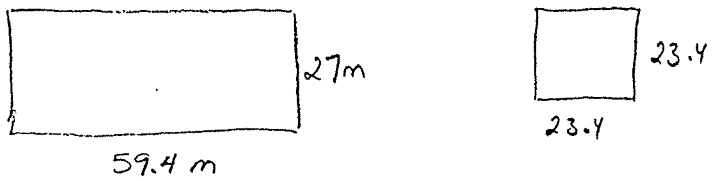
Seismic loading
Calculations

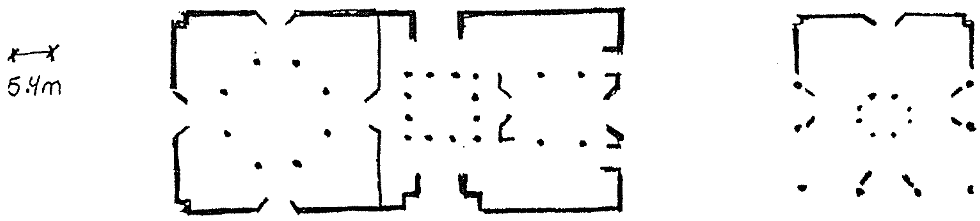
consolidated consultants engineering & environment	Project DS Panoramic Complex	Number
	Subject Design for EQ loads	
		Made by / Date H.S 9/12/99
		Checked / Date

* Jordan Code for Loads and Forces will be used.
* Two main buildings are studied

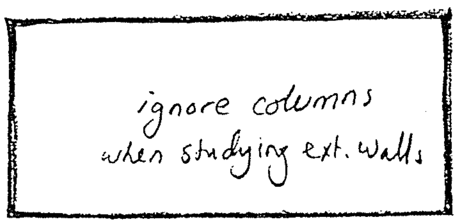


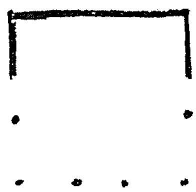
Museum & Conf. Restaurant

Vertical lateral load components



Simplifying for initial analysis





Allow for twist on external columns while ignoring internal ones

consolidated consultants engineering & environment	Project: D.S. Panoramic Complex	Number
	Subject: Design for EQ loads	
		Made by / Date: H.S. 9/12
		Checked / Date

EQ Loads (JCLF Chapter 5)

$$V_z = \alpha \beta \delta \theta \eta \sum_{z=1}^{n} (\gamma_z W_z)$$

$\alpha = .75$ zone A

$$T_x = \frac{.08H}{\sqrt{B}} \sqrt{\frac{H}{B+H}} = \frac{.08 \times 5.1}{\sqrt{59.4}} \cdot \sqrt{\frac{5.1}{59.4+5.1}} = .015$$

5.1 is conservative
H is actually variable

$$T_y = \frac{.08 \times 5.1}{\sqrt{27}} \sqrt{\frac{5.1}{27+5.1}} = .031$$

$$\beta_x = \frac{.05}{\sqrt[3]{.015}} = .2 > .1 \quad \text{use } .1$$

$$\beta_y = \frac{.05}{\sqrt[3]{.031}} = .14 > .1 \quad \text{use } .1$$

$\gamma_z = 1$

$\delta = 1.3$ as $T_s > T$

$\theta = 1.33$

$\eta = 1.2$

$\therefore V_z = .75 \times .1 \times 1.3 \times 1.33 \times 1.2 \times 1 \times W_z$

$= .156\ W_z$

Museum & Conference

elevation

Clearly flexure in shear walls does not govern.

As for shear:

W_z (assume whole floor) $= (59.4 \times 27 - 10 \times 10) \times 8$ (slab & finishes)

4250 (Half walls)

400 (partitions)

16,680 kN

Shear Force $= 16{,}680 \times .156 = 2600$ kN (each way)

Most critical is the short direction:

$v = \dfrac{2600 \times 10^3}{3 \times 27 \times .2 \times 10^6} = .16$ MPa $\qquad \dfrac{v_u}{.85} = \dfrac{.16 \times (.75 \times 1.1 \times 1.7)}{.85} = .2$

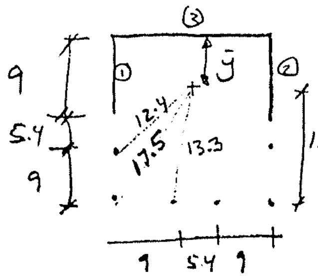
Other direction and while allowing for openings,

$v = \dfrac{2600 \times 10^3}{2 \times 37.8 \times .2 \times 10^6} = .17 \qquad \dfrac{v_u}{.85} = \dfrac{.17\,(.75 \times 1.1 \times 1.7)}{.85} = .28$

$v_c = \dfrac{\sqrt{20}}{6} = .75 \gg .28$ ✓ o.k.

Minimum reinforcement is required.

Restaurant :-



Taking a wall thickness of .2 and column diameter of .4m

$I_{col} = \frac{.2^2 \times \pi \times .2^2}{2} = .0025$

$I_{y(1)} \& (2) = \frac{9^3 \times .2}{12} = 12.2$

$I_y(3) = \frac{.2^3 \times 23.4}{12} = .016$

$I_x(3) = \frac{23.4^3 \times .2}{12} = 214$

$\bar{y} = \frac{.0025 \times 23.4^2 \times 4 + .0025 \times 14.4 \times 2 + 12.2 \times 4.5^2}{.0025 \times 6 + 12.2 \times 2 + .016} = 10.34$

$I = .0025 \times 2 \times (13.3^2 + 17.5^2 + 12.4^2) + 2 \times 11.7^2 \times 12.2 + 214 \times 10.34^2$

$= 26,223$

Force in x direction :

Eccentricity $= \frac{23.4}{2} - 10.34 = 1.36$

$F_{col} = \frac{.0025 \times 17.5^2}{26,223} \times 1.36 F = .00004 F$
or .004% of Total force
very small.

From computer run (attached output)

$F_{col} = 2.1\% \ F$ (still small and does not govern design).

Force in y direction : Column forces are negligible.

Shear wall : $V_z = .75 \times .1 \times 1.3 \times 1.33 \times 1.2 \times 1 \times W_z = .156$

$W_z = 23.4^2 \times 8 + \underset{\text{wall \& col}}{600} = 4980$

$\frac{v_u}{.85} = 4980 \times \frac{(1.4)}{.85} \times \frac{.156}{.2 \times 2 \times 9} \times 10^{-3} = .356 \ll .75$ ✓

Rigid Diaphragm Torsion Analysis

General | Wall Data | Results

Label	Thickness (cm)	Length (m)	Height (m)	Wall C.G. Location X (m)	Wall C.G. Location Y (m)	Angle deg	Fixity	E (relative)	Shear (kN)
1	55.00	0.550	5.000	0.25	0.25	0.0	Fix-Pin	1.000	0.017
2	55.00	0.550	5.000	9.00	0.25	0.0	Fix-Pin	1.000	0.017
3	55.00	0.550	5.000	15.00	0.25	0.0	Fix-Pin	1.000	0.017
4	55.00	0.550	5.000	23.60	0.25	0.0	Fix-Pin	1.000	0.017
5	55.00	0.550	5.000	0.25	8.90	0.0	Fix-Pin	1.000	0.010
6	55.00	0.550	5.000	0.25	15.00	0.0	Fix-Fix	1.000	0.020
7	22.00	7.500	5.000	0.11	19.25	90.0	Fix-Pin	1.000	30.739
8	22.00	8.500	5.000	5.25	23.50	0.0	Fix-Pin	1.000	1.317
9	22.00	8.500	5.000	18.75	23.50	0.0	Fix-Pin	1.000	1.317
10	22.00	7.500	5.000	23.50	19.25	90.0	Fix-Pin	1.000	32.529
11	55.00	0.550	5.000	23.50	8.90	0.0	Fix-Pin	1.000	0.010
12	55.00	0.550	5.000	23.60	14.80	0.0	Fix-Pin	1.000	0.005
13	35.00	0.350	5.000	9.80	6.50	0.0	Fix-Pin	1.000	0.002
14	35.00	0.350	5.000	14.40	6.40	0.0	Fix-Pin	1.000	0.002
15	35.00	0.350	5.000	6.60	9.70	0.0	Fix-Pin	1.000	0.002
16	35.00	0.350	5.000	6.60	14.10	0.0	Fix-Pin	1.000	0.001
17	35.00	0.350	5.000	9.80	17.30	0.0	Fix-Pin	1.000	0.001
18	35.00	0.350	5.000	14.40	17.30	0.0	Fix-Pin	1.000	0.001
19	35.00	0.350	5.000	17.50	14.20	0.0	Fix-Pin	1.000	0.001

Summary...

X Dist. to Center of Rigidity	11.563m	**Torsional Moments from Y-Y Shear**			
		Xcm + (Min%*MaxX) - Xcr	2.337m	=	2.34kN-m
Y Dist. to Center of Rigidity	21.259m	Xcm - (Min%*MaxX) - Xcr	-1.663m	=	-1.66kN-m
		Torsional Moments from X-X Shear			
X Accidental Eccentricity	2.000m	Ycm + (Min%*MaxY) - Ycr	-1.159m	=	0.00kN-m
Y Accidental Eccentricity	2.000m	Ycm - (Min%*MaxY) - Ycr	-5.159m	=	0.00kN-m

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٢٦ عمان - الأردن

Rigid Diaphragm Torsion Analysis

General | Wall Data | Results

Label	Thickness (cm)	Length (m)	Height (m)	Wall C.G. Location X (m)	Wall C.G. Location Y (m)	Angle deg	Fixity	E (relative)	Shear (kN)
10	22.00	7.500	5.000	23.50	19.25	90.0	Fix-Pin	1.000	32.529
11	55.00	0.550	5.000	23.50	8.90	0.0	Fix-Pin	1.000	0.010
12	55.00	0.550	5.000	23.60	14.80	0.0	Fix-Pin	1.000	0.005
13	35.00	0.350	5.000	9.80	6.50	0.0	Fix-Pin	1.000	0.002
14	35.00	0.350	5.000	14.40	6.40	0.0	Fix-Pin	1.000	0.002
15	35.00	0.350	5.000	6.60	9.70	0.0	Fix-Pin	1.000	0.002
16	35.00	0.350	5.000	6.60	14.10	0.0	Fix-Pin	1.000	0.001
17	35.00	0.350	5.000	9.80	17.30	0.0	Fix-Pin	1.000	0.001
18	35.00	0.350	5.000	14.40	17.30	0.0	Fix-Pin	1.000	0.001
19	35.00	0.350	5.000	17.50	14.20	0.0	Fix-Pin	1.000	0.001
20	35.00	0.350	5.000	17.50	9.60	0.0	Fix-Pin	1.000	0.002
21	35.00	1.200	5.000	10.30	1.20	120.0	Fix-Pin	1.000	-1.506
22	35.00	1.200	5.000	13.80	1.20	60.0	Fix-Pin	1.000	2.258
23	35.00	1.200	5.000	1.30	10.00	120.0	Fix-Pin	1.000	-1.073
24	35.00	1.200	5.000	1.20	13.80	60.0	Fix-Pin	1.000	1.958
25	35.00	1.200	5.000	22.80	10.00	60.0	Fix-Pin	1.000	1.724
26	35.00	1.200	5.000	22.80	13.80	120.0	Fix-Pin	1.000	-1.261
27	35.00	1.200	5.000	9.80	23.00	60.0	Fix-Pin	1.000	1.514
28	35.00	1.200	5.000	14.30	23.00	120.0	Fix-Pin	1.000	-0.854

Summary...

X Dist. to Center of Rigidity	11.563m
Y Dist. to Center of Rigidity	21.259m
X Accidental Eccentricity	2.000m
Y Accidental Eccentricity	2.000m

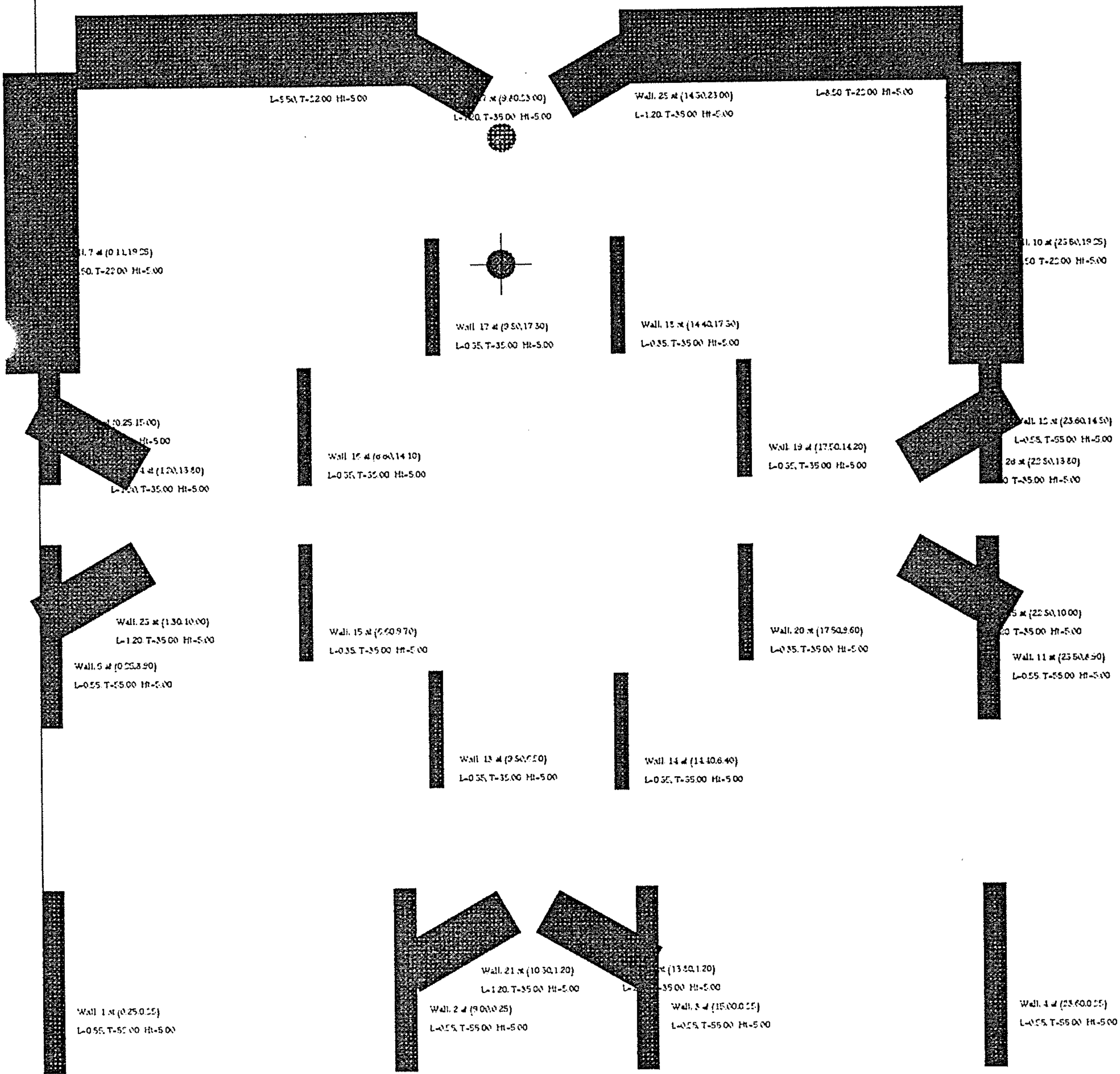
Torsional Moments from Y-Y Shear

Xcm + (MinZ*MaxX) - Xcr	2.337m	=	2.34kN-m
Xcm - (MinZ*MaxX) - Xcr	-1.663m	=	-1.66kN-m

Torsional Moments from X-X Shear

Ycm + (MinZ*MaxY) - Ycr	-1.159m	=	0.00kN-m
Ycm - (MinZ*MaxY) - Ycr	-5.159m	=	0.00kN-m

هاتف: ٦٤٤٠٨٨، ٦١٢٢٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن



هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Rigid Diaphragm Torsion Analysis

General | Wall Data | Results

Label	Eccentricity		Direct Shears		Torsional Shears		Maximum Shear
	X (m)	Y (m)	Length (kN)	Width (kN)	Length (kN)	Width (kN)	Along Length (kN)
1	1.66	0.00	0.00	2.94	0.02	0.42	0.017
2	1.66	0.00	0.00	2.94	0.02	0.09	0.017
3	1.66	0.00	0.00	2.94	0.02	-0.13	0.017
4	1.66	0.00	0.00	2.94	0.02	-0.44	0.017
5	1.66	0.00	0.00	2.94	0.01	0.42	0.010
6	1.66	0.00	0.00	5.69	0.02	0.80	0.020
7	1.66	0.00	26.89	0.00	3.85	0.09	30.739
8	2.34	0.00	0.00	4.16	1.32	-0.46	1.317
9	2.34	0.00	0.00	4.16	1.32	0.52	1.317
10	2.34	0.00	26.89	0.00	5.64	-0.13	32.529
11	1.66	0.00	0.00	2.94	0.01	-0.44	0.010
12	1.66	0.00	0.00	2.94	0.01	-0.44	0.005
13	1.66	0.00	0.00	0.61	0.00	0.01	0.002
14	1.66	0.00	0.00	0.61	0.00	-0.02	0.002
15	1.66	0.00	0.00	0.61	0.00	0.04	0.002
16	1.66	0.00	0.00	0.61	0.00	0.04	0.001
17	1.66	0.00	0.00	0.61	0.00	0.01	0.001
18	1.66	0.00	0.00	0.61	0.00	-0.02	0.001
19	1.66	0.00	0.00	0.61	0.00	-0.05	0.001

Summary...

X Dist. to Center of Rigidity	11.563 m
Y Dist. to Center of Rigidity	21.259 m
X Accidental Eccentricity	2.000 m
Y Accidental Eccentricity	2.000 m

Torsional Moments from Y-Y Shear

Xcm + (Min%*MaxX) - Xcr	2.337 m	=	2.34 kN-m
Xcm - (Min%*MaxX) - Xcr	-1.663 m	=	-1.66 kN-m

Torsional Moments from X-X Shear

Ycm + (Min%*MaxY) - Ycr	-1.159 m	=	0.00 kN-m
Ycm - (Min%*MaxY) - Ycr	-5.159 m	=	0.00 kN-m

هاتف: ٦٤٤٠٨٨، ٦١٢٢٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Rigid Diaphragm Torsion Analysis

General | Wall Data | Results

Label	Eccentricity		Direct Shears		Torsional Shears		Maximum Shear
	X (m)	Y (m)	Length (kN)	Width (kN)	Length (kN)	Width (kN)	Along Length (kN)
10	2.34	0.00	26.89	0.00	5.64	-0.13	32.529
11	1.66	0.00	0.00	2.94	0.01	-0.44	0.010
12	1.66	0.00	0.00	2.94	0.01	-0.44	0.005
13	1.66	0.00	0.00	0.61	0.00	0.01	0.002
14	1.66	0.00	0.00	0.61	0.00	-0.02	0.002
15	1.66	0.00	0.00	0.61	0.00	0.04	0.002
16	1.66	0.00	0.00	0.61	0.00	0.04	0.001
17	1.66	0.00	0.00	0.61	0.00	0.01	0.001
18	1.66	0.00	0.00	0.61	0.00	-0.02	0.001
19	1.66	0.00	0.00	0.61	0.00	-0.05	0.001
20	1.66	0.00	0.00	0.61	0.00	-0.05	0.002
21	2.34	0.00	-0.84	0.97	-0.67	-0.32	-1.506
22	1.66	0.00	1.46	1.68	0.80	-0.41	2.258
23	2.34	0.00	-0.84	0.97	-0.23	-0.34	-1.073
24	1.66	0.00	1.46	1.68	0.50	0.08	1.958
25	1.66	0.00	1.46	1.68	0.27	-0.44	1.724
26	2.34	0.00	-0.84	0.97	-0.42	0.08	-1.261
27	2.34	0.00	1.46	1.68	0.06	-0.10	1.514
28	1.66	0.00	-0.84	0.97	-0.01	-0.05	-0.854

Summary...

X Dist. to Center of Rigidity 11.563m

Y Dist. to Center of Rigidity 21.259m

X Accidental Eccentricity 2.000m

Y Accidental Eccentricity 2.000m

Torsional Moments from Y-Y Shear

Xcm + (Min%*MaxX) - Xcr 2.337m = 2.34kN-m

Xcm - (Min%*MaxX) - Xcr -1.663m = -1.66kN-m

Torsional Moments from X-X Shear

Ycm + (Min%*MaxY) - Ycr -1.159m = 0.00kN-m

Ycm - (Min%*MaxY) - Ycr -5.159m = 0.00kN-m

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Rigid Diaphragm Torsion Analysis

General | Wall Data | Results

Label	Eccentricity		Direct Shears		Torsional Shears		Maximum Shear
	X (m)	Y (m)	Length (kN)	Width (kN)	Length (kN)	Width (kN)	Along Length (kN)
1	0.00	5.16	-0.07	-0.00	-0.05	-1.29	-0.127
2	0.00	5.16	-0.07	-0.00	-0.05	-0.29	-0.127
3	0.00	5.16	-0.07	-0.00	-0.05	0.39	-0.127
4	0.00	5.16	-0.07	-0.00	-0.05	1.37	-0.127
5	0.00	5.16	-0.07	-0.00	-0.03	-1.29	-0.105
6	0.00	5.16	-0.29	-0.00	-0.06	-2.49	-0.351
7	0.00	5.16	-0.00	-4.14	-11.94	-0.29	-11.941
8	0.00	1.16	-37.81	-0.00	0.65	-0.23	-37.809
9	0.00	1.16	-37.81	-0.00	0.65	0.26	-37.809
10	0.00	1.16	-0.00	-4.14	2.80	-0.06	-0.000
11	0.00	5.16	-0.07	-0.00	-0.03	1.36	-0.105
12	0.00	5.16	-0.07	-0.00	-0.02	1.37	-0.090
13	0.00	5.16	-0.01	-0.00	-0.01	-0.04	-0.018
14	0.00	5.16	-0.01	-0.00	-0.01	0.07	-0.018
15	0.00	5.16	-0.01	-0.00	-0.00	-0.12	-0.017
16	0.00	5.16	-0.01	-0.00	-0.00	-0.12	-0.015
17	0.00	5.16	-0.01	-0.00	-0.00	-0.04	-0.014
18	0.00	5.16	-0.01	-0.00	-0.00	0.07	-0.014
19	0.00	5.16	-0.01	-0.00	-0.00	0.14	-0.015

Summary...

X Dist. to Center of Rigidity	11.563m
Y Dist. to Center of Rigidity	21.259m
X Accidental Eccentricity	2.000m
Y Accidental Eccentricity	2.000m

Torsional Moments from Y-Y Shear

Xcm + (MinY*MaxX) - Xcr	2.337m	=	0.00 kN-m
Xcm - (MinY*MaxX) - Xcr	-1.663m	=	0.00 kN-m

Torsional Moments from X-X Shear

Ycm + (MinY*MaxY) - Ycr	-1.159m	=	-1.16 kN-m
Ycm - (MinY*MaxY) - Ycr	-5.159m	=	-5.16 kN-m

هاتف: ٦٤٤٠٨٨ . ٦١٢٢٣٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Rigid Diaphragm Torsion Analysis

General | Wall Data | Results

Label	Eccentricity		Direct Shears		Torsional Shears		Maximum Shear
	X (m)	Y (m)	Length (kN)	Width (kN)	Length (kN)	Width (kN)	Along Length (kN)
10	0.00	1.16	-0.00	-4.14	2.80	-0.06	-0.000
11	0.00	5.16	-0.07	-0.00	-0.03	1.36	-0.105
12	0.00	5.16	-0.07	-0.00	-0.02	1.37	-0.090
13	0.00	5.16	-0.01	-0.00	-0.01	-0.04	-0.018
14	0.00	5.16	-0.01	-0.00	-0.01	0.07	-0.018
15	0.00	5.16	-0.01	-0.00	-0.00	-0.12	-0.017
16	0.00	5.16	-0.01	-0.00	-0.00	-0.12	-0.015
17	0.00	5.16	-0.01	-0.00	-0.00	-0.04	-0.014
18	0.00	5.16	-0.01	-0.00	-0.00	0.07	-0.014
19	0.00	5.16	-0.01	-0.00	-0.00	0.14	-0.015
20	0.00	5.16	-0.01	-0.00	-0.00	0.14	-0.017
21	0.00	5.16	-2.19	0.95	-1.47	-0.70	-3.661
22	0.00	5.16	-3.80	-1.65	-2.49	1.28	-6.285
23	0.00	5.16	-2.19	0.95	-0.51	-0.75	-2.705
24	0.00	5.16	-3.80	-1.65	-1.56	-0.25	-5.355
25	0.00	5.16	-3.80	-1.65	-0.83	1.37	-4.631
26	0.00	5.16	-2.19	0.95	-0.93	0.18	-3.120
27	0.00	1.16	-3.80	-1.65	0.03	-0.05	-3.798
28	0.00	1.16	-2.19	0.95	0.01	0.04	-2.193

Summary...

X Dist. to Center of Rigidity	11.563 m
Y Dist. to Center of Rigidity	21.259 m
X Accidental Eccentricity	2.000 m
Y Accidental Eccentricity	2.000 m

Torsional Moments from Y-Y Shear

Xcm + (Min/*MaxX) - Xcr	2.337 m	=	0.00 kN-m
Xcm - (Min/*MaxX) - Xcr	-1.663 m	=	0.00 kN-m

Torsional Moments from X-X Shear

Ycm + (Min/*MaxY) - Ycr	-1.159 m	=	-1.16 kN-m
Ycm - (Min/*MaxY) - Ycr	-5.159 m	=	-5.16 kN-m

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

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**************************************************
*                                                *
*          S T A A D - III                       *
*          Revision 22.0W                        *
*          Proprietary Program of                *
*          Research Engineers, Inc.              *
*          Date=     FEB  9, 1996                *
*          Time=     13:33:41                    *
*                                                *
*     USER ID: tHeRaiN/UCF2000                   *
**************************************************
```

```
 1. STAAD SPACE
 2. INPUT WIDTH 72
 3. UNIT METER KNS
 4. JOINT COORDINATES
 5.       1          .000          .000          .000
 6.       2         9.000          .000          .000
 7.       3        14.400          .000          .000
 8.       4        23.400          .000          .000
 9.       5          .000         5.100          .000
10.       6         9.000         5.100          .000
11.       7        14.400         5.100          .000
12.       8        23.400         5.100          .000
13.       9          .000          .000         9.000
14.      10        23.400          .000         9.000
15.      11          .000         5.100         9.000
16.      12        23.400         5.100         9.000
17.      13        11.700          .000        21.400
18.      14        11.700         5.100        21.400
19. MEMBER INCIDENCES
20.            1         1         5
21.            2         2         6
22.            3         3         7
23.            4         4         8
24.            5         9        11
25.            6        10        12
26.            7        13        14
27.            8         5         6
28.            9         6         7
29.           10         7         8
30.           11         5        11
31.           12         8        12
32.           13        11        14
33.           14        12        14
34. MEMBER PROPERTY CANADIAN
35. 1 TO 6 PRI YD .5
36. 8 TO 14 PRI YD .5 ZD .5
37. 7 PRI YD 9. ZD 23.4 YB 8.8 ZB .44
38. CONSTANT
39. E CONCRETE ALL
40. BETA 90. MEMB 7
41. SUPPORT
```

MEMBER END FORCES   STRUCTURE TYPE = SPACE

ALL UNITS ARE -- KIP FEET

MEMBER	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	-.84	.44	-1.68	-.47	4.85	1.16
		5	.84	-.44	1.68	.47	3.70	1.09
2	1	2	-.17	.39	-.16	-.34	.61	1.07
		6	.17	-.39	.16	.34	.21	.94
3	1	3	.17	.39	.16	-.34	-.61	1.07
		7	-.17	-.39	-.16	.34	-.21	.94
4	1	4	.84	.44	1.68	-.47	-4.85	1.16
		8	-.84	-.44	-1.68	.47	-3.70	1.09
5	1	9	.84	-1.12	-1.60	3.23	4.74	-4.05
		11	-.84	1.12	1.60	-3.23	3.43	-1.68
6	1	10	-.84	-1.12	1.60	3.23	-4.74	-4.05
		12	.84	1.12	-1.60	-3.23	-3.43	-1.68
7	1	13	.00	.00	-100.57	-905.24	512.68	.00
		14	.00	.00	100.57	905.24	.25	.00
8	1	5	.39	-.06	.09	.26	-.28	-.24
		6	-.39	.06	-.09	-.26	-.53	-.31
9	1	6	.00	-.23	-.07	.47	.19	-.63
		7	.00	.23	.07	-.47	.19	-.63
10	1	7	-.39	-.06	.09	.26	-.53	-.31
		8	.39	.06	-.09	-.26	-.28	-.24
11	1	5	-1.77	-.78	.84	-.86	-.19	-3.43
		11	1.77	.78	-.84	.86	-7.32	-3.59
12	1	8	1.77	.78	.84	-.86	-.19	3.43
		12	-1.77	-.78	-.84	.86	-7.32	3.59
13	1	11	-2.25	.06	-2.52	.49	10.56	.68
		14	2.25	-.06	2.52	-.49	32.38	.33
14	1	12	2.25	-.06	-2.52	.49	10.56	-.68
		14	-2.25	.06	2.52	-.49	32.38	-.33

General notes of EQ design:

1. Columns shall be spirally reinforced to insure ductile behavior even if small forces are expected to act on them.
2. Short column effect will be investigated for columns between different levels within the roof construction
3. Standard earthquake details shall be used throughout.
4. Nonstructural elements shall be carefully detailed for EQ loads including particularly the concrete block walls.

Gravity loading Calculations

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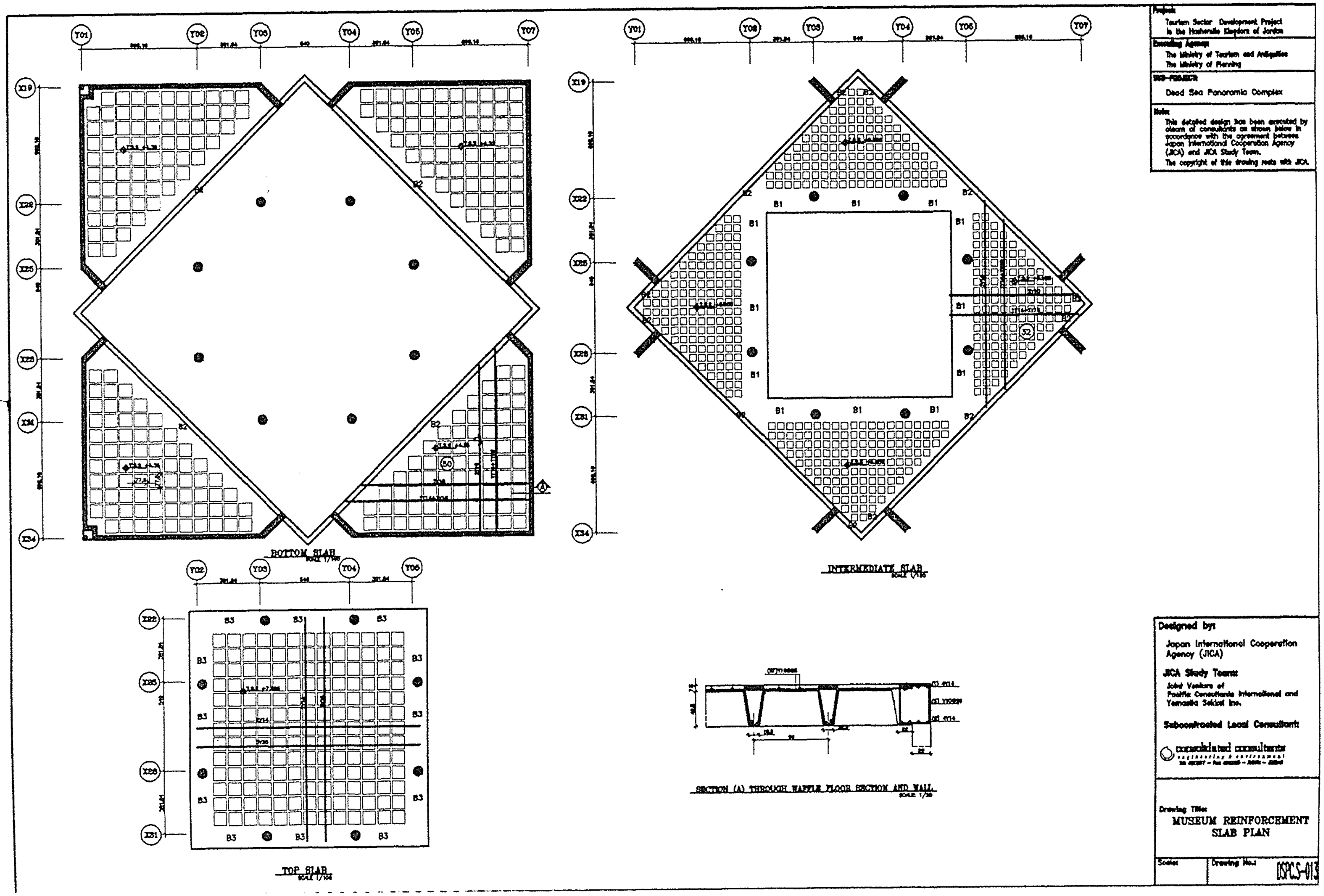
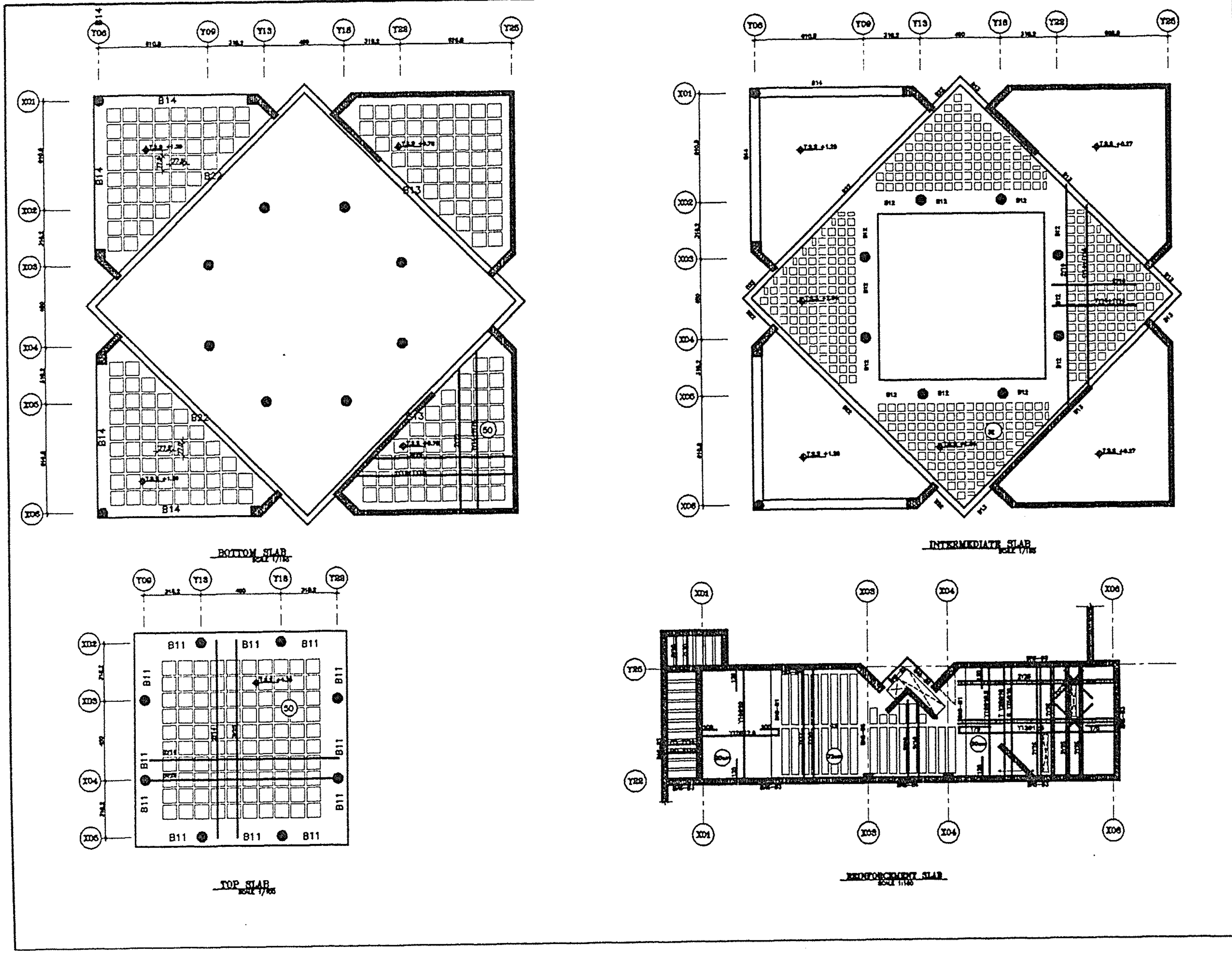


F:\jica-dead sea\DRAFTING\PHASE2\STRUC\DSPC-S013.dwg



Project:
Tourism Sector Development Project
in the Hashemite Kingdom of Jordan

Executing Agency:
The Ministry of Tourism and Antiquities
The Ministry of Planning

SUB-PROJECT:
Dead Sea Panoramic Complex

Note:
This detailed design has been executed by a team of consultants as shown below in accordance with the agreement between Japan International Cooperation Agency (JICA) and JICA Study Team.
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Designed by:
Japan International Cooperation Agency (JICA)

JICA Study Team:
Joint Venture of
Pacific Consultants International and
Yamashita Sekkei Inc.

Subcontracted Local Consultant:
consolidated consultants
engineering & environment

Drawing Title:
RESTURANT REINFORCEMENT
SLAB PLAN

Scale:	Drawing No.: DSPC-S-012

F:\jica-dead sea\DRAFTING\PHASE2\STRUC\DSPC-S012.dwg

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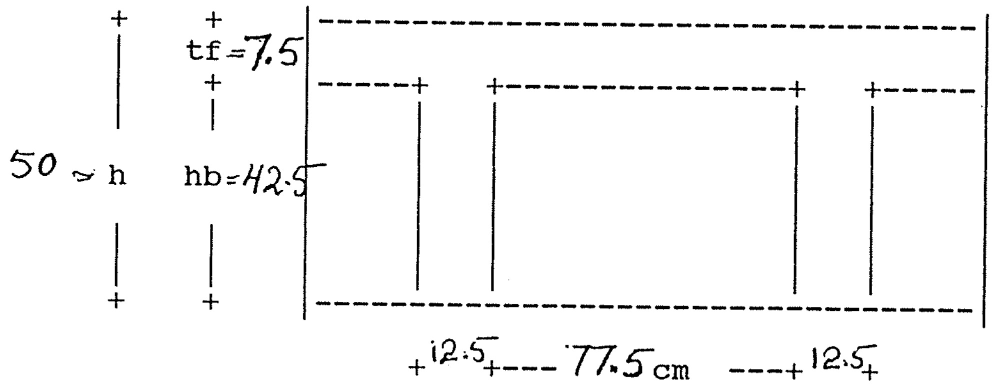
TWO WAY Waffle SLAB LOADING TYPE 1



** DATA **

Volume of Concrete = 0.258 m^3/m^2

weight of Concrete = 0.258 X 25 = 6.45 KN/m2

weight of Screed = .10 X 22 = 2.2 KN/m2

weight of False Ceiling = .60 KN/m2

Total Dead Load = 6.45+2.2+0.6
= 9.25 KN/m2

Live Load = 2 KN/m2

Total Working Load = 9.25 + 2 = 11.25 KN/m2

Total Ultimate Load = 1.4 DL + 1.6 LL
= 16.15 KN/m2

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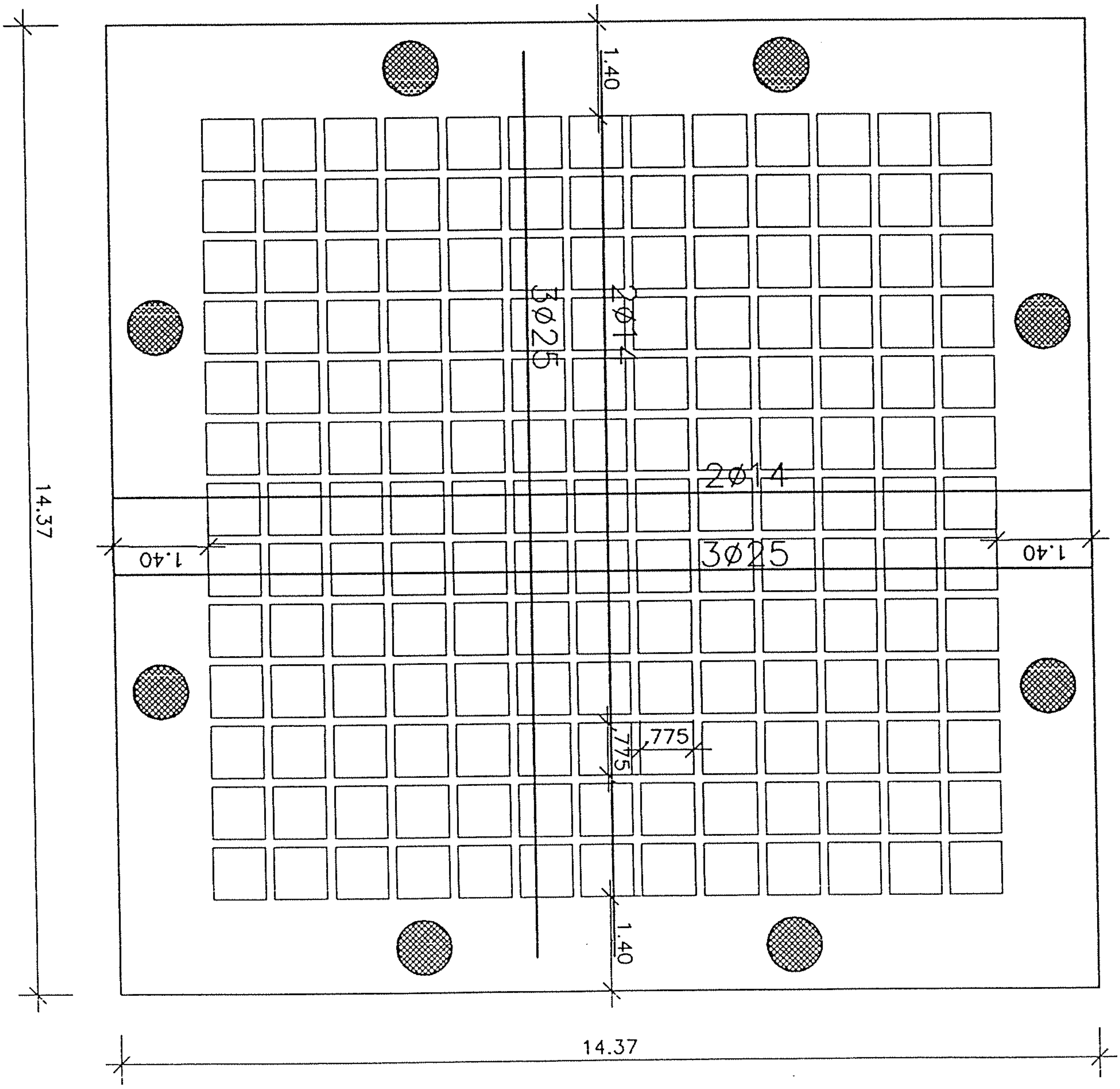

1.40
3Ø25
2Ø14
2Ø14
3Ø25
1.40
1.40
14.37
.775
.775
1.40
14.37

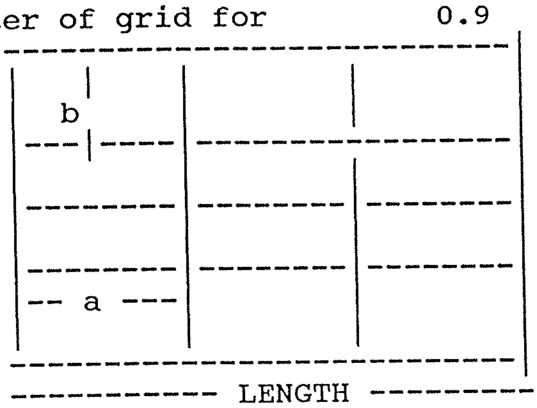
Elastic Theory analy for top slabs.

SLAB #1 at Top level

Data: (program prep. by Eng hassan Anas Al-khamrah)
length= 12.2 m (Shorter side of panel)
Width= 12.2 m (Longer side of panel)
fcu= 25
fy = 414 fyv= 414 MPa
a = 0.9 m
b = 0.9 m
Slab th= 75 mm
WEIGHT OF FINISH= 2.8 KN/m2
Live load/m2= 2 KN/m2
spacing of ribs= 0.9 m
number of beams in (x-direction)= 13 Ribs
number of beams in (y-direction)= 13 (span/depth=20)= 610
depth of ribs based on (span/depth=20)= 500 mm
width of 217 mm

Loads:
weight of slab= 1.8 KN/m2
TOTAL LOAD OF SLAB 267.912 KN
WEIGHT OF RIBS= 2.2134 KN/m
Total weight of beams in (X-direction) 351.0452 KN
Total weight of beams in (y-direction)= 351.0452 KN
Total weight of floor finish= 416.752 KN
Total live load = 297.68 KN
Total dead and live loads on grid floor
= 1684.434 KN
Load per m2=q= 11.31708 KN/m2

Moments:
q1= 5.66 KN/m2
q2= 5.66 KN/m2
Moments in x-and y direction at center of grid for meters 0.9 meters 0.9
MX= 94.74943 KN-M
MY= 94.74943 KN-M
QX= 31.07 KN
QY= 31.07 KN



Rigorous Method(plate theory)
(Df/D)= 0.15
(bw/bf)= 0.241111
be1 = 3050 mm
be2 = 1417 mm
be3 = 900 mm
be = 900 mm
k1 = 1.47
k2 = 2.99
k = 2.03
I = 4.6E+09
E = 2.9E+07
BEATA= 0.2455
CALCULATE C1&7C2
C1 = 1.55E+16
C2 = 1.6E+16
C1/B1 = 1.7E+16
C2/a1 = 1.7E+16
Deflections @ Center of Span
(Dx/ax4)= 6.56
(Dy/ay4)= 6.56

(2H/ax2by)= 1.5588

The deflection @ center of the plate is given by:
a = 0.012836 m
ASSUMING A CREEP COEFFICIENT =2
Ecc = (Ec/(1+coeff.)
Long term deflection= 0.038510 m
Span/250= 0.0488 m Deflection is Ok
Design Moments & Shears

				point	x(m)	y(m)	Qx(kn)	Qy(kn)
Dx	=	145253.4						
Mx	=	123.5163	(Kn.m)	D	0	12.2	0	0
My	=	123.5163	(Kn.m)	K	0	9.8	21.01	0
Qx1	=	0.012836		I	0.9	6.1	31.86	0
Qx2	=	2480.257		J	1.8	6.1	0	0
Qx3	=	294.8297		F	6.1	9.15	0	22.51
Qx	=	35.62	kn					
Qy	=	31.84	kn					

calculate steel for the middle rib
Moment resisted by central rib in x-direction over 0.9 m width
Ultimate moment= 166.7470 KN.m
Moment capacity of flange section
Muf = 254.2387 Kn.m
As = 1076.140 mm2 Try Fie= 25 use 3 Bars
Moment resisted by central rib in y direction over 0.9 m width
Ultimate moment= 166.7470 kn.m
As = 1091.409 mm2 Try Fie= 25 use 3 Bars
Mx(Rigorous analysis(plate theory)
---------------------------------- = 1.17
Approximate method(grashoff theory)
Calculate Torsional moment @ corners
X=0 AND Y=(1/4)x(WIDTH)
Mxy @ 9.15 meters= -14.70 Kn.m
X=0 AND Y=((WIDTH)
Mxy @ 12.2 meters= -14.70 Kn.m
Calculate Torsional moment @ corners
X=0 AND Y=(3/4)*WIDTH
Myx @ 9.15 meters= -10.39 Kn.m
X=0 AND Y=((WIDTH)
Myx @ 12.2 meters= -14.70 Kn.m
----------------Check Shear -------------------------
Vu = 46.60 Kn
t = 5.61 Kg/cm2 Actual shear stress
tuc = 8.38 Kg/cm2 Allowable shear stress
provide nominal shear reinforcement
tus = provide n Kg/cm2
Introduce the required diameter of stirrups= 10 mm
Introduce the number of stirrup legs required 2 legs
S = ERR cm (Ast.fy/tus.b)
Smax = 22.5 cm (d/2)
Smax = 85.62 cm (Ast.fyv/3.5.b)
Smax = ERR cm (The required spacing)

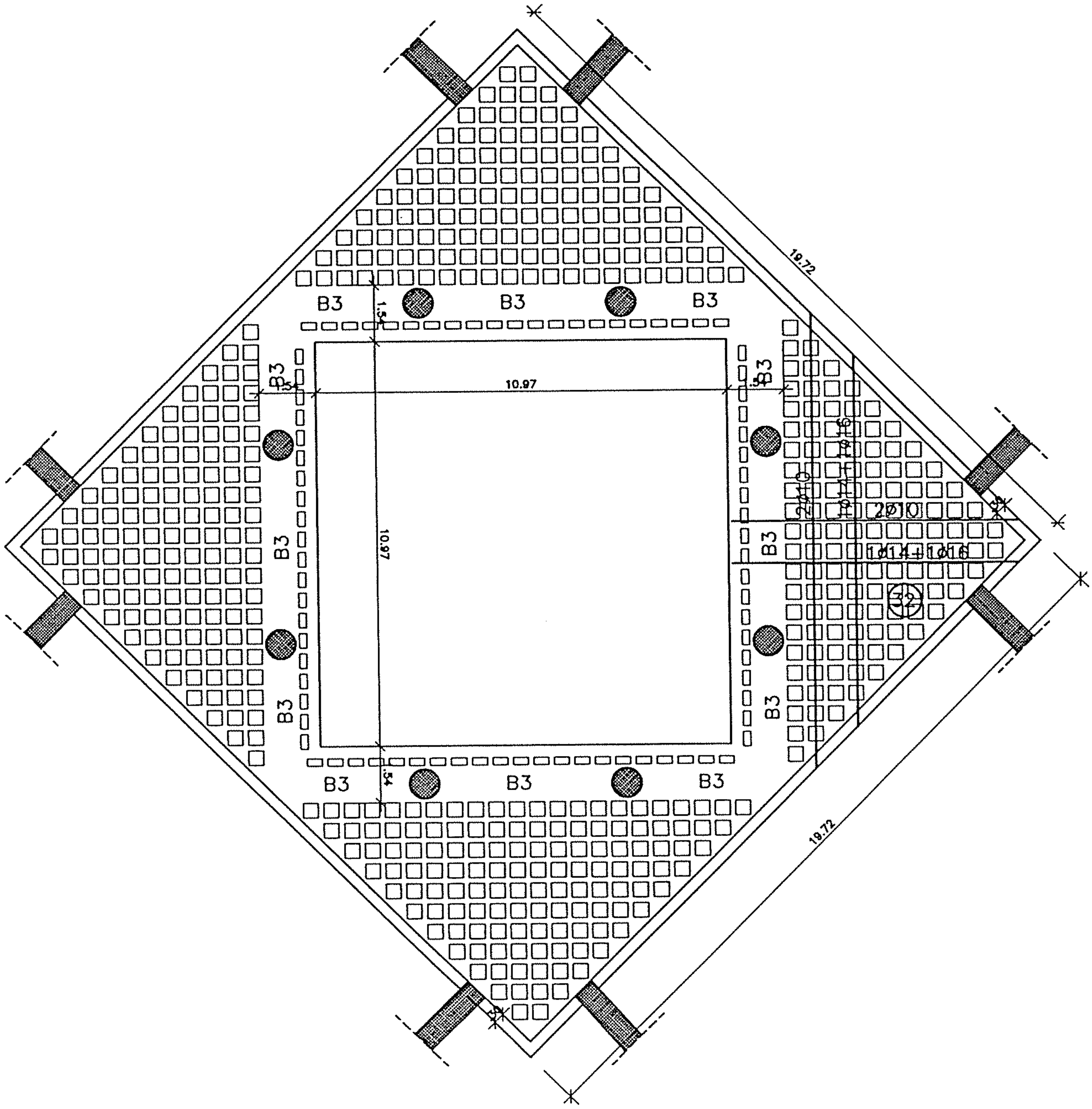
Combined design for shear & torsion
=====================================

fc' = 200 Kg/cm2
ttu =3Mu/(.85.y.x2)= 29.74 Kg/cm2
concrete capacity for Torsion=.4*(fc')^.5
CCAP = 5.6569 Kg/cm2
Design section for Torsion

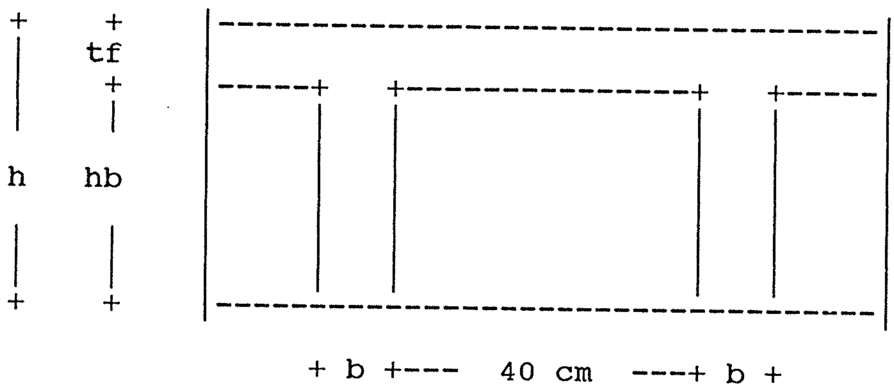
ttu = 45.25 Kg/cm2
Section Satisfactory
shear stress taken by conc. = 9.05 Kg/cm2
the actual shear stress on section = 3.42 Kg/cm2 (NOTE: SEE SHEAR S
shear stress to br res. by steel= 16.00 Kg/cm2
Mtc = 0.543406 t-m
Fie of stirrup= 10 No. of stirrup legs= 2
alfat= 1.549221
alfat= 1.5
s = 29.18 cm
Spacing of stirrups= 29.18 cm
Min Ast/S = 0.018345
Ast1/S= 0.0269
OK
S1MAX= 30 CM
S2MAX= 15.43 CM
S(FINAL)= 15.43 CM
Design for longitudinal steel

Al=2At(x1+y1)/s= 5.26 cm2
Min Al=(28bws/fy-2Ast)(x1+y1)/S= 2.32 cm2
Min Al=(28bws/fy-3.5bws/fy)= 13.40 cm2
Min AL1= 5.26
Min AL= 5.26 cm2
For longitudinal Reinforcement use AL= 5.26 cm2

Design of Two way Ribbed slab



Two way Ribbed slab:-



** DATA **

- Width of Rib .... b = 15 cm
- Height of Rib .... h = 32 cm
- Height of Block .... hb = 24 cm
- Thickness of Tiles ...... tt = 10 cm
- Average False Ceiling Load .. pw = 60 kg/m2
- Average Live Load .... LL = 200 kg/m2

** RIB LOADING **

** DEAD LOAD **

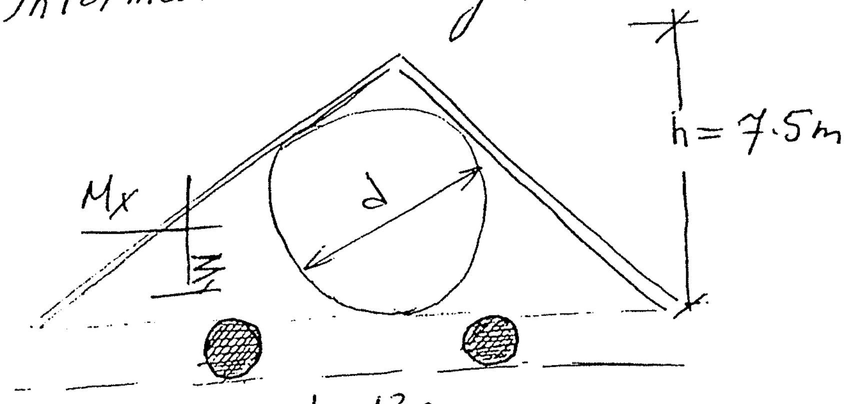
Weight of Rib	=(80+ 15)X 15 X 24 X 25 / (40+ 15)^2	= 283 kg/m2
Weight of Slab	= 8 X 25	= 200 kg/m2
Weight of Block	= 18 X 2 X 10000 / (40+ 15)^2	= 119 kg/m2
Weight of Tiling	= 10 X 22	= 220 kg/m2
Weight of False Ceiling	= 60	= 60 kg/m2
	TOTAL DEAD LOAD WD	= 882 kg/m2

** LIVE LOAD **

TOTAL LIVE LOAD WL = 200 kg/m2

TOTAL WORKING LOAD = WD + WL = 1082 kg/m2

Design of Intermediate two way Ribbed slab:-



$b = 13m$

$$d \approx \frac{2bh}{b + \sqrt{b^2 + 4h^2}}$$

$$= \frac{2 \times 13 \times 7.5}{13 + \sqrt{(13)^2 + 4 \times 7.5^2}} = 5.936 \text{ meters}$$

$$B.M \text{ @ Centre} = \frac{wd^2}{16}$$

$w_u = 15.13 \text{ KN/m}^2$

$$\therefore B.M = \frac{15.13(5.936)^2}{16} \approx 33.32 \text{ KN-m}$$ ← Controlls

From Table (36)

$l_x/l_y = 14/7.3 = 1.92 < 2$ (ok)

$\alpha_x = 0.0342$

$\alpha_y = 0.0377$

$M_x = \alpha_x P$ & $M_y = \alpha_y P$

$P = \frac{l_x l_y}{2} p = \frac{1}{2} \times 14 \times 7.3 \times 15.13 = 773.143$ KN

$\therefore M_x = 0.0342 \times 773.143 = 26.44$ KN-m

$M_y = 0.0377 \times 773.143 = 29.147$ KN-m

These values & the above are in harmony ok

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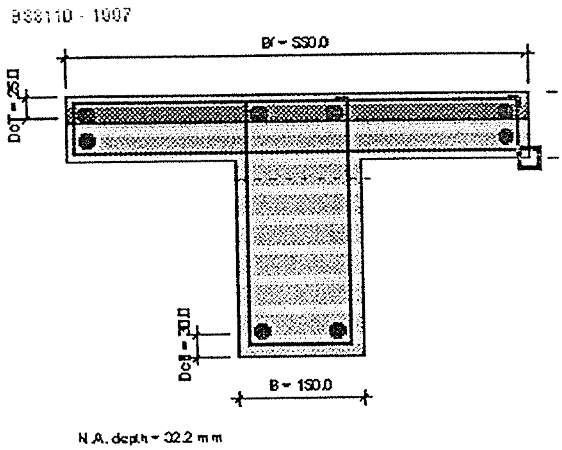
Bending Moment M (kNm)	33.32
Torsion Moment T (kNm)	
Shear Force V (kN)	25
Web width B (mm)	150
Total height H (mm)	320
Flange Width Wf (mm)	550
Flange Height Hf (mm)	80
Reinf centroid depth DcT (mm)	25
Reinf centroid depth DcB (mm)	30
fcu (Mpa)	25
fy - main bars (Mpa)	414
fyv - links (Mpa)	414
% Redistribution	



OUTPUT

Moment
Mu 138.5 kNm
As 308 mm²
As' 0 mm²
Anom 86 mm²

Shear
v 0.57 MPa
vc 0.61 MPa
Asv/Sv 0.00
Asv/Sv nom 0.15

Torsion (Web)
v 0.00 MPa
vt 0.34 MPa
Asv/Sv 0.00
As 0

Suggested Reinforcement Configurations:

Bars	(mm²)	Bars	(Asv/sv)	Bars	(Asv/sv)
4Y10	(314)	2Y8@500	(0.20)		
3Y12	(339)	2Y10@500	(0.31)		
2Y16	(402)	2Y12@500	(0.45)		

USE 1 Φ16 mm + 1 Φ14 Both sides

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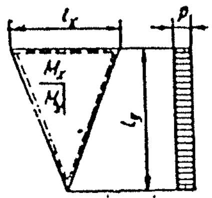
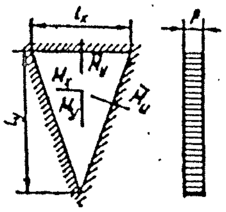
Table (36)

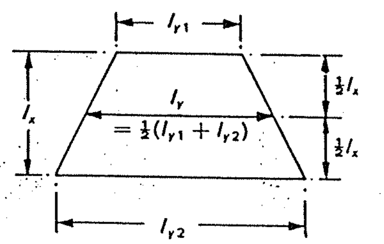
تبين الجداول ٣٦ ، ٣٧ المعطيات اللازمة لحساب عزوم الانعطاف في البلاطات المثلثية المتساوية الساقين والمحملة بحمولة موزعة بانتظام وحمولة مثلثية من أجل نسب القاعدة lx الى الارتفاع ly متغيرة من 0,5 الى 2,0 .

الجدول رقم ٣٦ : بلاطات مثلثية متساوية الساقين محملة بحمولة موزعة بانتظام

l_x/l_y	 $M_x = \alpha_x P$; $M_y = \alpha_y P$; $P = \frac{l_x l_y}{2} p$.		 $M_x = \alpha_x P$; $\overline{M}_u = -\beta_u P$; $M_y = \alpha_y P$; $\overline{M}_y = -\beta_y P$; $P = \frac{l_x l_y}{2} p$.			
	α_x	α_y	α_x	α_y	β_u	β_y
0,50	0,0396	0,0209	0,0187	0,0089	0,0356	0,0210
0,55	0,0404	0,0224	0,0203	0,0110	0,0365	0,0245
0,60	0,0411	0,0236	0,0209	0,0123	0,0370	0,0267
0,65	0,0418	0,0249	0,0211	0,0133	0,0372	0,0290
0,70	0,0424	0,0260	0,0211	0,0142	0,0372	0,0310
0,75	0,0428	0,0272	0,0210	0,0148	0,0371	0,0328
0,80	0,0432	0,0284	0,0207	0,0153	0,0367	0,0344
0,85	0,0433	0,0298	0,0205	0,0157	0,0361	0,0361
0,90	0,0433	0,0310	0,0202	0,0159	0,0354	0,0372
0,95	0,0431	0,0320	0,0199	0,0162	0,0346	0,0384
1,00	0,0428	0,0332	0,0196	0,0164	0,0338	0,0392
1,10	0,0421	0,0355	0,0190	0,0168	0,0321	0,0407
1,20	0,0413	0,0369	0,0184	0,0171	0.0303	0,0416
1,30	0,0404	0,0376	0,0178	0,0174	0,0284	0,0423
1,40	0,0394	0,0378	0,0171	0,0177	0,0265	0,0429
1,50	0,0385	0,0378	0,0164	0,0178	0,0246	0,0432
1,60	0,0375	0,0378	0,0157	0,0180	0,0225	0,0434
1,70	0,0366	0,0378	0,0149	0,0181	0,0206	0,0434
1,80	0,0355	0,0377	0,0140	0,0181	0,0186	0,0430
1,90	0,0342	0,0377	0,0130	0,0181	0,0167	0,0424
2,00	0,0324	0,0377	0,0117	0,0181	0,0148	0,0413

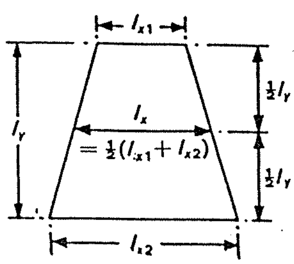
Trapezium

$l_x < l_y$



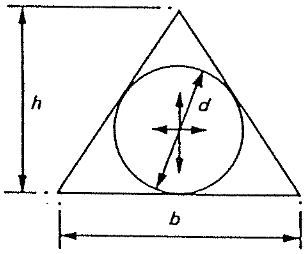
Calculate bending moments as for rectangular panel with $k = \dfrac{l_y}{l_x}$

$l_x < l_y$



If l_{y1} is small compared with l_{y2} or l_{x1} is small compared with l_{x2} } Apply rules for triangular panel

Isosceles triangle



d = diameter of inscribed circle $= \dfrac{2bh}{b + \sqrt{b^2 + 4h^2}}$

Freely-supported along all edges (corners restrained).

Bending moment (in two directions at centre of circle) $= +\dfrac{wd^2}{16}$

Continuous along all sides.

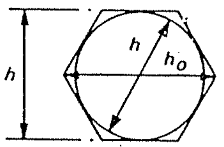
Bending moment (in two directions at centre of circle) $= +\dfrac{wd^2}{30}$

Bending moment (at sides) $= -\dfrac{wh^2}{30}$

w = intensity of uniformly-distributed load (or intensity of pressure at centre of circle if pressure varies uniformly).
These expressions are valid for values of $\nu \ngtr 0.2$

Regular polygon

Five or more sides.



h = diameter of inscribed circle = distance across flats.
h_0 = diameter of circumscribed circle
= distance across corners.
$h_1 = \frac{1}{2}(h + h_0) = 1.077\,h$ for hexagon
$1.041\,h$ for octagon
Calculate bending moments as for circle of diameter h_1.

Circle (diameter = h)

	Freely-supported edge	Clamped edge
Concentric concentrated load F uniformly distributed over small area of diameter d	Beneath loaded area: $M_r = M_t \ngtr \dfrac{F}{4\pi}\left[1 + (1+\nu)\ln\dfrac{b}{d}\right]$ Beneath unloaded area: $M_r = -\dfrac{F}{4\pi}(1+\nu)\ln\xi$ $M_t = \dfrac{F}{4\pi}[(1-\nu) - (1+\nu)\ln\xi]$	Beneath loaded area: $M_r = M_t \ngtr \dfrac{F}{5p}(1+\nu)\ln\dfrac{b}{d}$ Beneath unloaded area: $M_r = \dfrac{F}{4\pi}\left[\left(\dfrac{d}{2\xi h}\right)^2(1-\nu) - (1+\nu)\ln\xi - 1\right]$ $M_t = \dfrac{F}{4\pi}\left[\left(\dfrac{d}{2\xi h}\right)^2\nu(1-\nu) - (1+\nu)\ln\xi - \nu\right]$
Uniformly-distributed load w over entire panel	$M_r = \dfrac{wh^2}{64}(3+\nu)(1-\xi^2)$ $M_t = \dfrac{wh^2}{64}[(3+\nu) - (1+3\nu)\xi^2]$	$M_r = \dfrac{wh^2}{64}[(1+\nu) - (3+\nu)\xi^2]$ $M_t = \dfrac{wh^2}{64}[(1+\nu) - (1+3\nu)\xi^2]$

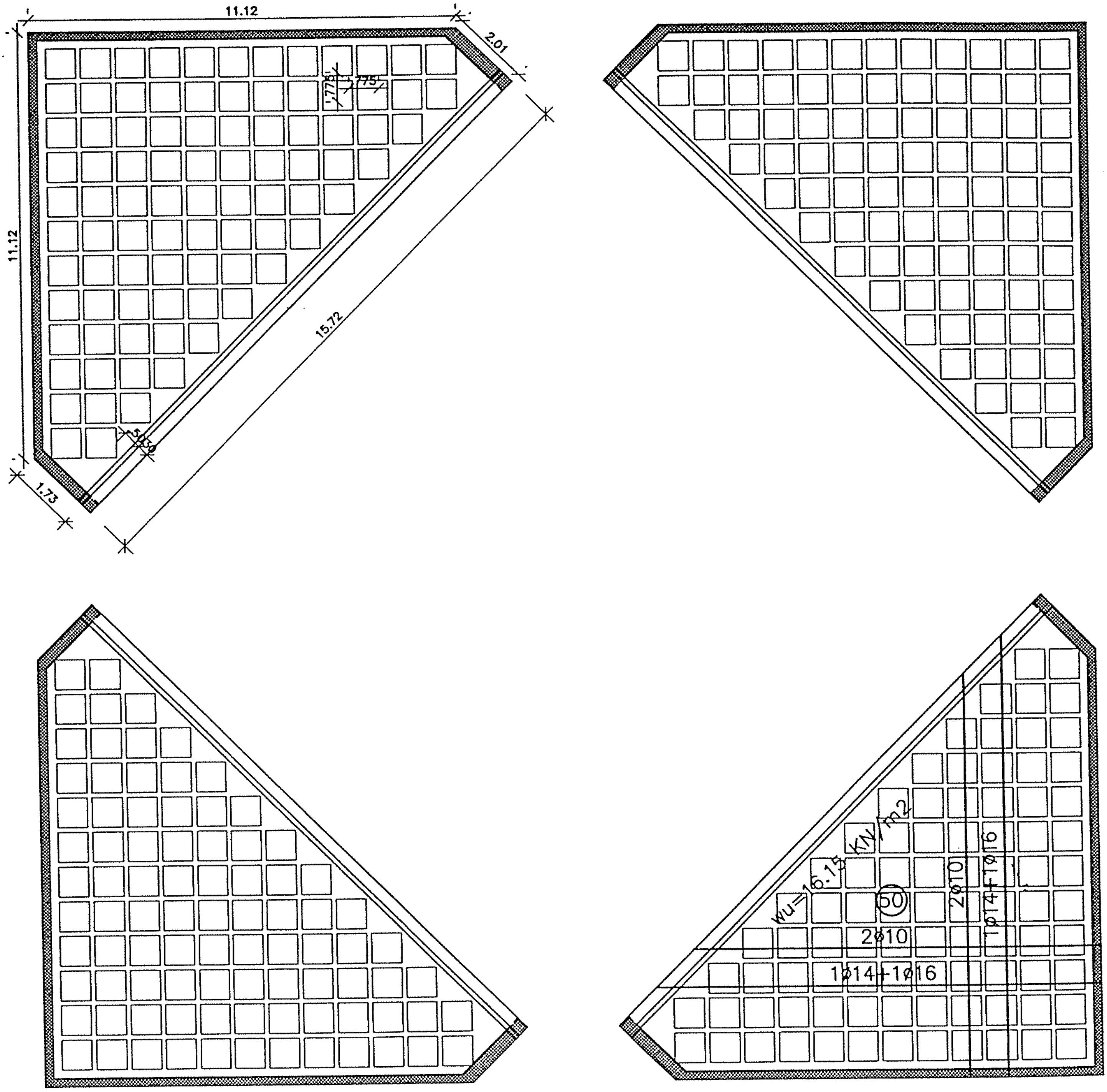
Notes

Reinforcement to resist positive bending moments to be provided in two directions mutually at right-angles.

M_r = moment in radial direction
M_t = moment in tangential direction
ν = Poisson's ratio
$\xi = \dfrac{\text{distance of point considered from slab centre}}{\text{radius of slab}}$

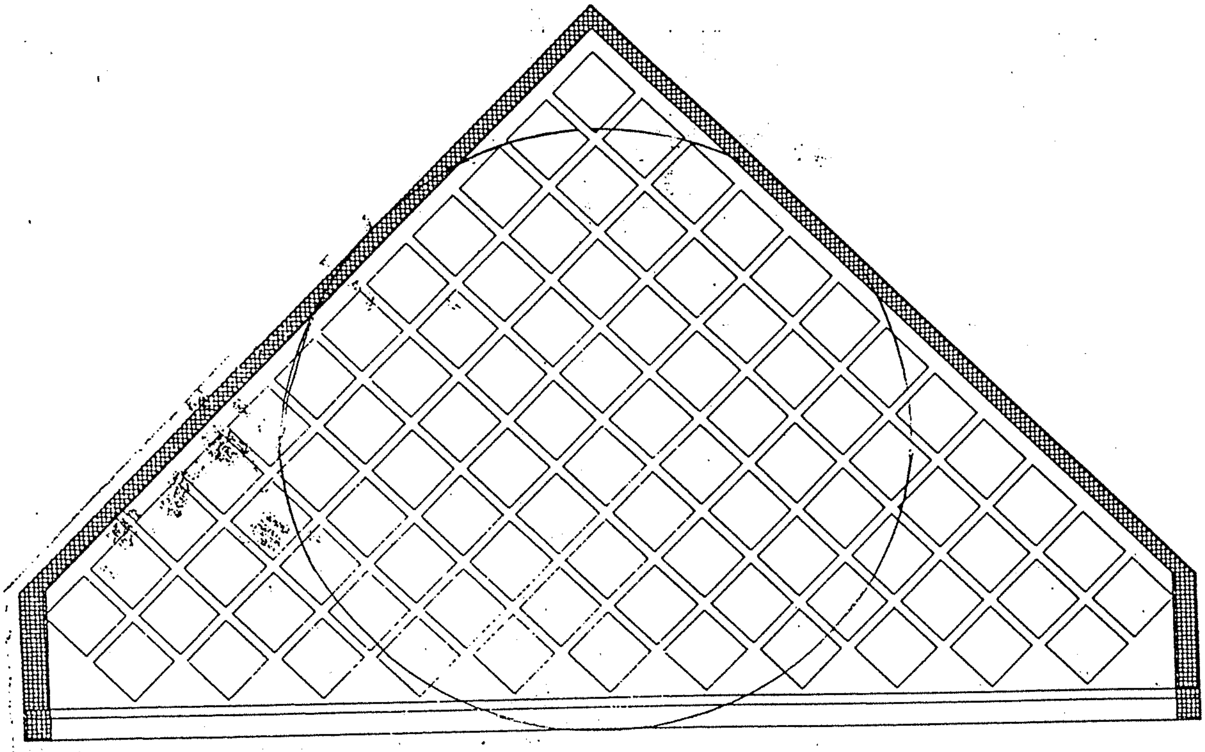
For slab continuous at edge, average moments obtained by considering freely-supported slab and slab with clamped edge.

If $d < \frac{1}{2}$ thickness of slab t, substitute $d' = \sqrt{1.6d^2 + t^2} - 0.675t$ for d in above formulæ.



Design of Bottom slab:-

Design of Bottom Slab



equivalent Diameter $= \dfrac{2bh}{b+\sqrt{b^2+4h^2}}$

$= \dfrac{2 \times 15.5 \times 9.3}{15.5+\sqrt{15.5^2+4\times 9.3^2}} \approx 7.26m$

$B.M \approx \dfrac{wd^2}{16} = \dfrac{16.15(7.26)^2}{16} = 53.2$ KN-m (ultimate)

equivalent Circle of diameter 7.26m is also equivalent to a square

$B = \sqrt{\frac{\pi}{4}(7.26)} \approx 6.5$ meters

Check by elastic Theory

$M_x = M_y = 34.965 \times \left(\dfrac{16.15}{9.25+2}\right) = 50.2$ KN-m which is (service)

almost the same as above figure

From Computer Analysis (service)

Max $M_{service} = 35.2$ KN-m which is the same as elastic Analysis

USE $1\Phi 16 + 1\Phi 14$ For Both Sides

allowable defl. $= l/250$

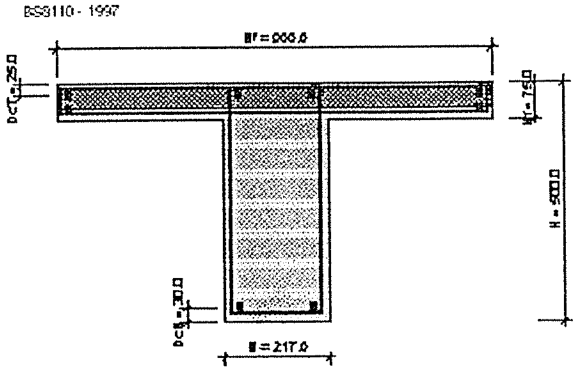
$= 950/250 = 3.8$ Cm >> elastic + long Term deflection

Consolidated Consultants
Engineering & Environment

Input/Design | Output | Help

ding Moment M (kNm)	53.2
on Moment T (kNm)	
r Force V (kN)	80
width B (mm)	217
height H (mm)	500
je Width Wf (mm)	900
je Height Hf (mm)	75
f.centroid depth DcT (mm)	25
f.centroid depth DcB (mm)	30
Mpa)	25
nain bars (Mpa)	414
links (Mpa)	414
distribution	

Error List



N.A. depth = 52.2 mm

ʻ UTPUT

Moment		Shear		Torsion (Web)		Torsion (Flange)	
Mu	434.1 kNm	v	0.78 MPa	v	0.00 MPa	v	0.00 MPa
As	303 mm²	vc	0.42 MPa	vt	0.34 MPa	vt	0.34 MPa
As'	0 mm²	Asv/Sv	0.20	Asv/Sv	0.00	Asv/Sv	0.00
Anom	195 mm²	Asv/Sv nom	0.22	As	0	As	0

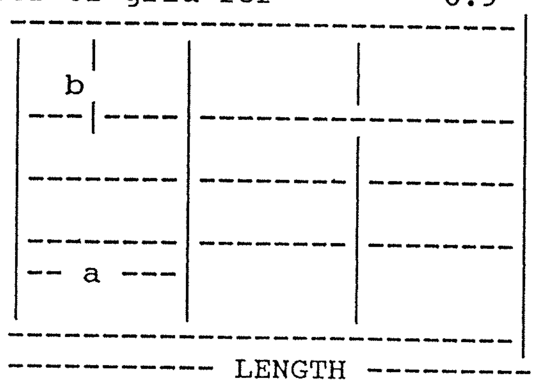
Suggested Reinforcement Configurations:

Bars	(mm²)	Bars	(Asv/sv)	Bars	(Asv/sv)	Bars	(Asv/s
4Y10	(314)	2Y8@450	(0.22)				
3Y12	(339)	2Y10@500	(0.31)				
2Y16	(402)	2Y12@500	(0.45)				

Tel. 644088, 612377 Fax.. 612380 P.O.Box 830746 Amman Jordan

Bottom slab designed by elastic method.

Data: (program prep. by Eng hassan Anas Al-khamrah)
length= 6.5 m (Shorter side of panel)
Width= 6.5 m (Longer side of panel)
fcu= 25
fy = 414 fyv= 414 MPa
a = 0.9 m
b = 0.9 m
Slab th= 75 mm
WEIGHT OF FINISH= 2.8 KN/m2
Live load/m2= 2 KN/m2
spacing of ribs= 0.9 m
number of beams in (x-direction)= 7 Ribs
number of beams in (y-direction)= 7 (span/depth=20)= 325
depth of ribs based on (span/depth=20)= 500 mm
width of 210 mm
Loads:
weight of slab= 1.8 KN/m2
TOTAL LOAD OF SLAB 76.05 KN
WEIGHT OF RIBS= 2.142 KN/m
Total weight of beams in (X-directio 97.461 KN
Total weight of beams in (y-direction)= 97.461 KN
Total weight of floor finish= 118.3 KN
Total live load = 84.5 KN
Total dead and live loads on grid floor
= 473.772 KN
Load per m2=q= 11.21353 KN/m2
Moments:
q1= 5.61 KN/m2
q2= 5.61 KN/m2
Moments in x-and y direction at center of grid for meters 0.9 meters 0.9
MX= 26.64967 KN-M
MY= 26.64967 KN-M
QX= 16.40 KN
QY= 16.40 KN



Rigorous Method(plate theory)
(Df/D)= 0.15
(bw/bf)= 0.233333
be1 = 1625 mm
be2 = 1410 mm
be3 = 900 mm
be = 900 mm
k1 = 1.49
k2 = 3.05
k = 2.05
I = 4.5E+09
E = 2.9E+07
BEATA= 0.2482
CALCULATE C1&7C2
C1 = 1.42E+16
C2 = 1.4E+16
C1/B1 = 1.6E+16
C2/a1 = 1.6E+16
Deflections @ Center of Span
(Dx/ax4)= 79.38
(Dy/ay4)= 79.38

(2H/ax2by)= 17.7282

The deflection @ center of the plate is given by:

a = 0.001057 m

ASSUMING A CREEP COEFFICIENT =2

Ecc = (Ec/(1+coeff.)

Long term deflection= 0.003172 m

Span/250= 0.026 m Deflection is Ok

Design Moments & Shears

				point	x(m)	y(m)	Qx(kn)	Qy(kn)
Dx	=	141696.7						
Mx	=	34.96587	(Kn.m)	D	0	6.5	0	0
My	=	34.96587	(Kn.m)	K	0	4.8	13.77	0
Qx1	=	0.001057		I	0.9	3.25	12.13	0
Qx2	=	15998.14		J	1.8	3.25	0	0
Qx3	=	1786.478		F	3.25	4.875	0	11.96
Qx	=	18.81	kn					
Qy	=	16.92	kn					

calculate steel for the middle rib

Moment resisted by central rib in x-direction over 0.9 m width

Ultimate moment= 47.20392 KN.m

Moment capacity of flange section

Muf = 254.2387 Kn.m

As = 294.7899 mm2 Try Fie= 16 use 2 Bars

Moment resisted by central rib in y direction over 0.9 m width

Ultimate moment= 47.20392 kn.m

As = 295.8377 mm2 Try Fie= 16 use 2 Bars

Mx(Rigorous analysis(plate theory)
---------------------------------- = 1.18
Approximate method(grashoff theory)

Calculate Torsional moment @ corners

X=0 AND Y=(1/4)x(WIDTH)

Mxy @ 4.875 meters= -3.91 Kn.m

X=0 AND Y=((WIDTH)

Mxy @ 6.5 meters= -3.91 Kn.m

Calculate Torsional moment @ corners

X=0 AND Y=(3/4)*WIDTH

Myx @ 4.875 meters= -2.76 Kn.m

X=0 AND Y=((WIDTH)

Myx @ 6.5 meters= -3.91 Kn.m

----------------Check Shear ------------------------

Vu	=	24.60	Kn	
t	=	3.06	Kg/cm2	Actual shear stress
tuc	=	8.38	Kg/cm2	Allowable shear stress

provide nominal shear reinforcement

tus = provide n Kg/cm2

Introduce the required diameter of stirrups= 10 mm

Introduce the number of stirrup legs required 2 legs

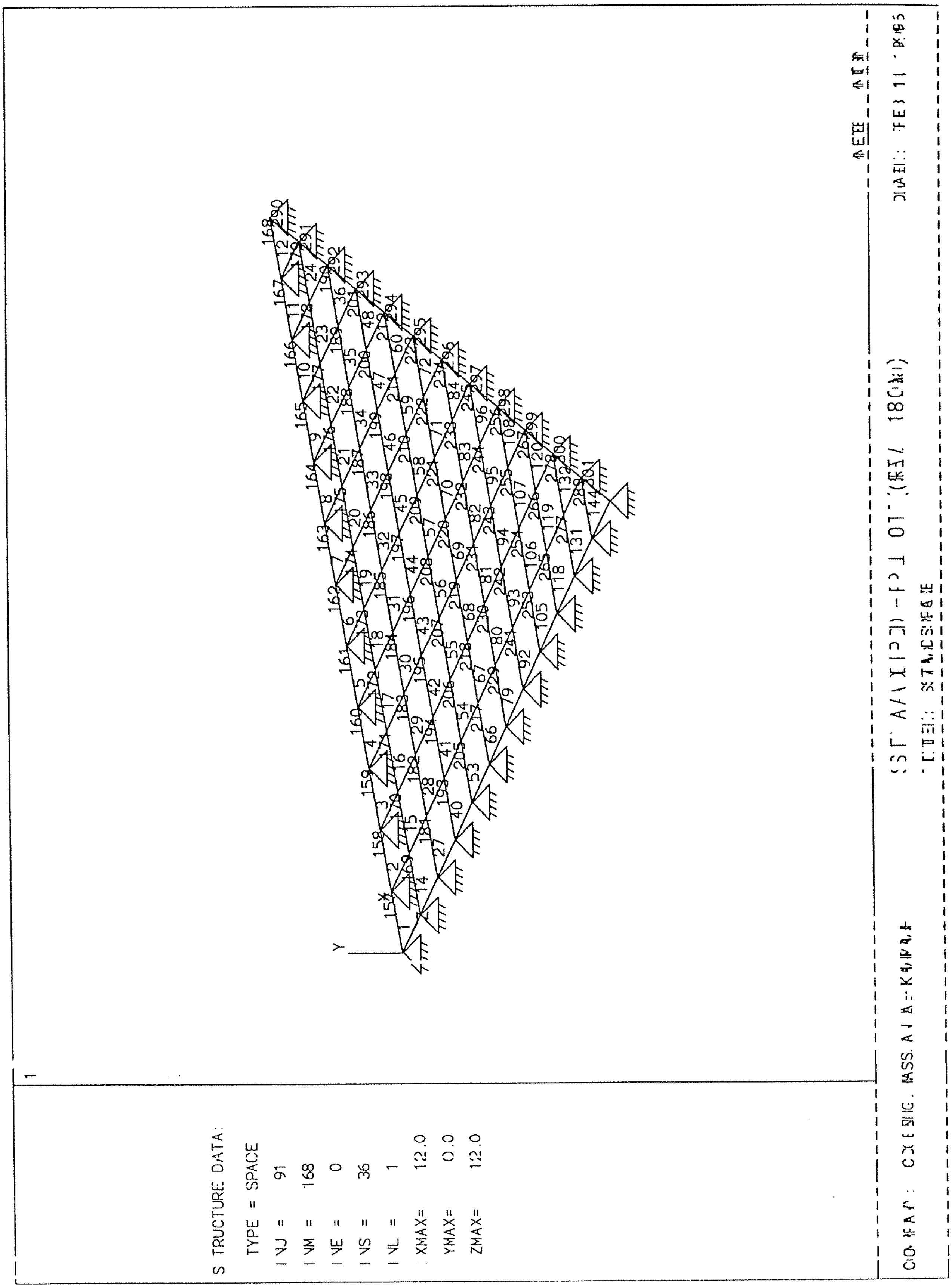
S	=	ERR	cm	(Ast.fy/tus.b)
Smax	=	22.5	cm	(d/2)
Smax	=	88.48	cm	(Ast.fyv/3.5.b)
Smax	=	ERR	cm	(The required spacing)

Combined design for shear & torsion

```
=====================================
 fc'  =        200 Kg/cm2
ttu  =3Mu/(.85.y.x2)=            8.45  Kg/cm2
concrete capacity for Torsion=.4*(fc')^.5
CCAP =        5.6569  Kg/cm2
Design section for Torsion
```

```
ttu  =       45.25  Kg/cm2
Section Satisfactory
shear stress taken by conc.        =     9.05 Kg/cm2
the actual shear stress on section =     2.31 Kg/cm2    (NOTE: SEE SHEAR S
shear stress to br res. by steel=       15.45 Kg/cm2
Mtc  =   0.508913 t-m
Fie of stirrup=          10 No. of stirrup legs=             2
alfat=   1.588125
alfat=        1.5
s    =      30.92       cm
Spacing of stirrups=          30.92 cm
Min Ast/S =         0.017753
Ast1/S=     0.0254
OK
S1MAX=          30 CM
S2MAX=       15.25 CM
S(FINAL)=    15.25 CM
Design for longitudinal steel
-----------------------------
Al=2At(x1+y1)/s=       5.25 cm2
Min Al=(28bws/fy-2Ast)(x1+y1)/S=        1.99 cm2
Min Al=(28bws/fy-3.5bws/fy)=           13.78 cm2
Min AL1=      5.25
Min AL=       5.25 cm2
For longitudinal  Reinforcement use AL=          5.25 cm2
```

Computer grid analysis for Bottom Slab

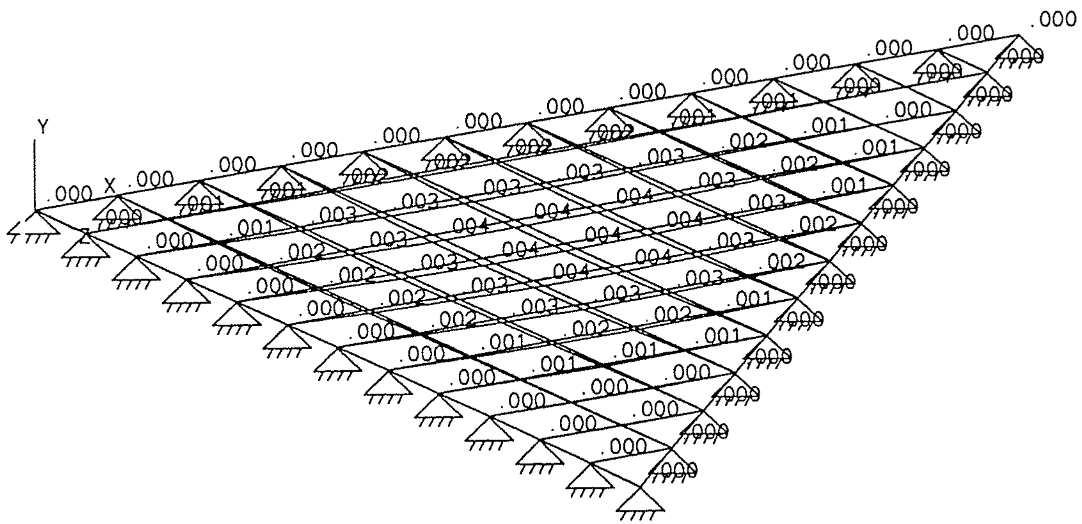


S TRUCTURE DATA:

TYPE = SPACE
NJ = 91
NM = 168
NE = 0
NS = 36
NL = 1
XMAX= 12.0
YMAX= 0.0
ZMAX= 12.0

1

DFDR LOAD= 1



COMPANY: C.C. ENG. ... | DATE: FEB 11 1995

```
 **************************************************
 *                                                *
 *           S T A A D - III                      *
 *           Revision 17.0                        *
 *           Proprietary Program of               *
 *           RESEARCH ENGINEERS, Inc.             *
 *           Date=     FEB 11, 1996               *
 *           Time=      3: 7:48                   *
 *                                                *
 **************************************************

     1. STAAD SPACE
     2. INPUT WIDTH 79
     3. UNIT METER MTON
     4. JOINT COORDINATES
     5.        1          0.000        0.000        0.000
     6.        2          1.000        0.000        0.000
     7.        3          2.000        0.000        0.000
     8.        4          3.000        0.000        0.000
     9.        5          4.000        0.000        0.000
    10.        6          5.000        0.000        0.000
    11.        7          6.000        0.000        0.000
    12.        8          7.000        0.000        0.000
    13.        9          8.000        0.000        0.000
    14.       10          9.000        0.000        0.000
    15.       11         10.000        0.000        0.000
    16.       12         11.000        0.000        0.000
    17.       13         12.000        0.000        0.000
    18.       14          0.000        0.000        1.000
    19.       15          1.000        0.000        1.000
    20.       16          2.000        0.000        1.000
    21.       17          3.000        0.000        1.000
    22.       18          4.000        0.000        1.000
    23.       19          5.000        0.000        1.000
    24.       20          6.000        0.000        1.000
    25.       21          7.000        0.000        1.000
    26.       22          8.000        0.000        1.000
    27.       23          9.000        0.000        1.000
    28.       24         10.000        0.000        1.000
    29.       25         11.000        0.000        1.000
    30.       27          0.000        0.000        2.000
    31.       28          1.000        0.000        2.000
    32.       29          2.000        0.000        2.000
    33.       30          3.000        0.000        2.000
    34.       31          4.000        0.000        2.000
    35.       32          5.000        0.000        2.000
    36.       33          6.000        0.000        2.000
    37.       34          7.000        0.000        2.000
    38.       35          8.000        0.000        2.000
    39.       36          9.000        0.000        2.000
    40.       37         10.000        0.000        2.000
    41.       40          0.000        0.000        3.000
    42.       41          1.000        0.000        3.000
    43.       42          2.000        0.000        3.000
    44.       43          3.000        0.000        3.000
    45.       44          4.000        0.000        3.000
```

```
      47         7.000         0.000         3.000
      48         8.000         0.000         3.000
      49         9.000         0.000         3.000
      53         0.000         0.000         4.000
      54         1.000         0.000         4.000
      55         2.000         0.000         4.000
      56         3.000         0.000         4.000
      57         4.000         0.000         4.000
      58         5.000         0.000         4.000
      59         6.000         0.000         4.000
      60         7.000         0.000         4.000
      61         8.000         0.000         4.000
      66         0.000         0.000         5.000
      67         1.000         0.000         5.000
      68         2.000         0.000         5.000
      69         3.000         0.000         5.000
      70         4.000         0.000         5.000
      71         5.000         0.000         5.000
      72         6.000         0.000         5.000
      73         7.000         0.000         5.000
      79         0.000         0.000         6.000
      80         1.000         0.000         6.000
      81         2.000         0.000         6.000
      82         3.000         0.000         6.000
      83         4.000         0.000         6.000
      84         5.000         0.000         6.000
      85         6.000         0.000         6.000
      92         0.000         0.000         7.000
      93         1.000         0.000         7.000
      94         2.000         0.000         7.000
      95         3.000         0.000         7.000
      96         4.000         0.000         7.000
      97         5.000         0.000         7.000
     105         0.000         0.000         8.000
     106         1.000         0.000         8.000
     107         2.000         0.000         8.000
     108         3.000         0.000         8.000
     109         4.000         0.000         8.000
     118         0.000         0.000         9.000
     119         1.000         0.000         9.000
     120         2.000         0.000         9.000
     121         3.000         0.000         9.000
     131         0.000         0.000        10.000
     132         1.000         0.000        10.000
     133         2.000         0.000        10.000
     144         0.000         0.000        11.000
     145         1.000         0.000        11.000
     157         0.000         0.000        12.000
 MEMBER INCIDENCES
       1       1    14
       2       2    15
       3       3    16
       4       4    17
       5       5    18
       6       6    19
       7       7    20
       8       8    21
       9       9    22
```

108.	12	12	25
109.	14	14	27
110.	15	15	28
111.	16	16	29
112.	17	17	30
113.	18	18	31
114.	19	19	32
115.	20	20	33
116.	21	21	34
117.	22	22	35
118.	23	23	36
119.	24	24	37
120.	27	27	40
121.	28	28	41
122.	29	29	42
123.	30	30	43
124.	31	31	44
125.	32	32	45
126.	33	33	46
127.	34	34	47
128.	35	35	48
129.	36	36	49
130.	40	40	53
131.	41	41	54
132.	42	42	55
133.	43	43	56
134.	44	44	57
135.	45	45	58
136.	46	46	59
137.	47	47	60
138.	48	48	61
139.	53	53	66
140.	54	54	67
141.	55	55	68
142.	56	56	69
143.	57	57	70
144.	58	58	71
145.	59	59	72
146.	60	60	73
147.	66	66	79
148.	67	67	80
149.	68	68	81
150.	69	69	82
151.	70	70	83
152.	71	71	84
153.	72	72	85
154.	79	79	92
155.	80	80	93
156.	81	81	94
157.	82	82	95
158.	83	83	96
159.	84	84	97
160.	92	92	105
161.	93	93	106
162.	94	94	107
163.	95	95	108
164.	96	96	109
165.	105	105	118

168.	108	108	121
169.	118	118	131
170.	119	119	132
171.	120	120	133
172.	131	131	144
173.	132	132	145
174.	144	144	157
175.	157	1	2
176.	158	2	3
177.	159	3	4
178.	160	4	5
179.	161	5	6
180.	162	6	7
181.	163	7	8
182.	164	8	9
183.	165	9	10
184.	166	10	11
185.	167	11	12
186.	168	12	13
187.	169	14	15
188.	170	15	16
189.	171	16	17
190.	172	17	18
191.	173	18	19
192.	174	19	20
193.	175	20	21
194.	176	21	22
195.	177	22	23
196.	178	23	24
197.	179	24	25
198.	181	27	28
199.	182	28	29
200.	183	29	30
201.	184	30	31
202.	185	31	32
203.	186	32	33
204.	187	33	34
205.	188	34	35
206.	189	35	36
207.	190	36	37
208.	193	40	41
209.	194	41	42
210.	195	42	43
211.	196	43	44
212.	197	44	45
213.	198	45	46
214.	199	46	47
215.	200	47	48
216.	201	48	49
217.	205	53	54
218.	206	54	55
219.	207	55	56
220.	208	56	57
221.	209	57	58
222.	210	58	59
223.	211	59	60
224.	212	60	61
225.	217	66	67

```
     220    69    70
     221    70    71
     222    71    72
     223    72    73
     229    79    80
     230    80    81
     231    81    82
     232    82    83
     233    83    84
     234    84    85
     241    92    93
     242    93    94
     243    94    95
     244    95    96
     245    96    97
     253   105   106
     254   106   107
     255   107   108
     256   108   109
     265   118   119
     266   119   120
     267   120   121
     277   131   132
     278   132   133
     289   144   145
     290    13    25
     291    25    37
     292    37    49
     293    49    61
     294    61    73
     295    73    85
     296    85    97
     297    97   109
     298   109   121
     299   121   133
     300   133   145
     301   145   157
MEMBER PROPERTY AMERICAN
1 TO 12 14 TO 24 27 TO 36 40 TO 48 53 TO 60 66 TO 72 79 TO 84 92 TO 96
105 TO 108 118 TO 120 131 132 144 157 TO 179 181 TO 190 193 TO 201 -
205 TO 212 217 TO 223 229 TO 234 241 TO 245 253 TO 256 265 TO 267 277 2
289 TO 301 PRISMATIC YD 0.5 ZD 0.9 YB 0.425 ZB 0.217
CONSTANTS
E CONCRETE ALL
SUPPORTS
1 TO 14 25 27 37 40 49 53 61 66 73 79 85 92 97 105 109 118 121 131 133
145 157 PINNED
LOAD 1
MEMBER LOAD
1 TO 12 14 TO 24 27 TO 36 40 TO 48 53 TO 60 66 TO 72 79 TO 84 92 TO 96
105 TO 108 118 TO 120 131 132 144 157 TO 179 181 TO 190 193 TO 201 -
205 TO 212 217 TO 223 229 TO 234 241 TO 245 253 TO 256 265 TO 267 277 2
289 TO 301 UNI GY -0.5064
PERFORM ANALYSIS
```

P R O B L E M   S T A T I S T I C S

```
NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS =     91/  168/    36
ORIGINAL/FINAL BAND-WIDTH =    13/    10
TOTAL PRIMARY LOAD CASES  =     1, TOTAL DEGREES OF FREEDOM =     438
SIZE OF STIFFNESS MATRIX =    26280 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE =    12.72 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.          3: 7:48
++ PROCESSING GLOBAL STIFFNESS MATRIX.           3: 7:48
++ PROCESSING TRIANGULAR FACTORIZATION.          3: 7:48
++ CALCULATING JOINT DISPLACEMENTS.              3: 7:49
++ CALCULATING MEMBER  FORCES.                   3: 7:49

282. PRINT ANALYSIS RESULTS
```

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	1	0.00000	0.00000	0.00000	0.00002	0.00000	-0.00002
2	1	0.00000	0.00000	0.00000	0.00040	0.00000	-0.00001
3	1	0.00000	0.00000	0.00000	0.00072	0.00000	-0.00001
4	1	0.00000	0.00000	0.00000	0.00092	0.00000	0.00000
5	1	0.00000	0.00000	0.00000	0.00099	0.00000	0.00000
6	1	0.00000	0.00000	0.00000	0.00095	0.00000	0.00000
7	1	0.00000	0.00000	0.00000	0.00083	0.00000	0.00000
8	1	0.00000	0.00000	0.00000	0.00064	0.00000	0.00000
9	1	0.00000	0.00000	0.00000	0.00043	0.00000	0.00000
10	1	0.00000	0.00000	0.00000	0.00024	0.00000	0.00000
11	1	0.00000	0.00000	0.00000	0.00009	0.00000	0.00000
12	1	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
13	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	1	0.00000	0.00000	0.00000	0.00001	0.00000	-0.00040
15	1	0.00000	-0.03970	0.00000	0.00036	0.00000	-0.00036
16	1	0.00000	-0.07101	0.00000	0.00065	0.00000	-0.00025
17	1	0.00000	-0.09047	0.00000	0.00082	0.00000	-0.00013
18	1	0.00000	-0.09752	0.00000	0.00088	0.00000	-0.00001
19	1	0.00000	-0.09335	0.00000	0.00083	0.00000	0.00009
20	1	0.00000	-0.08034	0.00000	0.00070	0.00000	0.00016
21	1	0.00000	-0.06166	0.00000	0.00052	0.00000	0.00020
22	1	0.00000	-0.04090	0.00000	0.00032	0.00000	0.00020
23	1	0.00000	-0.02169	0.00000	0.00013	0.00000	0.00017
24	1	0.00000	-0.00723	0.00000	0.00001	0.00000	0.00011
25	1	0.00000	0.00000	0.00000	-0.00003	0.00000	0.00005
27	1	0.00000	0.00000	0.00000	0.00001	0.00000	-0.00072
28	1	0.00000	-0.07101	0.00000	0.00025	0.00000	-0.00065
29	1	0.00000	-0.12753	0.00000	0.00046	0.00000	-0.00046
30	1	0.00000	-0.16226	0.00000	0.00058	0.00000	-0.00023
31	1	0.00000	-0.17358	0.00000	0.00060	0.00000	0.00000
32	1	0.00000	-0.16359	0.00000	0.00053	0.00000	0.00019
33	1	0.00000	-0.13691	0.00000	0.00039	0.00000	0.00033
34	1	0.00000	-0.09987	0.00000	0.00021	0.00000	0.00039
35	1	0.00000	-0.05977	0.00000	0.00003	0.00000	0.00038
36	1	0.00000	-0.02412	0.00000	-0.00011	0.00000	0.00030
37	1	0.00000	0.00000	0.00000	-0.00014	0.00000	0.00018
40	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00092
41	1	0.00000	-0.09047	0.00000	0.00013	0.00000	-0.00082
42	1	0.00000	-0.16226	0.00000	0.00023	0.00000	-0.00058
43	1	0.00000	-0.20496	0.00000	0.00027	0.00000	-0.00027
44	1	0.00000	-0.21569	0.00000	0.00023	0.00000	0.00004
45	1	0.00000	-0.19714	0.00000	0.00013	0.00000	0.00031
46	1	0.00000	-0.15603	0.00000	-0.00001	0.00000	0.00049
47	1	0.00000	-0.10186	0.00000	-0.00017	0.00000	0.00056
48	1	0.00000	-0.04588	0.00000	-0.00031	0.00000	0.00052
49	1	0.00000	0.00000	0.00000	-0.00033	0.00000	0.00039
53	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00099
54	1	0.00000	-0.09752	0.00000	0.00001	0.00000	-0.00088

JOINT DISPLACEMENT (CM RADIANS) STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
55	1	0.00000	-0.17358	0.00000	0.00000	0.00000	-0.00060
56	1	0.00000	-0.21569	0.00000	-0.00004	0.00000	-0.00023
57	1	0.00000	-0.22006	0.00000	-0.00014	0.00000	0.00014
58	1	0.00000	-0.19001	0.00000	-0.00026	0.00000	0.00044
59	1	0.00000	-0.13432	0.00000	-0.00040	0.00000	0.00063
60	1	0.00000	-0.06584	0.00000	-0.00052	0.00000	0.00068
61	1	0.00000	0.00000	0.00000	-0.00055	0.00000	0.00060
66	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00095
67	1	0.00000	-0.09335	0.00000	-0.00009	0.00000	-0.00083
68	1	0.00000	-0.16359	0.00000	-0.00019	0.00000	-0.00053
69	1	0.00000	-0.19714	0.00000	-0.00031	0.00000	-0.00013
70	1	0.00000	-0.19001	0.00000	-0.00044	0.00000	0.00026
71	1	0.00000	-0.14649	0.00000	-0.00057	0.00000	0.00057
72	1	0.00000	-0.07774	0.00000	-0.00069	0.00000	0.00075
73	1	0.00000	0.00000	0.00000	-0.00072	0.00000	0.00075
79	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00083
80	1	0.00000	-0.08034	0.00000	-0.00016	0.00000	-0.00070
81	1	0.00000	-0.13691	0.00000	-0.00033	0.00000	-0.00039
82	1	0.00000	-0.15603	0.00000	-0.00049	0.00000	0.00001
83	1	0.00000	-0.13432	0.00000	-0.00063	0.00000	0.00040
84	1	0.00000	-0.07774	0.00000	-0.00075	0.00000	0.00069
85	1	0.00000	0.00000	0.00000	-0.00079	0.00000	0.00079
92	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00064
93	1	0.00000	-0.06166	0.00000	-0.00020	0.00000	-0.00052
94	1	0.00000	-0.09987	0.00000	-0.00039	0.00000	-0.00021
95	1	0.00000	-0.10186	0.00000	-0.00056	0.00000	0.00017
96	1	0.00000	-0.06584	0.00000	-0.00068	0.00000	0.00052
97	1	0.00000	0.00000	0.00000	-0.00075	0.00000	0.00072
105	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00043
106	1	0.00000	-0.04090	0.00000	-0.00020	0.00000	-0.00032
107	1	0.00000	-0.05977	0.00000	-0.00038	0.00000	-0.00003
108	1	0.00000	-0.04588	0.00000	-0.00052	0.00000	0.00031
109	1	0.00000	0.00000	0.00000	-0.00060	0.00000	0.00055
118	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00024
119	1	0.00000	-0.02169	0.00000	-0.00017	0.00000	-0.00013
120	1	0.00000	-0.02412	0.00000	-0.00030	0.00000	0.00011
121	1	0.00000	0.00000	0.00000	-0.00039	0.00000	0.00033
131	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00009
132	1	0.00000	-0.00723	0.00000	-0.00011	0.00000	-0.00001
133	1	0.00000	0.00000	0.00000	-0.00018	0.00000	0.00014
144	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
145	1	0.00000	0.00000	0.00000	-0.00005	0.00000	0.00003
157	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

SUPPORT REACTIONS -UNIT MTON METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	-1.03	0.00	0.00	0.00	0.00
2	1	0.00	2.04	0.00	0.00	0.00	0.00
3	1	0.00	2.34	0.00	0.00	0.00	0.00
4	1	0.00	2.77	0.00	0.00	0.00	0.00
5	1	0.00	2.97	0.00	0.00	0.00	0.00
6	1	0.00	3.05	0.00	0.00	0.00	0.00
7	1	0.00	3.01	0.00	0.00	0.00	0.00
8	1	0.00	2.88	0.00	0.00	0.00	0.00
9	1	0.00	2.65	0.00	0.00	0.00	0.00
10	1	0.00	2.31	0.00	0.00	0.00	0.00
11	1	0.00	1.88	0.00	0.00	0.00	0.00
12	1	0.00	1.22	0.00	0.00	0.00	0.00
13	1	0.00	0.28	0.00	0.00	0.00	0.00
14	1	0.00	2.04	0.00	0.00	0.00	0.00
25	1	0.00	0.01	0.00	0.00	0.00	0.00
27	1	0.00	2.34	0.00	0.00	0.00	0.00
37	1	0.00	1.11	0.00	0.00	0.00	0.00
40	1	0.00	2.77	0.00	0.00	0.00	0.00
49	1	0.00	2.77	0.00	0.00	0.00	0.00
53	1	0.00	2.97	0.00	0.00	0.00	0.00
61	1	0.00	4.40	0.00	0.00	0.00	0.00
66	1	0.00	3.05	0.00	0.00	0.00	0.00
73	1	0.00	5.61	0.00	0.00	0.00	0.00
79	1	0.00	3.01	0.00	0.00	0.00	0.00
85	1	0.00	6.07	0.00	0.00	0.00	0.00
92	1	0.00	2.88	0.00	0.00	0.00	0.00
97	1	0.00	5.61	0.00	0.00	0.00	0.00
105	1	0.00	2.65	0.00	0.00	0.00	0.00
109	1	0.00	4.40	0.00	0.00	0.00	0.00
118	1	0.00	2.31	0.00	0.00	0.00	0.00
121	1	0.00	2.77	0.00	0.00	0.00	0.00
131	1	0.00	1.88	0.00	0.00	0.00	0.00
133	1	0.00	1.11	0.00	0.00	0.00	0.00
144	1	0.00	1.22	0.00	0.00	0.00	0.00
145	1	0.00	0.01	0.00	0.00	0.00	0.00
157	1	0.00	0.28	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	0.00	-0.52	0.00	0.47	0.00	-0.47
		14	0.00	1.02	0.00	-0.47	0.00	-0.30
2	1	2	0.00	1.10	0.00	0.43	0.00	0.08
		15	0.00	-0.59	0.00	-0.43	0.00	0.76
3	1	3	0.00	1.73	0.00	0.30	0.00	0.14
		16	0.00	-1.23	0.00	-0.30	0.00	1.33
4	1	4	0.00	2.11	0.00	0.16	0.00	0.15
		17	0.00	-1.61	0.00	-0.16	0.00	1.71
5	1	5	0.00	2.33	0.00	0.01	0.00	0.14
		18	0.00	-1.83	0.00	-0.01	0.00	1.94
6	1	6	0.00	2.43	0.00	-0.11	0.00	0.11
		19	0.00	-1.93	0.00	0.11	0.00	2.07
7	1	7	0.00	2.44	0.00	-0.19	0.00	0.07
		20	0.00	-1.93	0.00	0.19	0.00	2.11
8	1	8	0.00	2.35	0.00	-0.24	0.00	0.03
		21	0.00	-1.84	0.00	0.24	0.00	2.07
9	1	9	0.00	2.16	0.00	-0.24	0.00	-0.02
		22	0.00	-1.65	0.00	0.24	0.00	1.93
10	1	10	0.00	1.86	0.00	-0.20	0.00	-0.06
		23	0.00	-1.36	0.00	0.20	0.00	1.67
11	1	11	0.00	1.46	0.00	-0.13	0.00	-0.08
		24	0.00	-0.95	0.00	0.13	0.00	1.29
12	1	12	0.00	0.69	0.00	-0.06	0.00	-0.08
		25	0.00	-0.18	0.00	0.06	0.00	0.51
14	1	14	0.00	-0.08	0.00	0.39	0.00	-0.13
		27	0.00	0.59	0.00	-0.39	0.00	-0.20
15	1	15	0.00	0.59	0.00	0.35	0.00	-0.68
		28	0.00	-0.09	0.00	-0.35	0.00	1.02
16	1	16	0.00	0.97	0.00	0.25	0.00	-1.20
		29	0.00	-0.47	0.00	-0.25	0.00	1.92
17	1	17	0.00	1.26	0.00	0.12	0.00	-1.56
		30	0.00	-0.75	0.00	-0.12	0.00	2.57

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
18	1	18	0.00	1.43	0.00	-0.01	0.00	-1.81
		31	0.00	-0.92	0.00	0.01	0.00	2.99
19	1	19	0.00	1.50	0.00	-0.12	0.00	-1.97
		32	0.00	-0.99	0.00	0.12	0.00	3.21
20	1	20	0.00	1.47	0.00	-0.20	0.00	-2.05
		33	0.00	-0.96	0.00	0.20	0.00	3.27
21	1	21	0.00	1.35	0.00	-0.23	0.00	-2.05
		34	0.00	-0.84	0.00	0.23	0.00	3.14
22	1	22	0.00	1.13	0.00	-0.22	0.00	-1.95
		35	0.00	-0.62	0.00	0.22	0.00	2.82
23	1	23	0.00	0.85	0.00	-0.16	0.00	-1.73
		36	0.00	-0.34	0.00	0.16	0.00	2.33
24	1	24	0.00	-0.10	0.00	-0.09	0.00	-1.40
		37	0.00	0.60	0.00	0.09	0.00	1.05
27	1	27	0.00	0.02	0.00	0.24	0.00	-0.10
		40	0.00	0.49	0.00	-0.24	0.00	-0.14
28	1	28	0.00	0.34	0.00	0.22	0.00	-0.97
		41	0.00	0.17	0.00	-0.22	0.00	1.05
29	1	29	0.00	0.47	0.00	0.14	0.00	-1.81
		42	0.00	0.04	0.00	-0.14	0.00	2.03
30	1	30	0.00	0.59	0.00	0.05	0.00	-2.45
		43	0.00	-0.08	0.00	-0.05	0.00	2.78
31	1	31	0.00	0.66	0.00	-0.06	0.00	-2.88
		44	0.00	-0.15	0.00	0.06	0.00	3.28
32	1	32	0.00	0.65	0.00	-0.14	0.00	-3.13
		45	0.00	-0.15	0.00	0.14	0.00	3.53
33	1	33	0.00	0.57	0.00	-0.20	0.00	-3.22
		46	0.00	-0.06	0.00	0.20	0.00	3.53
34	1	34	0.00	0.38	0.00	-0.21	0.00	-3.14
		47	0.00	0.13	0.00	0.21	0.00	3.27
35	1	35	0.00	0.17	0.00	-0.16	0.00	-2.87
		48	0.00	0.33	0.00	0.16	0.00	2.79
36	1	36	0.00	-0.93	0.00	-0.10	0.00	-2.46

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
40	1	40	0.00	0.17	0.00	0.09	0.00	-0.02
		53	0.00	0.34	0.00	-0.09	0.00	-0.06
41	1	41	0.00	0.18	0.00	0.07	0.00	-1.01
		54	0.00	0.33	0.00	-0.07	0.00	0.94
42	1	42	0.00	0.12	0.00	0.02	0.00	-1.95
		55	0.00	0.38	0.00	-0.02	0.00	1.82
43	1	43	0.00	0.08	0.00	-0.04	0.00	-2.69
		56	0.00	0.43	0.00	0.04	0.00	2.52
44	1	44	0.00	0.02	0.00	-0.11	0.00	-3.20
		57	0.00	0.49	0.00	0.11	0.00	2.97
45	1	45	0.00	-0.09	0.00	-0.16	0.00	-3.47
		58	0.00	0.59	0.00	0.16	0.00	3.13
46	1	46	0.00	-0.27	0.00	-0.18	0.00	-3.52
		59	0.00	0.78	0.00	0.18	0.00	2.99
47	1	47	0.00	-0.47	0.00	-0.15	0.00	-3.30
		60	0.00	0.97	0.00	0.15	0.00	2.58
48	1	48	0.00	-1.56	0.00	-0.10	0.00	-2.92
		61	0.00	2.06	0.00	0.10	0.00	1.11
53	1	53	0.00	0.30	0.00	-0.05	0.00	0.05
		66	0.00	0.20	0.00	0.05	0.00	0.00
54	1	54	0.00	0.07	0.00	-0.06	0.00	-0.91
		67	0.00	0.44	0.00	0.06	0.00	0.73
55	1	55	0.00	-0.12	0.00	-0.09	0.00	-1.78
		68	0.00	0.62	0.00	0.09	0.00	1.41
56	1	56	0.00	-0.29	0.00	-0.12	0.00	-2.47
		69	0.00	0.80	0.00	0.12	0.00	1.92
57	1	57	0.00	-0.49	0.00	-0.15	0.00	-2.92
		70	0.00	0.99	0.00	0.15	0.00	2.19
58	1	58	0.00	-0.72	0.00	-0.17	0.00	-3.12
		71	0.00	1.22	0.00	0.17	0.00	2.15
59	1	59	0.00	-0.97	0.00	-0.14	0.00	-3.01
		72	0.00	1.47	0.00	0.14	0.00	1.79
60	1	60	0.00	-1.87	0.00	-0.08	0.00	-2.70

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
66	1	66	0.00	0.41	0.00	-0.16	0.00	0.11
		79	0.00	0.10	0.00	0.16	0.00	0.05
67	1	67	0.00	-0.01	0.00	-0.16	0.00	-0.71
		80	0.00	0.52	0.00	0.16	0.00	0.45
68	1	68	0.00	-0.28	0.00	-0.17	0.00	-1.39
		81	0.00	0.79	0.00	0.17	0.00	0.85
69	1	69	0.00	-0.57	0.00	-0.18	0.00	-1.90
		82	0.00	1.07	0.00	0.18	0.00	1.08
70	1	70	0.00	-0.87	0.00	-0.17	0.00	-2.18
		83	0.00	1.38	0.00	0.17	0.00	1.06
71	1	71	0.00	-1.22	0.00	-0.14	0.00	-2.18
		84	0.00	1.73	0.00	0.14	0.00	0.70
72	1	72	0.00	-1.80	0.00	-0.06	0.00	-1.89
		85	0.00	2.31	0.00	0.06	0.00	-0.16
79	1	79	0.00	0.47	0.00	-0.23	0.00	0.15
		92	0.00	0.03	0.00	0.23	0.00	0.08
80	1	80	0.00	-0.06	0.00	-0.23	0.00	-0.44
		93	0.00	0.56	0.00	0.23	0.00	0.13
81	1	81	0.00	-0.39	0.00	-0.22	0.00	-0.85
		94	0.00	0.90	0.00	0.22	0.00	0.21
82	1	82	0.00	-0.74	0.00	-0.19	0.00	-1.10
		95	0.00	1.25	0.00	0.19	0.00	0.10
83	1	83	0.00	-1.19	0.00	-0.15	0.00	-1.10
		96	0.00	1.69	0.00	0.15	0.00	-0.34
84	1	84	0.00	-1.40	0.00	-0.04	0.00	-0.78
		97	0.00	1.91	0.00	0.04	0.00	-0.87
92	1	92	0.00	0.50	0.00	-0.25	0.00	0.16
		105	0.00	0.01	0.00	0.25	0.00	0.08
93	1	93	0.00	-0.07	0.00	-0.25	0.00	-0.14
		106	0.00	0.58	0.00	0.25	0.00	-0.19
94	1	94	0.00	-0.43	0.00	-0.22	0.00	-0.24
		107	0.00	0.94	0.00	0.22	0.00	-0.45
95	1	95	0.00	-0.91	0.00	-0.16	0.00	-0.16

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
96	1	96	0.00	-0.80	0.00	-0.03	0.00	0.27
		109	0.00	1.31	0.00	0.03	0.00	-1.32
105	1	105	0.00	0.48	0.00	-0.24	0.00	0.16
		118	0.00	0.03	0.00	0.24	0.00	0.07
106	1	106	0.00	-0.05	0.00	-0.22	0.00	0.17
		119	0.00	0.56	0.00	0.22	0.00	-0.47
107	1	107	0.00	-0.49	0.00	-0.17	0.00	0.39
		120	0.00	1.00	0.00	0.17	0.00	-1.13
108	1	108	0.00	-0.19	0.00	-0.03	0.00	0.94
		121	0.00	0.70	0.00	0.03	0.00	-1.39
118	1	118	0.00	0.42	0.00	-0.18	0.00	0.14
		131	0.00	0.08	0.00	0.18	0.00	0.03
119	1	119	0.00	-0.05	0.00	-0.16	0.00	0.43
		132	0.00	0.56	0.00	0.16	0.00	-0.73
120	1	120	0.00	0.27	0.00	-0.04	0.00	1.07
		133	0.00	0.23	0.00	0.04	0.00	-1.05
131	1	131	0.00	0.33	0.00	-0.10	0.00	0.10
		144	0.00	0.17	0.00	0.10	0.00	-0.02
132	1	132	0.00	0.49	0.00	-0.04	0.00	0.69
		145	0.00	0.01	0.00	0.04	0.00	-0.45
144	1	144	0.00	0.36	0.00	-0.02	0.00	0.07
		157	0.00	0.14	0.00	0.02	0.00	0.04
157	1	1	0.00	-0.52	0.00	-0.47	0.00	-0.47
		2	0.00	1.02	0.00	0.47	0.00	-0.30
158	1	2	0.00	-0.08	0.00	-0.39	0.00	-0.13
		3	0.00	0.59	0.00	0.39	0.00	-0.20
159	1	3	0.00	0.02	0.00	-0.24	0.00	-0.10
		4	0.00	0.49	0.00	0.24	0.00	-0.14
160	1	4	0.00	0.17	0.00	-0.09	0.00	-0.02
		5	0.00	0.34	0.00	0.09	0.00	-0.06
161	1	5	0.00	0.30	0.00	0.05	0.00	0.05
		6	0.00	0.20	0.00	-0.05	0.00	0.00
162	1	6	0.00	0.41	0.00	0.16	0.00	0.11

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
163	1	7	0.00	0.47	0.00	0.23	0.00	0.15
		8	0.00	0.03	0.00	-0.23	0.00	0.08
164	1	8	0.00	0.50	0.00	0.25	0.00	0.16
		9	0.00	0.01	0.00	-0.25	0.00	0.08
165	1	9	0.00	0.48	0.00	0.24	0.00	0.16
		10	0.00	0.03	0.00	-0.24	0.00	0.07
166	1	10	0.00	0.42	0.00	0.18	0.00	0.14
		11	0.00	0.08	0.00	-0.18	0.00	0.03
167	1	11	0.00	0.33	0.00	0.10	0.00	0.10
		12	0.00	0.17	0.00	-0.10	0.00	-0.02
168	1	12	0.00	0.36	0.00	0.02	0.00	0.07
		13	0.00	0.14	0.00	-0.02	0.00	0.04
169	1	14	0.00	1.10	0.00	-0.43	0.00	0.08
		15	0.00	-0.59	0.00	0.43	0.00	0.76
170	1	15	0.00	0.59	0.00	-0.35	0.00	-0.68
		16	0.00	-0.09	0.00	0.35	0.00	1.02
171	1	16	0.00	0.34	0.00	-0.22	0.00	-0.97
		17	0.00	0.17	0.00	0.22	0.00	1.05
172	1	17	0.00	0.18	0.00	-0.07	0.00	-1.01
		18	0.00	0.33	0.00	0.07	0.00	0.94
173	1	18	0.00	0.07	0.00	0.06	0.00	-0.91
		19	0.00	0.44	0.00	-0.06	0.00	0.73
174	1	19	0.00	-0.01	0.00	0.16	0.00	-0.71
		20	0.00	0.52	0.00	-0.16	0.00	0.45
175	1	20	0.00	-0.06	0.00	0.23	0.00	-0.44
		21	0.00	0.56	0.00	-0.23	0.00	0.13
176	1	21	0.00	-0.07	0.00	0.25	0.00	-0.14
		22	0.00	0.58	0.00	-0.25	0.00	-0.19
177	1	22	0.00	-0.05	0.00	0.22	0.00	0.17
		23	0.00	0.56	0.00	-0.22	0.00	-0.47
178	1	23	0.00	-0.05	0.00	0.16	0.00	0.43
		24	0.00	0.56	0.00	-0.16	0.00	-0.73
179	1	24	0.00	0.49	0.00	0.04	0.00	0.69

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
181	1	27	0.00	1.73	0.00	-0.30	0.00	0.14
		28	0.00	-1.23	0.00	0.30	0.00	1.33
182	1	28	0.00	0.97	0.00	-0.25	0.00	-1.20
		29	0.00	-0.47	0.00	0.25	0.00	1.92
183	1	29	0.00	0.47	0.00	-0.14	0.00	-1.81
		30	0.00	0.04	0.00	0.14	0.00	2.03
184	1	30	0.00	0.12	0.00	-0.02	0.00	-1.95
		31	0.00	0.38	0.00	0.02	0.00	1.82
185	1	31	0.00	-0.12	0.00	0.09	0.00	-1.78
		32	0.00	0.62	0.00	-0.09	0.00	1.41
186	1	32	0.00	-0.28	0.00	0.17	0.00	-1.39
		33	0.00	0.79	0.00	-0.17	0.00	0.85
187	1	33	0.00	-0.39	0.00	0.22	0.00	-0.85
		34	0.00	0.90	0.00	-0.22	0.00	0.21
188	1	34	0.00	-0.43	0.00	0.22	0.00	-0.24
		35	0.00	0.94	0.00	-0.22	0.00	-0.45
189	1	35	0.00	-0.49	0.00	0.17	0.00	0.39
		36	0.00	1.00	0.00	-0.17	0.00	-1.13
190	1	36	0.00	0.27	0.00	0.04	0.00	1.07
		37	0.00	0.23	0.00	-0.04	0.00	-1.05
193	1	40	0.00	2.11	0.00	-0.16	0.00	0.15
		41	0.00	-1.61	0.00	0.16	0.00	1.71
194	1	41	0.00	1.26	0.00	-0.12	0.00	-1.56
		42	0.00	-0.75	0.00	0.12	0.00	2.57
195	1	42	0.00	0.59	0.00	-0.05	0.00	-2.45
		43	0.00	-0.08	0.00	0.05	0.00	2.78
196	1	43	0.00	0.08	0.00	0.04	0.00	-2.69
		44	0.00	0.43	0.00	-0.04	0.00	2.52
197	1	44	0.00	-0.29	0.00	0.12	0.00	-2.47
		45	0.00	0.80	0.00	-0.12	0.00	1.92
198	1	45	0.00	-0.57	0.00	0.18	0.00	-1.90
		46	0.00	1.07	0.00	-0.18	0.00	1.08
199	1	46	0.00	-0.74	0.00	0.19	0.00	-1.10

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
200	1	47	0.00	-0.91	0.00	0.16	0.00	-0.16
		48	0.00	1.42	0.00	-0.16	0.00	-1.01
201	1	48	0.00	-0.19	0.00	0.03	0.00	0.94
		49	0.00	0.70	0.00	-0.03	0.00	-1.39
205	1	53	0.00	2.33	0.00	-0.01	0.00	0.14
		54	0.00	-1.83	0.00	0.01	0.00	1.94
206	1	54	0.00	1.43	0.00	0.01	0.00	-1.81
		55	0.00	-0.92	0.00	-0.01	0.00	2.99
207	1	55	0.00	0.66	0.00	0.06	0.00	-2.88
		56	0.00	-0.15	0.00	-0.06	0.00	3.28
208	1	56	0.00	0.02	0.00	0.11	0.00	-3.20
		57	0.00	0.49	0.00	-0.11	0.00	2.97
209	1	57	0.00	-0.49	0.00	0.15	0.00	-2.92
		58	0.00	0.99	0.00	-0.15	0.00	2.19
210	1	58	0.00	-0.87	0.00	0.17	0.00	-2.18
		59	0.00	1.38	0.00	-0.17	0.00	1.06
211	1	59	0.00	-1.19	0.00	0.15	0.00	-1.10
		60	0.00	1.69	0.00	-0.15	0.00	-0.34
212	1	60	0.00	-0.80	0.00	0.03	0.00	0.27
		61	0.00	1.31	0.00	-0.03	0.00	-1.32
217	1	66	0.00	2.43	0.00	0.11	0.00	0.11
		67	0.00	-1.93	0.00	-0.11	0.00	2.07
218	1	67	0.00	1.50	0.00	0.12	0.00	-1.97
		68	0.00	-0.99	0.00	-0.12	0.00	3.21
219	1	68	0.00	0.65	0.00	0.14	0.00	-3.13
		69	0.00	-0.15	0.00	-0.14	0.00	3.53
220	1	69	0.00	-0.09	0.00	0.16	0.00	-3.47
		70	0.00	0.59	0.00	-0.16	0.00	3.13
221	1	70	0.00	-0.72	0.00	0.17	0.00	-3.12
		71	0.00	1.22	0.00	-0.17	0.00	2.15
222	1	71	0.00	-1.22	0.00	0.14	0.00	-2.18
		72	0.00	1.73	0.00	-0.14	0.00	0.70
223	1	72	0.00	-1.40	0.00	0.04	0.00	-0.78

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
229	1	79	0.00	2.44	0.00	0.19	0.00	0.07
		80	0.00	-1.93	0.00	-0.19	0.00	2.11
230	1	80	0.00	1.47	0.00	0.20	0.00	-2.05
		81	0.00	-0.96	0.00	-0.20	0.00	3.27
231	1	81	0.00	0.57	0.00	0.20	0.00	-3.22
		82	0.00	-0.06	0.00	-0.20	0.00	3.53
232	1	82	0.00	-0.27	0.00	0.18	0.00	-3.52
		83	0.00	0.78	0.00	-0.18	0.00	2.99
233	1	83	0.00	-0.97	0.00	0.14	0.00	-3.01
		84	0.00	1.47	0.00	-0.14	0.00	1.79
234	1	84	0.00	-1.80	0.00	0.06	0.00	-1.89
		85	0.00	2.31	0.00	-0.06	0.00	-0.16
241	1	92	0.00	2.35	0.00	0.24	0.00	0.03
		93	0.00	-1.84	0.00	-0.24	0.00	2.07
242	1	93	0.00	1.35	0.00	0.23	0.00	-2.05
		94	0.00	-0.84	0.00	-0.23	0.00	3.14
243	1	94	0.00	0.38	0.00	0.21	0.00	-3.14
		95	0.00	0.13	0.00	-0.21	0.00	3.27
244	1	95	0.00	-0.47	0.00	0.15	0.00	-3.30
		96	0.00	0.97	0.00	-0.15	0.00	2.58
245	1	96	0.00	-1.87	0.00	0.08	0.00	-2.70
		97	0.00	2.37	0.00	-0.08	0.00	0.58
253	1	105	0.00	2.16	0.00	0.24	0.00	-0.02
		106	0.00	-1.65	0.00	-0.24	0.00	1.93
254	1	106	0.00	1.13	0.00	0.22	0.00	-1.95
		107	0.00	-0.62	0.00	-0.22	0.00	2.82
255	1	107	0.00	0.17	0.00	0.16	0.00	-2.87
		108	0.00	0.33	0.00	-0.16	0.00	2.79
256	1	108	0.00	-1.56	0.00	0.10	0.00	-2.92
		109	0.00	2.06	0.00	-0.10	0.00	1.11
265	1	118	0.00	1.86	0.00	0.20	0.00	-0.06
		119	0.00	-1.36	0.00	-0.20	0.00	1.67
266	1	119	0.00	0.85	0.00	0.16	0.00	-1.73

MEMBER END FORCES STRUCTURE TYPE = SPACE

ALL UNITS ARE -- MTON METE

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
267	1	120	0.00	-0.93	0.00	0.10	0.00	-2.46
		121	0.00	1.43	0.00	-0.10	0.00	1.28
277	1	131	0.00	1.46	0.00	0.13	0.00	-0.08
		132	0.00	-0.95	0.00	-0.13	0.00	1.29
278	1	132	0.00	-0.10	0.00	0.09	0.00	-1.40
		133	0.00	0.60	0.00	-0.09	0.00	1.05
289	1	144	0.00	0.69	0.00	0.06	0.00	-0.08
		145	0.00	-0.18	0.00	-0.06	0.00	0.51
290	1	13	0.00	0.14	0.00	-0.04	0.00	0.01
		25	0.00	0.58	0.00	0.04	0.00	-0.32
291	1	25	0.00	-0.40	0.00	-0.15	0.00	-0.35
		37	0.00	1.12	0.00	0.15	0.00	-0.72
292	1	37	0.00	-0.85	0.00	-0.24	0.00	-0.72
		49	0.00	1.57	0.00	0.24	0.00	-0.99
293	1	49	0.00	-0.93	0.00	-0.26	0.00	-0.85
		61	0.00	1.65	0.00	0.26	0.00	-0.98
294	1	61	0.00	-0.63	0.00	-0.20	0.00	-0.70
		73	0.00	1.34	0.00	0.20	0.00	-0.70
295	1	73	0.00	-0.01	0.00	-0.07	0.00	-0.30
		85	0.00	0.73	0.00	0.07	0.00	-0.22
296	1	85	0.00	0.73	0.00	0.07	0.00	0.22
		97	0.00	-0.01	0.00	-0.07	0.00	0.30
297	1	97	0.00	1.34	0.00	0.20	0.00	0.70
		109	0.00	-0.63	0.00	-0.20	0.00	0.70
298	1	109	0.00	1.65	0.00	0.26	0.00	0.98
		121	0.00	-0.93	0.00	-0.26	0.00	0.85
299	1	121	0.00	1.57	0.00	0.24	0.00	0.99
		133	0.00	-0.85	0.00	-0.24	0.00	0.72
300	1	133	0.00	1.12	0.00	0.15	0.00	0.72
		145	0.00	-0.40	0.00	-0.15	0.00	0.35
301	1	145	0.00	0.58	0.00	0.04	0.00	0.32
		157	0.00	0.14	0.00	-0.04	0.00	-0.01

```
************** END OF LATEST ANALYSIS RESULT **************

283. PLOT DISPLACEMENT FILE
284. PLOT BENDING FILE
285. FINISH

   *************** END OF STAAD-III ***************

     **** DATE= FEB 11,1996   TIME=  3: 7:50 ****

   ********************************************************
   *       For questions on STAAD-III/ISDS, contact:      *
   *              RESEARCH ENGINEERS, Inc at              *
   *       Ph: (714) 974-2500   Fax:  (714) 974-4771      *
   ********************************************************
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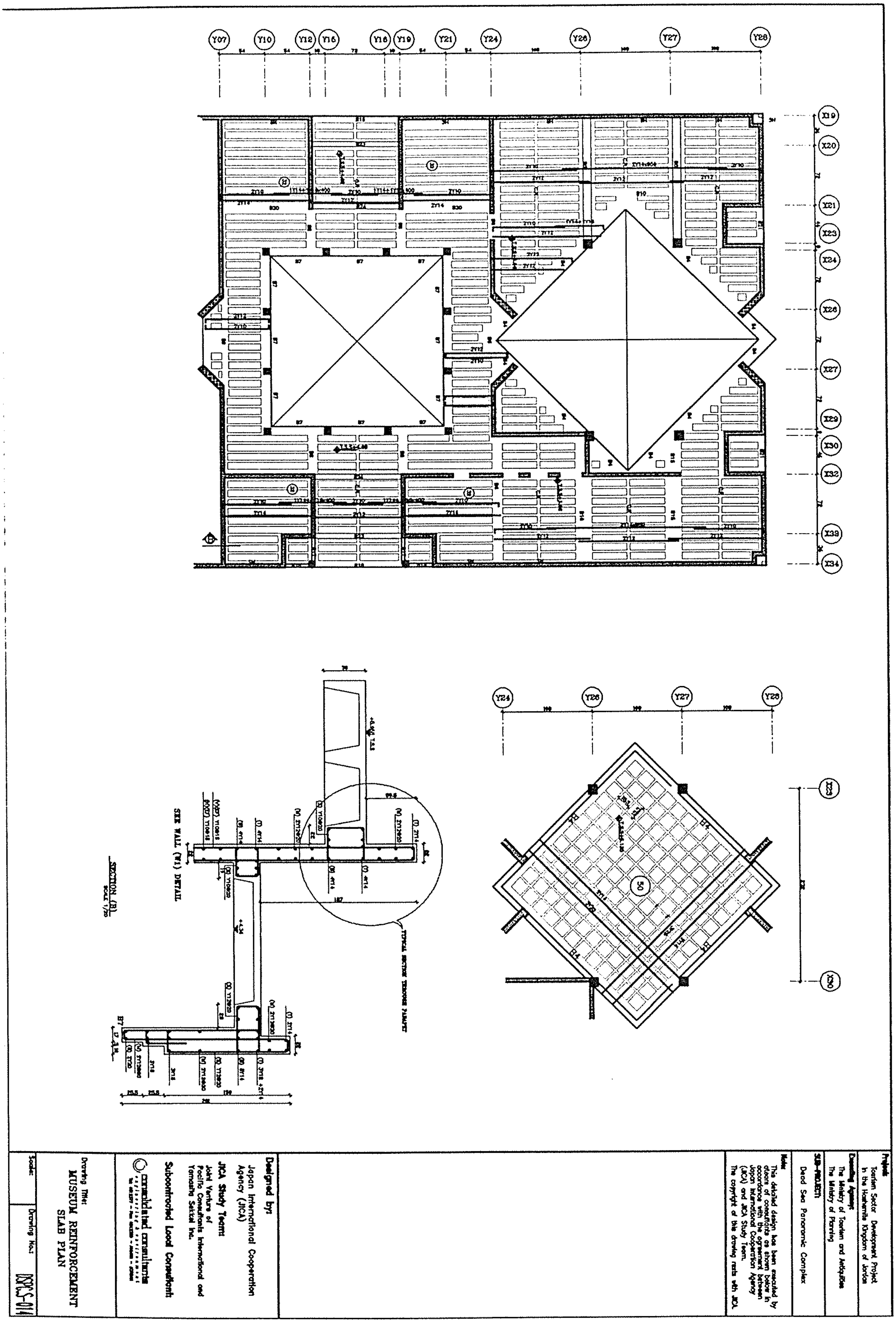
F:\jica-dead sea\DRAFTING\PHASE2\STRUC\DSPC-S014.dwg



One way Ribbed Slab Loading :-

```
+     +     |------------------------------------|
|     tf    |                                    |
|     +     |-----+     +---------------+     +-----|
|     |     |     |     |               |     |     |
h     hb    |     |     |               |     |     |
|     |     |     |     |               |     |     |
+     +     |------------------------------------|

                + b +---   40 cm   ---+ b +
```

** DATA **

- Width of Rib	b =	15 cm
- Height of Rib	h =	32 cm
- Height of Block	hb =	24 cm
- Thickness of Screed	tt =	10 cm
- Average False Ceiling Load ..	pw =	60 kg/m2
- Average Live Load	LL =	200 kg/m2

** RIB LOADING **

** DEAD LOAD **

Weight of Rib	= 15 X 24 X 0.250	= 90 kg/m/rib
Weight of Slab	= 8 X 55 X 0.250	= 110 kg/m/rib
Weight of Block	= 18 X 5	= 90 kg/m/rib
Weight of Screed .	= 10 X 55 X 0.190	= 105 kg/m/rib
Weight of false Ceiling	= 60 X 55 /100	= 33 kg/m/rib
	TOTAL DEAD LOAD WD	= 428 kg/m/rib

** LIVE LOAD **

LIVE LOAD WL = 200 X 55 / 100 = 110 kg/m/rib

TOTAL WORKING LOAD = WD + WL = 538 kg/m/rib

Tel.. 644088, 612377 Fax.. 612380 P.O.Box 830746 Amman Jordan

SPANS Bent and Beam Analysis Program V4.1 SPANS
SPANS Prepared by H. Saffarini 2/2/93 SPANS

Rib 1

rib1/block 1

Number of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	5.600	0.150	0.320	0.080	0.550
2	5.600	0.150	0.320	0.080	0.550
3	5.600	0.150	0.320	0.080	0.550

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	18.5	-24.6	17.6	-26.4
2	-24.6	6.2	-24.6	22.0	-22.0
3	-24.6	18.5	-0.0	26.4	-17.6

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	65	0	0	190	271	0
2	271	0	0	65	271	0
3	271	0	0	190	65	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	1.40	214	8	1.40	214	8	214	8
2	2	1.40	214	8	1.40	214	8	214	8
3	2	1.40	214	8	1.40	214	8	214	8

Span	1	2	3
Span/Depth	19.6	19.6	19.6
Allowable	38.0	42.9	38.0

65	0	271	0	271	0	65	Requ. To
2 Φ 10	2 Φ 10	2 Φ 14	2 Φ 14	2 Φ 14	2 Φ 10	2 Φ 10	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
157	157	308	308	308	157	157	Prov. Tc

| span 1 | span 2 | span 3 |

SPANS Bent and Beam Analysis Program V4.1 SPANS
SPANS Prepared by H. Saffarini 2/2/93 SPANS

Rib 2

BLOCK1-RIB2

Number of spans = 5 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	2.500	0.150	0.320	0.060	0.550
2	5.200	0.150	0.320	0.060	0.550
3	5.800	0.150	0.320	0.060	0.550
4	5.600	0.150	0.320	0.060	0.550
5	5.200	0.150	0.320	0.060	0.550

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	7.86	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %
5	0.000	0 %
6	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	0	0.00	0	0	0.00	0	0	0	0
2	0	0.00	0	0	0.00	0	0	0	0
3	0	0.00	0	0	0.00	0	0	0	0
4	0	0.00	0	0	0.00	0	0	0	0

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RIB3-OF THE ELEVATED ROOMS

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	5.600	0.150	0.320	0.080	0.550

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	7.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

velope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	0.0	0.0	0.0	0.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	0	0	0	0	0	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	0	0.00	0	0	0.00	0	0	0	0

Span	1
Span/Depth	0.0
Allowable	0.0

```
     65           0          65    Requ. Top
 0 Φ  0      2 Φ 10      0 Φ  0
 0 Φ  0      0 Φ  0      0 Φ  0
      0         157          0    Prov. Top
      --------------------------
      |        span  1        |
      0         316          0    Requ. Bot
 0 Φ  0      2 Φ 14      0 Φ  0
 0 Φ  0      0 Φ  0      0 Φ  0
      0         308          0    Prov. Bot
```

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Bottom slab designed by elastic method.

```
 Data:  (program prep. by Eng hassan Anas Al-khamrah)
 length=       6.5      m     (Shorter side of panel)
 Width=        6.5      m     (Longer side of panel)
  fcu=          25
  fy  =        414    fyv=          414 MPa
  a   =        0.9      m
  b   =        0.9      m
Slab th=        75     mm
WEIGHT OF FINISH=        2.8    KN/m2
Live load/m2=              2 KN/m2
spacing of ribs=        0.9       m
number of beams in (x-direction)=          7 Ribs
number of beams in (y-direction)=          7 (span/depth=20)=        325
depth of ribs based on (span/depth=20)=           500      mm
width of        210     mm
 Loads:
weight of slab=          1.8    KN/m2
TOTAL LOAD OF SLAB    76.05     KN
WEIGHT OF RIBS=      2.142    KN/m
Total weight of beams in (X-directio            97.461     KN
Total weight of beams in (y-direction)=         97.461     KN
Total weight of floor finish=         118.3     KN
Total live load                =        84.5     KN
Total dead and live loads on grid floor
     =       473.772      KN
Load per m2=q=     11.21353 KN/m2
Moments:
   q1=          5.61    KN/m2
   q2=          5.61    KN/m2                          meters    meters
Moments in x-and y direction at center of grid for        0.9       0.9
   MX=     26.64967    KN-M          ---------------------------
   MY=     26.64967    KN-M          |   |   |        |        |
   QX=        16.40     KN           |  b    |        |        |
   QY=        16.40     KN           ---|----  ------------------
Rigorous Method(plate theory)        |                          |
 (Df/D)=        0.15                 --------  --------  --------
(h/bf)= 0.233333                     |                          |
 be1    =        1625     mm         --------  --------  --------
 be2    =        1410     mm         -- a ---  |        |
 be3    =         900     mm         |         |        |
 be     =         900     mm         ---------------------------
 k1     =        1.49                ----------- LENGTH ---------
 k2     =        3.05
 k      =        2.05
 I      =     4.5E+09
  E     =     2.9E+07
 BEATA=       0.2482
CALCULATE C1&7C2
 C1       = 1.42E+16
 C2       =   1.4E+16
C1/B1    =   1.6E+16
C2/a1    =   1.6E+16
Deflections @ Center of Span
(Dx/ax4)=    79.38
(Dy/ay4)=    79.38
```

(2H/ax2by)= 17.7282

:he deflection @ center of the plate is given by:
a = 0.001057 m
ASSUMING A CREEP COEFFICIENT =2
:cc = (Ec/(1+coeff.)
.ong term deflection= 0.003172 m
Span/250= 0.026 m Deflection is Ok
Design Moments & Shears

				point	x(m)	y(m)	Qx(kn)	Qy(kn)
Dx	=	141696.7						
Mx	=	34.96587	(Kn.m)	D	0	6.5	0	0
My	=	34.96587	(Kn.m)	K	0	4.8	13.77	0
Qx1	=	0.001057		I	0.9	3.25	12.13	0
(2	=	15998.14		J	1.8	3.25	0	0
Q.3	=	1786.478		F	3.25	4.875	0	11.96
Qx	=	18.81	kn					
Qy	=	16.92	kn					

calculate steel for the middle rib
Moment resisted by central rib in x-direction over 0.9 m width
Jltimate moment= 47.20392 KN.m
Moment capacity of flange section
Muf = 254.2387 Kn.m
As = 294.7899 mm2 Try Fie= 16 use 2 Bars
Moment resisted by central rib in y direction over 0.9 m width
Ultimate moment= 47.20392 kn.m
As = 295.8377 mm2 Try Fie= 16 use 2 Bars
Mx(Rigorous analysis(plate theory)
-------------------------------- = 1.18
Approximate method(grashoff theory)
Calculate Torsional moment @ corners
X=0 AND Y=(1/4)x(WIDTH)
Mxy @ 4.875 meters= -3.91 Kn.m
X= AND Y=((WIDTH)
Mxy @ 6.5 meters= -3.91 Kn.m
Calculate Torsional moment @ corners
X=0 AND Y=(3/4)*WIDTH
Myx @ 4.875 meters= -2.76 Kn.m
X=0 AND Y=((WIDTH)
Myx @ 6.5 meters= -3.91 Kn.m
----------------Check Shear -------------------------
Vu = 24.60 Kn
t = 3.06 Kg/cm2 Actual shear stress
tuc = 8.38 Kg/cm2 Allowable shear stress
provide nominal shear reinforcement
tus = provide n Kg/cm2
Introduce the required diameter of stirrups= 10 mm
Introduce the number of stirrup legs required 2 legs
S = ERR cm (Ast.fy/tus.b)
Smax = 22.5 cm (d/2)
Smax = 88.48 cm (Ast.fyv/3.5.b)
Smax = ERR cm (The required spacing)

Combined design for shear & torsion
==================================

fc' = 200 Kg/cm2
ttu =3Mu/(.85.y.x2)= 8.45 Kg/cm2
concrete capacity for Torsion=.4*(fc')^.5
ICAP = 5.6569 Kg/cm2
Design section for Torsion

ttu = 45.25 Kg/cm2
Section Satisfactory
Shear stress taken by conc. = 9.05 Kg/cm2
the actual shear stress on section = 2.31 Kg/cm2 (NOTE: SEE SHEAR S
shear stress to br res. by steel= 15.45 Kg/cm2
Itr = 0.508913 t-m
Fi of stirrup= 10 No. of stirrup legs= 2
alfat= 1.588125
alfat= 1.5
S = 30.92 cm
Spacing of stirrups= 30.92 cm
Min Ast/S = 0.017753
Ast1/S= 0.0254
OK
S1MAX= 30 CM
S2MAX= 15.25 CM
S(FINAL)= 15.25 CM
Design for longitudinal steel

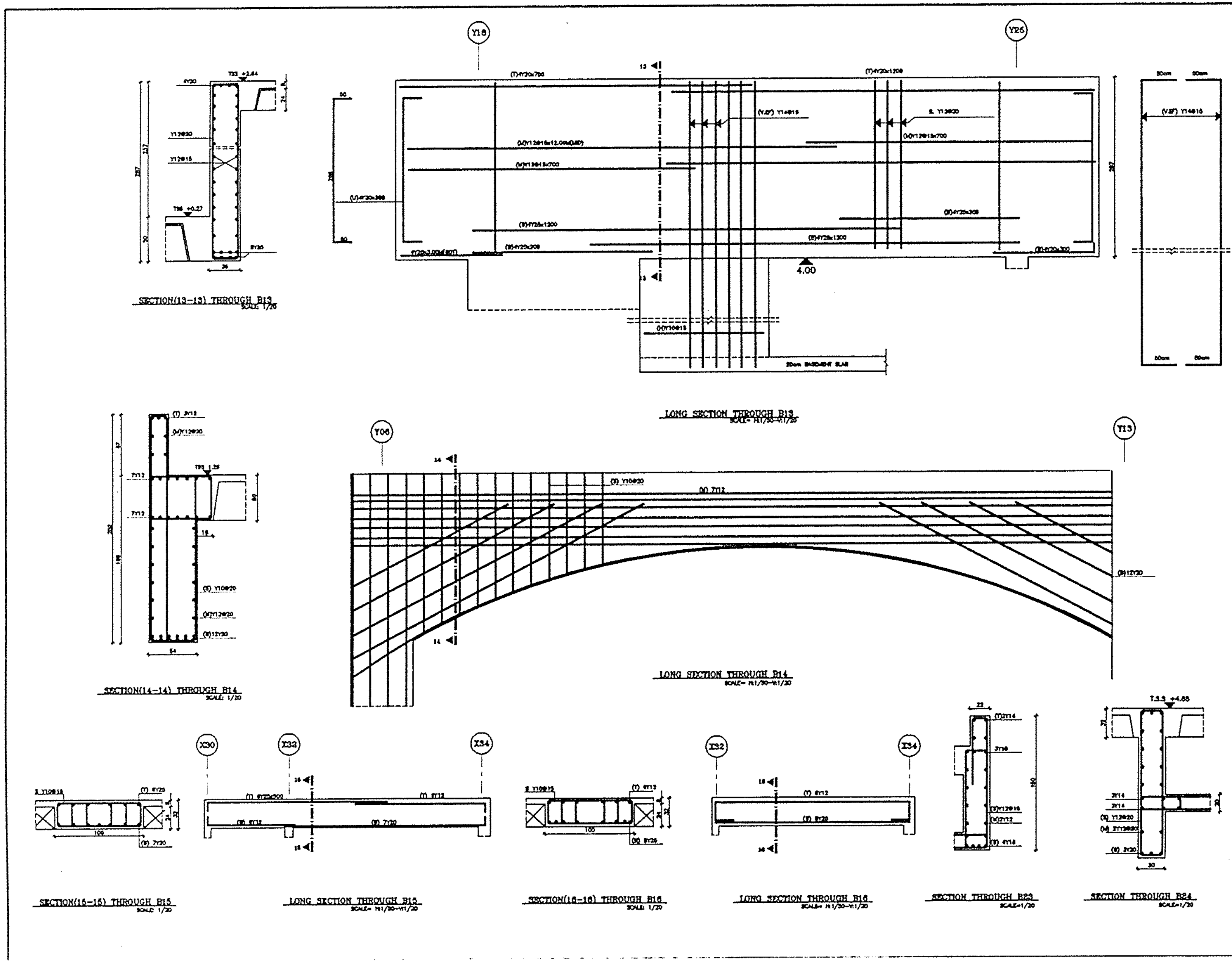
Al=2At(x1+y1)/s= 5.25 cm2
Min Al=(28bws/fy-2Ast)(x1+y1)/S= 1.99 cm2
Min Al=(28bws/fy-3.5bws/fy)= 13.78 cm2
Min AL1= 5.25
Min AL= 5.25 cm2
For longitudinal Reinforcement use AL= 5.25 cm2

```
   5      0    0.00      0      0    0.00      0      0      0      0

 an               1        2        3        4        5
pan/Depth        0.0      0.0      0.0      0.0      0.0
'lowable         0.0      0.0      0.0      0.0      0.0

   65        89       335        0       182        0       237    Requu. Top
 0 Φ 14   1 Φ 14   1 Φ 14   1 Φ 14   1 Φ 12   0 Φ  0   1 Φ 12
 1 Φ 16   1 Φ 16   1 Φ 16   1 Φ 16   1 Φ 10   0 Φ  0   1 Φ 14
  355      355      355      355      192        0      267    Prov. Top
   ----------------------------------------------------------
   |      span  1      |      span  2      |      span  3      |
    0        65         0        65         0       138         0    Requ. Bot
 0 Φ  0   2 Φ 10   0 Φ  0   2 Φ 10   0 Φ  0   2 Φ 10   0 Φ  0
 0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0
    0       157         0       157         0       157         0    Prov. Bot

    0       252         0        65
 2 Φ 10   1 Φ 12   2 Φ 10   2 Φ 10
 0 Φ  0   1 Φ 14   0 Φ  0   0 Φ  0
  157      267      157      157
   ----------------------------------
     span  4      |     span  5      |
   85          0      154          0
 2 Φ 10   0 Φ  0   1 Φ 10   0 Φ  0
 0 Φ  0   0 Φ  0   1 Φ 12   0 Φ  0
  157          0      192          0
```



Project:
Tourism Sector Development Project
In the Hashemite Kingdom of Jordan

Executing Agency:
The Ministry of Tourism and Antiquities
The Ministry of Planning

SUB-PROJECT:
Dead Sea Panoramic Complex

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Drawing Title:
BEAM STRUCTURAL DETAILS

Scale:
Drawing No.: DSPCS-018

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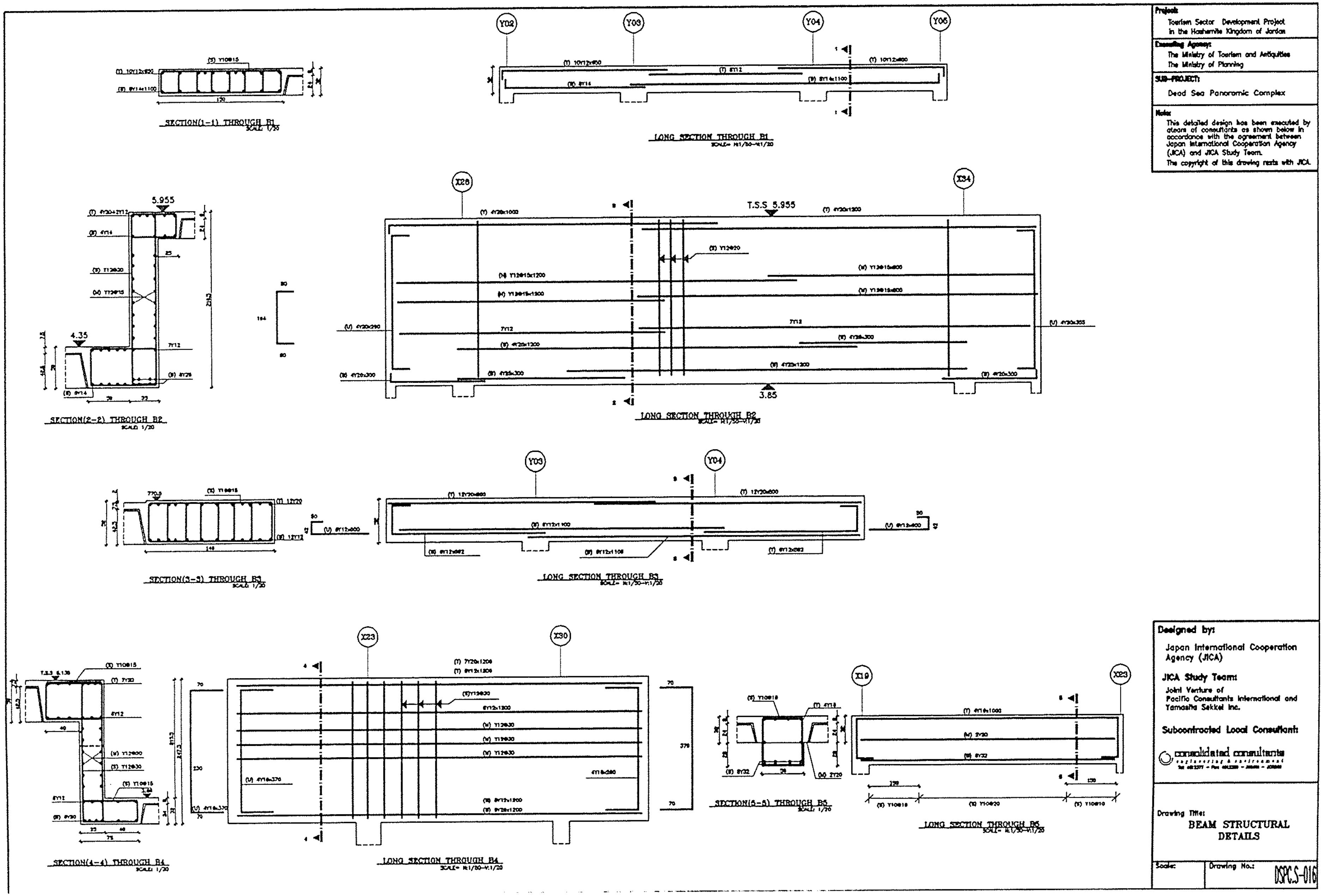

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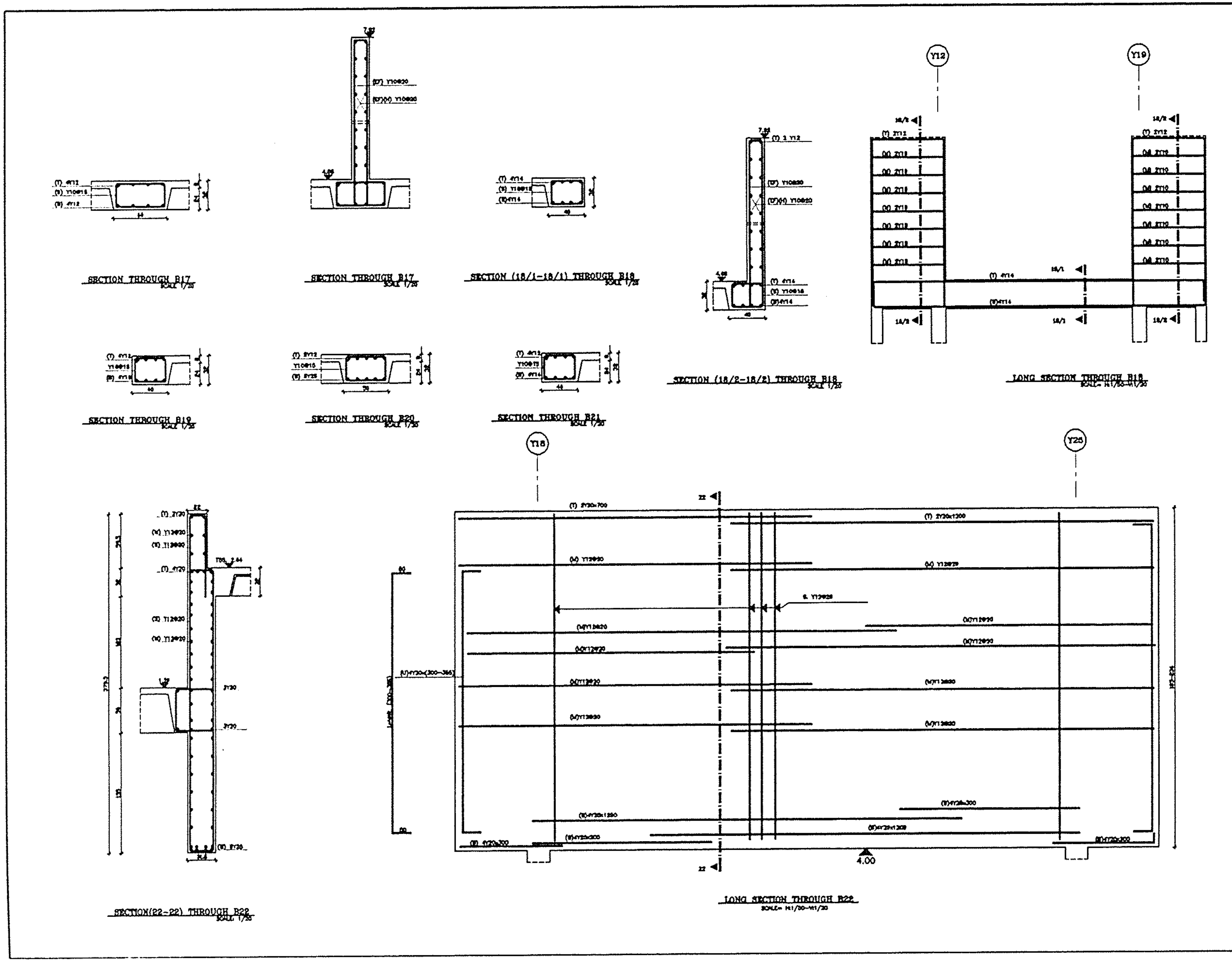

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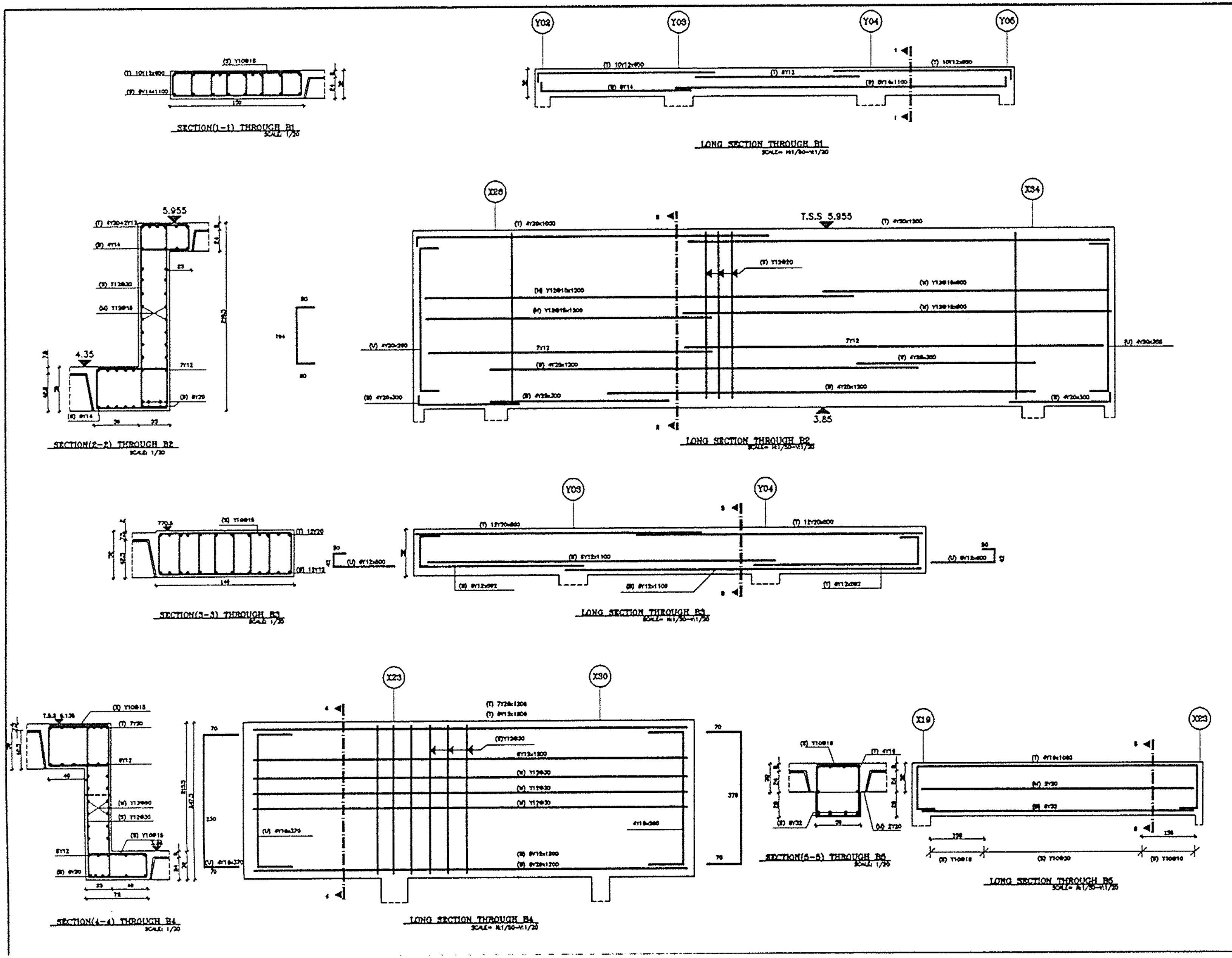

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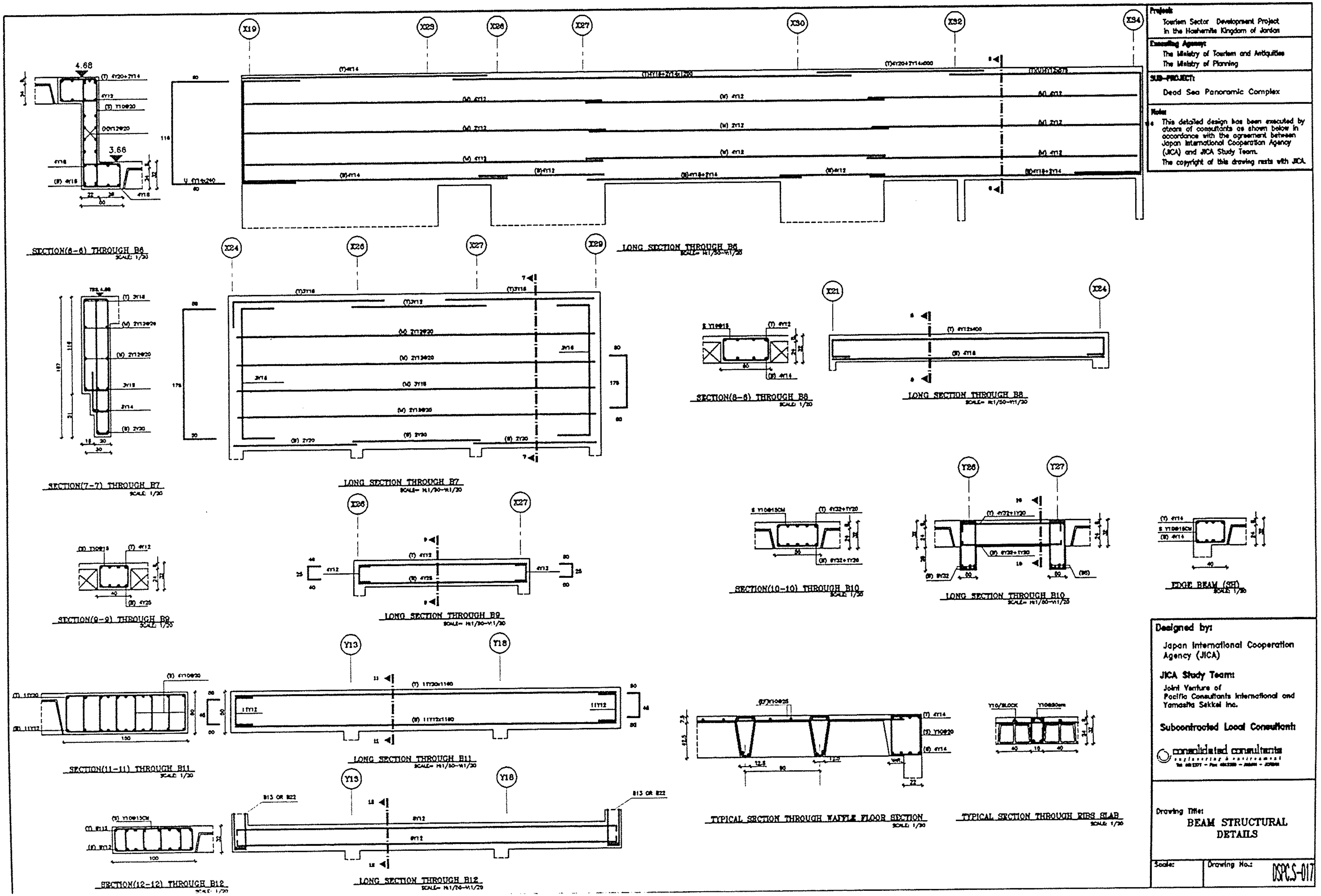

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Number of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	4.500	1.550	0.520	0.000	1.550
2	5.400	1.550	0.520	0.000	1.550
3	4.500	1.550	0.520	0.000	1.550

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	54.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	65.87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	54.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.350	0 %
	0.350	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	-138.4	-553.5	0.0	-246.0
2	-553.5	-313.4	-553.5	177.8	-177.8
3	-553.5	-138.4	-0.0	246.0	-0.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	1143	0	1143	1143	3455	0
2	3455	0	1889	1143	3455	0
3	3455	0	1143	1143	1143	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	8	1.13	226	8	1.13	226	8	226	8
2	8	1.35	226	8	1.35	226	8	226	8
3	8	1.13	226	8	1.13	226	8	226	8

Span	1	2	3
Span/Depth	9.3	11.1	9.3
Allowable	13.3	52.3	13.3

1143	1143	3455	1889	3455	1143	1143	Requ. To
0 Φ 20	0 Φ 0	11 Φ 20	11 Φ 20	11 Φ 20	11 Φ 20	11 Φ 20	
0 Φ 0	11 Φ 20	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
0	3454	3454	3454	3454	3454	3454	Prov. Tc

	span 1		span 2		span 3		
0	1143	0	1143	0	1143	0	Requ. Bc
0 Φ 0	12 Φ 12	0 Φ 0	12 Φ 12	0 Φ 0	12 Φ 12	10 Φ 0	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	

هاتف: ٦٤٤٠٨٨ ، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Design of Main Beams :-

Design of B4:-

$wu/m2 = 16.15\ KN/m2$

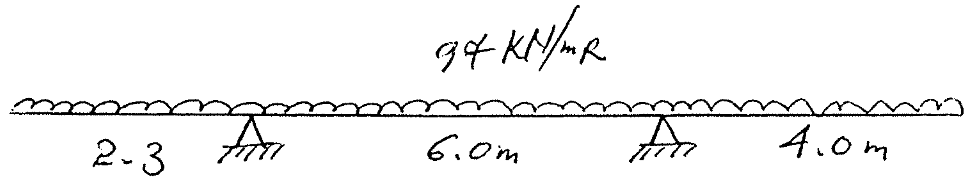
Total load from Slab $= 16.15 \times 12.1 \times 12 = 2345\ KN$

$w/m\ Run = 2345/(12 \times 4) = 48.9\ KN/mR$

Beam (o.w) $= 0.3 \times 2.45 \times 25 \times 1.4 = 25.73\ KN/mR$

weight from Lower slab (Two way Ribbed slab) in average $= 22\ KN/mR$

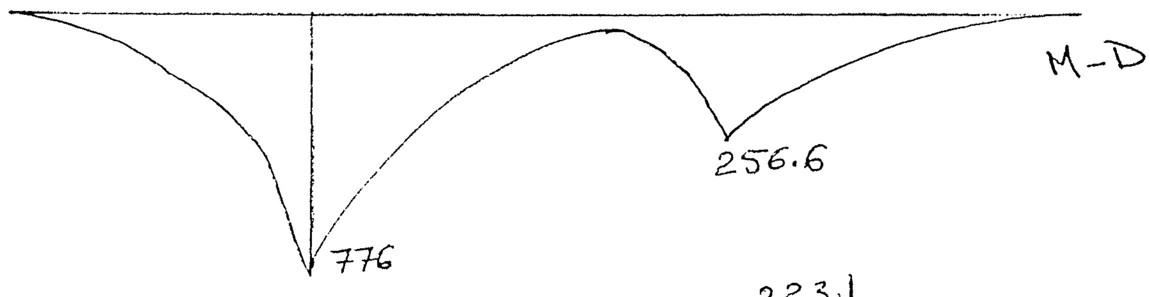
Total Load $= 22 + 25.73 + 48.9 = 97\ KN/mR$

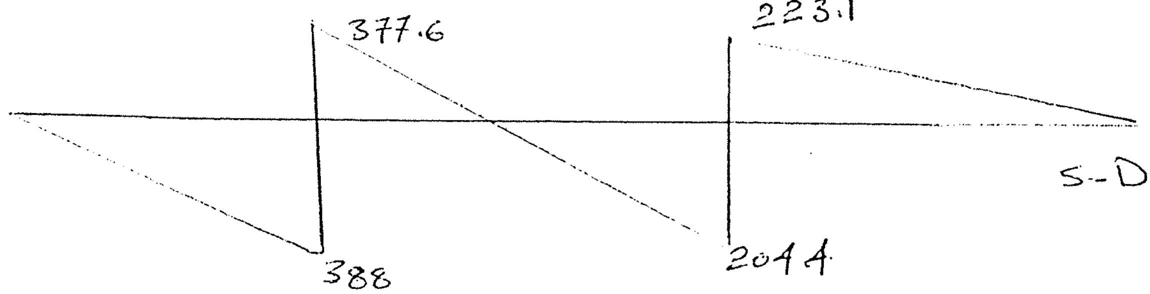


Check Deep Beam:-

$ln/h < 2$

$5.4/2.95 \simeq 1.83 < 2$ design as Deep Beam





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The distance (net) Between side Bracing should not be more than

$60 b_c = 60 \times (0.3) = 18\ m$

or $\frac{250 b_c^2}{d} = \frac{250 (0.3)^2}{2.95} = 7.627$

max $l_n = 5.4 < 7.627$ (ok)

$Z = \frac{1}{5}(l_n + 2h) = \frac{1}{5}(5.4 + 2 \times 2.95) = 2.26\ m$

$\varepsilon = \frac{\text{width of support}}{\text{width of supp.} + \text{span(net)}} = \frac{0.3}{5.4 + 0.3} = 0.0526$

$M_{-ve} = 776\ kN\text{-}m$

$A_s = \frac{M}{\phi_s f_y Z} = \frac{776 \times 10^2}{0.87 \times (414)(2260)} = 0.095\ mm^2$

$\rho_{min} = \frac{70}{f_y} = \frac{70}{414} = 0.17\%$, $A_{s\,min} = \frac{0.17}{100} \times 300 \times (d = 2380) \approx 1213\ mm^2$

Convert the deep Beam into ordinary Beam

$Z \leq 0.95 d$

$Z = 2260\ mm$

$2260 = 0.95 d \Rightarrow d = 2380\ mm$

$X = \frac{d - Z}{0.45} \Rightarrow$ and since $X \leq 0.5 d$

$0.5 d = \frac{d - 2.}{0.45} \Rightarrow d = 2.916\ m$

$R = \frac{M}{b d^2 f_{cu}} = \frac{776 \times 10^6}{300 \times (2916)^2 \times 25} = 0.01217$

$Z = \left[0.5 + \sqrt{0.25 - \frac{R}{0.9}}\right] d = 0.986 d$

$= 0.986 \times 2.916 = 2.876 > 2.26$ (o.k)

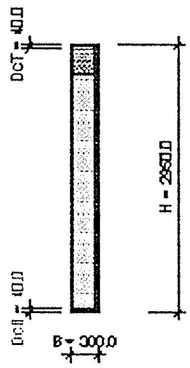
$\therefore A_{s(min)} = \frac{0.17}{100} \times 300 \times 2380 = 1213\ mm^2$

check by Computer

USE $4\Phi 20 \rightarrow A_s = 1257\ mm^2$

Bending Moment M (kNm)	776
Torsion Moment T (kNm)	
Shear Force V (kN)	
Web width B (mm)	300
Total height H (mm)	2950
Flange Width Wf (mm)	
Flange Height Hf (mm)	
Reinf centroid depth DcT (mm)	40
Reinf centroid depth DcB (mm)	40
fcu (Mpa)	25
fy - main bars (Mpa)	414
fyv - links (Mpa)	280
% Redistribution	

BS8110 - 1997



N.A. depth = 323.3 mm

OUTPUT

Moment		Shear		Torsion (Web)	
Mu	9894.1 kNm	v	0.00 MPa	v	0.00 MPa
As	714 mm²	vc	0.34 MPa	vt	0.34 MPa
As'	0 mm²	Asv/Sv	0.00	Asv/Sv	0.00
Anom	1151 mm²	Asv/Sv nom	0.45	As	0

Suggested Reinforcement Configurations:

Bars	(mm²)	Bars	(Asv/sv)	Bars	(Asv/sv)
6Y16	(1206)	2R8@220	(0.46)		
4Y20	(1257)	2R10@300	(0.52)		
3Y25	(1473)	2R12@500	(0.45)		

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check shear

$l_n/d = 5.4/2.8 = 1.9 < 5$ (ok)

$$\rho = \frac{1257}{300 \times (Z/0.95)} = \frac{1257}{300 \times 2378} = 0.176\%$$

$V_{max} = 0.8 \phi_v \sqrt{f_{cu}}$

$= 0.8 \times 0.8 \sqrt{25} = 3.2\ N/mm^2$

$v_c = 0.27 \phi_v \sqrt[3]{\rho f_{cu}} = 0.27(0.8)\sqrt[3]{0.176 \times 25}$

$= 0.3539$

@ $0.15 l_n$ From support $\approx 5.4 \times 0.15 = 0.81\ m$

$V_{ult} = 261$ KN

$$v = \frac{V}{bd} = \frac{261 \times 10^3}{300 \times 2378} = 0.3658\ N/mm^2$$

min vertical Reinf.

$A_{sv} \geq 0.0015\, b_w S_h$

$S_h \leq d/5 = 2800/5 = 560 > 500$

$S_h = 500$ mm

$A_{sh} \geq 0.0025\, b_w S_v$ (horizontal Reinf)

$S_v \leq d/3 = 2800/3 = 933 > 500 \Rightarrow$ use 500

$$\phi = \sqrt{\frac{S.b}{f_y}}$$

Since $b = 300 < 500$ mm use 500

∴ Try 12mm Bars

$$12 = \sqrt{\frac{S(500)}{414}} \rightarrow S = 119\ mm$$

$A_{sv} \geq 0.0015 \times 300 \times 119 = 53\ mm^2 < \phi 12 = 113\ mm^2$ (ok

$A_{sh} \geq 0.0025\, b_w S_v$

$= .0025 \times 300 \times 119 = 89.25 < \phi 12 = 113\ mm^2$ (ok)

$$V_s = \phi_s \frac{f_{yv}}{b} \left[\frac{A_{sv}}{S_v} \left(\frac{1 + l_n/d}{12} \right) + \frac{A_{sh}}{S_h} \left(\frac{11 - l_n/d}{12} \right) \right]$$

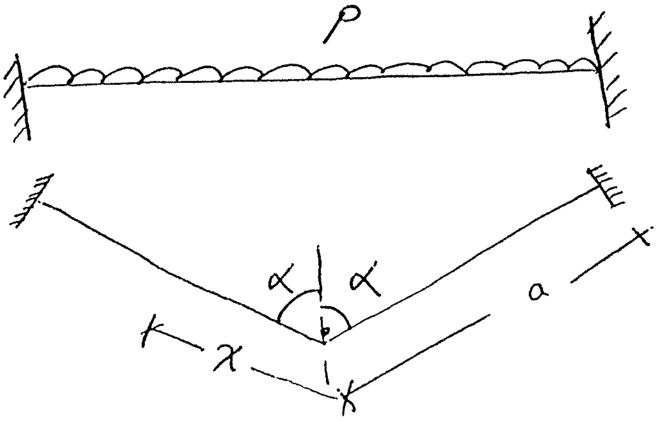
$$V_s = 0.87 \times \frac{414}{300} \left[\frac{113}{119} \left(\frac{1 + \frac{5400}{2378}}{12} \right) + \frac{113}{119} \left(\frac{11 - \frac{5400}{2378}}{12} \right) \right]$$

$$= 1.14 \ N/mm^2$$

$$V_c + V_s = 0.3539 + 1.14 = 1.4939 > V = 0.3658 \quad (ok)$$

Design of B3 :-

M ⇒



$$M = -\frac{Px^2}{2} + P\frac{a^2 \sin^2\alpha}{6}$$

for $x = a$ & $\alpha = 45°$

$$M = \frac{-Pa^2}{2} + \frac{Pa^2(\sin 45)^2}{6} = -\frac{2.5}{6}Pa^2 \approx -0.4167\,Pa^2$$

For a Free Cantilever $M_c = Pa^2/2 = 0.5\,Pa^2$

$$\frac{M}{M_c} = \frac{0.4167}{0.5} = 0.8334 \approx 83\%$$

∴ Load carried by Cantilever part ≈ 83% from the Load on the rest of Beam.

$$\text{Load/m from slab} = \frac{16.15\,KN/m^2 \times 11.5 \times 11.5\,m^2}{4 \times 14.5\,m} \approx 36.82\,KN/m_R$$

Beam (o.w) = 1.5 X 0.5 X 25 X 1.4 = 26.25

weight of Parapet = 0.2 X 0.4 X 25 X 1.4 = 2.8 KN/mR

Σ Load = 36.82 + 26.25 + 2.8 = 65.87

Load on Cantilever Part = 65.87 X 83% = 54.67 KN/mR

$$M_{Torsion} \approx \frac{Pa^2 \sin\alpha \cos\alpha}{6} = 0.083\,Pa^2$$

$$\approx 0.083 \times (4.5)^2 \times 54.67 = 92.26\ KN\text{-}m$$

left side top slab beam "B3"

umber of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	4.500	1.550	0.520	0.000	1.550
2	5.400	1.550	0.520	0.000	1.550
3	4.500	1.550	0.520	0.000	1.550

Load case number : 1

pan	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	54.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	65.87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	54.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

pan Line Load From Length Intensity

Support	Width	Redistribution
1	0.350	0 %
2	0.350	0 %
3	0.000	0 %
4	0.000	0 %

nvelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	-138.4	-553.5	0.0	-246.0
2	-553.5	-313.4	-553.5	177.8	-177.8
3	-553.5	-138.4	-0.0	246.0	-0.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	1143	0	1143	1143	3167	0
2	3249	0	1889	1143	3249	0
3	3167	0	1143	1143	1143	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	8	1.13	226	8	1.13	226	8	226	8
2	8	1.35	226	8	1.35	226	8	226	8
3	8	1.13	226	8	1.13	226	8	226	8

Span	1	2	3
Span/Depth	9.3	11.1	9.3
Allowable	9.4	52.3	13.8

1143	1143	3249	1889	3249	1143	1143	Requ. Top
0 Φ 20	0 Φ 0	11 Φ 20	11 Φ 20	11 Φ 20	11 Φ 20	11 Φ 20	
0 Φ 0	11 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
0	3454	3454	3454	3454	3454	3454	Prov. Top

| span 1 | span 2 | span 3 |

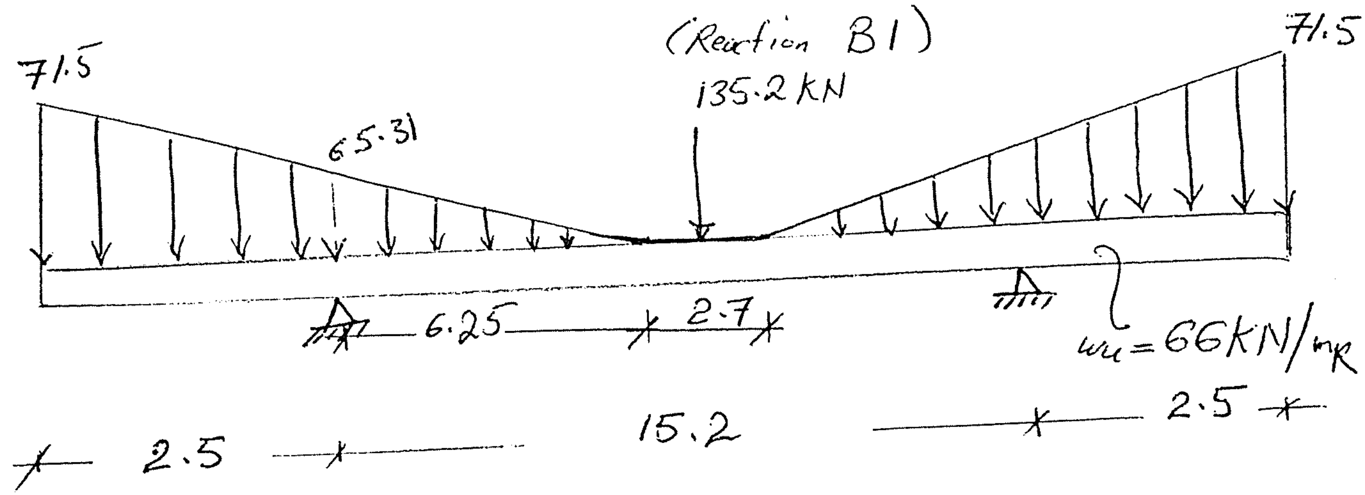
Design of B 2

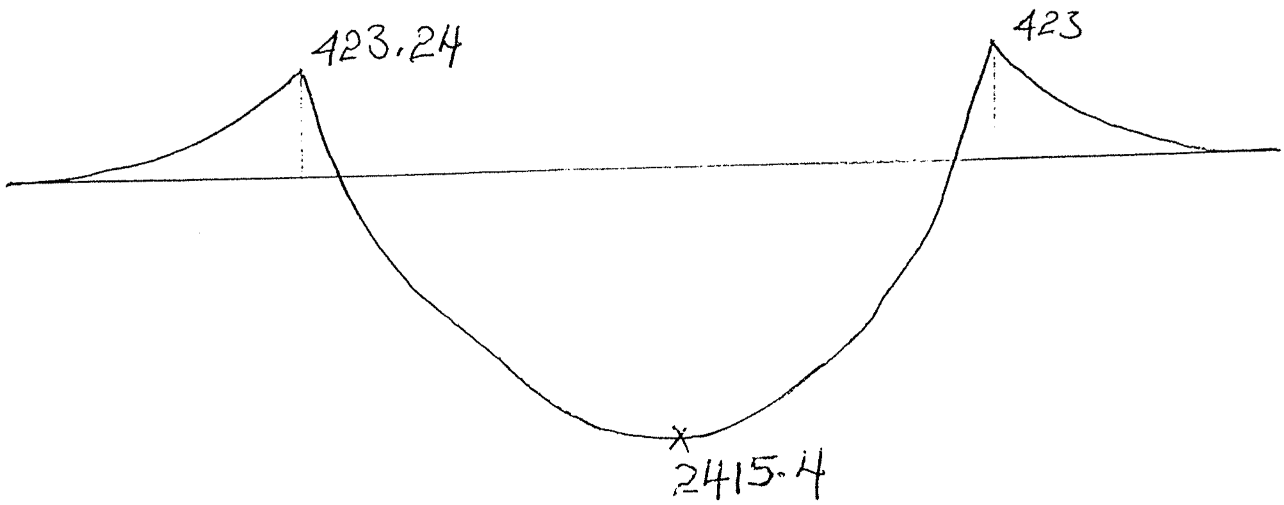
O.W = 0.3 X 25 X 2 X 1.4 = 21 KN/mR
weight of slab = 0.75 X 15.55 = 11.66
Max. Load from Triangular (Intermediate slab) = 4.6 X 15.55
≈ 71.5 KN/mR
weight of Parapet = 0.2 X 0.4 X 25 X 1.4
≈ 2.8 KN/mR

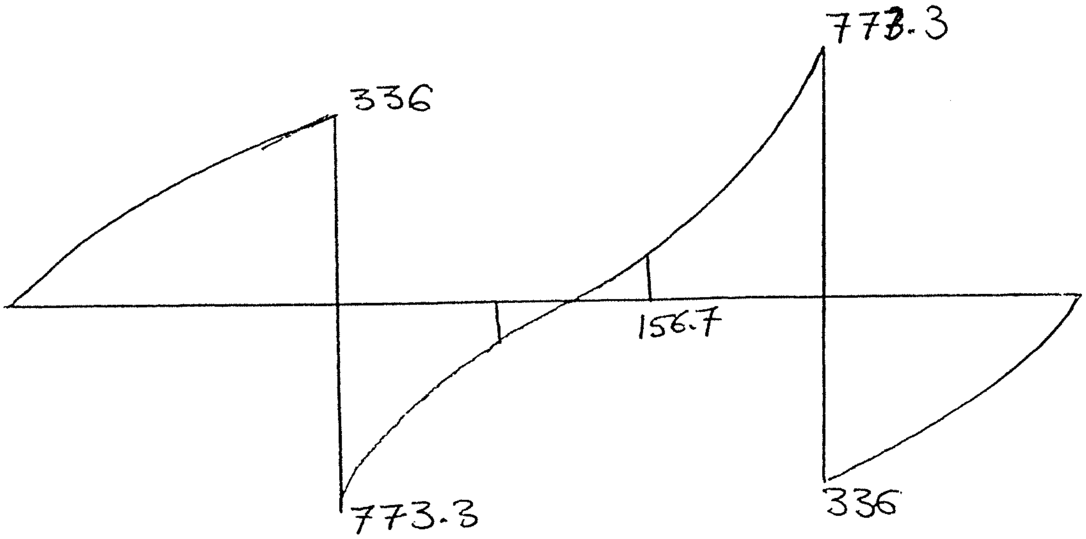
Load from Traingular lower slab = 16.25 X $\frac{1}{2}$ X 15.2 X 10
≈ 1235 KN's

Load/mR = 1235/(15 + 1.7X2 + 11X2) = 30.57 KN/mR

Total load = 21 + 11.66 + 2.8 + 30.57
= 66 KN/mR







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Bending Moment M (kNm)	2415
Torsion Moment T (kNm)	
Shear Force V (kN)	
Web width B (mm)	300
Total height H (mm)	2000
Flange Width Wf (mm)	
Flange Height Hf (mm)	
Reinf centroid depth DcT (mm)	40
Reinf centroid depth DcB (mm)	40
fcu (Mpa)	25
fy - main bars (Mpa)	414
fyv - links (Mpa)	414
% Redistribution	

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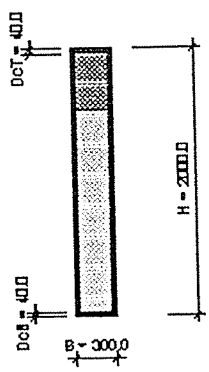

N.A. depth = 458.5 mm

OUTPUT

Moment		Shear		Torsion (Web)	
Mu	4488.5 kNm	v	0.00 MPa	v	0.00 MPa
As	3500 mm²	vc	0.53 MPa	vt	0.34 MPa
As'	0 mm²	Asv/Sv	0.00	Asv/Sv	0.00
Anom	780 mm²	Asv/Sv nom	0.31	As	0

Suggested Reinforcement Configurations:

Bars	(mm²)	Bars	(Asv/sv)	Bars	(Asv/sv)
8Y25	(3927)	2Y8@300	(0.34)		
5Y32	(4021)	2Y10@500	(0.31)		
3Y40	(3770)	2Y12@500	(0.45)		

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♣♠MEMBERS UMIST

No	Node A	Node B	A x 10^3 (mm^2)	I x 10^6 (mm^4)	E (kN/mm^2)	Pinned
1	1	2	600.000	200000.000	21.000	--
2	2	3	600.000	200000.000	21.000	--
3	3	4	600.000	200000.000	21.000	--
4	4	5	600.000	200000.000	21.000	--
5	5	6	600.000	200000.000	21.000	--

LOADINGS UMIST

Memb No	Load type	Glob/Loc	Distance - A (m)	Magnitude(kN)
3	POINT	Global	1.350	-135.20

Memb No	Load type	Glob/Loc	Magnitude - A (kN/m)	Magnitude - B (kN/m)
1	DISTRIBUTED	Global	-66.00	-66.00
2	DISTRIBUTED	Global	-66.00	-66.00
3	DISTRIBUTED	Global	-66.00	-66.00
4	DISTRIBUTED	Global	-66.00	-66.00
5	DISTRIBUTED	Global	-66.00	-66.00

Memb No	Type	Glob/Loc	Distance-A (m)	Distance-B (m)	Magnitude-A (kN/m)	Magnitude-B (kN/m)
1	PATCH	Global	0.000	2.500	-71.50	-65.31
2	PATCH	Global	0.000	6.250	-65.31	0.00
4	PATCH	Global	0.000	6.250	0.00	-65.31
5	PATCH	Global	0.000	2.500	-65.31	-71.50

NODAL DISPLACEMENTS (Global) UMIST

NODE No	X-Displacement (mm)	Z-Displacement (mm)	Rotation (rads)
1	0.000	6.366	0.002525
2	0.000	0.000	0.002610
3	0.000	-12.576	0.000757
4	0.000	-12.576	-0.000757
5	0.000	0.000	-0.002610
6	0.000	6.366	-0.002525

MEMBER FORCES (Local) UMIST

Memb No	Node	Node No	Axial (kN)	Shear (kN)	Moment (kNm)

1	A	1	0.0	0.0	0.0
1	B	2	0.0	336.0	423.2
2	A	2	0.0	773.3	-423.2
2	B	3	0.0	-156.7	-2270.4
3	A	3	0.0	156.7	2270.4
3	B	4	0.0	156.7	-2270.4
4	A	4	0.0	-156.7	2270.4
4	B	5	0.0	773.3	423.2
5	A	5	0.0	336.0	-423.2
5	B	6	0.0	0.0	0.0

EACTIONS (Global) UMIST

ʼlode No	X Component(kN)	Z Component (kN)	Moment (kNm)
2	0.0	1109.3	-0.0
5	0.0	1109.3	0.0

ICREMENTAL DETAILED RESULTS FOR MEMBER No 1 UMIST

No	Dist-A(m)	B.M.(kNm)	S.F.(kN)	Disp X (mm)	Disp Z (mm)
0	0.000	-0.0	-0.0	0.000	6.366
1	0.167	1.9	22.9	0.000	5.945
2	0.333	7.6	45.7	0.000	5.524
3	0.500	17.1	68.4	0.000	5.103
4	0.667	30.4	91.1	0.000	4.682
5	0.833	47.5	113.7	0.000	4.261
6	1.000	68.3	136.3	0.000	3.839
7	1.167	92.9	158.7	0.000	3.417
8	1.333	121.2	181.1	0.000	2.995
9	1.500	153.3	203.5	0.000	2.571
10	1.667	189.1	225.7	0.000	2.147
11	1.833	228.5	247.9	0.000	1.721
12	2.000	271.7	270.0	0.000	1.294
13	2.167	318.5	292.1	0.000	0.865
14	2.333	369.1	314.1	0.000	0.434
15	2.500	423.2	336.0	0.000	0.000

INCREMENTAL DETAILED RESULTS FOR MEMBER No 2 UMIST

	Dist-A(m)	B.M.(kNm)	S.F.(kN)	Disp X (mm)	Disp Z (mm)
0	0.000	423.2	-773.3	0.000	0.000
1	0.417	112.3	-719.5	0.000	-1.093
2	0.833	-176.6	-667.5	0.000	-2.191
3	1.250	-444.2	-617.3	0.000	-3.282
4	1.667	-691.3	-569.0	0.000	-4.354
5	2.083	-918.6	-522.4	0.000	-5.399
6	2.500	-1126.9	-477.7	0.000	-6.405
7	2.917	-1316.9	-434.8	0.000	-7.365
8	3.333	-1489.4	-393.6	0.000	-8.271
9	3.750	-1645.2	-354.4	0.000	-9.115
10	4.167	-1785.0	-316.9	0.000	-9.892
11	4.583	-1909.5	-281.2	0.000	-10.595
12	5.000	-2019.6	-247.4	0.000	-11.219
13	5.417	-2115.9	-215.3	0.000	-11.760
14	5.833	-2199.2	-185.1	0.000	-12.214
15	6.250	-2270.4	-156.7	0.000	-12.576

[NCREMENTAL DETAILED RESULTS FOR MEMBER No 3 UMIST

Þ	Dist-A(m)	B.M.(kNm)	S.F.(kN)	Disp X (mm)	Disp Z (mm)
0	0.000	-2270.4	-156.7	0.000	-12.576
1	0.180	-2297.5	-144.8	0.000	-12.704
2	0.360	-2322.5	-132.9	0.000	-12.814
3	0.540	-2345.4	-121.1	0.000	-12.905
4	0.720	-2366.1	-109.2	0.000	-12.979
5	0.900	-2384.7	-97.3	0.000	-13.035
6	1.080	-2401.1	-85.4	0.000	-13.072
7	1.260	-2415.4	-73.5	0.000	-13.090
8	1.440	-2415.4	73.5	0.000	-13.090
9	1.620	-2401.1	85.4	0.000	-13.072
10	1.800	-2384.7	97.3	0.000	-13.035
11	1.980	-2366.1	109.2	0.000	-12.979
12	2.160	-2345.4	121.1	0.000	-12.905
13	2.340	-2322.5	132.9	0.000	-12.814
14	2.520	-2297.5	144.8	0.000	-12.704
1⌐	2.700	-2270.4	156.7	0.000	-12.576

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Concrete Section design

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Bending Moment M (kNm)	423
Torsion Moment T (kNm)	
Shear Force V (kN)	650
Web width B (mm)	300
Total height H (mm)	2000
Flange Width Wf (mm)	
Flange Height Hf (mm)	
Reinf centroid depth DcT (mm)	40
Reinf centroid depth DcB (mm)	40
fcu (Mpa)	25
fy - main bars (Mpa)	414
fyv - links (Mpa)	414
% Redistribution	

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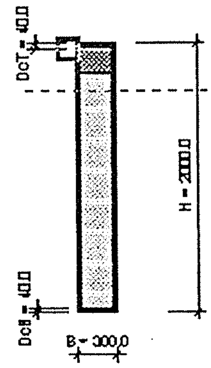


N.A. depth = 217.8 mm

OUTPUT

Moment		Shear		Torsion (Web)	
Mu	4488.5 kNm	v	1.11 MPa	v	0.00 MPa
As	578 mm²	vc	0.34 MPa	vt	0.34 MPa
As'	0 mm²	Asv/Sv	0.59	Asv/Sv	0.00
Anom	780 mm²	Asv/Sv nom	0.31	As	0

Suggested Reinforcement Configurations:

Bars	(mm²)	Bars	(Asv/sv)	Bars	(Asv/sv)
7Y12	(792)	2Y8@150	(0.67)		
4Y16	(804)	2Y10@250	(0.63)		
3Y20	(942)	2Y12@350	(0.65)		

check design for Cont. Part of Deep Beam.

$l/h = 2.5/2 = 1.25 < 2$ deep Beam. (see Reynolds)(P338)

Since $1 \leq l/h < 2 \rightarrow Z = \left(\frac{l+2h}{5}\right)$

The area of Reinf required is the greater of either

$$\frac{1.9M}{f_y l} = \frac{1.9 \times 423.24 \times 10^6}{414 \times 2500} = 776.96 \text{ mm}^2$$

or

$$\frac{1.55M}{f_y \xi h} = \frac{1.55 \times 423.24 \times 10^6}{414 \times 2000 \times 1} = 792 \text{ mm}^2$$

which is Consistant with $A_s = 780 \text{ mm}^2$ from analysis

$V = 650$ KN

$$b \simeq \frac{0.55V}{k_1(\xi h - 0.35\alpha a_1) f_t} = \frac{0.55 \times 650 \times 10^3}{0.7(2000 - 0) \times 2.5} = 102 \text{ mm}$$

$b_{provided} \simeq 300\text{mm} > b_{calculated}$

$$V_1 = k_1(\xi h - 0.35\alpha a_1) f_t b$$

$= 0.7(2000) \times 2.5 \times 300 = 1050$ KN >> 650 KN

provide Min Reinf

$A_{sv} \geq .0015\, b_w S_h$

$S_h \leq d/5 = 180/5 = 36 < 50$ Cm

$\phi = \sqrt{\frac{s \cdot b}{f_y}} \rightarrow$ Try ϕ 12mm Bars

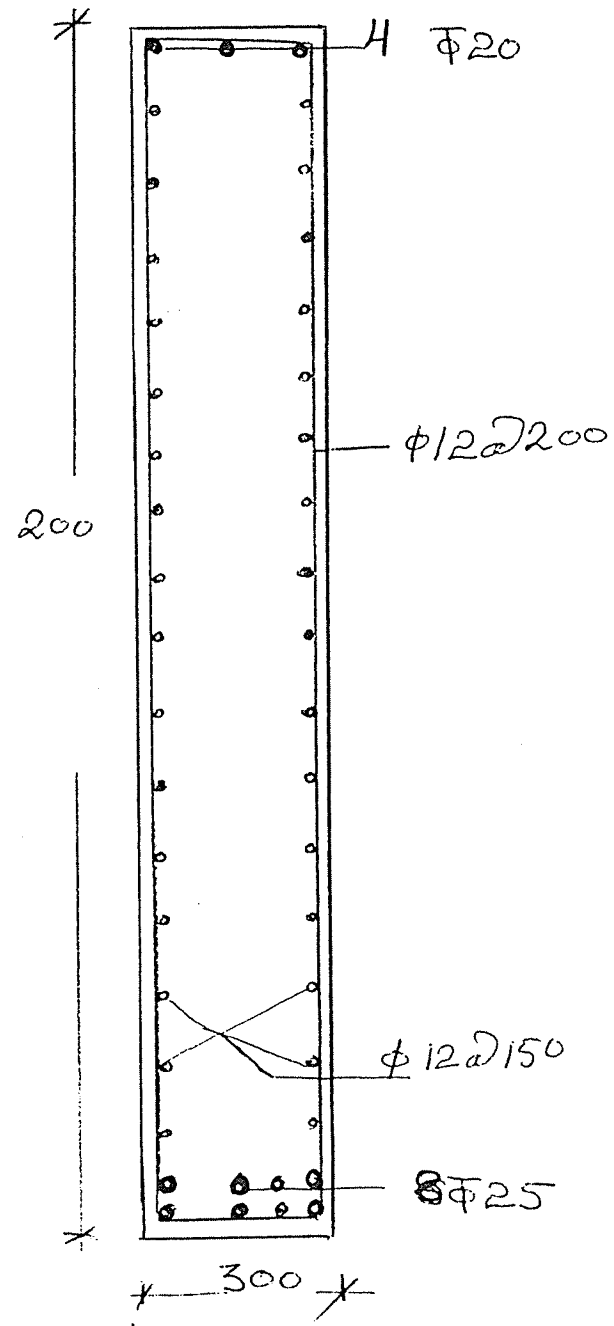
$12 = \sqrt{\frac{s(300)}{414}} \rightarrow s = 198.7$ mm

Try 200

$\therefore A_{sv} = 0.0015 \times 300 \times 200 = 90 \text{ mm}^2 < 113$ $\phi 12$ @ 200 (ok)

$A_{sh} = 0.0025 \times 300 \times 200 = 150 > 113$

Try $\phi 12$ @ 150mm $\rightarrow A_{sh} = 112.5$ (ok)



Section Through B12

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```
SPANS    Bent and Beam Analysis Program V4.1    SPANS
 PANS    Prepared by H. Saffarini 2/2/93         SPANS

ribl/block 1

Number of spans =  3          Number of load cases =  1

Span      Length      Width      Depth      Flange     Flange
                                            thickness  width
 1         5.600      0.150      0.320      0.080      0.550
 2         5.600      0.150      0.320      0.080      0.550
 3         5.600      0.150      0.320      0.080      0.550

Load case number :            1

Span    UDL     Load 1        Load 2        Load 3        Load 4        Load 5
               Val   Dis     Val   Dis     Val   Dis     Val   Dis     Val   Dis
 1     7.86    0.0   0.0     0.0   0.0     0.0   0.0     0.0   0.0     0.0   0.0
 2     7.86    0.0   0.0     0.0   0.0     0.0   0.0     0.0   0.0     0.0   0.0
 3     7.86    0.0   0.0     0.0   0.0     0.0   0.0     0.0   0.0     0.0   0.0

Span         Line Load        From     Length Intensity

Support            Width    Redistribution
 1                 0.000              0 %
 2                 0.000              0 %
 3                 0.000              0 %
 4                 0.000              0 %

Envelope

       Span     lft BM      span BM     rgt BM      lft SF      rgt SF
        1         0.0        18.5       -24.6        17.6       -26.4
        2       -24.6         6.2       -24.6        22.0       -22.0
        3       -24.6        18.5        -0.0        26.4       -17.6

  Required Steel Areas (mm square)

  Span    Top L    Bot L    Top M    Bot M    Top R    Bot R
    1       65        0        0      190      271        0
    2      271        0        0       65      271        0
    3      271        0        0      190       65        0


  Maximum Spacing of Shear Stirrups in mm
  Span     leg L-zone spacing   dia. R-zone spacing   dia. Rest-spc dia.
    1       2   1.40    214       8   1.40    214        8    214      8
    2       2   1.40    214       8   1.40    214        8    214      8
    3       2   1.40    214       8   1.40    214        8    214      8

Span              1        2        3
Span/Depth      19.6     19.6     19.6
Allowable       38.0     42.9     38.0

     65        0       271       0       271       0       65    Requ. Top
  0 Φ 10    2 Φ 10   2 Φ 14   2 Φ 10   2 Φ 14   2 Φ 10   2 Φ 10
  0 Φ  0    0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0   0 Φ  0
    157      157      308      157      308      157      157   Prov. Top
      ----------------------------------------------------------
      |       span  1      |       span  2      |      span  3      |
```

```
SPANS    Bent and Beam Analysis Program V4.1    SPANS
SPANS    Prepared by H. Saffarini 2/2/93        SPANS


Number of spans =  1           Number of load cases =  1

Span       Length      Width      Depth     Flange    Flange
                                            thickness width
 1          3.000      0.150      0.320      0.080     0.550

Load case number :            1

Span    UDL    Load 1      Load 2      Load 3      Load 4      Load 5
              Val   Dis   Val   Dis   Val   Dis   Val   Dis   Val   Dis
 1     7.86   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0

Span         Line Load       From     Length Intensity

Support           Width    Redistribution
 1                0.000              0 %
 2                0.000              0 %

Envelope

        Span     lft BM      span BM     rgt BM     lft SF     rgt SF
         1         0.0         8.8       -0.0       11.8      -11.8

  Required Steel Areas (mm square)

  Span    Top L    Bot L    Top M    Bot M    Top R    Bot R
     1      65        0        0       91       65        0


  Maximum Spacing of Shear Stirrups in mm
  Span     leg L-zone spacing  dia. R-zone spacing  dia. Rest-spc dia.
     1       2   0.75    214      8   0.75    214      8    214      8

Span              1
Span/Depth      10.5
Allowable       32.0

     65          0         65   Requ. Top
  0 Φ  0     2 Φ 10     0 Φ  0
  0 Φ  0     0 Φ  0     0 Φ  0
      0        157         0    Prov. Top
      --------------------------
      |       span  1       |
      0         91         0    Requ. Bot
  0 Φ  0     2 Φ 10     0 Φ  0
  0 Φ  0     0 Φ  0     0 Φ  0
      0        157         0    Prov. Bot
```

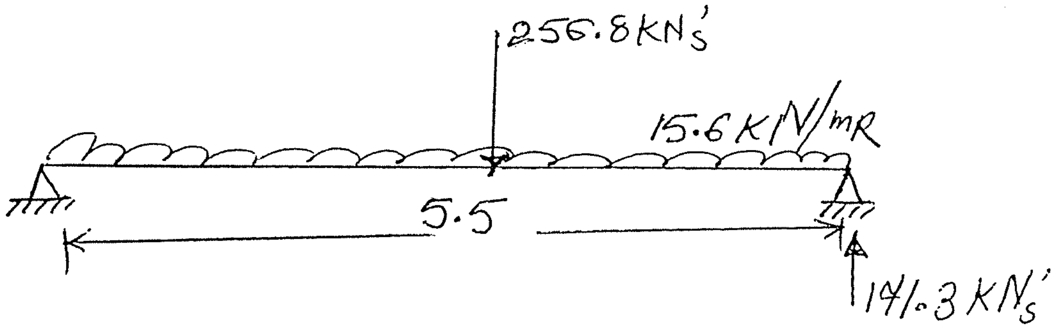
Design of (B10)

Reaction From BH = 128.4 X2 = 256.8 KN's ↓

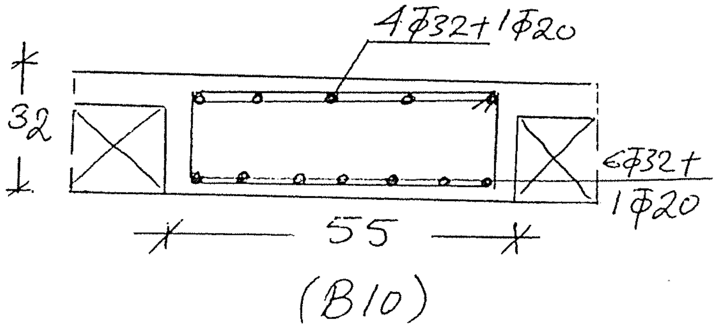
O.w = 0.55 X0.32X1.4X25 = 5.6 KN/mR (Dist)

Load From slab ⇒ Say 10KN/mR (Dist)

Total = 10+5.6 = 15.6KN/mR



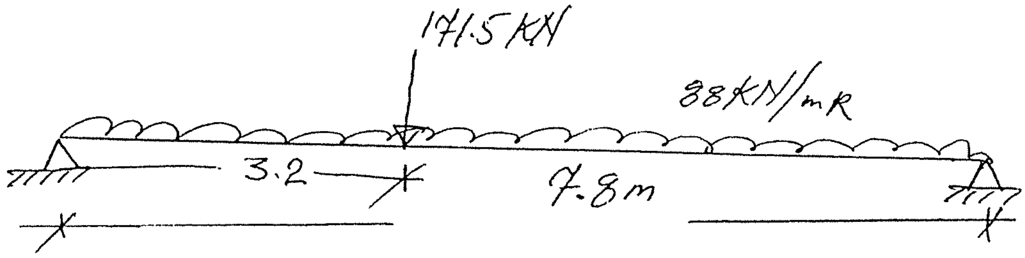

```
PL1-B10
 Number of spans =    1          Number of load cases =   1
Span      Length      Width      Depth     Flange     Flange
                                           thickness  width
 1        5.500       0.550      0.320      0.000      0.550
Load case number :               1

Span     UDL     Load 1       Load 2       Load 3       Load 4       Load 5
                 Val    Dis   Val    Dis   Val    Dis   Val    Dis   Val    Dis
 1     15.60  256.8    2.8   0.0    0.0   0.0    0.0   0.0    0.0   0.0    0.0

Span          Line Load        From     Length Intensity

Support                Width     Redistribution
 1                     0.000                0 %
 2                     0.000                0 %
Envelope
       Span      lft BM      span BM     rgt BM      lft SF      rgt SF
          1        0.0        412.1       -0.0        171.3      -171.3
  Required Steel Areas (mm square)
   Span   Top L    Bot L    Top M    Bot M    Top R    Bot R
     1     238       0      3282     4892      238       0
  Maximum Spacing of Shear Stirrups in mm
  Span      leg L-zone spacing   dia. R-zone spacing  dia. Rest-spc dia.
     1        2    1.38     142      10    1.38     142      10     159       8
 Span                 1
Span/Depth       19.3
Allowable        21.1

    238        3282        238     Requ. Top
  0  Φ   0     4  Φ  32    4  Φ   0
  0  Φ   0     1  Φ  20    0  Φ   0
      0        3529          0     Prov. Top
      --------------------------
      |        span  1       |
      0        4892          0     Requ. Bot
  0  Φ   0     6  Φ  32    0  Φ   0
  0  Φ   0     1  Φ  20    0  Φ   0
      0        5137          0     Prov. Bot
```



Design of B5:-

weight from Rib #1 = 88KN/mR

Reaction From B10 = 171.5 KN



-B5-

Number of spans = 1   Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	7.800	0.500	0.600	0.320	1.000

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	88.00	171.5	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	-0.0	943.6	-0.0	444.3	-413.6

Required Steel Areas (mm square)

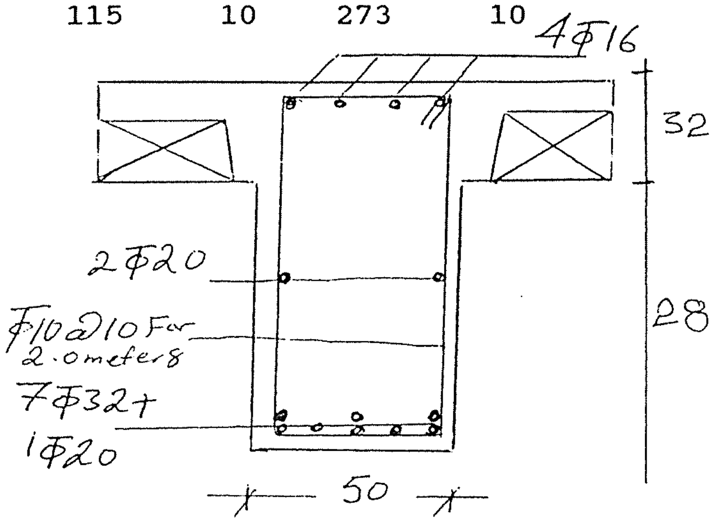
Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	430	0	0	5657	430	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	1.95	103	10	1.95	115	10	273	10

Span	1
Span/Depth	13.8
Allowable	18.7

430	0	430	Requ. Top
0 Φ 0	4 Φ 16	4 Φ 0	
0 Φ 0	0 Φ 0	0 Φ 0	
0	804	0	Prov. Top
	span 1		
0	5657	0	Requ. Bot
0 Φ 0	7 Φ 32	0 Φ 0	
0 Φ 0	1 Φ 20	0 Φ 0	
0	5941	0	Prov. Bot



Detail of (B5)

b15

lumber of spans = 2 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	2.400	1.000	0.320	0.000	1.000
2	5.400	1.000	0.320	0.000	1.000

.oad case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	80.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	80.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span	Line Load	From	Length	Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	-52.2	-219.6	4.5	-187.5
2	-219.6	181.8	-0.0	256.7	-175.3

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	434	0	535	434	2550	0
2	2550	0	0	2032	434	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	6	0.60	214	8	0.60	214	8	214	8
2	6	1.35	214	8	1.35	214	8	214	8

Span	1	2
Span/Depth	8.4	18.9
Allowable	49.4	29.2

```
   434       535      2550        0        434    Requ. Top
 0 Φ 12    6 Φ 12    6 Φ 25    6 Φ 12    6 Φ 12
 0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0
   678       678      2944       678       678    Prov. Top
    -----------------------------------------
     |       span  1      |      span  2     |
     0        434         0       2032        0   Requ. Bot
 0 Φ  0    6 Φ 12    0 Φ  0    7 Φ 20    0 Φ  0
 0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0
     0        678         0       2198        0   Prov. Bot
```

SPANS Bent and Beam Analysis Program V4.1 SPANS
PANS Prepared by H. Saffarini 2/2/93 SPANS

b16

umber of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	5.500	1.000	0.320	0.000	1.000

oad case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	75.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

upport	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

En. elope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	283.6	0.0	206.3	-206.3

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	434	0	0	3566	434	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	6	1.38	214	8	1.38	214	8	214	8

Span	1
Span/Depth	19.3
Allowable	21.7

```
   434          0        434    Requ. Top
 0 Φ  0      6 Φ 12    0 Φ  0
 0 Φ  0      0 Φ  0    0 Φ  0
     0        678          0    Prov. Top
     --------------------------
     |       span  1      |
     0        3566         0    Requ. Bot
 0 Φ  0      8 Φ 25    0 Φ  0
 0 Φ  0      0 Φ  0    0 Φ  0
     0        3925         0    Prov. Bot
```

SPANS Bent and Beam Analysis Program V4.1 SPANS
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B17

umber of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	1.800	0.600	0.320	0.000	0.600

oad case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	107.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

upport	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

En.elope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	43.3	-0.0	96.3	-96.3

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	260	0	0	444	260	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.45	146	8	0.45	146	8	146	8

Span	1
Span/Depth	6.3
Allowable	41.1

```
    260          0         260    Requ. Top
 0 Φ  0      4 Φ 12     0 Φ  0
 0 Φ  0      0 Φ  0     0 Φ  0
     0        452         0    Prov. Top
     --------------------------
     |       span  1       |
     0        444         0    Requ. Bot
 0 Φ  0      4 Φ 14     0 Φ  0
 0 Φ  0      0 Φ  0     0 Φ  0
     0        615         0    Prov. Bot
```

```
SPANS   Bent and Beam Analysis Program V4.1   SPANS
‾PANS   Prepared by H. Saffarini 2/2/93       SPANS

B19

 umber of spans =  1          Number of load cases =  1

Span     Length     Width     Depth     Flange     Flange
                                        thickness  width
 1        5.500     0.400     0.320      0.000      0.400

ʳoad case number :            1

span    UDL    Load 1      Load 2      Load 3      Load 4      Load 5
               Val   Dis   Val   Dis   Val   Dis   Val   Dis   Val   Dis
 1    20.00    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0

Span        Line Load      From     Length Intensity

·upport           Width    Redistribution
 1                0.000              0 %
 2                0.000              0 %

ᴇr. ˌlope

        Span     lft BM     span BM    rgt BM     lft SF     rgt SF
         1         0.0        75.6       0.0        55.0      -55.0

  Required Steel Areas (mm square)

  Span   Top L   Bot L   Top M   Bot M   Top R   Bot R
    1     173       0       0     851     173       0


  Maximum Spacing of Shear Stirrups in mm
  Span     leg L-zone spacing  dia. R-zone spacing  dia. Rest-spc dia.
    1        2    1.38    214     8    1.38    214     8     214     8

Span              1
ʖpan/Depth      19.3
Allowable       27.3

    173          0        173    Requ. Top
  0 Φ  0     4 Φ 12    4 Φ  0
  0 Φ  0     0 Φ  0    0 Φ  0
      0        452          0    Prov. Top
      --------------------------
      |      span  1        |
      0        851          0    Requ. Bot
  0 Φ  0     4 Φ 18    0 Φ  0
  0 Φ  0     0 Φ  0    0 Φ  0
      0       1017          0    Prov. Bot
```

B20

umber of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	5.500	0.500	0.320	0.000	0.500

oad case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	45.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span	Line Load	From	Length	Intensity

upport	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

E..elope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	170.2	0.0	123.8	-123.8

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	217	0	240	2177	217	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	1.38	170	8	1.38	170	8	175	8

Span	1
Span/Depth	19.3
Allowable	20.9

```
   217         240         217    Requ. Top
 0 Φ  0      4 Φ 12      4 Φ  0
 0 Φ  0      0 Φ  0      0 Φ  0
     0         452           0    Prov. Top
     --------------------------
     |       span  1        |
     0        2177           0    Requ. Bot
 0 Φ  0      5 Φ 25      0 Φ  0
 0 Φ  0      0 Φ  0      0 Φ  0
     0        2453           0    Prov. Bot
```

```
SPANS   Bent and Beam Analysis Program V4.1   SPANS
 PANS   Prepared by H. Saffarini 2/2/93       SPANS

B21

 umber of spans =  1          Number of load cases =  1

Span    Length     Width     Depth    Flange    Flange
                                      thickness width
 1       2.500     0.400     0.320     0.000     0.400

 oad case number :            1

Span   UDL    Load 1      Load 2      Load 3      Load 4      Load 5
              Val   Dis   Val   Dis   Val   Dis   Val   Dis   Val   Dis
 1   31.00    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0

Span        Line Load      From     Length Intensity

 upport             Width   Redistribution
 1                  0.000              0 %
 2                  0.000              0 %

En..elope

       Span     lft BM      span BM     rgt BM      lft SF      rgt SF
        1         0.0        24.2         0.0        38.8       -38.8

  Required Steel Areas (mm square)

  Span     Top L    Bot L    Top M    Bot M    Top R    Bot R
     1      173        0        0      248      173        0


  Maximum Spacing of Shear Stirrups in mm
  Span      leg L-zone spacing  dia. R-zone spacing  dia. Rest-spc dia.
     1        2   0.63    214      8    0.63    214      8     214      8

 pan               1
 pan/Depth       8.8
Allowable       44.7

    173          0         173    Requ. Top
  0 Φ  0     4 Φ 12     4 Φ  0
  0 Φ  0     0 Φ  0     0 Φ  0
      0        452          0     Prov. Top
      --------------------------
      |        span  1        |
      0        248          0     Requ. Bot
  0 Φ  0     4 Φ 14     0 Φ  0
  0 Φ  0     0 Φ  0     0 Φ  0
      0        615          0     Prov. Bot
```

SPANS Bent and Beam Analysis Program V4.1 SPANS
PANS Prepared by H. Saffarini 2/2/93 SPANS

B22

umber of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	2.300	0.540	3.200	0.000	0.540
2	12.700	0.540	3.200	0.000	0.540
3	2.300	0.540	3.200	0.000	0.540

Load case number : 1

pan	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	100.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	100.00	135.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	100.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

pan Line Load From Length Intensity

Support	Width	Redistribution
1	0.350	0 %
2	0.350	0 %
3	0.000	0 %
4	0.000	0 %

nvelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	-66.1	-264.5	0.0	-230.0
2	-264.5	2177.5	-264.5	703.1	-702.1
3	-264.5	-66.1	0.0	230.0	0.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	2600	0	2600	2600	2600	0
2	2600	0	0	2600	2600	0
3	2600	0	2600	2600	2600	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.57	162	8	0.57	162	8	162	8
2	2	3.17	162	8	3.17	162	8	162	8
3	2	0.57	162	8	0.57	162	8	162	8

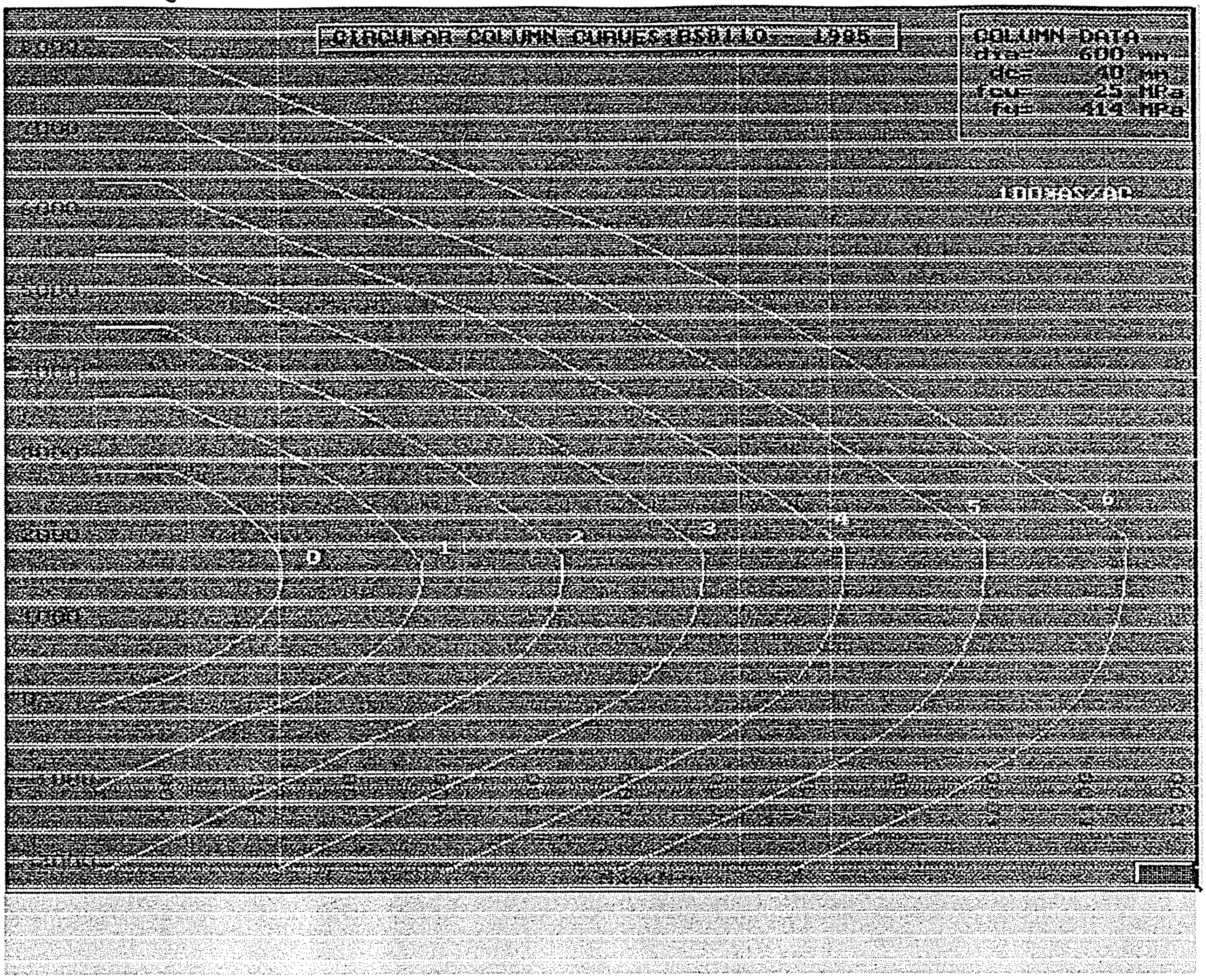
Span	1	2	3
Span/Depth	0.7	4.0	0.7
Allowable	14.0	39.8	14.0

2600	2600	2600	0	2600	2600	2600	Requ. Top
6 Φ 25	6 Φ 25	6 Φ 25	6 Φ 25	6 Φ 25	6 Φ 25	6 Φ 25	
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	
0	2944	2944	2944	2944	2944	2944	Prov. Top

| span 1 | span 2 | span 3 |

0	2600	0	2600	0	2600	0	Requ. Bot
0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	0 Φ 0	6 Φ 25	0 Φ 0	
0 Φ 0	6 Φ 25	0 Φ 0	6 Φ 25	0 Φ 0	0 Φ 0	0 Φ 0	
0	2944	0	2944	0	2944	0	Prov. Bot

Design of Interior 60 Cm Column



9999999999999999999999999999999999999999999999999999999999999999999999999999999

SYMMETRICALLY REINFORCED COLUMN DESIGN

9999999999999999999999999999999999999999999999999999999999999999999999999999999

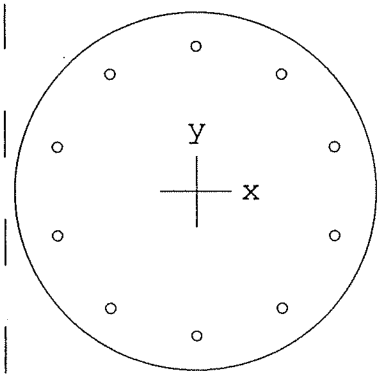
fcu = 25.00 MPa	SLENDER COLUMN
fy = 414.00 MPa	Mtop= 32.00 kN.m
N = 650.00 kN	Mbot= 0.00 kN.m
	Lex = 6.00 kN.m
	Lex = 6.00 kN.m
b = 530 mm	Ley = 6.00 kN.m
h = 530 mm	Unbraced Structure
	c = 30 mm

9999999999999999999999999999999999999999999999999999999999999999999999999999999

UNREINFORCED SECTION SUFFICIENT

MINIMUM Asc RQD.= 1124 mm^2

اتحاد المستشارين
للهندسة والبيئة



500 mm diam.

f'c = 21 MPa

fy = 414 MPa

Confinement: Spiral

clr cover = 40 mm

spacing = 109 mm

10 N-16 at 1.02%

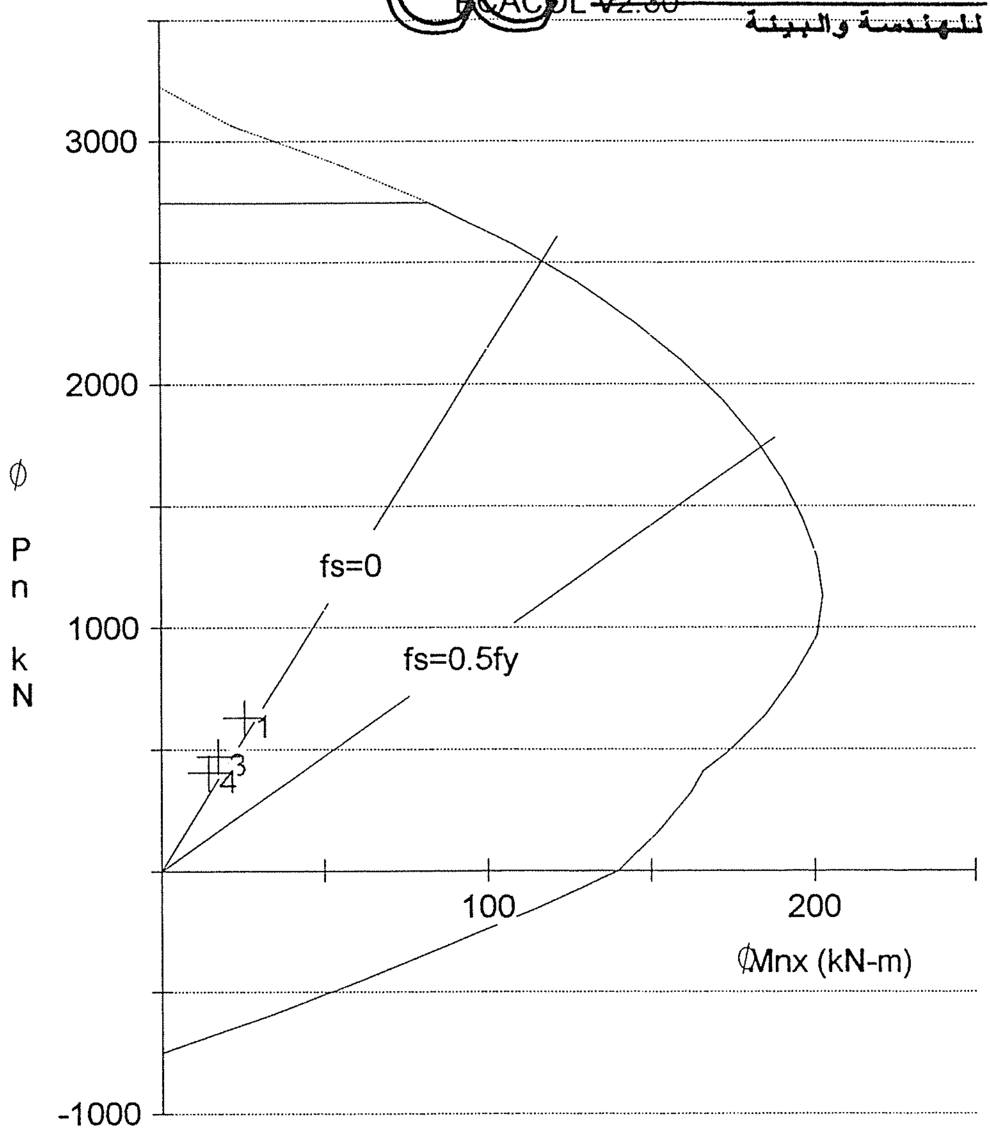
As = 2010 mm^2

Ix = 3.068e+009 mm^4

Iy = 3.068e+009 mm^4

Xo = 0 mm

© 1993 PCA



censed To: Licensee name not yet specified.

File name: C:\C1.COL

Project: DEAD SEA COMPLEX

Column Id: 500 mm INTERIOR COL.

Engineer: HASSAN AL-KHAMRAH

Date: 5/2/2000 Time: 15:11:53

Code: ACI 318-89

Units: Metric

Material Properties:

Ec = 23168 MPa eu = 0.003 mm/mm

fc = 17.85 MPa Es = 199955 MPa

Beta1 = 0.85

Stress Profile: Block

phi(c) = 0.75, phi(b) = 0.90

X-axis slenderness is considered; k(b) = 1.00 k(s) = 1.20

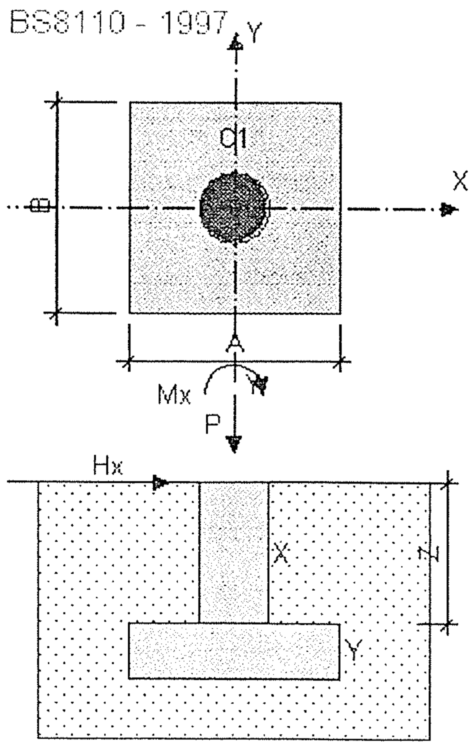
Concrete Base Design :

Input Data

Base Length A (m)		1.5
Base Width B (m)		1.5
Column(s)	Col 1	Col 2
C (m)	.5	
D (m)		
E (m)		
F (m)		
Stub column height X (m)		1
Base Depth Y (m)		.4
Soil Cover Z (m)		1
Concrete Density (kN/m3)		25
Soil Density (kN/m3)		20
Soil friction angle (°)		35
Base friction constant		.5
Reinf. depth top X (mm)		50
Reinf. depth top Y (mm)		50
Reinf. depth bottom X (mm)		50
Reinf. depth bottom Y (mm)		50
Min Load Factor: self weight		1.5

Allow Bearing Press. (kN/m²)	400
S.F. Overturning (ULS)	1.5
S.F. Slip (ULS)	1.5
fcu base (MPa)	25
fcu columns (MPa)	25
fy (MPa)	414

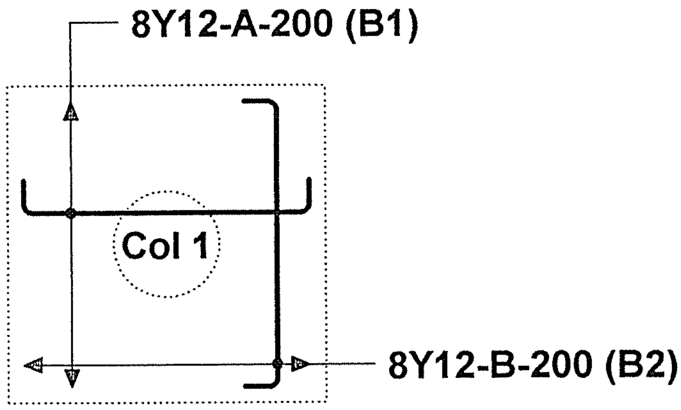
		Loads						
Load Case	Column no.	LF min	LF max	P (kN)	Hx (kN)	Hy (kN)	Mx (kNm)	M (kN
1	1	1	1.6	450				



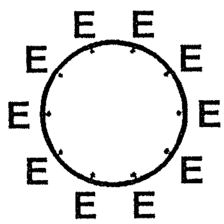
Output for Load Case 1

OUTPUT FOR LOAD CASE 1	
Max. soil pressure (kPa)	230.56
SF overturning (SLS)	>100
SF overturning (ULS)	>100
Safety Factor slip (ULS)	>100
Safety Factor uplift (ULS)	>100
BOTTOM:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
TOP:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
Linear shear X (kN)	0.000
vc X (MPa)	0.347
Linear shear Y (kN)	0.000
vc Y (MPa)	0.347
Linear shear other (kN)	0.000
Punching shear (kN)	0.000
vc Punch	0.347

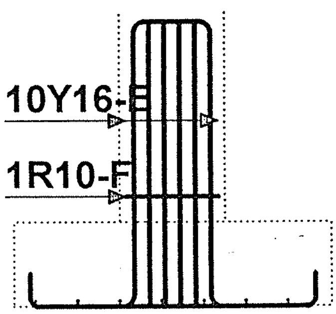
هاتف: ٠٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن



PLAN



Section:Column 1



SECTION

SPANS Prepared by H. Saffarini 2/2/93
B1/(B11 OLD)

Number of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	4.500	1.500	0.320	0.000	1.500
2	5.500	1.500	0.320	0.000	1.500
3	4.500	1.500	0.320	0.000	1.500

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	40.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	40.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	40.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	50.8	-101.0	67.6	-112.4
2	-101.0	50.3	-101.0	110.0	-110.0
3	-101.0	50.8	-0.0	112.4	-67.6

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	650	0	0	650	1035	0
2	1035	0	0	650	1035	0
3	1035	0	0	650	650	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	8	1.13	214	8	1.13	214	8	214	8
2	8	1.38	214	8	1.38	214	8	214	8
3	8	1.13	214	8	1.13	214	8	214	8

Span	1	2	3
Span/Depth	15.8	19.3	15.8
Allowable	44.4	50.3	44.4

```
   650         0        1035         0        1035         0        650    Requ. To
 0 Φ  0     8 Φ 12    10 Φ 12     8 Φ 12    10 Φ 12     8 Φ 12    8 Φ 12
 8 Φ 12     0 Φ  0     0 Φ  0     0 Φ  0     0 Φ  0     0 Φ  0    0 Φ  0
   904        904       1130        904       1130        904       904    Prov. To
  -----------------------------------------------------------------------
  |       span  1       |       span  2       |       span  3       |
  0         650         0         650         0         650         0     Requ. Bo
 0 Φ  0     8 Φ 12     0 Φ  0     8 Φ 12     0 Φ  0     8 Φ 12    0 Φ  0
 0 Φ  0     0 Φ  0     0 Φ  0     0 Φ  0     0 Φ  0     0 Φ  0    0 Φ  0
```

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

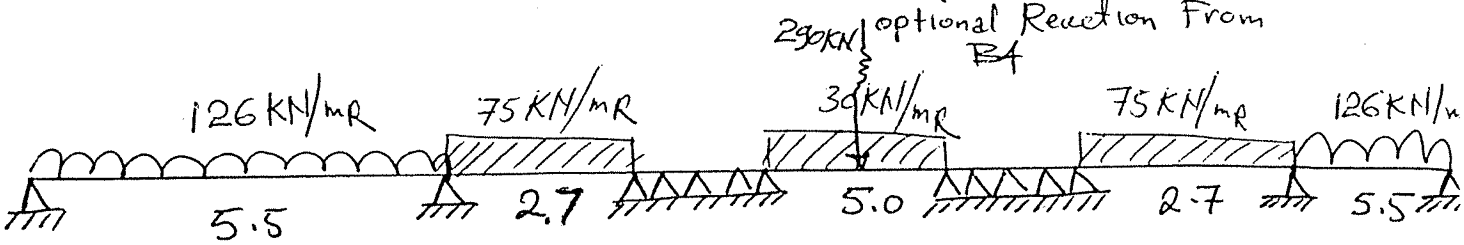
Design of B6 :-

weight of Parapet wall :-

$0.3 \times 25 \times 1.4 \times 3.25 = 34.125$ KN/mR

weight from slab $= 50.4/0.55 = 91.636$ KN/mR

Total $= 34.125 + 91.636 = 125.76$ KN/mR



Design of B7 :-

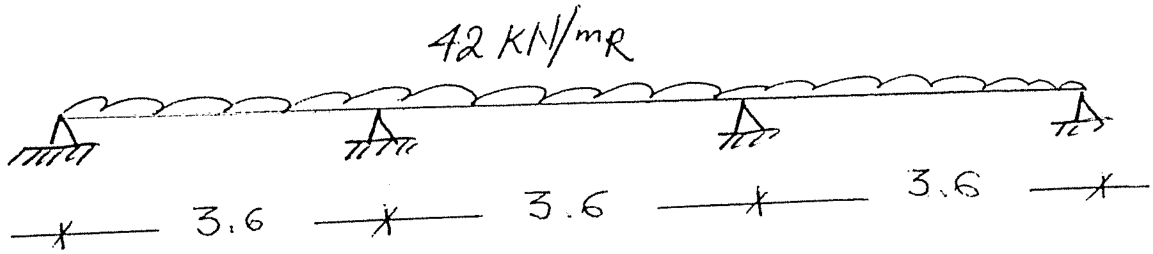
$(o.w) = (1.15 \times 0.3 + 0.7 \times 0.2) \times 25 \times 1.4 = 16.975$ KN/mR

$+ 0.5 \times 0.2 \times 25 \times 1.4 \approx 3.5$

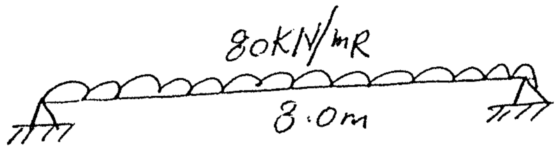
Total (o.w) $= 20.5$ KN/mR

weight From Slab $= \frac{3}{2} \times 14.5 = 21.27$

Total $= 41.77 \approx 42$ KN/mR



Design of B8 :-



weight from slab $= 14.5 \times \frac{11.5}{2} \approx 80$ KN/mR

SPANS Bent and Beam Analysis Program V4.1
BL1-B6

Number of spans = 5 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	5.500	0.800	0.320	0.000	0.800
2	2.700	0.800	0.320	0.000	0.800
3	5.000	0.800	0.320	0.000	0.800
4	2.700	0.800	0.320	0.000	0.800
5	5.500	0.800	0.320	0.000	0.800

Col	Bot Height	Depth	Width	Top Height	Depth	Width
1	0.000	0.220	5.000	0.000	0.000	0.000
2	4.700	0.220	0.400	0.000	0.000	0.000
3	4.700	0.220	3.500	0.000	0.000	0.000
4	4.700	0.220	3.500	0.000	0.000	0.000
5	4.700	0.220	0.600	0.000	0.000	0.000
6	0.000	0.220	5.000	0.000	0.000	0.000

Load case number : 1

Span	UDL	Load 1		Load 2		Load 3		Load 4		Load 5	
		Val	Dis	Val	Dis	Val	Dis	Val	Dis	Val	Dis
1	126.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	75.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	30.00	290.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	75.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	126.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %
5	0.000	0 %
.	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	303.8	-345.2	283.7	-409.3
2	-311.9	-111.3	-47.4	199.2	-3.3
3	-194.5	260.8	-196.3	219.6	-220.4
4	-51.1	-107.8	-301.3	8.6	-193.9
5	-349.5	301.7	0.0	410.1	-282.9

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	347	0	807	3833	4293	1363
2	3923	916	1198	347	486	0
3	2320	0	230	3356	2348	0
4	524	0	1156	347	3805	773
5	4341	1421	778	3809	347	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	4	1.38	121	8	1.38	111	8	214	8
2	4	0.68	214	8	0.68	214	8	214	8
3	4	1.25	214	8	1.25	214	8	214	8
4	4	0.68	214	8	0.68	214	8	214	8
5	4	1.38	110	8	1.38	122	8	214	8

Span	1	2	3	4	5
Span/Depth	19.3	9.5	17.5	9.5	19.3
Allowable	22.3	37.2	24.7	37.5	22.3

```
   347       807       4293      1198      2320      230       2348    Requ. Top
 8 Φ 12    8 Φ 12    9 Φ 25    8 Φ 14    8 Φ 20    6 Φ 12    8 Φ 20
 0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0
   904       904       4416      1231      2512      678       2512    Prov. Top
    ----------------------------------------------------------------
    |       span  1         |      span  2      |      span  3      |
    0       3833      1363      347        0       3356        0     Requ. Bot
 0 Φ  0    8 Φ 25    0 Φ  0    8 Φ 12    0 Φ  0    7 Φ 25    0 Φ  0
 0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0
    0       3925        0       904        0       3434        0     Prov. Bot

  1156      4341       778       347
 8 Φ 14    9 Φ 25    7 Φ 12    7 Φ 12
 0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0
  1231      4416       791       791
    ------------------------------------
      span   4      |     span   5      |
   347      1421      3809         0
 8 Φ 12    0 Φ  0    8 Φ 25    0 Φ  0
 0 Φ  0    0 Φ  0    0 Φ  0    0 Φ  0
   904        0       3925         0
```

SPANS Prepared by H. Saffarini 2/2/93 SPANS

BL1-B7

Number of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.600	0.200	1.850	0.000	0.200
[illegible]	3.600	0.200	1.850	0.000	0.200
[illegible]	3.600	0.200	1.850	0.000	0.200

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	42.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	42.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	42.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	40.8	-54.4	60.5	-90.7
2	-54.4	13.6	-54.4	75.6	-75.6
3	-54.4	40.8	0.0	90.7	-60.5

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	552	0	0	552	552	0
2	552	0	0	552	552	0
3	552	0	0	552	552	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.90	437	8	0.90	437	8	437	8
2	2	0.90	437	8	0.90	437	8	437	8
3	2	0.90	437	8	0.90	437	8	437	8

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```
Span                1        2        3
Span/Depth        2.0      2.0      2.0
Allowable        49.0     55.4     49.0

    552         0       552        0       552        0       552     Requ. To
  0 Φ 18    3 Φ 18   3 Φ 18    3 Φ 18   3 Φ 18    3 Φ 18   3 Φ 18
  0 Φ  0    0 Φ  0   0 Φ  0    0 Φ  0   0 Φ  0    0 Φ  0   0 Φ  0
    763       763      763       763      763       763      763     Prov. To
      ----------------------------------------------------------------
      |       span  1        |       span  2       |      span  3       |
      0         552          0         552         0        552          0   Requ. Bo
  0 Φ  0    2 Φ 20   0 Φ  0    2 Φ 20   0 Φ  0    2 Φ 20   0 Φ  0
  0 Φ  0    0 Φ  0   0 Φ  0    0 Φ  0   0 Φ  0    0 Φ  0   0 Φ  0
      0       628      0         628       0        628         0   Prov. Bo
```

SPANS Bent and Beam Analysis Program V4.1 SPANS
SPANS Prepared by H. Saffarini 2/2/93 SPANS

BLOCK1-B8

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.000	0.500	0.320	0.000	0.500

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	80.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	90.0	0.0	120.0	-120.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	217	0	0	1004	217	0

Maximum Spacing of Shear Stirrups in mm

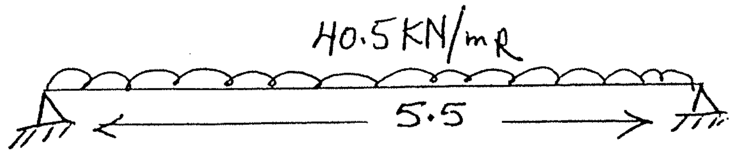
Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	0.75	175	8	0.75	175	8	175	8

Span	1
Span/Depth	10.5
Allowable	25.0

```
   217         0        217    Requ. Top
0  Φ  0    0  Φ  0    0  Φ  0
0  Φ  0    4  Φ 12    0  Φ  0
     0       452         0     Prov. Top
    ---------------------------
    |       span  1        |
     0      1004         0     Requ. Bot
0  Φ  0    4  Φ 18    0  Φ  0
0  Φ  0    0  Φ  0    0  Φ  0
     0      1017         0     Prov. Bot
```

هاتف: ٦٤٤٠٨٨ ، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Design of B9:-



weight from slab $= \frac{4}{2} \times (7.8/0.55) = 28.36$

half weight of Spandrel Beam $= (6.6-4.36) \times 0.3 \times 25 \times 1.4$

$= 23.52$ KN/m $/ 2.0$

$= 11.76$ KN/mR

Total Load $= 11.76 + 28.36 = 40.5$ KN/mR

```
Number of spans =  1          Number of load cases =  1
Span     Length     Width      Depth     Flange     Flange
                                         thickness  width
 1        5.500     0.400      0.320      0.000      0.400
Load case number :              1
Span    UDL     Load 1      Load 2      Load 3      Load 4      Load 5
               Val    Dis   Val    Dis   Val    Dis   Val    Dis   Val    Dis
 1    41.00    0.0    0.0   0.0    0.0   0.0    0.0   0.0    0.0   0.0    0.0
Span          Line Load      From     Length Intensity
Support            Width     Redistribution
 1                 0.000                0 %
 2                 0.000                0 %
Envelope
       Span     lft BM      span BM     rgt BM      lft SF      rgt SF
          1        0.0       155.0        0.0        112.8      -112.8
  Required Steel Areas (mm square)
  Span      Top L     Bot L     Top M     Bot M     Top R     Bot R
     1       173         0       445      1951       173         0
  Maximum Spacing of Shear Stirrups in mm
  Span      leg L-zone spacing   dia. R-zone spacing   dia. Rest-spc dia.
     1        2    1.38    168       8   1.38    168       8     214       8
Span                 1
Span/Depth       19.3
Allowable        19.5
    173         445         173    Requ. Top
  0 Φ  0      4 Φ 12      4 Φ 12
  4 Φ 12      0 Φ  0      0 Φ  0
    452         452         452    Prov. Top
        --------------------------
        |         span  1        |
        0          1951          0    Requ. Bot
  0 Φ  0      4 Φ 25      0 Φ  0
  0 Φ  0      0 Φ  0      0 Φ  0
        0          1963          0    Prov. Bot
```

SPANS Bent and Beam Analysis Program V4.1 SPANS
SPANS Prepared by H. Saffarini 2/2/93 SPANS

B11

Number of spans = 3 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	3.600	1.000	0.500	0.000	1.000
2	3.600	1.000	0.500	0.000	1.000
3	3.600	1.000	0.500	0.000	1.000

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	48.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	48.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	48.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

S~~n Line Load From Length Intensity

Support	Width	Redistribution
1	0.350	0 %
2	0.350	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	-77.8	-311.0	0.0	-172.8
2	-311.0	-233.3	-311.0	86.4	-86.4
3	-311.0	-77.8	-0.0	172.8	-0.0

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	707	0	707	707	2014	0
2	2014	0	1477	707	2014	0
3	2014	0	707	707	707	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	6	0.90	262	8	0.90	262	8	262	8
2	6	0.90	262	8	0.90	262	8	262	8
3	6	0.90	262	8	0.90	262	8	262	8

Span	1	2	3
Span/Depth	7.7	7.7	7.7
Allowable	9.3	62.0	14.0

707	707	2014	1477	2014	707	707	Requ. To
7 Φ 20	0 Φ 0	7 Φ 20	7 Φ 20	7 Φ 20	7 Φ 20	7 Φ 20	
2198	2198	2198	2198	2198	2198	2198	Prov. To

	span 1		span 2		span 3		
0	707	0	707	0	707	0	Requ. Bo
0 Φ 0	8 Φ 12	0 Φ 0	8 Φ 12	0 Φ 0	8 Φ 12	0 Φ 0	
0	904	0	904	0	904	0	Prov. Bo

```
SPANS    Bent and Beam Analysis Program V4.1    SPANS
SPANS    Prepared by H. Saffarini 2/2/93        SPANS
```

RESTORENT B12

Number of spans = 3   Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	4.000	1.000	0.320	0.000	1.000
2	4.500	1.000	0.320	0.000	1.000
3	4.200	1.000	0.320	0.000	1.000

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	30.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	30.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	30.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span   Line Load   From   Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %
3	0.000	0 %
4	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	36.3	-53.2	46.7	-73.3
2	-53.2	20.6	-57.4	66.6	-68.4
3	-57.4	40.5	-0.0	76.7	-49.3

Required Steel Areas (mm square)

Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	434	0	0	434	546	0
2	546	0	0	434	589	0
3	589	0	0	434	434	0

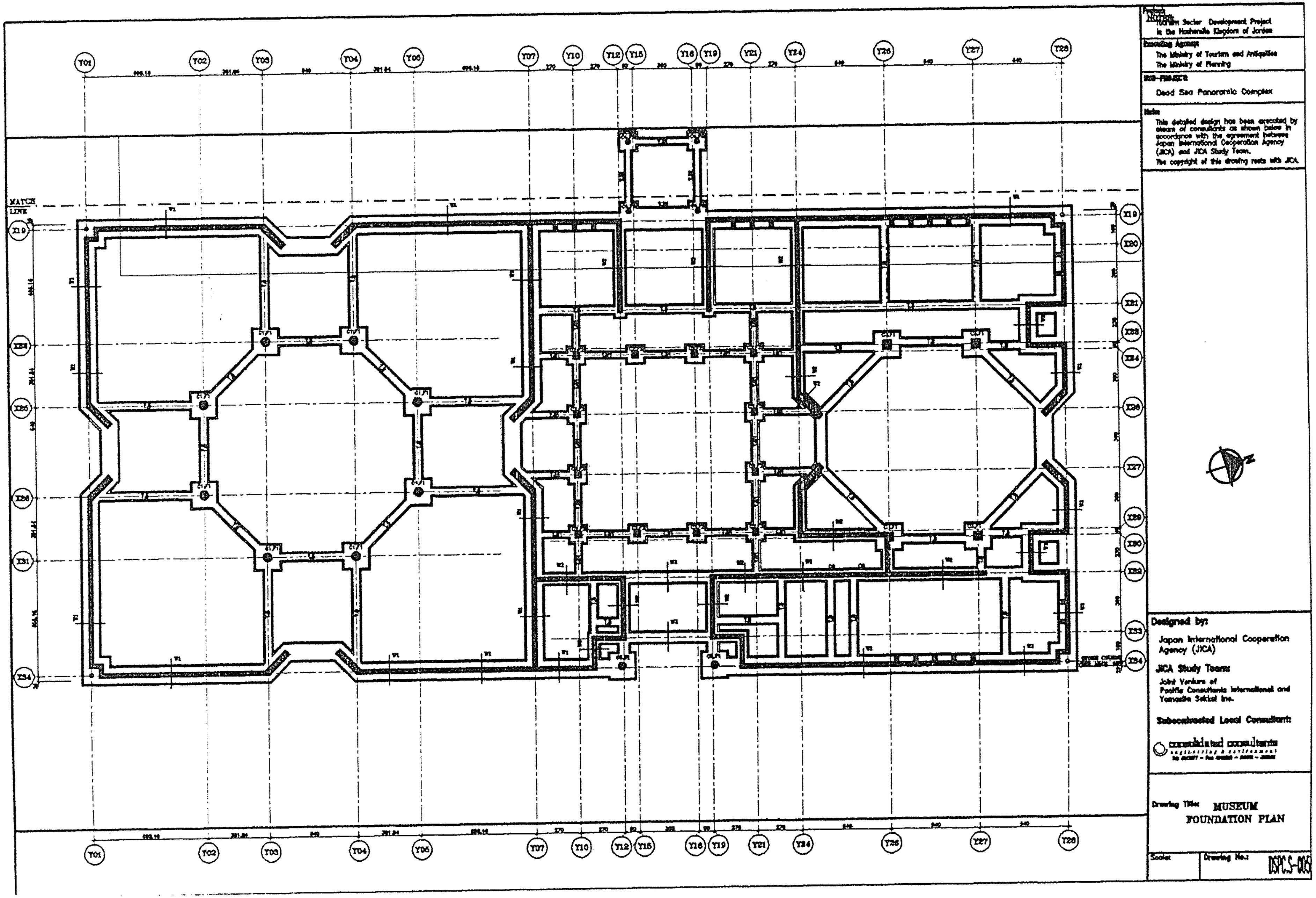
laximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	6	1.00	214	8	1.00	214	8	214	8
2	6	1.13	214	8	1.13	214	8	214	8
3	6	1.05	214	8	1.05	214	8	214	8

Span	1	2	3
Span/Depth	14.0	15.8	14.7
Allowable	43.7	52.0	42.5

```
  434       0      546       0      589       0      434    Requ. Top
8 Φ 12   8 Φ 12  8 Φ 12   8 Φ 12  8 Φ 12   8 Φ 12  8 Φ 12
  904      904     904      904     904      904     904    Prov. Top
 ----------------------------------------------------------
  |      span  1     |      span  2     |      span  3     |
  0        434       0        434       0        434       0    Requ. Bot
0 Φ 0    8 Φ 12    0 Φ 0    8 Φ 12    0 Φ 0    8 Φ 12    0 Φ 0
  0        904       0        904       0        904       0    Prov. Bot
```

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن



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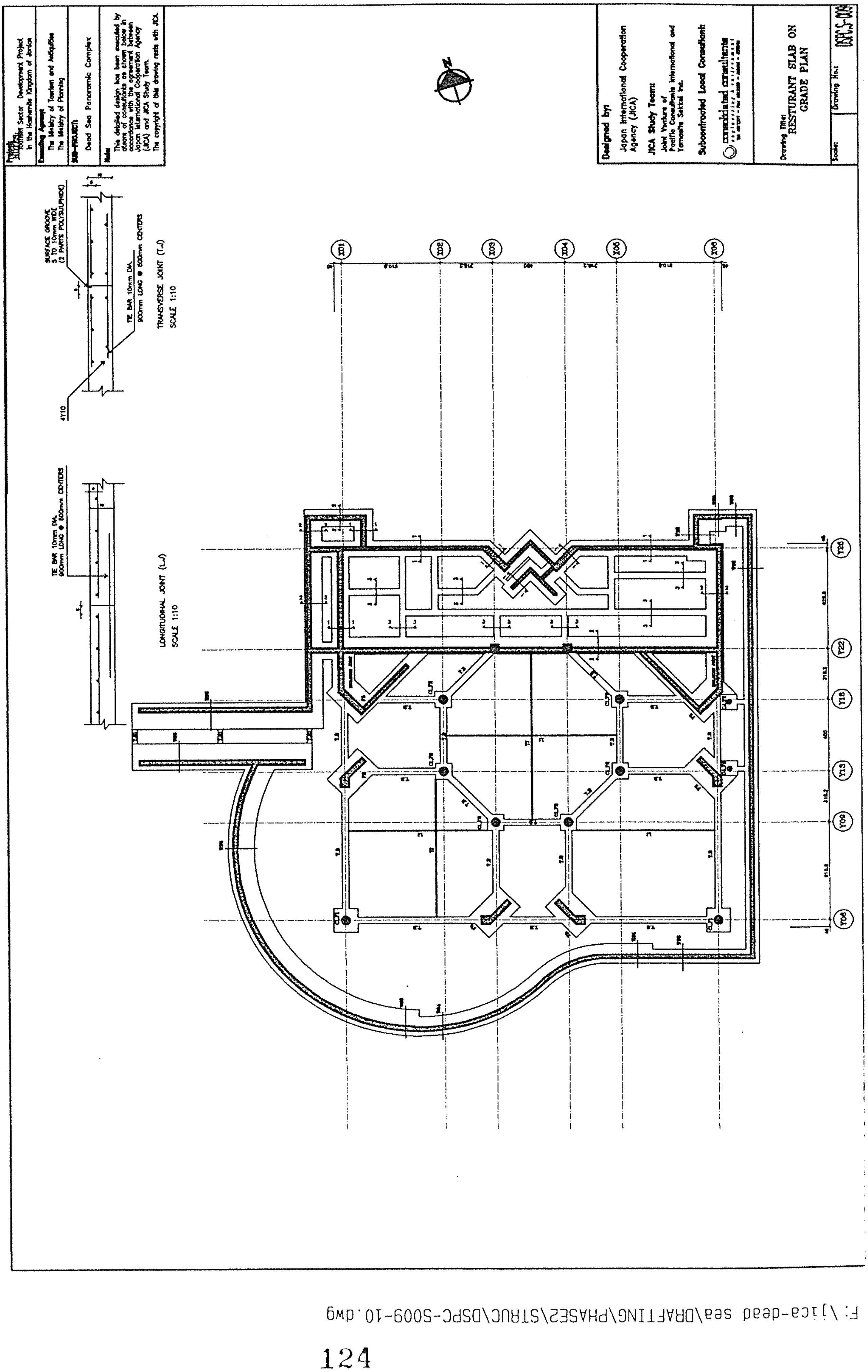

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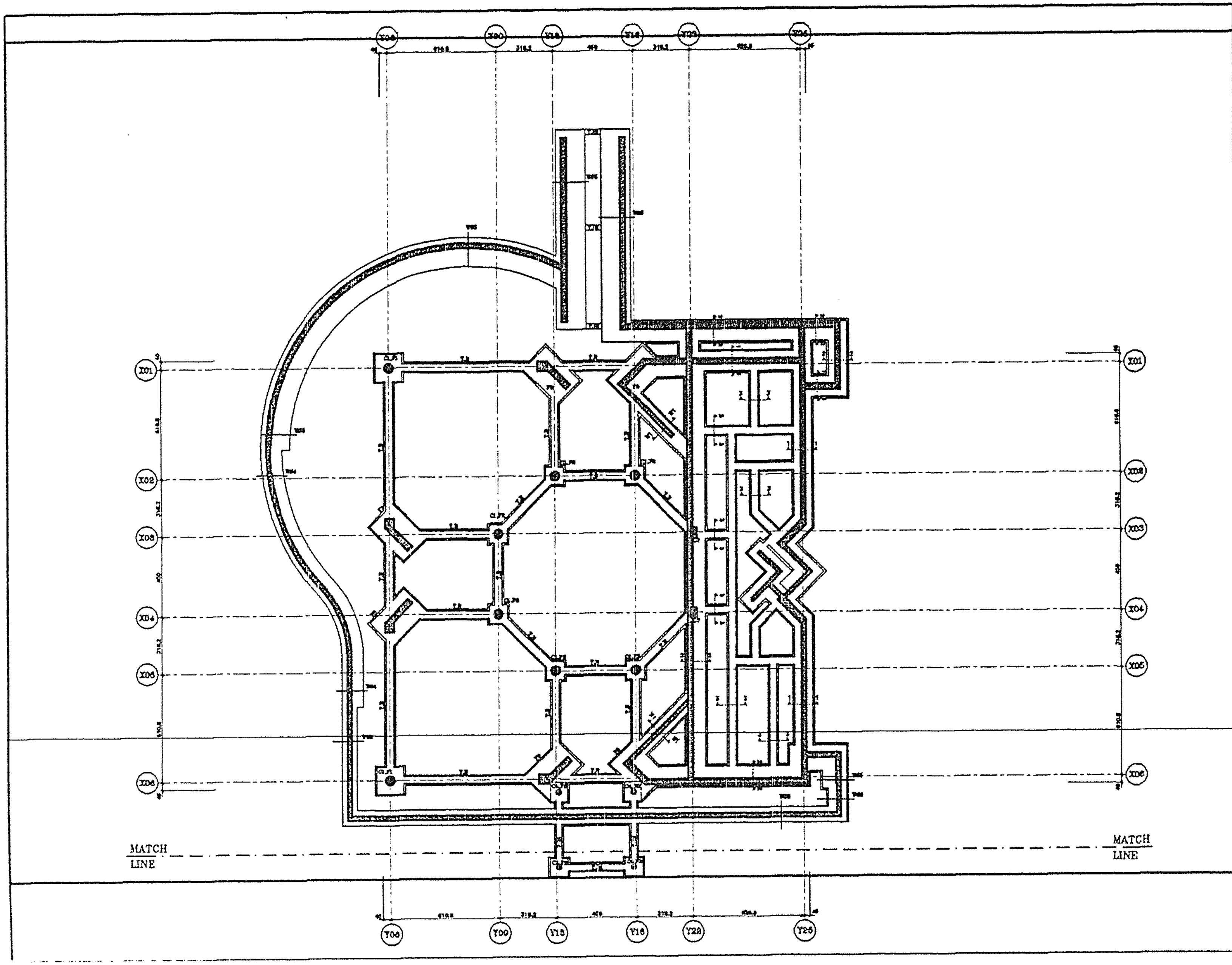

Project: Tourism Sector Development Project in the Hashemite Kingdom of Jordan

Executing Agency: The Ministry of Tourism and Antiquities; The Ministry of Planning

SUB-PROJECT: Dead Sea Panoramic Complex

Note: This detailed design has been executed by a team of consultants as shown below in accordance with the agreement between Japan International Cooperation Agency (JICA) and JICA Study Team. The copyright of this drawing rests with JICA.

Designed by: Japan International Cooperation Agency (JICA)

JICA Study Team: Joint Venture of Pacific Consultants International and Yamashita Sekkei Inc.

Subcontracted Local Consultant: consolidated consultants engineering & environment

Drawing Title: RESTURANT FOUNDATION PLAN

Scale:

Drawing No.: DSPC-S-003

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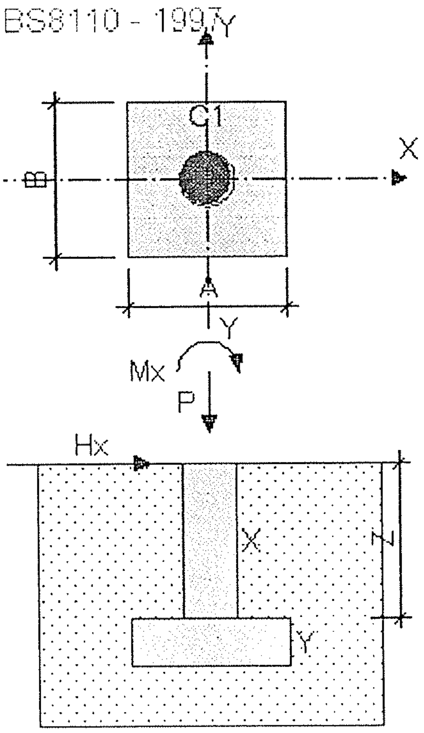
Concrete Base Design : Museum

Input Data

Base Length A (m)	1	
Base Width B (m)	1	
Column(s)	Col 1	Col 2
C (m)	.35	
D (m)		
E (m)	0.00	0.00
F (m)	0.00	0.00
Stub column height X (m)	1	
Base Depth Y (m)	0.4	
Soil Cover Z (m)	1	
Concrete Density (kN/m3)	25	
Soil Density (kN/m3)	20	
Soil friction angle (°)	35	
Base friction constant	.5	
Reinf. depth top X (mm)	50	
Reinf. depth top Y (mm)	50	
Reinf. depth bottom X (mm)	50	
Reinf. depth bottom Y (mm)	50	
Min Load Factor: self weight	1.5	

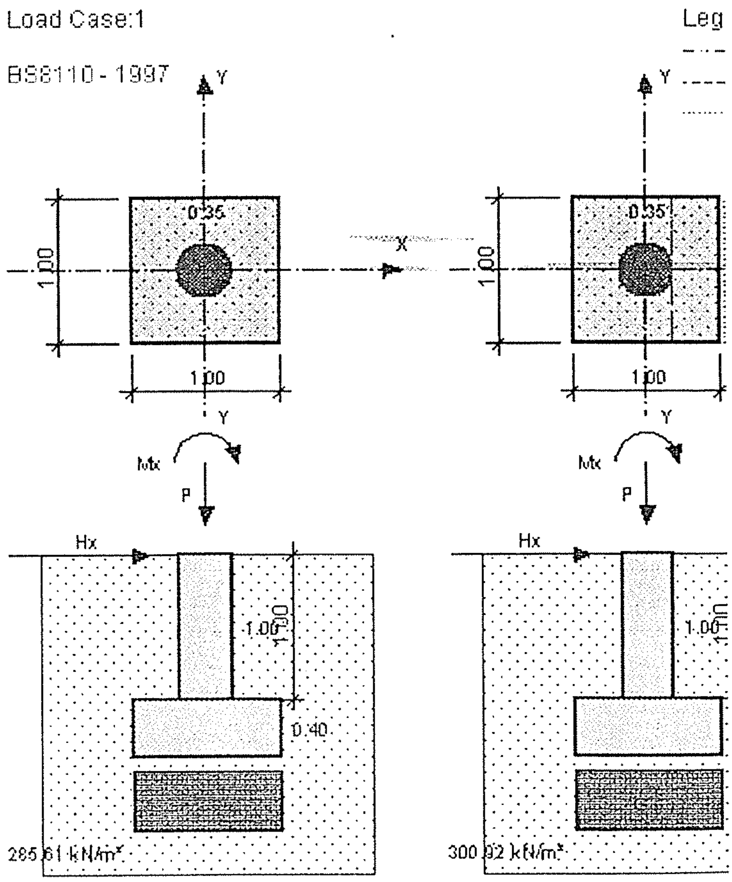
Allow Bearing [illegible]	
S.F. Overturning (ULS)	1.5
S.F. Slip (ULS)	1.5
fcu base (MPa)	25
fcu columns (MPa)	25
fy (MPa)	414

		Loads						
Load Case	Column no.	LF min	LF max	P (kN)	Hx	Hy	Mx	My
1	1	1	1.6	255				



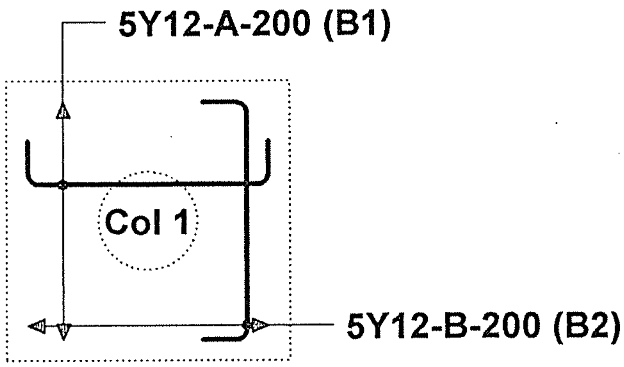
Output for Load Case 1

OUTPUT FOR LOAD CASE 1	
Max. soil pressure (kPa)	283.11
SF overturning (SLS)	>100
SF overturning (ULS)	>100
Safety Factor slip (ULS)	>100
Safety Factor uplift (ULS)	>100
BOTTOM:	
Design moment X (kNm)	21.58
Reinforcement X (mm²/m)	231
Design moment Y (kNm)	21.58
Reinforcement Y (mm²/m)	231
TOP:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
Linear shear X (kN)	0.109
vc X (MPa)	0.378
Linear shear Y (kN)	0.109
vc Y (MPa)	0.378
Linear shear other (kN)	0.000
Punching shear (kN)	0.000
vc Punch	0.378

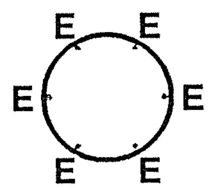


Soil Pressures at SLS   Soil Pressures at ULS

هاتف: ٠٨٨ ٦٤٤ ٠، ٦١٢٢٧٧ فاكس: ٦١٢٢٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن



PLAN



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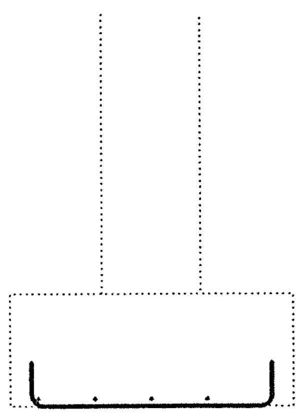


SECTION

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Design of B14:-

weight from slab = ½(13X6.1+1.8X13) X16.25 = 1024.5 KN's

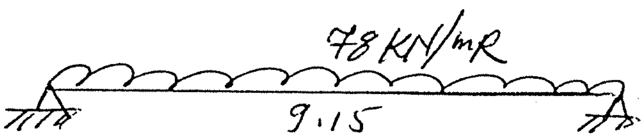
wu/mR = 1024.5/(9.14X2+1.8X2+0.35X2+12.23) = 29.43 KN/mR

o.w (Beam) = 0.4X1.53X25X1.4 = 21.42 KN/mR

weight of Parapet = (1.8−1.04)X25X1.4X0.3 = 8 KN's

weight of Stone = 0.5X27X1.4 = 18.9

Total = 51+8+18.9 = 78 KN/mR



RESTURANT/B14

Number of spans = 1 Number of load cases = 1

Span	Length	Width	Depth	Flange thickness	Flange width
1	9.150	0.400	1.500	0.000	0.400

Load case number : 1

Span	UDL	Load 1 Val	Load 1 Dis	Load 2 Val	Load 2 Dis	Load 3 Val	Load 3 Dis	Load 4 Val	Load 4 Dis	Load 5 Val	Load 5 Dis
1	78.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Span Line Load From Length Intensity

Support	Width	Redistribution
1	0.000	0 %
2	0.000	0 %

Envelope

Span	lft BM	span BM	rgt BM	lft SF	rgt SF
1	0.0	816.3	0.0	356.8	-356.9

Required Steel Areas (mm square)

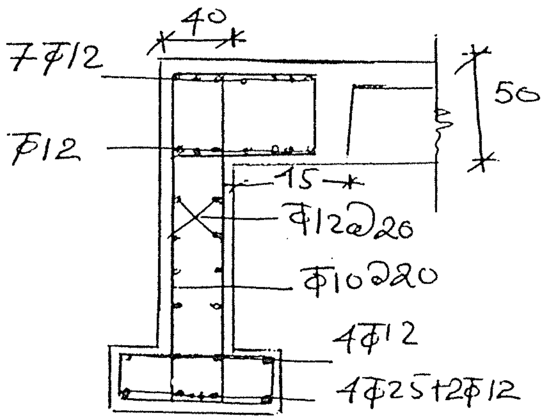
Span	Top L	Bot L	Top M	Bot M	Top R	Bot R
1	891	0	0	1628	891	0

Maximum Spacing of Shear Stirrups in mm

Span	leg	L-zone	spacing	dia.	R-zone	spacing	dia.	Rest-spc	dia.
1	2	2.29	219	8	2.29	219	8	219	8

Span	1
Span/Depth	6.2
Allowable	36.5

891	0	891	Requ. Top
4 Φ 18	4 Φ 18	4 Φ 18	
0 Φ 0	0 Φ 0	0 Φ 0	
1017	1017	1017	Prov. Top
|	span 1	|	
0	1628	0	Requ. Bot
0 Φ 0	4 Φ 25	0 Φ 0	
0 Φ 0	0 Φ 0	0 Φ 0	
0	1963	0	Prov. Bot



Concrete Base Design : F1

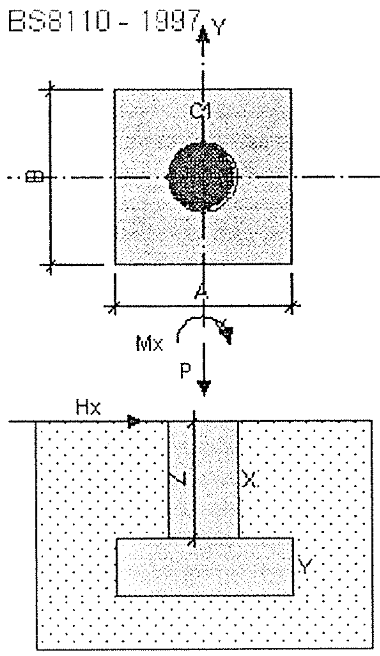
Input Data

Base Length A (m)	1.5	
Base Width B (m)	1.5	
Column(s)	Col 1	Col 2
C (m)	.6	
D (m)		
E (m)		
F (m)		
Stub column height X (m)	1	
Base Depth Y (m)	.5	
Soil Cover Z (m)	1	
Concrete Density (kN/m3)	25	
Soil Density (kN/m3)	20	
Soil friction angle (°)	35	
Base friction constant	.5	
Reinf. depth top X (mm)	50	
Reinf. depth top Y (mm)	50	
Reinf. depth bottom X (mm)	50	
Reinf. depth bottom Y (mm)	50	
Min Load Factor: self weight	1.5	

Allow Bearing Press. (kN/m²)	400
S.F. Overturning (ULS)	1.5
S.F. Slip (ULS)	1.5
fcu base (MPa)	25
fcu columns (MPa)	25
fy (MPa)	414

		Loads						
Load Case	Column no.	LF min	LF max	P (kN)	Hx (kN)	Hy (kN)	Mx (kNm)	My (kNm)
1	1	1	1.6	447				

Sketch of Base



Exterior _ Corner Footing

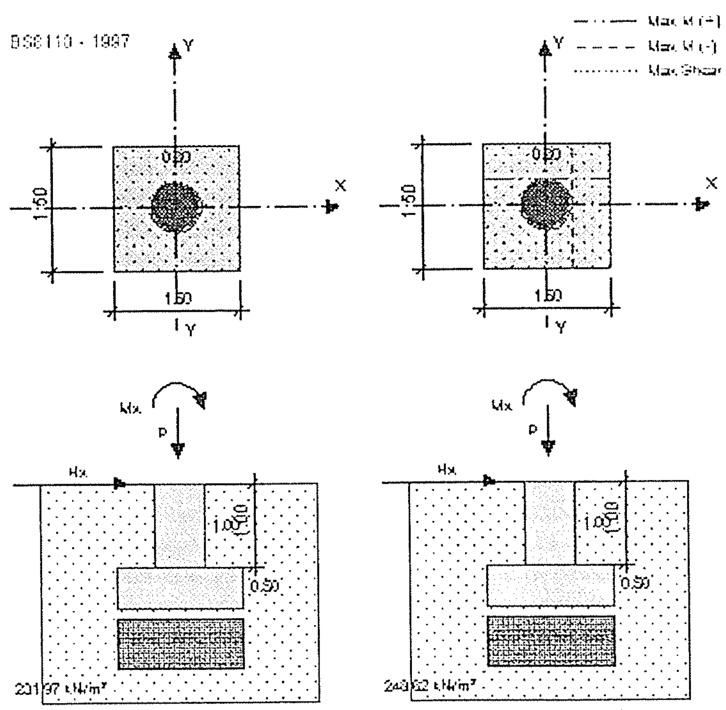
Print Now | Send to Calcpad

Output for Load Case 1

OUTPUT FOR LOAD CASE 1	
Max. soil pressure (kPa)	231.97
SF overturning (SLS)	>100
SF overturning (ULS)	>100
Safety Factor slip (ULS)	>100
Safety Factor uplift (ULS)	>100
BOTTOM:	
Design moment X (kNm)	32.31
Reinforcement X (mm²/m)	192
Design moment Y (kNm)	32.31
Reinforcement Y (mm²/m)	192
TOP:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
Linear shear X (kN)	0.000
vc X (MPa)	0.336
Linear shear Y (kN)	0.000
vc Y (MPa)	0.336
Linear shear other (kN)	0.000
Punching shear (kN)	0.000
vc Punch	0.336

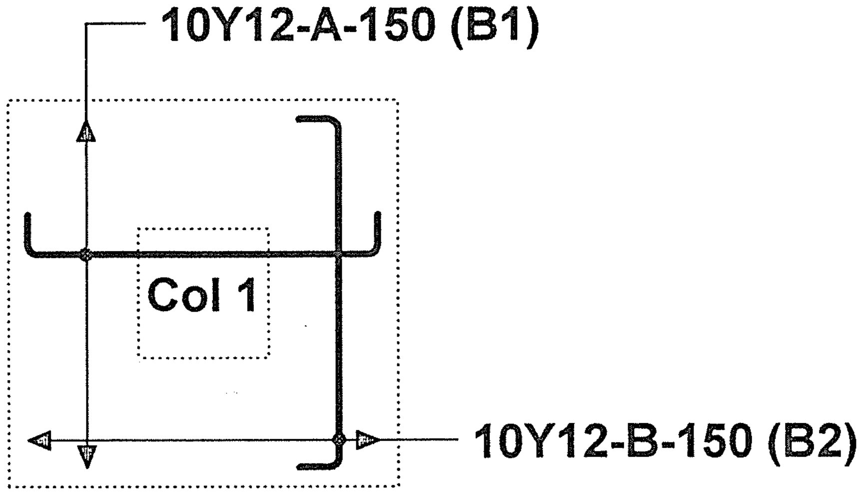
Load Case:1

Legend

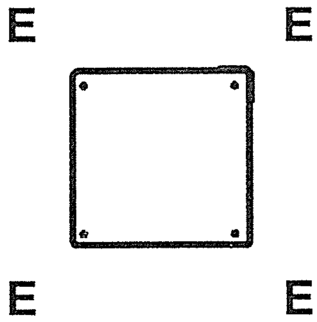


Soil Pressures at SLS

Soil Pressures at ULS



PLAN



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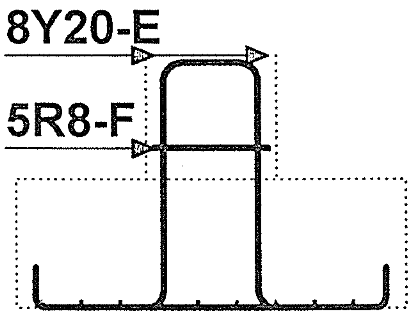
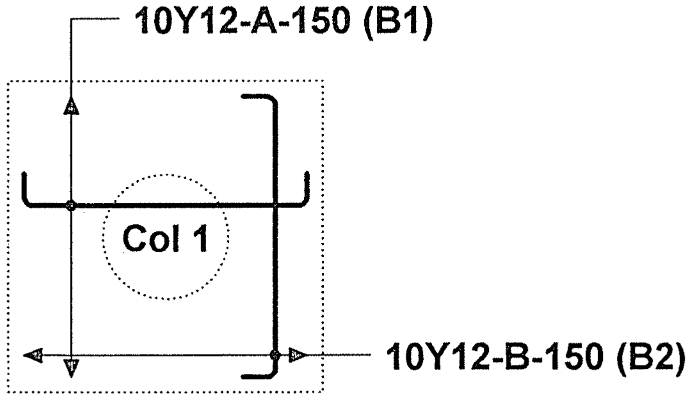


SECTION

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن



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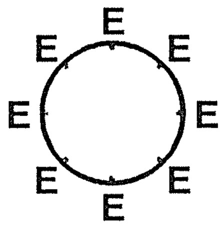

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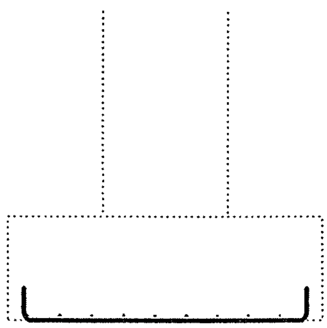


SECTION

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Concrete Base Design :

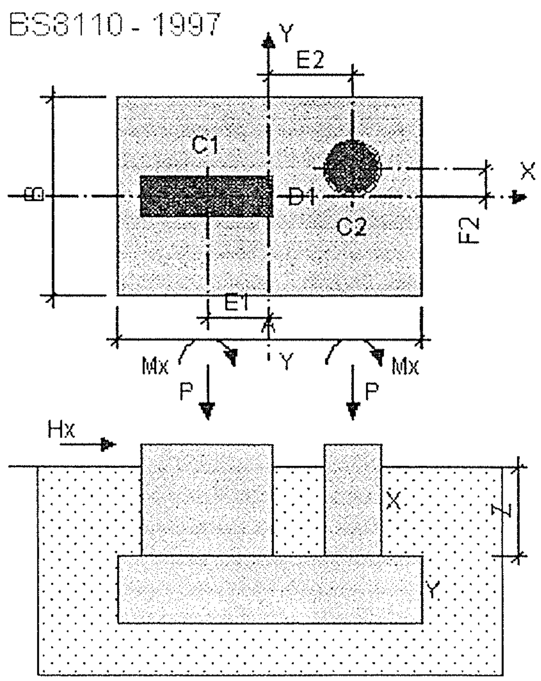
Input Data

Base Length A (m)		2.7
Base Width B (m)		1.8
Column(s)	Col 1	Col 2
C (m)	1.15	.5
D (m)	.35	
E (m)	-.55	.75
F (m)	0	.25
Stub column height X (m)		1
Base Depth Y (m)		.6
Soil Cover Z (m)		.8
Concrete Density (kN/m3)		25
Soil Density (kN/m3)		20
Soil friction angle (°)		35
Base friction constant		1.4
Reinf. depth top X (mm)		50
Reinf. depth top Y (mm)		50
Reinf. depth bottom X (mm)		50
Reinf. depth bottom Y (mm)		50
Min Load Factor: self weight		1.5

Allow Bearing Press. (kN/m²)	400
S.F. Overturning (ULS)	1
S.F. Slip (ULS)	1.5
fcu base (MPa)	25
fcu columns (MPa)	25
fy (MPa)	414

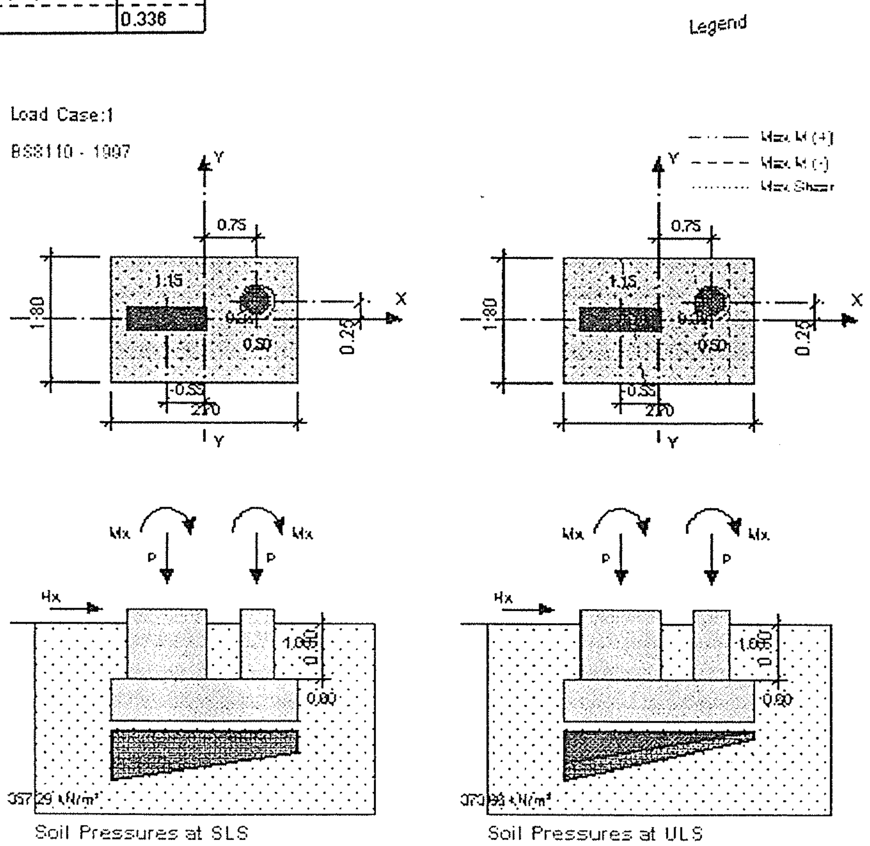
		Loads						
Load Case	Column no.	LF min	LF max	P (kN)	Hx (kN)	Hy (kN)	Mx (kNm)	My (kNm)
1	1	1	1.6	693				
	2	1	1.6	225				

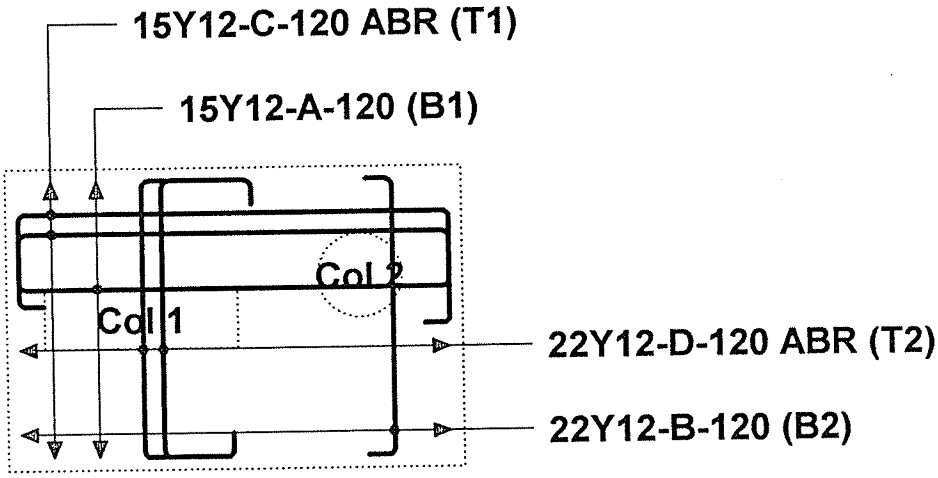
Sketch of Base



Output for Load Case 1

OUTPUT FOR LOAD CASE 1	
Max. soil pressure (kPa)	357.29
SF overturning (SLS)	4.87
SF overturning (ULS)	4.83
Safety Factor slip (ULS)	>100
Safety Factor uplift (ULS)	>100
BOTTOM:	
Design moment X (kNm)	89.08
Reinforcement X (mm²/m)	433
Design moment Y (kNm)	67.94
Reinforcement Y (mm²/m)	331
TOP:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
Linear shear X (kN)	0.000
vc X (MPa)	0.336
Linear shear Y (kN)	0.081
vc Y (MPa)	0.336
Linear shear other (kN)	0.114
Punching shear (kN)	0.000
vc Punch	0.336





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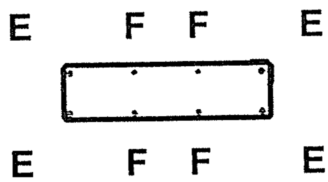

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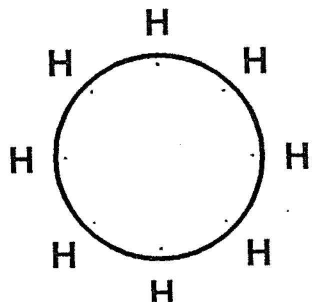

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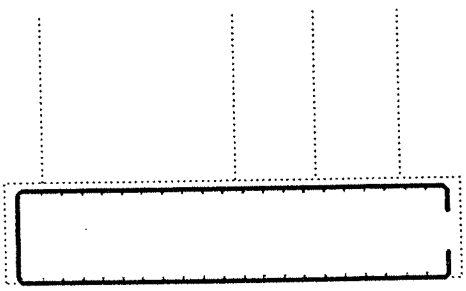
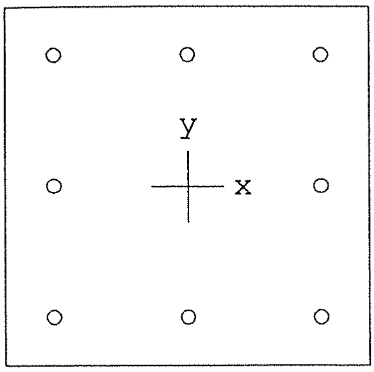


SECTION



350 x 350 mm

f'c = 21 MPa

fy = 414 MPa

Confinement: Spiral

clr cover = 40 mm

spacing = 114 mm

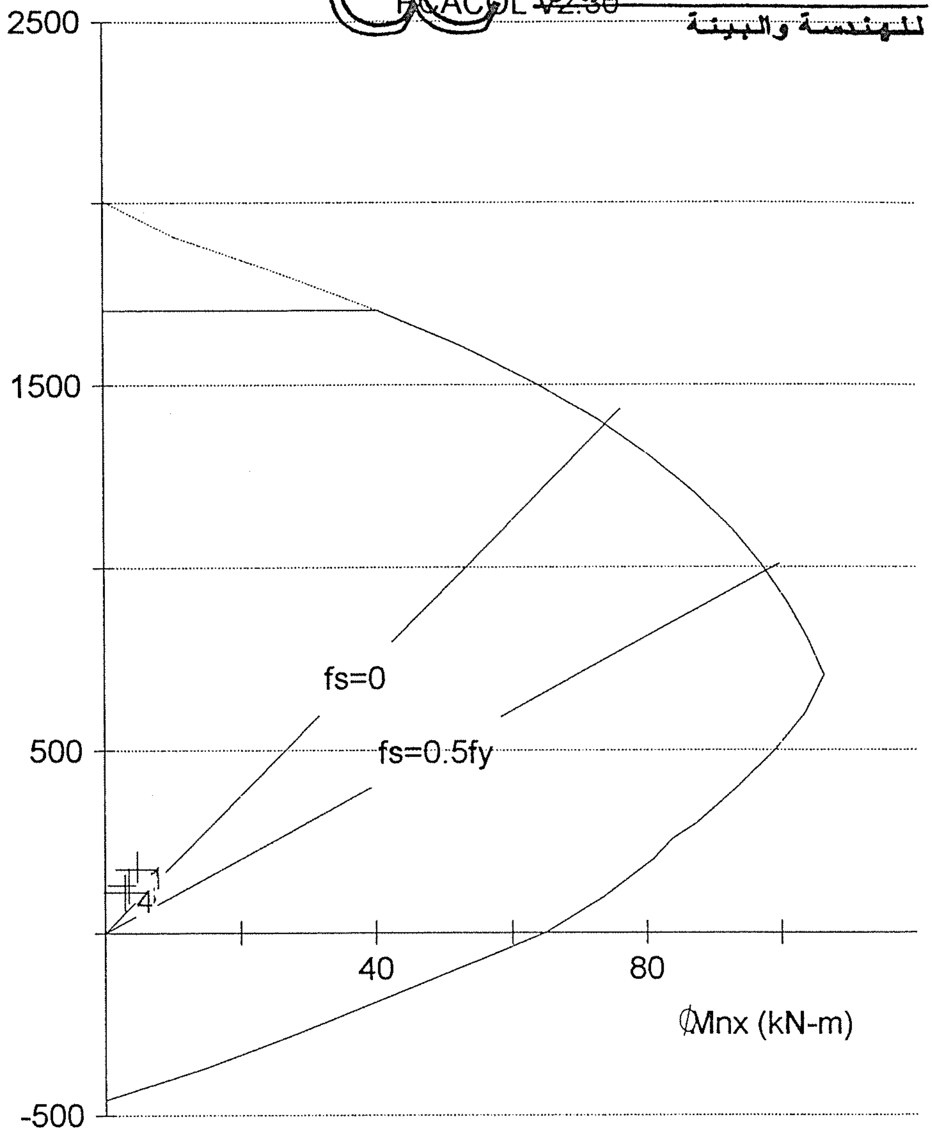
8 N-14 at 1.01%

As = 1232 mm^2

Ix = 1.251e+009 mm^4

Iy = 1.251e+009 mm^4

Xo = 0 mm



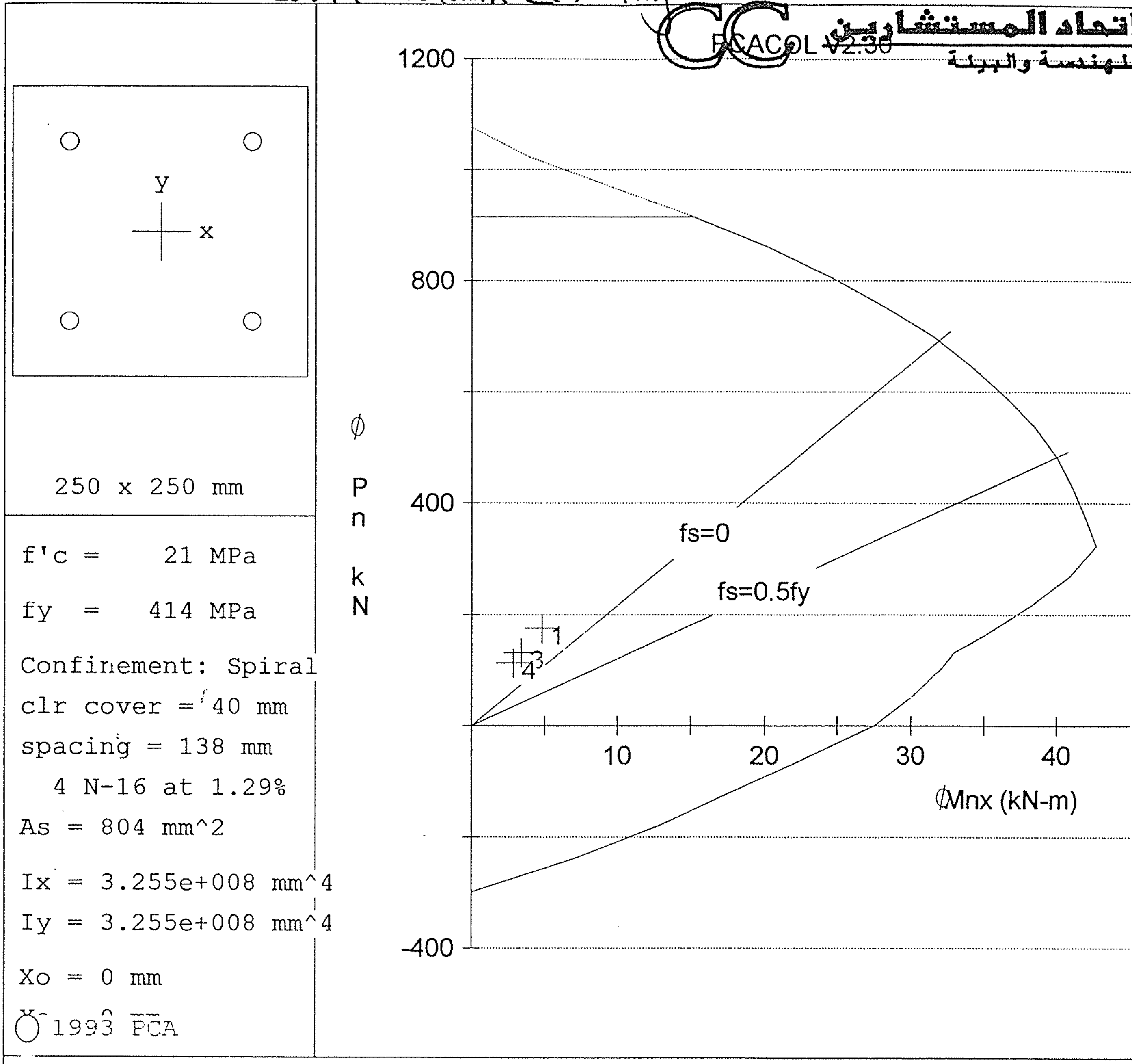
icensed To: Licensee name not yet specified.

File name: C:\C4.COL

Project: DEAD SEA COMPLEX	Material Properties:
Column Id: 500 mm INTERIOR COL.	Ec = 23168 MPa eu = 0.003 mm/mm
Engineer: HASSAN AL-KHAMRAH	fc = 17.85 MPa Es = 199955 MPa
Date: 5/2/2000 Time: 15:11:53	Beta1 = 0.85
Code: ACI 318-89	Stress Profile: Block
Units: Metric	phi(c) = 0.75, phi(b) = 0.90

X-axis slenderness is considered; k(b) = 1.00   k(s) = 1.20

Court Column & Footing C2



f'c = 21 MPa

fy = 414 MPa

Confinement: Spiral

clr cover = 40 mm

spacing = 138 mm

4 N-16 at 1.29%

As = 804 mm^2

Ix = 3.255e+008 mm^4

Iy = 3.255e+008 mm^4

Xo = 0 mm

File name: C:\C1.COL

Project: DEAD SEA COMPLEX

Column Id: 500 mm INTERIOR COL.

Engineer: HASSAN AL-KHAMRAH

Date: 5/2/2000 Time: 15:11:53

Code: ACI 318-89

Units: Metric

Material Properties:

Ec = 23168 MPa eu = 0.003 mm/mm

fc = 17.85 MPa Es = 199955 MPa

Beta1 = 0.85

Stress Profile: Block

phi(c) = 0.75, phi(b) = 0.90

X-axis slenderness is considered; k(b) = 1.00 k(s) = 1.20

هاتف: ٦٤٤٠٨٨، ٦١٢٣٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Court Footing (F2)

Concrete Base Design :

Input Data

Base Length A (m)		1
Base Width B (m)		1
Column(s)	Col 1	Col 2
C (m)	.25	
D (m)		
E (m)		
F (m)		
Stub column height X (m)		1
Base Depth Y (m)		.4
Soil Cover Z (m)		1
Concrete Density (kN/m3)		25
Soil Density (kN/m3)		20
Soil friction angle (°)		35
Base friction constant		.5
Reinf. depth top X (mm)		50
Reinf. depth top Y (mm)		50
Reinf. depth bottom X (mm)		50
Reinf. depth bottom Y (mm)		50
Min Load Factor: self weight		1.5

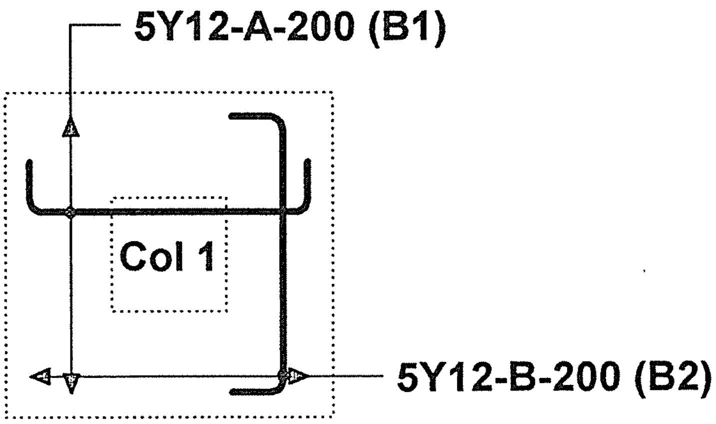
Allow Bearing Press. (kN/m²)	400
S.F. Overturning (ULS)	1.5
S.F. Slip (ULS)	1.5
fcu base (MPa)	25
fcu columns (MPa)	25
fy (MPa)	414

		Loads						
Load Case	Column no.	LF min	LF max	P (kN)	Hx (kN)	Hy (kN)	Mx (kNm)	My (kNm)
1	1	1	1.6	125				

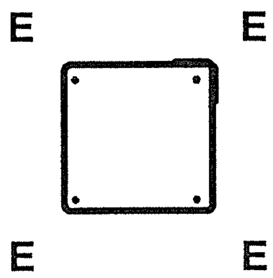
Sketch of Base

Output for Load Case 1

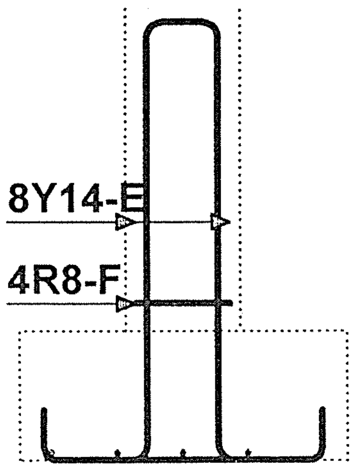
OUTPUT FOR LOAD CASE 1	
Max. soil pressure (kPa)	155.31
SF overturning (SLS)	>100
SF overturning (ULS)	>100
Safety Factor slip (ULS)	>100
Safety Factor uplift (ULS)	>100
BOTTOM:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
TOP:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
Linear shear X (kN)	0.000
vc X (MPa)	0.347
Linear shear Y (kN)	0.000
vc Y (MPa)	0.347
Linear shear other (kN)	0.000
Punching shear (kN)	0.000
vc Punch	0.347



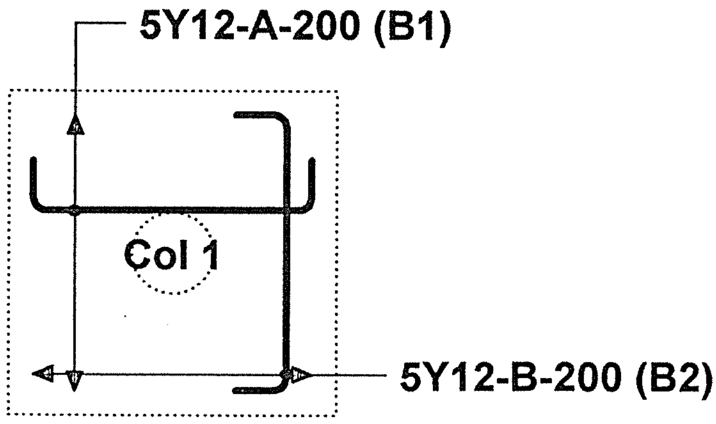
PLAN



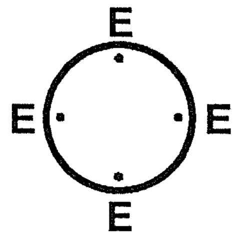
Section:Column 1



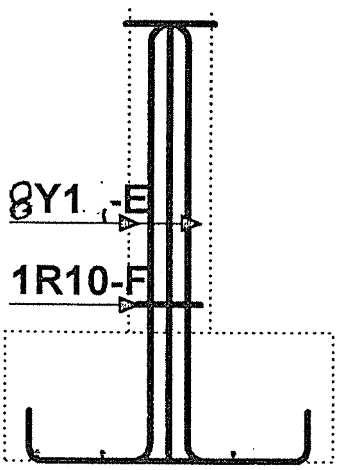
SECTION



PLAN



Section:Column 1

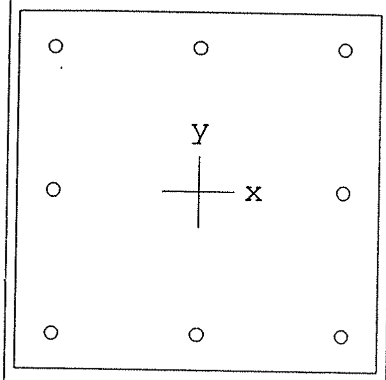


SECTION

C3

اتحاد المستشارين للهندسة والبيئة

PCACOL V2.30



500 x 500 mm

f'c = 21 MPa

fy = 414 MPa

Confinement: Spiral

clr cover = 40 mm

spacing = 180 mm

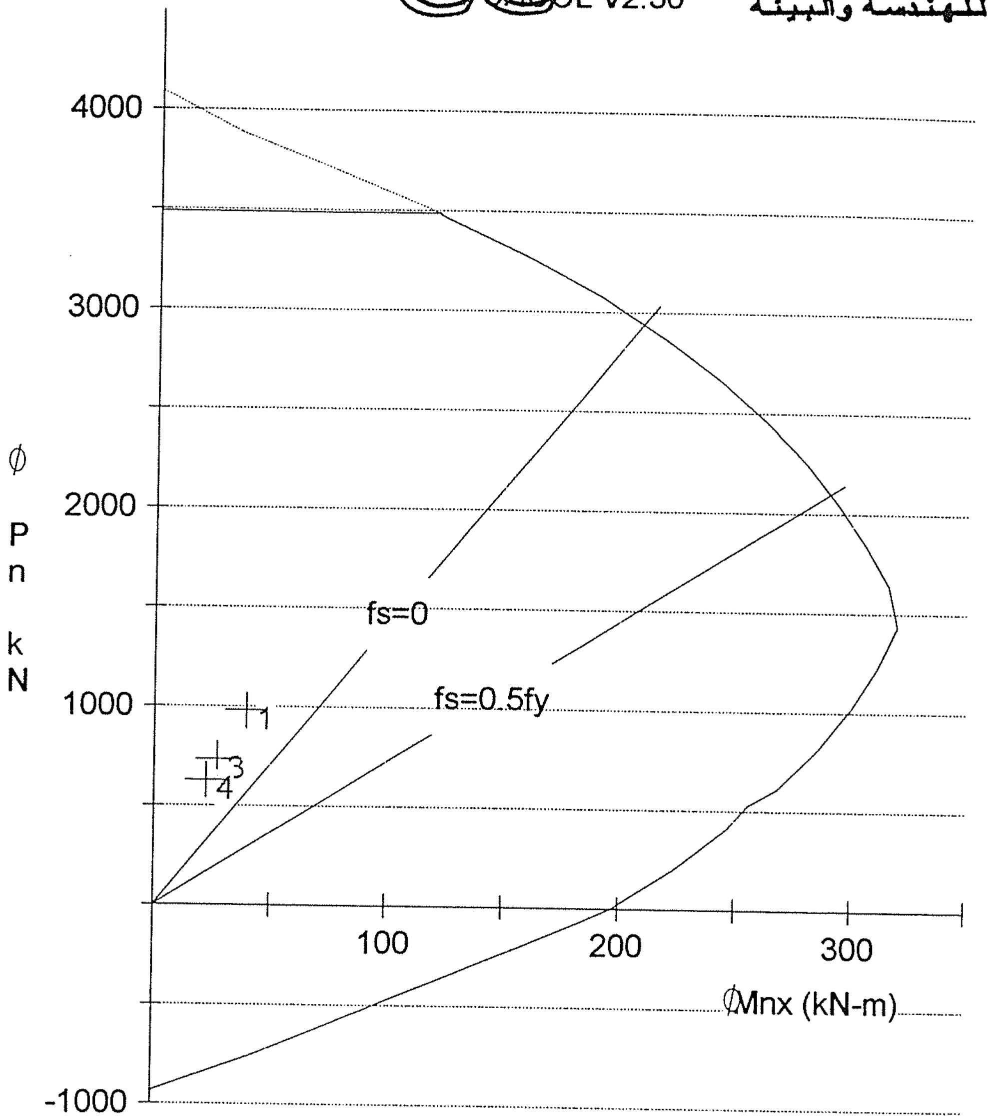
8 N-20 at 1.00%

As = 2512 mm^2

Ix = 5.208e+009 mm^4

Iy = 5.208e+009 mm^4

Xo = 0 mm



File name: C:\C1.COL

Project: DEAD SEA COMPLEX

Column Id: 500 mm INTERIOR COL.

Engineer: HASSAN AL-KHAMRAH

Date: 5/2/2000 Time: 15:11:53

Code: ACI 318-89

Units: Metric

Material Properties:

Ec = 23168 MPa eu = 0.003 mm/mm

fc = 17.85 MPa Es = 199955 MPa

Beta1 = 0.85

Stress Profile: Block

phi(c) = 0.75, phi(b) = 0.90

X-axis slenderness is considered; k(b) = 1.00 k(s) = 1.20

هاتف: ٦٤٤٠٨٨، ٦١٢٢٧٧ فاكس: ٦١٢٢٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

Museum Internal walls:-

Retaining Wall Design : Propped cantilever exam

Input Data

Wall Dimensions				Live Loads		General Parameters		Design Parameters	
H1 (m)	4.5	C (m)	0.4	W (kN/m²)		Soil Frict (°)	35	SF Overt.	1.5
H2 (m)	.5	F (m)		P (kN)		Fill slope (°)		SF Slip	1.5
H3 (m)	4	xf (m)		xp (m)		Wall Frict (°)	12	DL Factor	1.4
Hw (m)		At (m)	.22	L (kN/m)	100	Conc Density	25	LL Factor	1.6
Hr (m)		Ab (m)	.22	xl (m)	.11	Soil Density	20	Pmax (kPa)	400
B (m)	.3	Cover: wall	50	Lh (kN/m)		fcu (MPa)	25		
D (m)	.3	Cover: base	50	x (m)		fy (MPa)	414		

Seepage allowed

Theory : Coulomb
Wall type : Propped cantilever

SEISMIC ANALYSIS SETTINGS:

Seismic Analysis ON/OFF:OFF

Hor Accel. (g)	.15
Vert Accel. (g)	.05
Include LL's	Y

Retaining Wall Design : Propped cantilever exam

C14

Input Data

Seepage allowed

Theory : Coulomb
Wall type : Propped cantilever

SEISMIC ANALYSIS SETTINGS:

Seismic Analysis ON/OFF:OFF

VALUES OF PRESSURE COEFFICIENTS:

Active Pressure coefficient Ka :0.25
Passive Pressure coefficient Kp :5.76
Base frictional constant μ :0.70

FORCES ACTING ON THE WALL:

Description	F Horizontal left (+)	Lever arm	F Vertical down (+)	Lever arm
	FORCES (kN) and their LEVER ARMS (m)			
Destabilizing forces:				
Total Active pressure Pa	0.613	0.167	0.130	0.520
Stabilizing forces:				
Passive pressure on base Pp	-14.398	0.167		
Weight of the wall + base			30.750	0.410
Weight of soil on the base			1.200	0.410
Line load of 100.00 kN/m on backfill			100.000	0.410

EQUILIBRIUM CALCULATIONS AT SLS

1.Force Equilibrium

Sum of Vertical forces Pv : 132.1 kN
Frictional resistance Pfric : 92.5 kN
Passive Pressure on shear key : 0.0 kN
Passive pressure on base : 14.4 kN
Horizontal reaction at top : -0.0 kN
=> Horizontal resistance Fr : 106.8 kN
Horizontal sliding force Fh : 0.6 kN

Safety factor against overall sliding = Fr/Fh = 174.42

Reaction at base : 0.7 kN
Resistance at base : 106.9 kN
Safety factor against base sliding = Fr(base)/P(base) = 163.33

SOIL PRESSURES UNDER BASE

Maximum pressure :180.0 kPa
Minimum pressure : 84.1 kPa
Maximum pressure occurs at right hand side of base

WALL MOMENTS (ULS) AND REINFORCEMENT TO BS8110 - 1997

Position from base top (m)	Moment (kNm)	Front Reinforcing (mm²/m)	Back Reinforcing (mm²/m)	Nominal (0.13%) (mm²/m)
0.00	0.21	0.00	3.59	286.00
0.08	0.24	0.00	3.94	286.00
0.16	0.23	0.00	3.86	286.00
0.25	0.23	0.00	3.78	286.00
0.33	0.22	0.00	3.70	286.00
0.41	0.22	0.00	3.62	286.00
0.49	0.21	0.00	3.54	286.00
0.57	0.21	0.00	3.46	286.00
0.66	0.20	0.00	3.38	286.00
0.74	0.20	0.00	3.30	286.00
0.82	0.19	0.00	3.22	286.00
0.90	0.19	0.00	3.14	286.00
0.98	0.18	0.00	3.05	286.00
1.07	0.18	0.00	2.97	286.00
1.15	0.17	0.00	2.89	286.00
1.23	0.17	0.00	2.81	286.00
1.31	0.16	0.00	2.73	286.00
1.39	0.16	0.00	2.65	286.00
1.48	0.15	0.00	2.57	286.00
1.56	0.15	0.00	2.49	286.00
1.64	0.14	0.00	2.41	286.00
1.72	0.14	0.00	2.33	286.00
1.80	0.13	0.00	2.25	286.00
1.89	0.13	0.00	2.17	286.00
1.97	0.12	0.00	2.09	286.00
2.05	0.12	0.00	2.01	286.00
2.13	0.12	0.00	1.93	286.00
2.21	0.11	0.00	1.85	286.00
2.30	0.11	0.00	1.77	286.00
2.38	0.10	0.00	1.69	286.00
2.46	0.10	0.00	1.61	286.00
2.54	0.09	0.00	1.53	286.00
2.62	0.09	0.00	1.45	286.00
2.71	0.08	0.00	1.37	286.00
2.79	0.08	0.00	1.29	286.00
2.87	0.07	0.00	1.21	286.00
2.95	0.07	0.00	1.13	286.00
3.03	0.06	0.00	1.05	286.00
3.12	0.06	0.00	0.96	286.00
3.20	0.05	0.00	0.88	286.00
3.28	0.05	0.00	0.80	286.00
3.36	0.04	0.00	0.72	286.00
3.44	0.04	0.00	0.64	286.00
3.53	0.03	0.00	0.56	286.00
3.61	0.03	0.00	0.48	286.00
3.69	0.02	0.00	0.40	286.00
3.77	0.02	0.00	0.32	286.00
3.85	0.01	0.00	0.24	286.00
3.94	0.01	0.00	0.16	286.00
4.02	0.00	0.00	0.08	286.00
4.10	0.00	0.00	0.00	286.00

BASE MOMENTS (ULS) AND REINFORCEMENT TO BS8110 - 1997

Position from left (m)	Moment (kNm)	Top Reinforcing (mm²/m)	Bot Reinforcing (mm²/m)	Nominal (0.13%) (mm²/m)

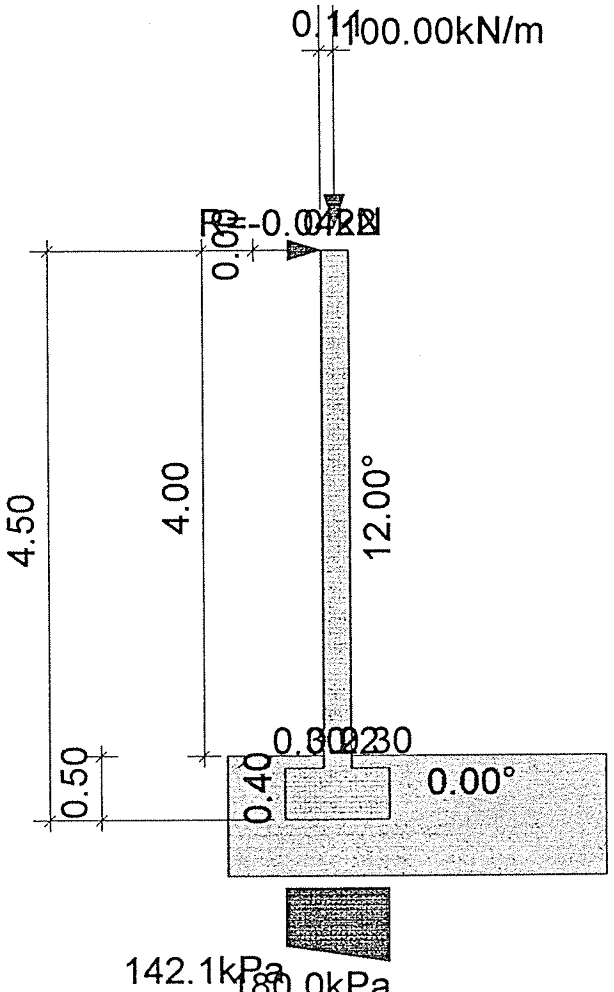
0.02	-0.00	0.00	0.00	520.00
0.03	-0.03	0.00	0.23	520.00
0.05	-0.12	0.00	0.91	520.00
0.07	-0.26	0.00	2.05	520.00
0.08	-0.46	0.00	3.65	520.00
0.10	-0.72	0.00	5.71	520.00
0.11	-1.04	0.00	8.22	520.00
0.13	-1.42	0.00	11.18	520.00
0.15	-1.86	0.00	14.61	520.00
0.16	-2.35	0.00	18.49	520.00
0.18	-2.90	0.00	22.82	520.00
0.20	-3.51	0.00	27.62	520.00
0.21	-4.18	0.00	32.87	520.00
0.23	-4.90	0.00	38.57	520.00
0.25	-5.68	0.00	44.74	520.00
0.26	-6.52	0.00	51.35	520.00
0.28	-7.42	0.00	58.43	520.00
0.30	-8.38	0.00	65.96	520.00
0.31	-9.39	0.00	73.95	520.00
0.33	-10.47	0.00	82.40	520.00
0.34	-11.60	0.00	91.30	520.00
0.36	-12.79	0.00	100.66	520.00
0.38	-14.03	0.00	110.47	520.00
0.39	-15.34	0.00	120.74	520.00
0.41	-16.70	0.00	131.47	520.00
0.43	-18.12	0.00	142.65	520.00
0.44	-18.12	0.00	142.65	520.00
0.46	-21.09	166.05	0.00	520.00
0.48	-19.44	153.04	0.00	520.00
0.49	-17.85	140.55	0.00	520.00
0.51	-16.34	128.59	0.00	520.00
0.52	-14.88	117.17	0.00	520.00
0.54	-13.50	106.27	0.00	520.00
0.56	-12.18	95.91	0.00	520.00
0.57	-10.94	86.08	0.00	520.00
0.59	-9.75	76.78	0.00	520.00
0.61	-8.64	68.02	0.00	520.00
0.62	-7.59	59.78	0.00	520.00
0.64	-6.62	52.07	0.00	520.00
0.66	-5.70	44.90	0.00	520.00
0.67	-4.86	38.26	0.00	520.00
0.69	-4.08	32.15	0.00	520.00
0.71	-3.38	26.57	0.00	520.00
0.72	-2.73	21.52	0.00	520.00
0.74	-2.16	17.00	0.00	520.00
0.75	-1.65	13.02	0.00	520.00
0.77	-1.22	9.56	0.00	520.00
0.79	-0.84	6.64	0.00	520.00
0.80	-0.54	4.25	0.00	520.00
0.82	-0.30	2.39	0.00	520.00

SHEAR CHECK AT WALL-BASE JUNCTION TO BS8110 - 1997

Shear force at bottom of wall V = 0.9 kN
Shear stress at bottom of wall v = 0.01 MPa OK
Allowable shear stress vc = 1.15 MPa (based on Wall tensile reinf.)

Sketch of Wall

Design code: BS8110 - 1997

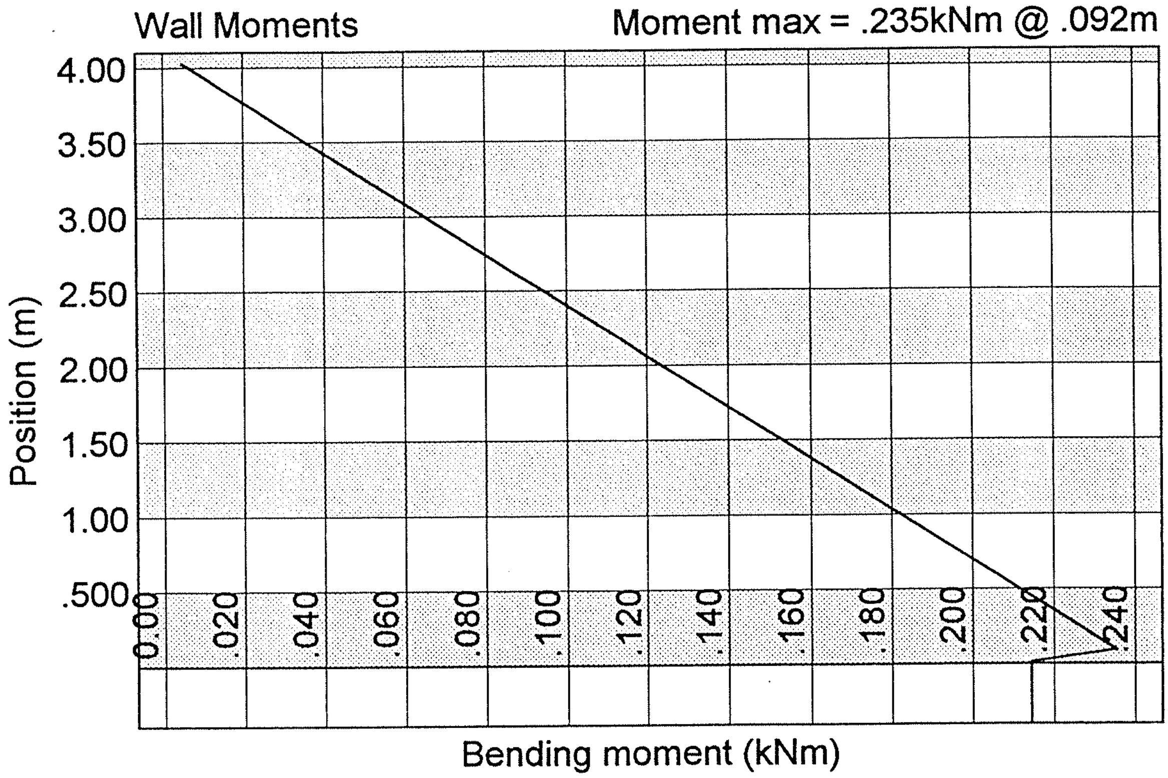


Ka=0.25
Kp=5.76

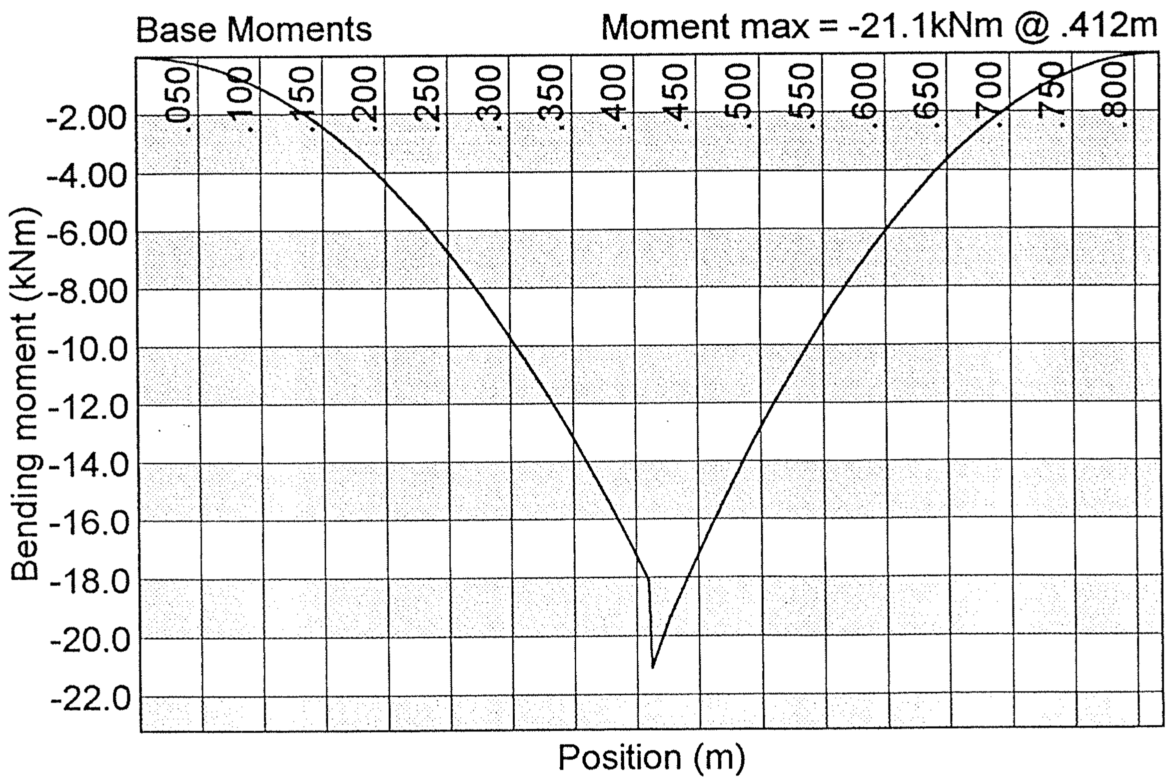
μ=0.70
V= 0.9kN
v= 0.01MPa
vc= 1.15MPa

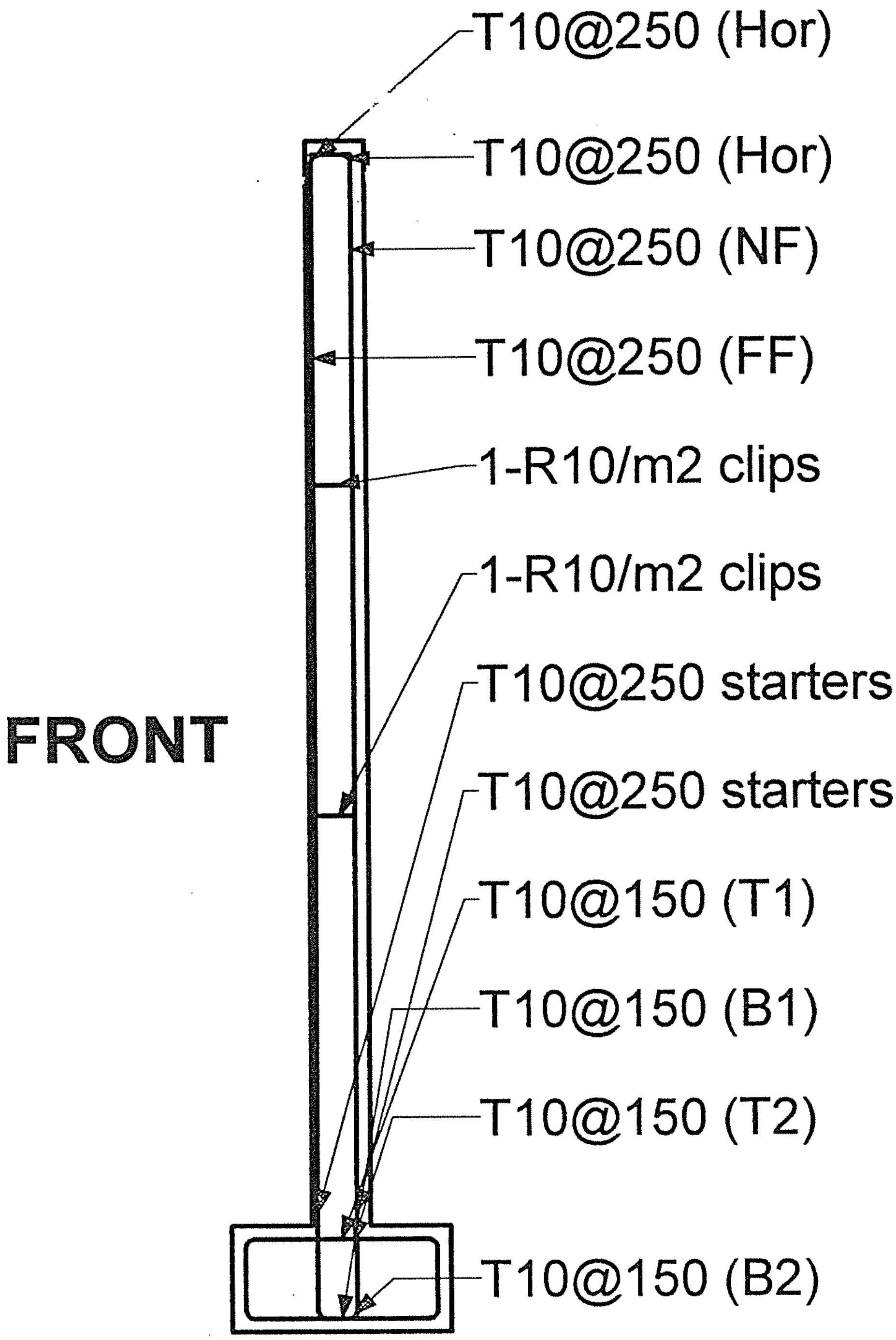
Wall type: Propped cantilever
Sslip = 174.42
Theory: Coulomb

Wall Bending Moments

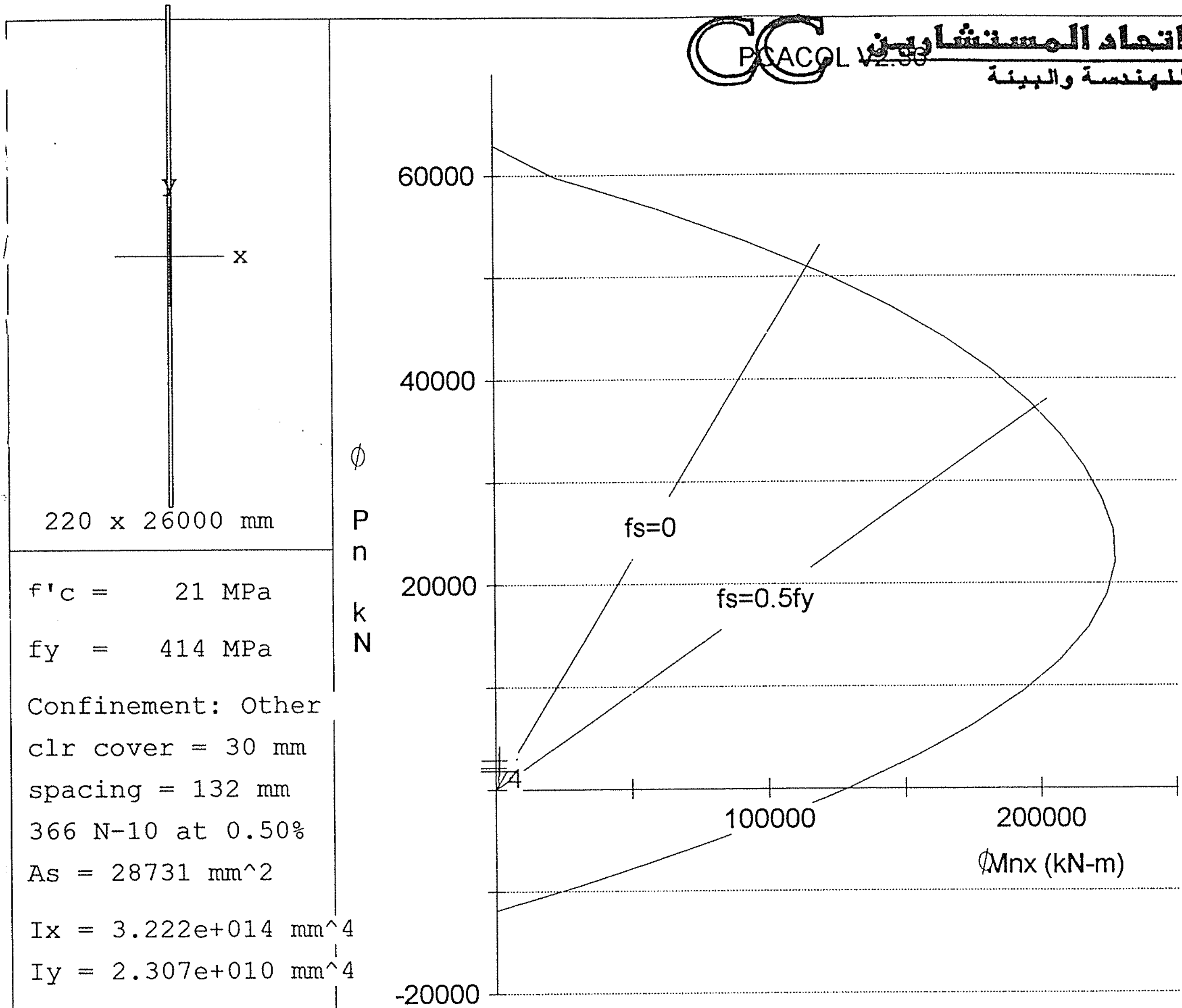


Base Bending Moments




T10@250 (Hor)
T10@250 (Hor)
T10@250 (NF)
T10@250 (FF)
1-R10/m2 clips
1-R10/m2 clips
T10@250 starters
T10@250 starters
FRONT
T10@150 (T1)
T10@150 (B1)
T10@150 (T2)
T10@150 (B2)

SECTION



f'c = 21 MPa

fy = 414 MPa

Confinement: Other

clr cover = 30 mm

spacing = 132 mm

366 N-10 at 0.50%

As = 28731 mm^2

Ix = 3.222e+014 mm^4

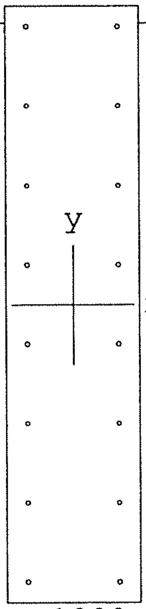
Iy = 2.307e+010 mm^4

Xo = 0 mm

File name: UNTITLED.COL

Project: DEAD SEA COMPLEX	Material Properties:
Column Id: EXTERNAL WALLS	Ec = 23168 MPa eu = 0.003 mm/mm
Engineer: Hassan Al-hkamrah	fc = 8.97 MPa Es = 199955 MPa
Date: 8/2/2000 Time: 13:37:44	Betal = 0.85
Code: ACI 318-89	Stress Profile: Block
Units: Metric	phi(c) = 1.00, phi(b) = 1.00

X-axis slenderness is considered; k(b) = 1.00   k(s) = 1.20



220 x 1000 mm

f'c = 21 MPa

fy = 414 MPa

Confinement: Other

clr cover = 30 mm

spacing = 123 mm

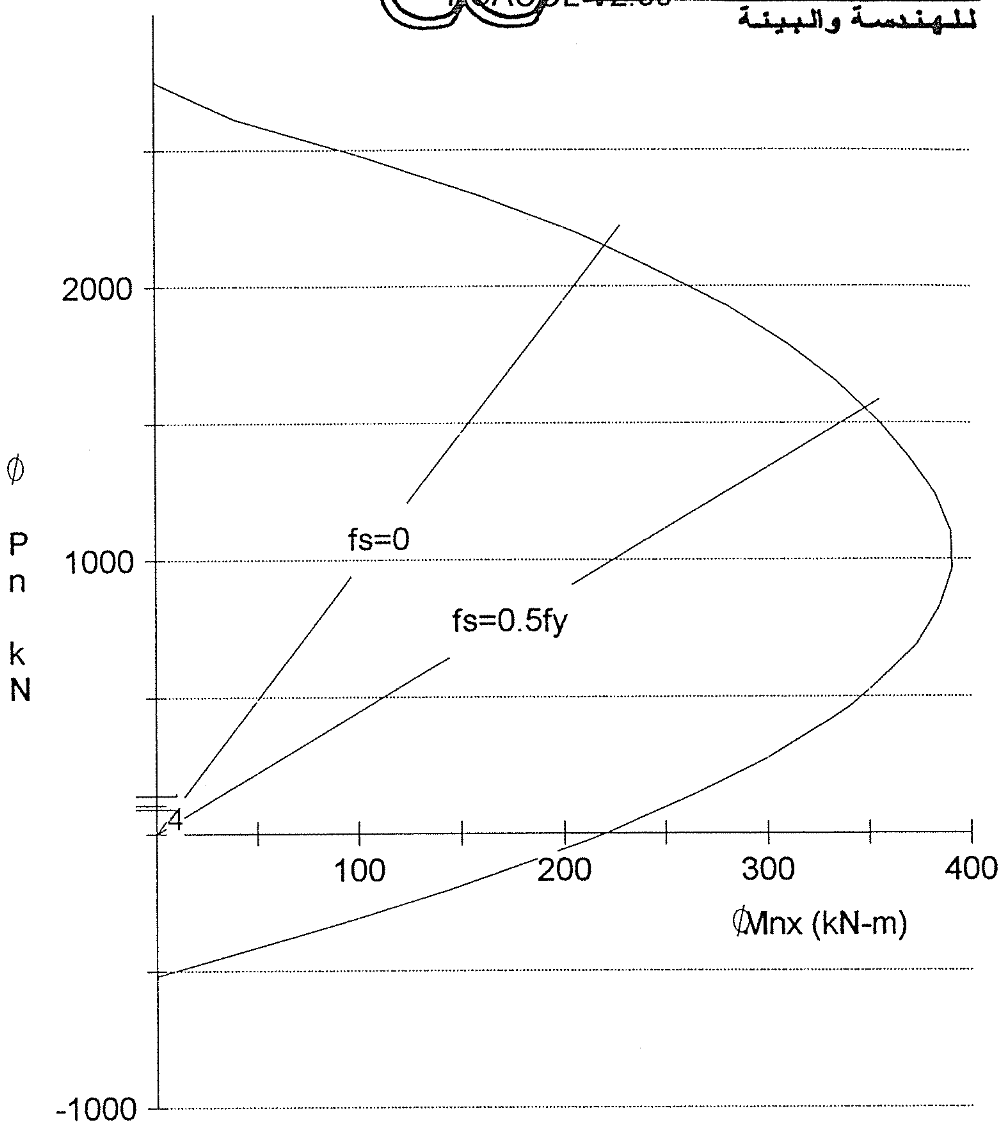
16 N-10 at 0.57%

As = 1256 mm^2

Ix = 1.833e+010 mm^4

Iy = 8.873e+008 mm^4

Xo = 0 mm



File name: C:\COMW1.COL

Project: DEAD SEA COMPLEX

Column Id: INTERNAL WALLS

Engineer: Hassan Al-hkamrah

Date: 8/2/2000 Time: 13:37:44

Code: ACI 318-89

Units: Metric

X-axis slenderness is considered; k(b) = 1.00 k(s) = 1.20

Material Properties:

Ec = 23168 MPa eu = 0.003 mm/mm

fc = 10.19 MPa Es = 199955 MPa

Beta1 = 0.85

Stress Profile: Block

phi(c) = 1.00, phi(b) = 1.00

Concrete Base Design :

Input Data

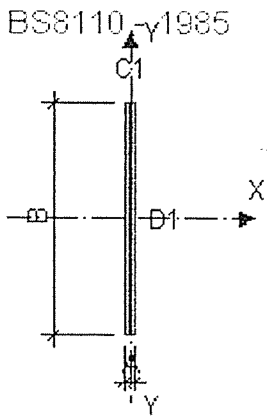
Base Length A (m)		1
Base Width B (m)		26
Column(s)	Col 1	Col 2
C (m)	.22	
D (m)	26	
E (m)		
F (m)		
Stub column height X (m)		.1
Base Depth Y (m)		.4
Soil Cover Z (m)		
Concrete Density (kN/m3)		25
Soil Density (kN/m3)		20
Soil friction angle (°)		22
Base friction constant		.5
Reinf. depth top X (mm)		50
Reinf. depth top Y (mm)		50
Reinf. depth bottom X (mm)		50
Reinf. depth bottom Y (mm)		50
Min Load Factor: self weight		1.6

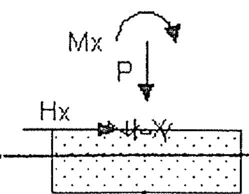
Allow Bearing Press. (kN/m²)	400
S.F. Overturning (ULS)	1.5
S.F. Slip (ULS)	1.5
fcu base (MPa)	25
fcu columns (MPa)	25
fy (MPa)	414

		Loads						
Load Case	Column no.	LF min	LF max	P (kN)	Hx (kN)	Hy (kN)	Mx (kNm)	M (kN
1	1	1	1.6	2045		320		101:

Sketch of Base

Sketch of Base

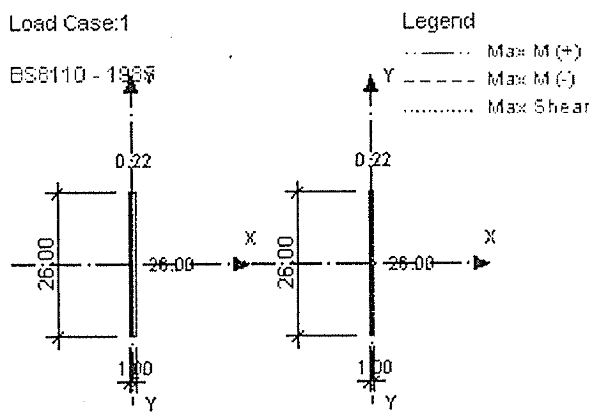


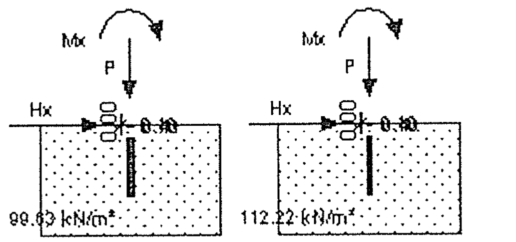


هاتف: ٠٨٠٦٤٤٠٨٨ ، ٦١٢٣٧٧ فاكس: ٦١٢٢٣٨٠ ص.ب ٨٣٠٧٤٦ عمان - الأردن

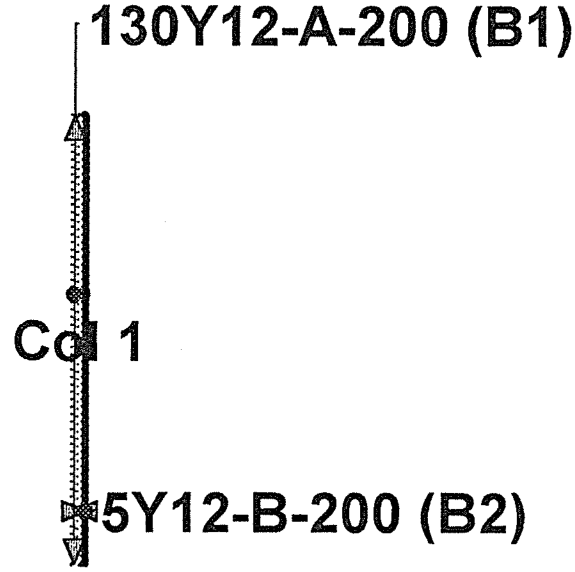
Output for Load Case 1

OUTPUT FOR LOAD CASE 1	
Max. soil pressure (kPa)	99.63
SF overturning (SLS)	25.66
SF overturning (ULS)	25.66
Safety Factor slip (ULS)	61.86
Safety Factor uplift (ULS)	>100
BOTTOM:	
Design moment X (kNm)	9.63
Reinforcement X (mm²/m)	74
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
TOP:	
Design moment X (kNm)	0.00
Reinforcement X (mm²/m)	0
Design moment Y (kNm)	0.00
Reinforcement Y (mm²/m)	0
Linear shear X (kN)	0.012
vc X (MPa)	0.347
Linear shear Y (kN)	0.000
vc Y (MPa)	0.347
Linear shear other (kN)	0.000
Punching shear (kN)	0.000
vc Punch	0.347





Soil Pressures at SLSSoil Pressures at ULS



PLAN