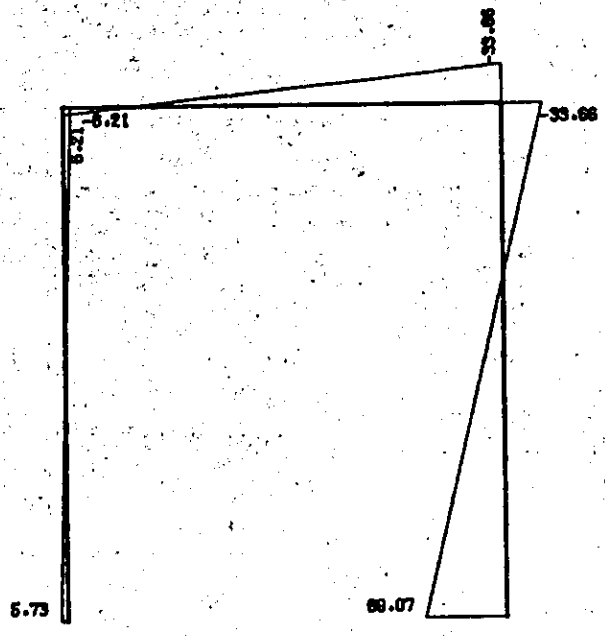
SHEARING FORCE



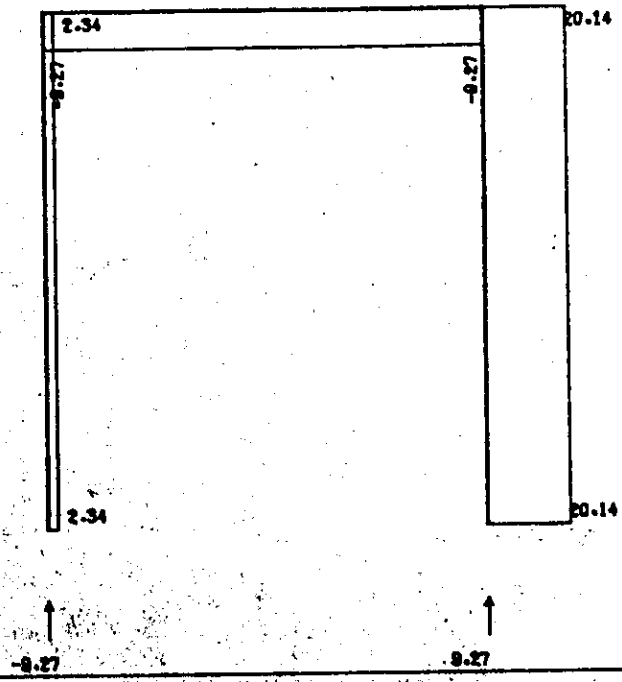
VIADUCT OF PLATFORM (CENTRAL) C-11

CASE- 8 (SEISMIC LOAD)

BENDING MOMENT



SHEARING FORCE



INPUT DATA

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=== INPUT DATA ===                                                    CRC-FANSY  V6.3
      5   10        20        30        40        50        60        70        80.   CARD NUMBER
      ....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....|
TITLE    VIADUCT OF PLATFORM (CENTRAL) C-11                                          1
PLOT          1    2                   6.0                                          2
TYPE1-1-1 L=4.3  H=5.101  M1=4.0,0.05333   M2=0.25,0.00521 M3=5.0,0.10417            3
          P=2.7E+6,1.0E-5  S=0                                                       4
POINT    1 0.25    0.45      2.35      3.7       4.0       4.09                     5
PICKUP        1    1   9                                                           6
              2    1  10   14                                                      7
LOAD          1     CASE 1 (DEAD LOAD)                                             8
J             1                -55.35                                             9
              2                -62.48    -28.16                                   10
DL            1    2-10.55                                                       11
              2    2-0.63                                                        12
              3    2-12.5                                                        13
END                                                                              14
LOAD          2     CASE  2 (PEDESTRIANS LOAD)                                     15
J             1                -14.78                                           16
              2                -16.58    -13.23                                 17
DL            1    2-3.5                                                         18
END                                                                              19
LOAD          3     CASE  3 (EARTH PRESSURE 1)                                     20
D             3  3 1                      1.33      -3.01     -19.94    3.125     21
                   -19.94    -27.96      0.646                                    22
END                                                                              23
LOAD          4     CASE  4 (EARTH PRESSURE 2)                                     24
D             3  3 1                      1.33      -12.04    -28.97    3.125     25
                   -28.97    -36.93      0.646                                    26
END                                                                              27
LOAD          5     CASE  5 (EARTH PRESSURE 3)                                     28
D             3  3 1                      1.33      -3.97     -26.3     3.125     29
                   -26.3     -34.81      0.646                                    30
END                                                                              31
LOAD          6     CASE  6 (TEMPERATURE)                                          32
T             1     10.0                                                         33
END                                                                              34
LOAD          7     CASE  7 (TEMPERATURE + SCHRINKAGE)                             35
T             1     -25.0                                                        36
END                                                                              37
LOAD          8     CASE  8 (SEISMIC LOAD)                                         38
J             1     11.24                                  2                     39
END                                                                              40
MTP       9              1   3                                                   41
         10              1   2   4                                               42
         110.8696        1   3   6                                               43
         120.8696        1   3   7                                               44
         130.6667        1   5   8                                               45
         140.6667        1   5  -8                                               46
FINISH                                                                           47
```

TITLE.VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

CONTROL DATA

METHOD	STRUCTURE	J.RENUMBER	M.RENUMBER	S.F. DIS.	UNI.SPRING	STAN.STIF.	BARA	SKEW MEM.
DIS	*RAHMEN*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*	*OFF*

LOAD TITLE

LOAD 1 CASE 1 (DEAD LOAD)
LOAD 2 CASE 2 (PEDESTRIANS LOAD)
LOAD 3 CASE 3 (EARTH PRESSURE 1)
LOAD 4 CASE 4 (EARTH PRESSURE 2)
LOAD 5 CASE 5 (EARTH PRESSURE 3)
LOAD 6 CASE 6 (TEMPERATURE)
LOAD 7 CASE 7 (TEMPERATURE + SCHRINKAGE)
LOAD 8 CASE 8 (SEISMIC LOAD)

MIX 9 CASE 9 (1+3)
MIX 10 CASE 10 (1+2+4)
MIX 11 CASE 11 (1+3+6)
MIX 12 CASE 12 (1+3+7)
MIX 13 CASE 13 (1+5+8)
MIX 14 CASE 14 (1+5-8)

PICK UP LOAD CASE

PICK 1 9
PICK 2 10 11 12 13 14

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-PANSY V6.3

JOINT DATA

JOINT NUMBER 4

ZAHYO(M) JOINT	X	Y
1	0.0000	5.1010
2	4.3000	5.1010
3	0.0000	0.0000
4	4.3800	0.0000

MEMBER DATA

MEMBER NUMBER 3

MEMBER	ITAN	JTAN	CONNECT.	ITAN	JTAN	LENGTH	A	I	AES	KD(BANE)	PRO.NUM
1	1	2		FIX	FIX	4.3000	4.00000	.0533300			1
2	1	3		FIX	FIX	5.1010	.25000	.0052100			1
3	2	4		FIX	FIX	5.1010	5.00000	.1041700			1

PROPERTY DATA

PROPERTY NUMBER 1

PROPERTY	E	G	EPS
1	2.700E+06	0.	1.000E-05

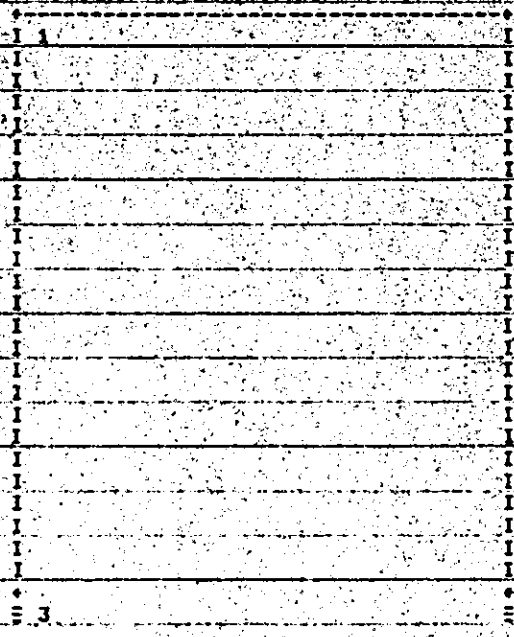
SUPPORT DATA

SUPPORT NUMBER 2

SUPPORT	SUPPORT-JYOKEN	X	Y	THET Z	X(BANE)	Y(BANE)	THET Z(BANE)
3		FIX	FIX	FIX	0.0	0.0	0.0
4		FIX	FIX	FIX	0.0	0.0	0.0

TITLE, VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.1

STRUCTURAL FIGURE



TITLE..VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

MOVE DATA

MEMBER	GOIKI ITAN	GOIKI JTAN	POINT 1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	.....	.....	.250	.450	2.150	3.700	4.000	4.050								
2	.....	.....														
3	.....	.....														

TITLE.. VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

LOAD DATA

	M/J	NAME	D	W1	W2	L1	L2
LOAD - 1		CASE 1 (DEAD LOAD)					
MEMBER	1	LINEAR	Y	-10.550	-10.550	0.000	0.000
	2	LINEAR	Y	-.630	-.630	0.000	0.000
	3	LINEAR	Y	-12.500	-12.500	0.000	0.000
JOINT	1	JOINTLOAD	Y	-55.350			
	2	JOINTLOAD	Y	-62.480			
		JOINTLOAD	Z	-28.160			
LOAD - 2		CASE 2 (PEDESTRIANS LOAD)					
MEMBER	1	LINEAR	Y	-3.500	-3.500	0.000	0.000
JOINT	1	JOINTLOAD	Y	-14.780			
	2	JOINTLOAD	Y	-16.580			
		JOINTLOAD	Z	-13.230			
LOAD - 3		CASE 3 (EARTH PRESSURE 1)					
MEMBER	3	LINEAR	X	-3.010	-19.940	1.330	.646
		LINEAR	X	-19.940	-27.960	4.455	0.000
LOAD - 4		CASE 4 (EARTH PRESSURE 2)					
MEMBER	3	LINEAR	X	-12.040	-28.970	1.330	.646
		LINEAR	X	-28.970	-36.990	4.455	0.000
LOAD - 5		CASE 5 (EARTH PRESSURE 3)					
MEMBER	3	LINEAR	X	-3.970	-26.300	1.330	.646
		LINEAR	X	-26.300	-34.810	4.455	0.000
LOAD - 6		CASE 6 (TEMPERATURE)					
MEMBER	1	TEMP		10.0(DO)			
LOAD - 7		CASE 7 (TEMPERATURE + SCHRINKAGE)					
MEMBER	1	TEMP		-25.0(DO)			
LOAD - 8		CASE 8 (SEISMIC LOAD)					
JOINT	1	JOINTLOAD	X	11.240			
	2	JOINTLOAD	X	11.240			

TITLE: VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

MIX DATA

MIX NUMBER 6

LOAD	SS	N	S1	K1	S2	K2	S3	K3	S4	K4	S5	K5	S6	K6	S7	K7	S8	K8
9	1.0000	2	1.0000	1	1.0000	3												
10	1.0000	3	1.0000	1	1.0000	2	1.0000	4										
11	.8696	3	1.0000	1	1.0000	3	1.0000	6										
12	.6696	3	1.0000	1	1.0000	3	1.0000	7										
13	.6667	3	1.0000	1	1.0000	5	1.0000	8										
14	.6667	3	1.0000	1	1.0000	5	-1.0000	8										

PICK UP

TITLE..VIADUOT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

PICK UP 1

MOMENT MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	-2.198	17.848	-.877
1	.250	(9)	1.934	15.210	-.877
2	.450	(9)	4.765	13.100	-.877
3	2.150	(9)	11.791	-4.835	-.877
4	3.700	(9)	-8.376	-21.187	-.877
5	4.000	(9)	-15.206	-24.352	-.877
6	4.050	(9)	-16.437	-24.880	-.877
JTAN	4.300	(9)	-22.987	-27.517	-.877
MAX	1.911	(9)	12.645	-2.314	-.877
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	2.198	-.877	-73.196
JTAN	5.101	(9)	-2.277	-.877	-76.412
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	5.173	.877	-89.997
JTAN	5.101	(9)	-60.487	-50.454	-153.760

MOMENT MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	-2.198	17.848	-.877
1	.250	(9)	1.934	15.210	-.877
2	.450	(9)	4.765	13.100	-.877
3	2.150	(9)	11.791	-4.835	-.877
4	3.700	(9)	-8.376	-21.187	-.877
5	4.000	(9)	-15.206	-24.352	-.877
6	4.050	(9)	-16.437	-24.880	-.877
JTAN	4.300	(9)	-22.987	-27.517	-.877
MAX	1.911	(9)	12.645	-2.314	-.877
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	2.198	-.877	-73.196
JTAN	5.101	(9)	-2.277	-.877	-76.412
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	5.173	.877	-89.997
JTAN	5.101	(9)	-60.487	-50.454	-153.760

TITLE.VIADUCT OF PLATFORM (CENTRAL) C-11 GRC-FANSY - V6.3

PICK UP 1

SHEAR MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(9)	-2.198	17.848	-.877
1	.250	(9)	1.934	15.210	-.877
2	.450	(9)	4.765	13.180	-.877
3	2.150	(9)	11.791	-4.835	-.877
4	3.700	(9)	-8.376	-21.187	-.877
5	4.000	(9)	-15.206	-24.352	-.877
6	4.050	(9)	-16.437	-24.880	-.877
JTAN	4.300	(9)	-22.987	-27.517	-.877
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	2.198	-.877	-73.198
JTAN	5.101	(9)	-2.277	-.877	-76.412
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	5.173	.877	-89.997
JTAN	5.101	(9)	-60.487	-50.454	-153.760

SHEAR MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(9)	-2.198	17.848	-.877
1	.250	(9)	1.934	15.210	-.877
2	.450	(9)	4.765	13.180	-.877
3	2.150	(9)	11.791	-4.835	-.877
4	3.700	(9)	-8.376	-21.187	-.877
5	4.000	(9)	-15.206	-24.352	-.877
6	4.050	(9)	-16.437	-24.880	-.877
JTAN	4.300	(9)	-22.987	-27.517	-.877
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	2.198	-.877	-73.198
JTAN	5.101	(9)	-2.277	-.877	-76.412
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	5.173	.877	-89.997
JTAN	5.101	(9)	-60.487	-50.454	-153.760

TITLE: VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

PICK UP 1

AXIAL MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	-2.198	17.848	-.877
1	.250	(9)	1.934	15.210	-.877
2	.450	(9)	4.765	13.180	-.877
3	2.150	(9)	11.791	-4.835	-.877
4	3.700	(9)	-8.376	-21.187	-.877
5	4.000	(9)	-15.206	-24.352	-.877
6	4.050	(9)	-16.437	-24.880	-.877
JTAN	4.300	(9)	-22.987	-27.517	-.877
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	2.198	-.877	-73.198
JTAN	5.101	(9)	-2.277	-.877	-76.412
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	5.173	.877	-89.997
JTAN	5.101	(9)	-60.487	-50.454	-153.760

AXIAL MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(9)	-2.198	17.848	-.877
1	.250	(9)	1.934	15.210	-.877
2	.450	(9)	4.765	13.180	-.877
3	2.150	(9)	11.791	-4.835	-.877
4	3.700	(9)	-8.376	-21.187	-.877
5	4.000	(9)	-15.206	-24.352	-.877
6	4.050	(9)	-16.437	-24.880	-.877
JTAN	4.300	(9)	-22.987	-27.517	-.877
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(9)	2.198	-.877	-73.198
JTAN	5.101	(9)	-2.277	-.877	-76.412
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(9)	5.173	.877	-89.997
JTAN	5.101	(9)	-60.487	-50.454	-153.760

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

PICK-UP 2

MOMENT MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(13)	2.228	6.221	-6.691
1	.250	(12)	3.996	12.949	.204
2	.450	(12)	6.402	11.114	.204
3	2.150	(14)	17.641	3.462	5.175
4	3.700	(14)	14.557	-7.441	5.175
5	4.000	(14)	12.008	-9.551	5.175
6	4.050	(14)	11.522	-9.902	5.175
JTAN	4.300	(14)	8.826	-11.661	5.175
MAX	2.867	(14)	18.315	-1.579	5.175
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(14)	6.058	-2.318	-55.486
JTAN	5.101	(13)	1.867	.803	-45.265
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(14)	27.601	-12.669	-53.316
JTAN	5.101	(13)	-6.497	-30.508	-106.190

MOMENT MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) G ==					
ITAN	0.000	(14)	-6.058	18.584	5.175
1	.250	(14)	-1.632	16.826	5.175
2	.450	(14)	-1.592	15.419	5.175
3	2.150	(13)	-.654	-8.902	-6.691
4	3.700	(13)	-22.901	-19.804	-6.691
5	4.000	(13)	-29.158	-21.914	-6.691
6	4.050	(13)	-30.263	-22.266	-6.691
JTAN	4.300	(13)	-36.049	-24.024	-6.691
MAX	.956	(13)	-4.961	-.500	-6.691
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(13)	-2.228	.803	-43.123
JTAN	5.101	(14)	-5.768	-2.318	-57.628
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(13)	-17.275	14.185	-65.679
JTAN	5.101	(10)	-110.820	-83.704	-178.187

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V8.3

PICK UP 2

SHEAR MAXIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(10)	-4.261	25.051	-1.679
1	.250	(10)	1.563	21.538	-1.679
2	.450	(10)	5.590	18.728	-1.679
3	2.150	(14)	17.641	3.462	5.175
4	3.700	(14)	14.557	-7.441	5.175
5	4.000	(14)	12.008	-9.551	5.175
6	4.050	(14)	11.522	-9.902	5.175
JTAN	4.300	(14)	8.826	-11.661	5.175
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(13)	-2.228	.803	-43.123
JTAN	5.101	(13)	1.867	.803	-45.265
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(13)	-17.275	14.185	-65.679
JTAN	5.101	(13)	-6.497	-30.508	-108.190

SHEAR MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(13)	2.228	6.221	-6.691
1	.250	(13)	3.563	4.462	-6.691
2	.450	(13)	4.315	3.056	-6.691
3	2.150	(13)	-.654	-8.902	-6.691
4	3.700	(10)	-7.745	-26.934	-1.679
5	4.000	(10)	-16.457	-31.149	-1.679
6	4.050	(10)	-16.032	-31.852	-1.679
JTAN	4.300	(10)	-26.434	-35.364	-1.679
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(14)	6.058	-2.318	-55.486
JTAN	5.101	(14)	-5.768	-2.318	-57.626
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(14)	27.601	-12.669	-53.316
JTAN	5.101	(10)	-110.620	-83.704	-178.187

TITLE..VIADUCT OF PLATFORM (CENTRAL) C-11 CRC-FANSY V6.3

PICK UP 2

AXIAL MAXIMUM

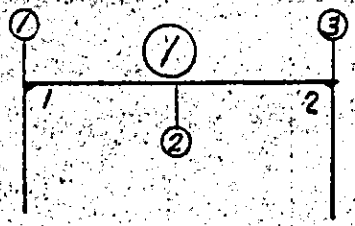
	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(14)	-6.058	18.584	5.175
1	.250	(14)	-1.632	16.626	5.175
2	.450	(14)	1.592	15.419	5.175
3	2.150	(14)	17.641	3.462	5.175
4	3.700	(14)	14.557	-7.441	5.175
5	4.000	(14)	12.008	-9.551	5.175
6	4.050	(14)	11.522	-9.902	5.175
JTAN	4.300	(14)	8.826	-11.661	5.175
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(13)	-2.228	.803	-43.123
JTAN	5.101	(13)	1.867	.803	-45.265
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(14)	27.601	-12.669	-53.316
JTAN	5.101	(14)	-98.602	-57.361	-95.827

AXIAL MINIMUM

	L	CASE	M	Q	N
== MEMBER 1 (1 - 2) C ==					
ITAN	0.000	(13)	2.228	6.221	-6.691
1	.250	(13)	3.563	4.462	-6.691
2	.450	(13)	4.315	3.856	-6.691
3	2.150	(13)	-.654	-8.902	-6.691
4	3.700	(13)	-22.901	-19.804	-6.691
5	4.000	(13)	-29.158	-21.916	-6.691
6	4.050	(13)	-30.263	-22.266	-6.691
JTAN	4.300	(13)	-36.049	-24.024	-6.691
== MEMBER 2 (1 - 3) C ==					
ITAN	0.000	(10)	4.261	-1.679	-95.181
JTAN	5.101	(10)	-4.385	-1.679	-98.395
== MEMBER 3 (2 - 4) C ==					
ITAN	0.000	(10)	14.956	1.679	-114.424
JTAN	5.101	(10)	-110.820	-83.704	-178.187

[6] Calculation of upper beam

1. Stress calculation of Intermediate slab



(a) Summary of stresses

(i) At the support point

Pick up No 2

		Ⅰ			
		①	CO.	③	CO.
Combined stress	Top	-6.60	14	-36.05	13
	Bottom	4.00	12	11.52	14
Dead load		-2.20	9	-12.98	9

(ii) Span moment

		Ⅰ	
		②	CO.
Combined stress	Bottom	11.42	12

(Note 1) Dead load is of Pick-up No.

(Note 2) CO. — combination

(b) Allowable stress for upper beam, safe against cracking

(i) At the support point 2

Dead load $M_d = -22.89$ (case 9)

Pedestrian load $M_p = -12.46$ (case 2)

$\Sigma M = -35.35$

$$\alpha = \frac{12.46}{35.35} = 0.35 > 0.25$$

Hence, $\sigma_{sa} = 1,000$ kg/cm²

(C) Calculation of bending stress

	(1)			
	③		②	
M (tm)	-22.98	-36.05	17.64	
N (t)				
S (t)				
b (cm)	100		100	
h (cm)	40		40	
d (cm)	35.4		35.4	
d' (cm)	4.6		4.6	
As (cm²)	D16-20cm (50*) = 99.30		D16-20cm (50*) = 99.30	
p	0.00281		0.00281	
As' (cm²)				
p'				
e=M/N (cm)				
e=M/N+u' (cm)				
e=M/N-u (cm)				
e/h				
d/e				
d'/h				
d'/d				
~~M~~ Ne/bd² (kg/cm²)	1.83	2.88	1.41	
k				
c				
j				
1/Lc	8.69		8.69	
1/Ls	389		389	
β=σs/σc				
σc (kg/cm²)		25	12.2	
σs (kg/cm²)	710	1120	550	
τ (kg/cm²)				
σsa (kg/cm²)	1,000	1,800	1,800	
σca (kg/cm²)		90	90	
τa (kg/cm²)				
Nomogram number	M-1	〃	〃	
Combination	D	D+S	D+S	

(d) Required minimum cross section of re-bars

(i) At the top of support point

$$As = \frac{M}{\sigma sa \cdot j \cdot d} \times \frac{4}{3}$$

$$= \frac{22.98 \times 10^5}{1000 \times 0.875 \times 35.4} \times \frac{4}{3} = 98.92^{cm^2}$$

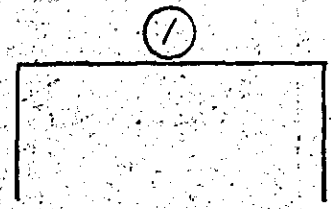
Hence D16 - $\overset{(20^{cm})}{50}$ = 99.30^{cm^2} > 98.92^{cm^2}

(ii) At the span center point

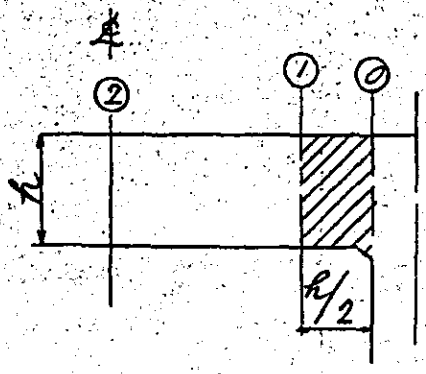
$$As = \frac{17.64 \times 10^5}{1800 \times 0.875 \times 35.4} \times \frac{4}{3} = 42.18^{cm^2}$$

Hence D16 - $\overset{(20^{cm}c/c)}{50}$ = 99.30^{cm^2} > 42.18^{cm^2}

2. Shearing stress of Intermediate slab



(1) Summary of shearing stress



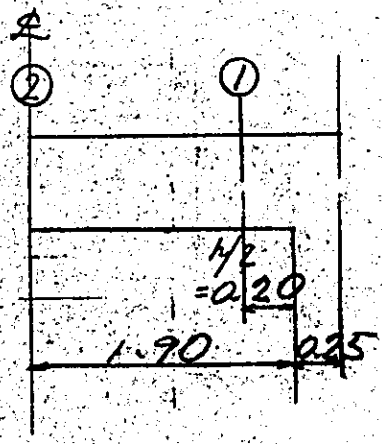
For the design of crass section of slab end, the value of shearing stress at h/2 point is applied.

	①			
	Left support	CO.	Right support	CO.
⓪	21.54	10	-31.85	10
①	18.73		-26.93	
②	-5.16		-5.16	

(Note) CO. — combination

(2) Shearing stress

(a) Shearing stress caused by bending



(i) Shearing stress of the member of uniform height

$$\tau = \frac{S}{b \cdot d}$$

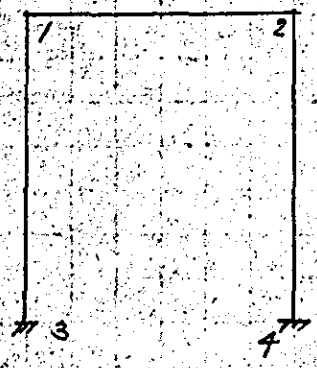
$$\tau_1 = \frac{26.93 \times 10^3}{1000 \times 35.4} = 0.76 \text{ kg/cm}^2 < 3.9 \text{ kg/cm}^2$$

$$\tau_2 = \frac{5.16 \times 10^3}{1000 \times 35.4} = 0.15 \text{ "} < \text{ "}$$

(ii) Therefore,

Disregarded the diagonal tension bar for calculation.

3. Calculation of column and wall



Critical cases No 2

	Member	M (t·m)	N (t)	case No
column	1 — 3	6.06	55.49	14
	3 — 1	5.77	57.63	14
Wall	4 — 2	110.82	178.19	10
	4 — 2	98.60	95.83	14

(Refer the result of computer analysis on stress calculation)

	column		Wall		
	1-3	3-1	4-2	4-2	
M (tm)	6.06	5.77	110.82	98.60	
N (t)	55.49	57.63	178.19	95.83	
S (t)					
b (cm)	50		1000		
h (cm)	50		50		
d (cm)	43.9		42.7		
d' (cm)	6.1		7.3		
As (cm²)	025 - 4 = 20.27		D19-20cm ctc (50) = 143.25		
p	0.00811		0.00335		
As (cm²)					
p					
e=M/N (cm)	10.92	10.01	62.2	102.89	
e=M/N+u (cm)					
e=M/N-u (cm)					
e/h	0.218	0.200			
d/e					
d'/h	0.122	0.218			
d'/d					
Ne/bd²(kg/cm²)	22.19	23.05	7.81	6.34	
k	0.928	0.973			
c	0.576	0.605	0.155	0.142	
j					
1/Lc					
1/Ls					
β=σs/σc			27.67	32.30	
σc (kg/cm²)	38.5	38.1	50.3	44.7	
σs (kg/cm²)	—	—	1390	1440	
τ (kg/cm²)					
σsa (kg/cm²)	1800		1800		
σca (kg/cm²)	90		90		
τa (kg/cm²)					
Case number	MN-3	"	MN-5.67	"	
Case number	D+TE+S	"	D+PE+EA	D+TE+S	

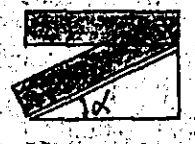
§10 Calculation of Stairway

1. Slab Calculation

1) Load Calculation

Pedestrian load		$= 0.500^{t/m}$
Step	$2.5^{t/m^3} \times 0.33 \times 0.165 \times 1/2 \times \frac{1}{0.33}$	$= 0.206$ "
pavement	$1.1^{t} \times 0.05$	$= 0.055$ "
Slab	$2.5^{t} \times 0.447$	$= 1.118$ "
		$w' = 1.879^{t/m}$

$\ell = 12.51^{m}\ (26°56'15")$



$w = w' \cdot \cos\alpha^2$

$= 1.879 \times \left(\frac{11.19}{12.51}\right)^2 = 1.503$

2) Bending moment

At the support point

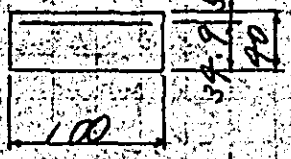
$M = -\frac{1}{12} \times 1.503 \times 12.51^2 = 19.60^{t\cdot m}$

At the span center point

$M = \frac{1}{24} \times 1.503 \times 12.51^2 = 9.80^{t\cdot m}$

3) Calculation of Bending stress

· At the support point



$A_S = D25 - 12.5^{cm}cc = 90.54\ cm^2$

$p = \frac{90.54}{100 \times 34.9} = 0.01162$

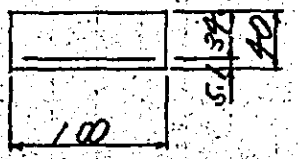
· Nomogram number M-1

$1/L_C = 5.31 \quad 1/L_S = 101$

$\sigma_C = \frac{19.60 \times 10^5}{100 \times 34.9^2} \times 5.31 = 85.9\ kg/cm^2 < 90\ kg/cm^2$

$\sigma_S = \text{——} \text{〃} \text{——} \times 101 = 1630\ \text{〃} < 1800\ \text{〃}$

· At the span center point



$A_S = D25 - 25.0^{cm}cc = 20.27\ cm^2$

$p = \frac{20.27}{100 \times 34.9} = 0.00581$

Nomogram number M-1

$1/L_C = 6.64 \quad 1/L_S = 194$

$\sigma_C = \frac{9.80 \times 10^5}{100 \times 34.9^2} \times 6.64 = 53.4\ kg/cm^2 < 90\ kg/cm^2$

$\sigma_S = \text{——} \text{〃} \text{——} \times 194 = 1560\ \text{〃} < 1800\ \text{〃}$

Reinforcement at the support of railway cross section shall be 1/6 of that of at the support of railway profile

$$AS' = D25 - 12.5\,cm\,ctc(8) = 40.54\,cm^2$$

$$40.54 \times 1/6 = 6.76\,cm^2$$

$$AS = D16 - 25.0\,cm\,ctc = 7.94\,cm^2 > 6.76\,cm^2$$

4) Shearing Stress

$$S_{h/2} = 1/2 \times 1.879 \times 12.51 - 1.879 \times 0.20$$

$$= 11.38^t$$

$$\tau = \frac{11.38 \times 10^3}{100 \times 39.9} = 3.26\,kg/cm^2 < 3.9\,kg/cm^2$$

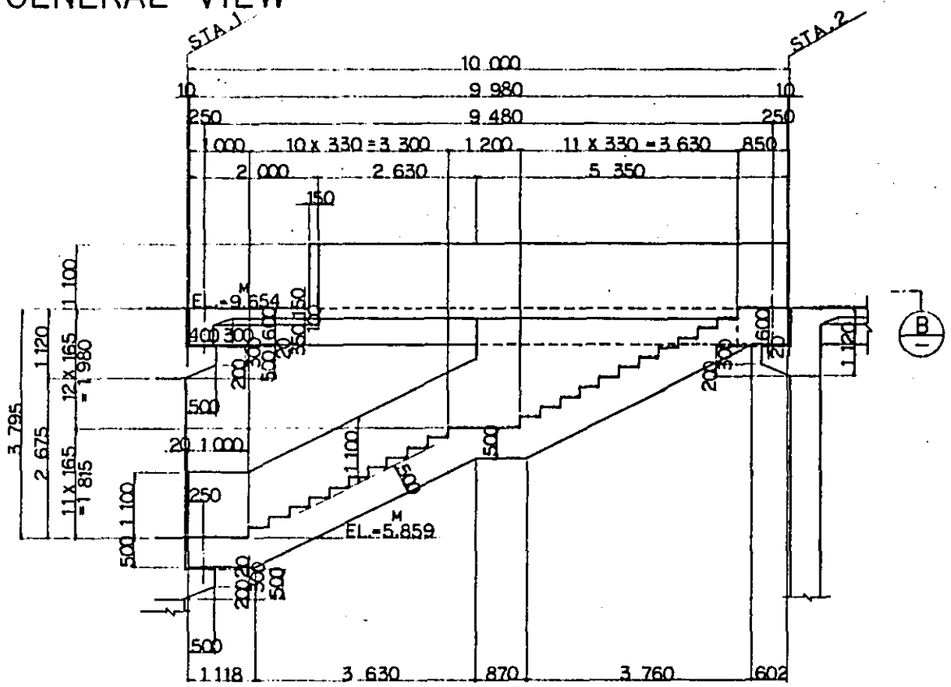
No.

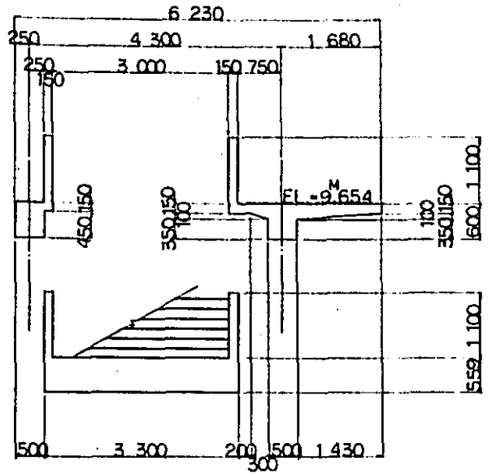
§§11. R.C. GIRDER OF PLATFORM RCP1.

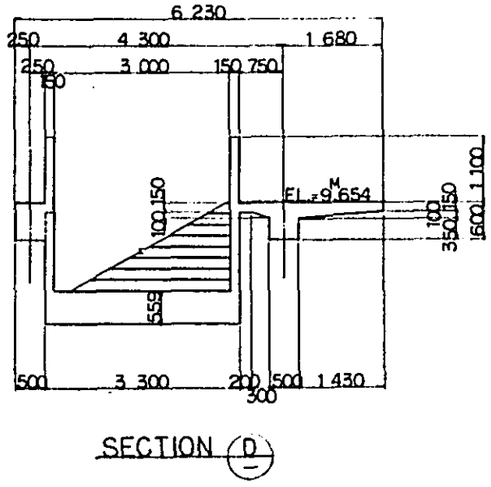
JICA

CONTENTS

§1. GENERAL VIEW







NOTES :

1 ALL DIMENSIONS ARE SHOWN IN MILLIMETERS UNLESS OTHERWISE INDICATED

2 REFERENCE DRAWING FOR BAR ARRANGEMENT : CS-248~250

DIMENSION SCHEDULE

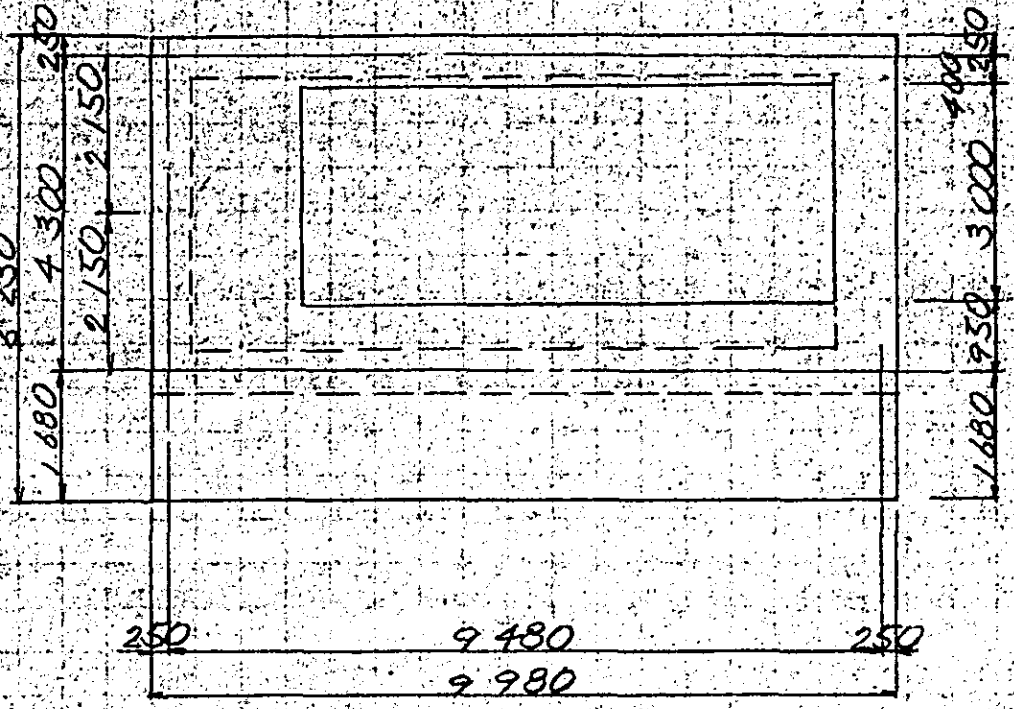
		STATION	AZIMUTH ANGLE
RCP 1	STA.2	17K340M000	345°30'45"
	STA.1	17K350M000	〃
RCP 2	STA.1	17K380M000	345°30'45"
	STA.2	17K390M000	〃

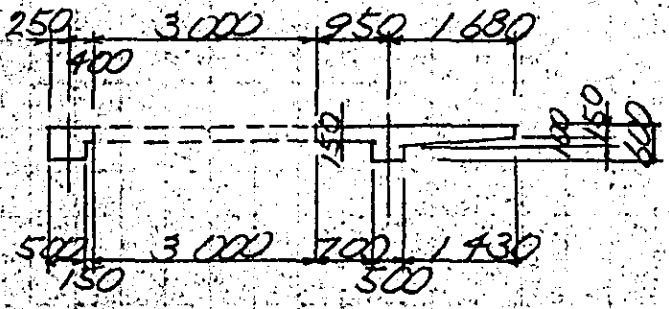
§2 Calculation of slab

VP2 (Refer. viaduct of platform (north side))

§3. Calculation of main beam

(1) Configiulation and dimension





(2) Load calculation

1. Dead load

- own weight of main beam and slab

$$W_{d1} = 2.5 \times \{(0.15 + 0.25) \times 1/2 \times 1.43 + 0.15 \times 0.70 + 0.50 \times 0.60\} = 1.73 \text{ t/m}$$

- loads on slab

Pavement	$1.1 \text{ t/m}^3 \times 0.05 \times (0.80 + 1.68)$	$= 0.136 \text{ t/m}$
handrail	$2.5 \text{ t/m}^3 \times 0.15 \times 1.10$	$= 0.413$
		0.55 t/m

2. pedestrion load (people load)

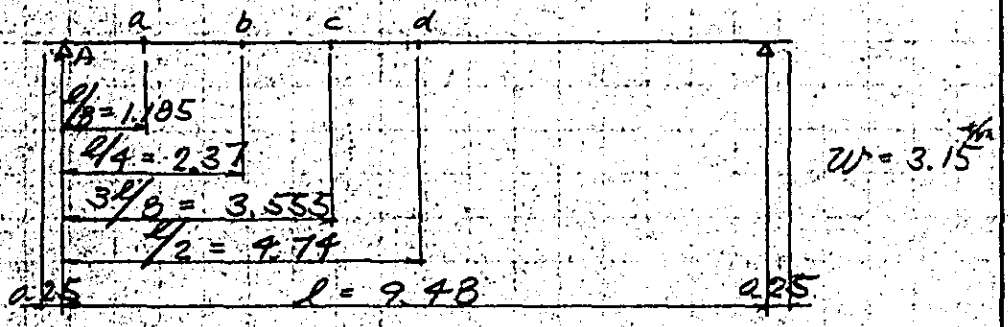
$$w = 0.35 \text{ t/m}^2 \times (0.80 + 1.68) = 0.87 \text{ t/m}$$

3 Total of loads

$$\Sigma W_{d+p} = 1.73 + 0.55 + 0.87 = 3.15 \text{ t/m}$$

(3) Calculation of sectional forces

(1) Calculation of bending moment



$$M_a = \frac{1}{2} \times 3.15 \times 1.185 \times (9.48 - 1.185) = 15.48 \text{ t·m}$$

$$M_b = \frac{1}{2} \times 3.15 \times 2.37 \times (9.48 - 2.37) = 26.54 \text{ t·m}$$

$$M_c = \frac{1}{2} \times 3.15 \times 3.555 \times (9.48 - 3.555) = 33.17 \text{ t·m}$$

$$M_d = \frac{1}{8} \times 3.15 \times 9.48^2 = 35.39 \text{ t·m}$$

(2) Calculation of bending shear

At the H/2 point

$$S = 1/2 \times 3.15 \times 9.48 - 1/2 \times 0.60 \times 3.15$$

$$= 13.99 \text{ t}$$

Effective width

$$be = 0.50 + 2 \times (0.10 + \frac{\ell}{8} \times 9.48 \times 0.6)$$

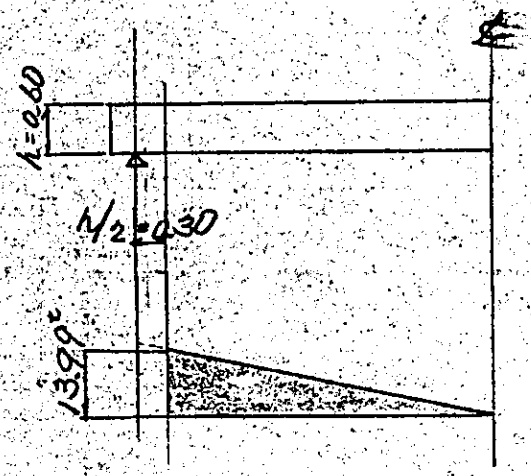
$$= 2.12 \text{ m}$$

a) Calculation of bending stress

M (tm)	35.39			
N (t)				
S (t)				
b (cm)	212			
h (cm)	60			
d (cm)	51.9			
d' (cm)	8.1			
As (cm²)	025 - 5/5 = 50.67			
p	0.00461			
As' (cm²)	t=15			
p'	t/d = 0.289			
e = M/N (cm)				
e = M/N + u (cm)				
e = M/N − u (cm)				
e/h				
d/e				
d'/h				
d'/d				
M/e/bd² (kg/cm²)	6.20			
k	0.310			
c				
j	0.898			
1/Lc				
1/Ls				
β = σs/σc				
σc (kg/cm²)	44.8			
σs (kg/cm²)	1500			
τ (kg/cm²)				
σsa (kg/cm²)	1800			
σca (kg/cm²)	90			
τa (kg/cm²)				
Nomogram number	M-47.48			
combination	D+P			

(3) Shearing stress

Shearing stress caused by bending

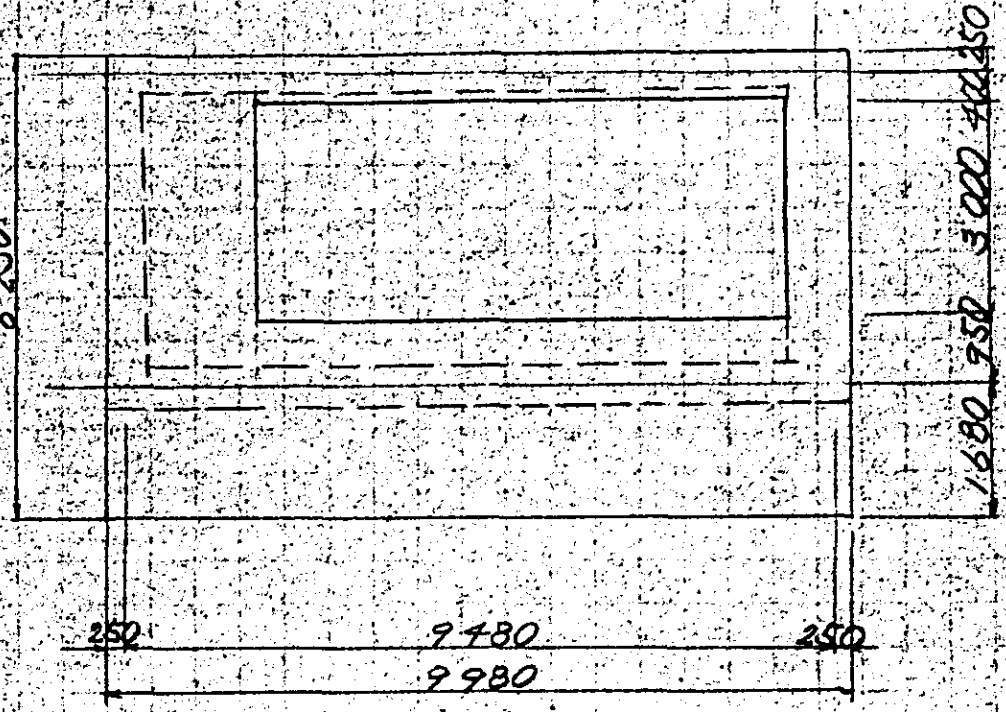


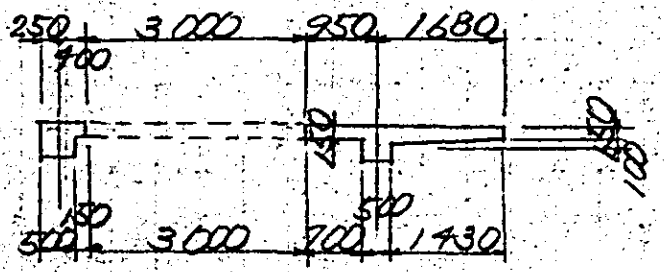
a) Shearing stress of the member of uniform height

$$\tau = \frac{S}{b \cdot d}$$

$$\tau_1 = \frac{13.99 \times 10^3}{50 \times 54.7} = 5.12 \ ^{kg/cm^2} > 3.9 \ ^{kg/cm^2}$$

(4) Calculation of Torsional moment





1) Moment of supporting point at the intermediate span

Pavement $1.1^{t/m^3} \times 0.05 = 0.055^{t/m^2}$

Slab $2.5 \times 0.15 = 0.375$

$0.430\ t/m^2$

$M = 0.43 \times 0.95^2 \times 1/2 = 0.194\ tm$