

**KINGDOM OF THAILAND**  
**MINISTRY OF TRANSPORT**  
**DEPARTMENT OF HIGHWAYS**

**PEDESTRIAN BRIDGE**

**DESIGN CALCULATION**

**EPSILON CO.,LTD.**  
**September-08**

**1) Design Notes**

**1.1) Design Standard and References**

- a) Ministry of Interior Regulation
  - Control of the Construction of Buildings ACT B.E.2522 and B.E. 2535
- b) American Concrete Institute
  - ACI 318-99 "Building Code Requirement for Reinforced Concrete"
  - ACI 315-99 "Details and Detailing of Concrete Reinforcement"
- c) American Institute of Steel Construction
  - AISC-Ninth Edition "Manual of Steel Construction, Allowable Stress Design"

**1.2) Design Loadings**

a) Dead Loads		
Steel	:	
Concrete	:	7,850 kg/cu.m.
Compacted Sand	:	2,400 kg/cu.m.
b) Live Loads		
Public Area	:	2,000 kg/cu.m.
Inaccessible Roof	:	
c) Wind Load		
Wind Pressure	:	400 kg/sq.m.
		50 kg/sq.m.
	:	80 kg/sq.m.

### 1.3) Load Combination

The following load combination will be considered in the design of the steel structures :

Case	Combination
1	$S1 = 1.0D + 1.0L$
2	$S2 = 1.0D + 1.0W_x$
3	$S3 = 1.0D + 1.0W_y$
6	$S6 = 1.0D + 0.75[ 1.0L + 1.0W_x ]$
7	$S7 = 1.0D + 0.75[ 1.0L + 1.0W_x ]$

The following load combination will be considered in the design of the RC. structures :

Case	Combination
1	$U1 = 1.7D + 2.0L$
2	$U2 = 0.9D + 1.3W_x$
3	$U3 = 0.9D + 1.3W_y$
6	$U6 = 0.75[ 1.7D + 2.0L + 2.0W_x ]$
7	$U7 = 0.75[ 1.7D + 2.0L + 2.0W_y ]$

Where

- S = Allowable Strength Design Load
- U = Ultimate Strength Design Load
- D = Dead Load
- L = Live Load
- W = Wind Load

#### 1.4) Materials Data

##### a) Concrete

Bored Pile	:	300 ksc ( cube )
Reinforced Concrete Structure	:	300 ksc ( cube )
Lean Concrete	:	180 ksc ( cube )

##### b) Reinforcements.

Reinforcement for reinforced concrete will conform to the following Thai Industrial Standard (TIS)

Mild Steel Round bars , TIS 20 Grade SR-24

(RB6 - RB9) ; fy

: 2,400 ksc

Deformed bars , TIS 24 Grade SD-40

(DB12 - DB32) ; fy

: 4,000 ksc

##### c) Cover to Reinforcement

c.1) Concrete cast against and Permanently exposed to Earth	:	75 mm.
c.2) Concrete exposed to earth or weather	:	
- Bar diameter $\geq$ 16 mm.	:	50 mm.
- Bar diameter < 16 mm.	:	40 mm.
c.3) Concrete not exposed to weather or in contact with ground	:	
- Slab , Stair , Walls	:	20 mm.
- Beam	:	30 mm.
- Column	:	35 mm.
c.4) Where bundle bars are used or the equivalent bundle baes diameter , which is the greater	:	50 mm.

##### d) Structural Steel

- d.1) Stuctural steel structure shall conform to the following Thai Industrial Standard (TIS)  
Minimum Yield Strength , fy : 2,400 ksc
- d.2) Bolts for structural steel joints shall conform to ASTM A325
- d.3) Anchor bolt and thread bars shall conform to ASTM A307
- d.4) All welding connections shall be in accordance with the American Welding Society (AWS),  
Electrodes to be E70 series.

##### e) Bored Concrete Pile by Dry Process

Bored Concrete Pile diameter 0.50 m. Safe Load 35 Metric Tons.

**Design Criteria**  
In According with The Strength Design Method of ACI 318-99

**Properties of Materials**

fc'				
fy				
Ec			=	250 ksc
Es			=	4,000 ksc
β1			=	2.51E+05 ksc
ec'			=	2.04E+06 ksc
ey	=	fy/Es	=	0.85
			=	0.0030
			=	0.0020

pb	=	0.85*β1(fc'/fy)(ec'/(ec'+ey))	<b>Flexural</b>	
ρ (max)	=	0.75*pb		
ρ (min)	=	14/fy		= 0.0273
W	=	ρ(max)fy/fc'		= 0.0205
φR	=	φfc'*W/(1-0.59W)		= 0.0035
Ca	=	ρ(max)fy*d/(0.85β1*fc')		= 0.3277
φMr	=	φR bd <sup>2</sup>		= 59.48 ksc
Mu < φMr				= 0.45 *d
As1	=	0.85fc'/fy [1-Sqrt(1-2.35Mu/(φfc'*b*d <sup>2</sup> ))]*b*d		
As2	=	ρ(max)*b*d		
es'	=	(Mu-φMr)/fy(d-d')		
fs'	=	ec'(Ca-d')/Ca		
As'	=	Es*es' ; If fs' > fy , fs' = fy		
As1	=	As2*fy/fs' ; Compression Reinf.		
As2	=	As1+As2 ; Tension Reinf.		

vu	=	φvc+φvs	<b>Shear</b>	
φvc/2 < vu < φvc				
φvc < vu < φ1.63 Sqrt(fc')			Spacing , S	= Av*fy/(3.5b)
φ1.63 Sqrt(fc') < vu < φ2.65 Sqrt(fc')			Spacing , S	= φAv*fy*d/(Vu-φVc) < d/2
vu > φ2.65 Sqrt(fc')			Spacing , S	= φAv*fy*d/(Vu-φVc) < d/4
φvc	=	φ0.53 Sqrt(fc')	Provided Enlarge Section	
φvc (two-way)	=	φ1.06 Sqrt(fc')		= 7.12 ksc
φvc (d/4)	=	φ1.63 Sqrt(fc')		= 14.25 ksc
φvc (max)	=	φ2.65 Sqrt(fc')		= 21.37 ksc
				= 35.62 ksc

Stirrup : 2 Legs

RB-6 :	fyv	=	2,400 ksc	S-max
RB-9 :	Spacing , S	=	1,155 *d/φVS	Av*fy/(3.5b)
	Spacing , S	=	2,595 *d/φVS	361 /b
DB-12 :	fyv	=	4,000 ksc	872 /b
DB-16 :	Spacing , S	=	7,616 *d/φVS	2,560 /b
	Spacing , S	=	13,668 *d/φVS	4,594 /b

Tu(mim)	=	φ0.13*Sqrt(fc')X <sup>2</sup> Y	<b>Torsion &amp; Shear</b>	
Tu(max)	=	φ1.05*Sqrt(fc')X <sup>2</sup> Y/Sqrt(1+(0.40*Vu/ct*Tu) <sup>2</sup> )		; > Tu Torsion may be Neglected
Vu(max)	=	φ2.65*Sqrt(fc')b*d/Sqrt(1+(2.50*ct*Tu/Vu) <sup>2</sup> )		; ct=b*d/X <sup>2</sup> Y
	=	φ0.21*Sqrt(fc')X <sup>2</sup> Y/Sqrt(1+(0.40*Vu/ct*Tu) <sup>2</sup> )		; Tu- φTc < 4φTc
	=	φ0.53*Sqrt(fc')b*d/Sqrt(1+(2.50*ct*Tu/Vu) <sup>2</sup> )		; Vu- φVc < φ2.12Sqrt(fc')*b*d
Shear Reinforcement				
Av/S	=	Vu-φVc/(φfyv*d)		
At/S	=	Tu-φTc/(φfyv*at*x1*y1)		
ΣA/S = Av/S + 2At/S	=	(cm <sup>2</sup> /cm/2-Legs)		
Spacing , S	=	ΣA		; at = [0.66+0.33(y1/x1)]
				; < (x1+y1)/4
				; < d/2
				; < Av*fy/(3.5b)

Longitudinal Reinforcement

AI	=	2At/S(x1+y1)
or AI	=	[28*X*S/fy(Tu/(Tu+Vu/3ct))-2At/S](x1+y1)/S

USE : Max( 3.5bS/fy , 2At)

**Job Information**

Engineer                      Checked                      Approved

Name: PSJ  
Date: 15-Sep-08

*Design of  
RC. Frame*

Structure Type    SPACE FRAME

Number of Nodes            14    Highest Node                      15  
Number of Elements        14    Highest Beam                      167  
  
Number of Basic Load Cases                      5  
Number of Combination Load Cases            20

Included in this printout are data for:  
All                      The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SW
Primary	2	DL
Primary	3	LL
Primary	4	WLX
Primary	5	WLZ
Combination	101	S1:DL
Combination	102	S2:DL+LL
Combination	103	S3:DL+WLX
Combination	104	S4:DL-WLX
Combination	105	S5:DL+WLZ
Combination	106	S6:DL-WLZ
Combination	107	S7:DL+LL+WLX
Combination	108	S8:DL+LL-WLX
Combination	109	S9:DL+LL+WLZ
Combination	110	S10:DL+LL-WLZ
Combination	201	U1 DL
Combination	202	U2 DL+LL
Combination	203	U3 DL+WLX
Combination	204	U4 DL-WLX
Combination	205	U5 DL+WLZ
Combination	206	U6 DL-WLZ
Combination	207	U7 DL+LL+WLX
Combination	208	U8 DL+LL-WLX
Combination	209	U9 DL+LL+WLZ
Combination	210	U10 DL+LL-WLZ

**Section Properties**

Prop	Section	Area (cm <sup>2</sup> )	I <sub>yy</sub> (cm <sup>4</sup> )	I <sub>zz</sub> (cm <sup>4</sup> )	J (cm <sup>4</sup> )	Material
1	Rect 0.70x0.30	2100.00	158E 3	857E 3	460E 3	CONCRETE
2	Rect 1.10x1.60	17.6E 3	37.5E 6	17.7E 6	40.8E 6	CONCRETE
3	Rect 1.10x1.80	19.8E 3	53.5E 6	20E 6	49.5E 6	CONCRETE
4	Rect 0.60x0.30	1800.00	135E 3	540E 3	371E 3	CONCRETE
5	Rect 0.60x1.20	7200.00	8.64E 6	2.16E 6	5.93E 6	CONCRETE

**Materials**

Mat	Name	E (kN/mm <sup>2</sup> )	v	Density (kg/m <sup>3</sup> )	α (1/°K)
1	STEEL	205.00	0.300	7833.41	12E -6
2	ALUMINUM	68.95	0.330	2712.63	23E -6
3	CONCRETE	21.72	0.170	2402.62	10E -6

### Supports

Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN·m/deg)	rY (kN·m/deg)	rZ (kN·m/deg)
1	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
15	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

### Basic Load Cases

Number	Name
1	SW
2	DL
3	LL
4	WLX
5	WLZ

### Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
101	S1:DL	1	SW	1.00
102	S2:DL+LL	2	DL	1.00
		1	SW	1.00
		2	DL	1.00
103	S3:DL+WLX	3	LL	1.00
		1	SW	1.00
		2	DL	1.00
104	S4:DL-WLX	4	WLX	1.00
		1	SW	1.00
		2	DL	1.00
105	S5:DL+WLZ	4	WLX	1.00
		1	SW	-1.00
		2	DL	1.00
106	S6:DL-WLZ	5	WLZ	1.00
		1	SW	1.00
		2	DL	1.00
107	S7:DL+LL+WLX	5	WLZ	1.00
		1	SW	-1.00
		2	DL	0.75
		3	LL	0.75
108	S8:DL+LL-WLX	4	WLX	0.75
		1	SW	0.75
		2	DL	0.75
		3	LL	0.75
109	S9:DL+LL+WLZ	4	WLX	0.75
		1	SW	-0.75
		2	DL	0.75
		3	LL	0.75
110	S10:DL+LL-WLZ	5	WLZ	0.75
		1	SW	0.75
		2	DL	0.75
		3	LL	0.75
201	U1 DL	5	WLZ	0.75
		1	SW	-0.75
202	U2 DL+LL	2	DL	1.70
		1	SW	1.70
		2	DL	1.70
203	U3 DL+WLX	3	LL	1.70
		1	SW	2.00
		2	DL	0.90
204	U4 DL-WLX	4	WLX	0.90
		1	SW	1.30
				0.90

**Combination Load Cases Cont...**

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
205	U5 DL+WLZ	2	DL	0.90
		4	WLX	-1.30
		1	SW	0.90
		2	DL	0.90
		5	WLZ	0.90
206	U6 DL-WLZ	1	SW	1.30
		2	DL	0.90
		5	WLZ	0.90
		2	DL	1.27
		3	LL	1.27
207	U7 DL+LL+WLX	4	WLX	1.50
		1	SW	1.50
		2	DL	1.27
		3	LL	1.27
		5	WLZ	1.50
208	U8 DL+LL-WLX	1	SW	-1.30
		2	DL	1.27
		3	LL	1.27
		4	WLX	1.50
		5	WLZ	1.50
209	U9 DL+LL+WLZ	1	SW	1.27
		2	DL	1.27
		3	LL	1.50
		4	WLX	1.50
		5	WLZ	-1.50
210	U10 DL+LL-WLZ	1	SW	1.27
		2	DL	1.27
		3	LL	1.50
		5	WLZ	1.50
		5	WLZ	-1.50

**Node Loads : 1 SW**

Node	FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
12	-	-11.30	-	-	-	-
13	-	-11.30	-	-	-	-

**Selfweight : 1 SW**

Direction Factor

Y	-1.000
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**Node Loads : 2 DL**

Node	FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
12	-	-5.78	-	-	-	-
13	-	-5.78	-	-	-	-



**Beam Loads : 2 DL**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
121	UNI	MTon/m	GY	-0.050	-	-	-
122	UNI	MTon/m	GY	-0.050	-	-	-
161	UNI	MTon/m	GY	-0.500	-	-	-
	UM	MTon-m/m	X	0.490	-	-	-
162	UNI	MTon/m	GY	-0.500	-	-	-
	UM	MTon-m/m	X	0.490	-	-	-
163	UNI	MTon/m	GY	-0.500	-	-	-
	UM	MTon-m/m	X	0.490	-	-	-
164	UNI	MTon/m	GY	-0.500	-	-	-
	UM	MTon-m/m	X	0.490	-	-	-
165	UNI	MTon/m	GY	-0.500	-	-	-
	UM	MTon-m/m	X	0.490	-	-	-
166	UNI	MTon/m	GY	-1.000	-	-	-
167	UNI	MTon/m	GY	-0.500	-	-	-
	UM	MTon-m/m	X	-0.490	-	-	-

**Node Loads : 3 LL**

Node	FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
12	-	-17.33	-	-	-	-
13	-	-17.33	-	-	-	-

**Beam Loads : 3 LL**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
111	UNI	MTon/m	GY	-0.720	-	-	-
112	UNI	MTon/m	GY	-0.720	-	-	-
121	UNI	MTon/m	GY	-0.640	-	-	-
122	UNI	MTon/m	GY	-0.640	-	-	-
161	UNI	MTon/m	GY	-0.560	-	-	-
	UM	MTon-m/m	X	0.550	-	-	-
162	UNI	MTon/m	GY	-0.560	-	-	-
	UM	MTon-m/m	X	0.550	-	-	-
163	UNI	MTon/m	GY	-0.560	-	-	-
	UM	MTon-m/m	X	0.550	-	-	-
164	UNI	MTon/m	GY	-0.560	-	-	-
	UM	MTon-m/m	X	0.550	-	-	-
165	UNI	MTon/m	GY	-0.560	-	-	-
	UM	MTon-m/m	X	0.550	-	-	-
166	UNI	MTon/m	GY	-1.120	-	-	-
167	UNI	MTon/m	GY	-0.560	-	-	-
	UM	MTon-m/m	X	-0.550	-	-	-

**Node Loads : 4 WLX**

Node	FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
12	-	0.27	-	-	-	-
	-5.12	-	-	-	-	-
13	-	0.27	-	-	-	-
	-5.12	-	-	-	-	-

**Beam Loads : 4 WLX**

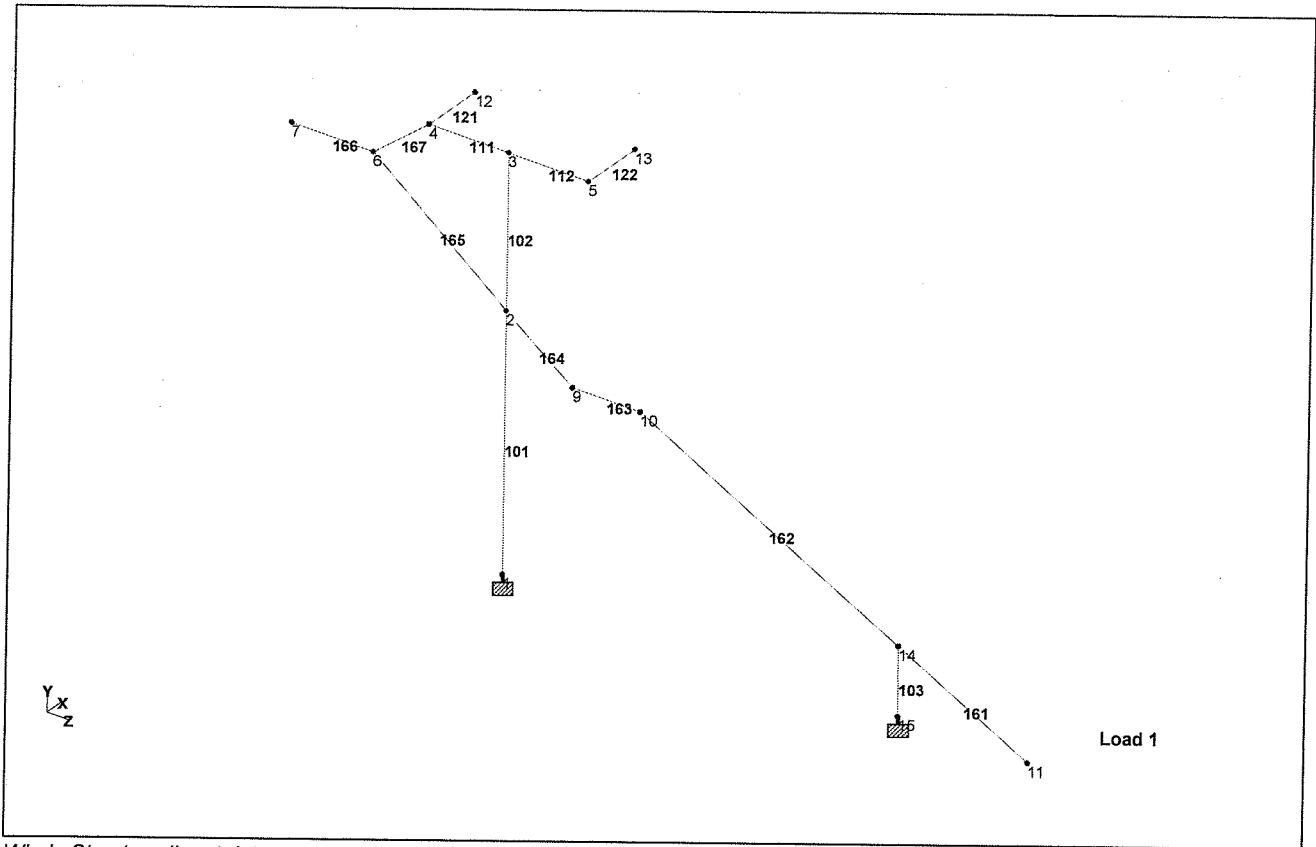
Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
101	UNI	MTon/m	GX	-0.096	-	-	-
102	UNI	MTon/m	GX	-0.096	-	-	-
103	UNI	MTon/m	GX	-0.050	-	-	-
111	UNI	MTon/m	GX	-0.088	-	-	-
112	UNI	MTon/m	GX	-0.088	-	-	-
161	UNI	MTon/m	GX	-0.050	-	-	-
162	UNI	MTon/m	GX	-0.050	-	-	-
163	UNI	MTon/m	GX	-0.050	-	-	-
164	UNI	MTon/m	GX	-0.050	-	-	-
165	UNI	MTon/m	GX	-0.050	-	-	-
166	UNI	MTon/m	GX	-0.050	-	-	-

**Node Loads : 5 WLZ**

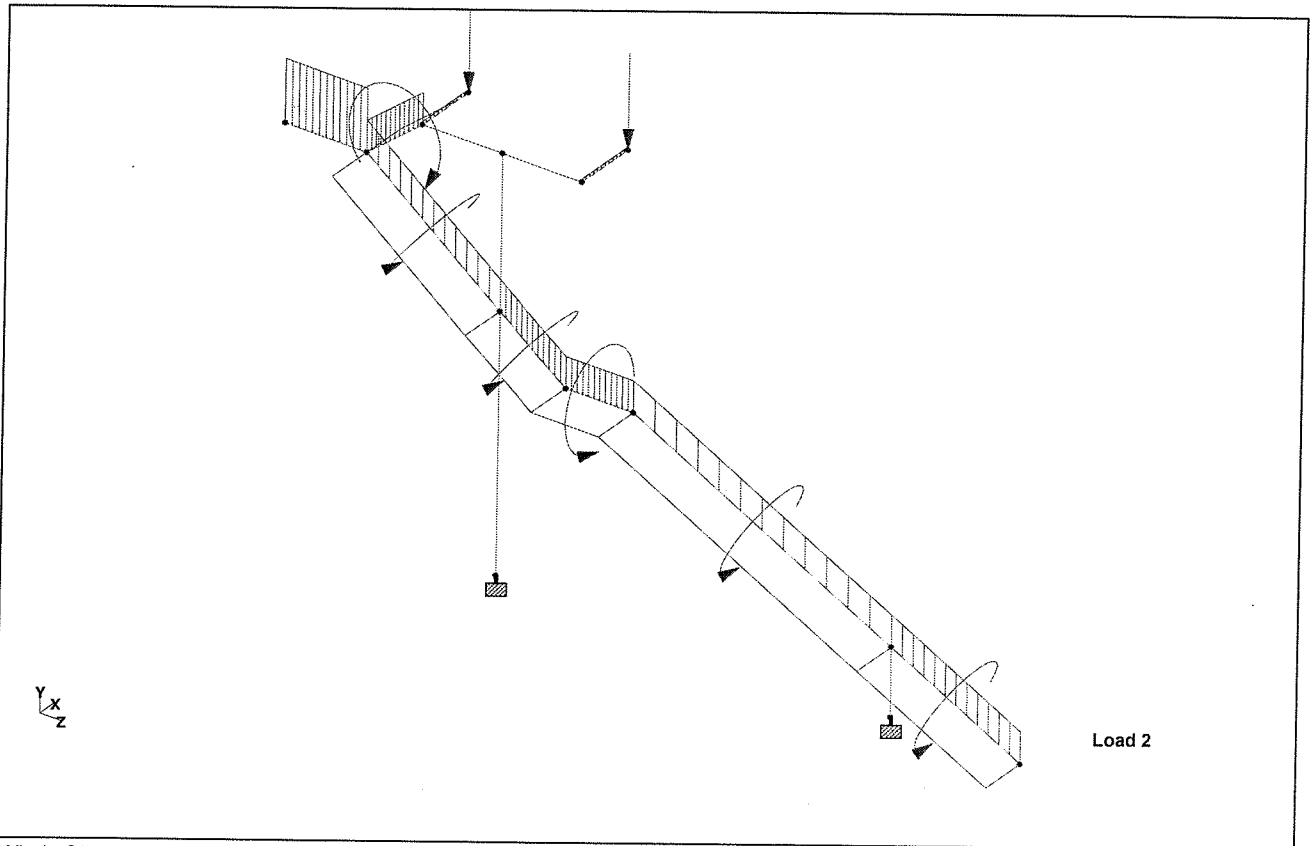
Node	FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon'm)	MY (MTon'm)	MZ (MTon'm)
12	-	-	-4.00	-	-	-
	-	9.15	-	-	-	-
	-12.40	-	-	-	-	-
13	-	-	-4.00	-	-	-
	-	-9.15	-	-	-	-
	12.40	-	-	-	-	-

**Beam Loads : 5 WLZ**

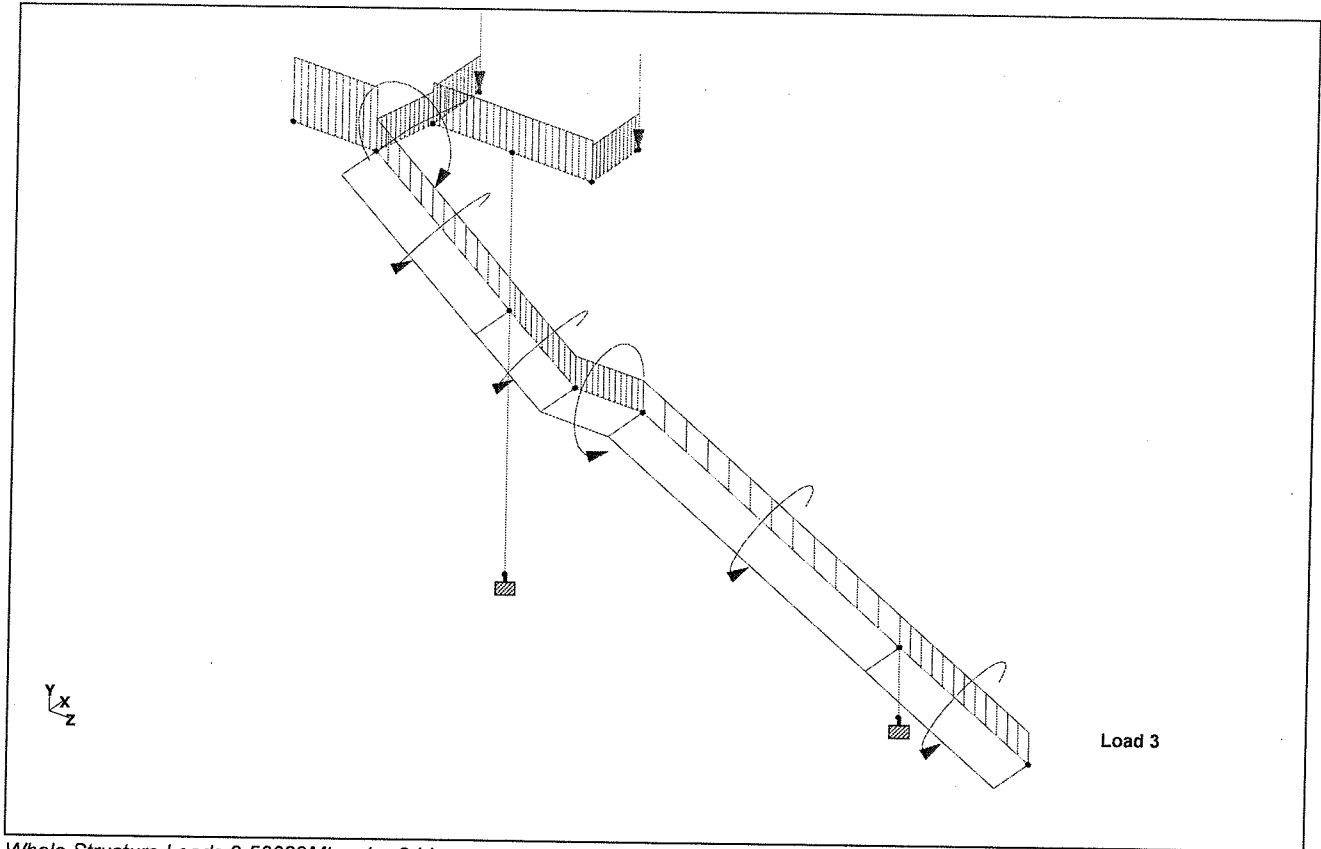
Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
101	UNI	MTon/m	GZ	0.048	-	-	-
102	UNI	MTon/m	GZ	0.048	-	-	-
103	UNI	MTon/m	GZ	0.048	-	-	-
121	UNI	MTon/m	GZ	0.088	-	-	-
122	UNI	MTon/m	GZ	0.088	-	-	-
161	UNI	MTon/m	GZ	0.048	-	-	-
162	UNI	MTon/m	GZ	0.048	-	-	-
163	UNI	MTon/m	GZ	0.048	-	-	-
164	UNI	MTon/m	GZ	0.048	-	-	-
165	UNI	MTon/m	GZ	0.048	-	-	-
166	UNI	MTon/m	GZ	0.048	-	-	-
167	UNI	MTon/m	GZ	0.048	-	-	-



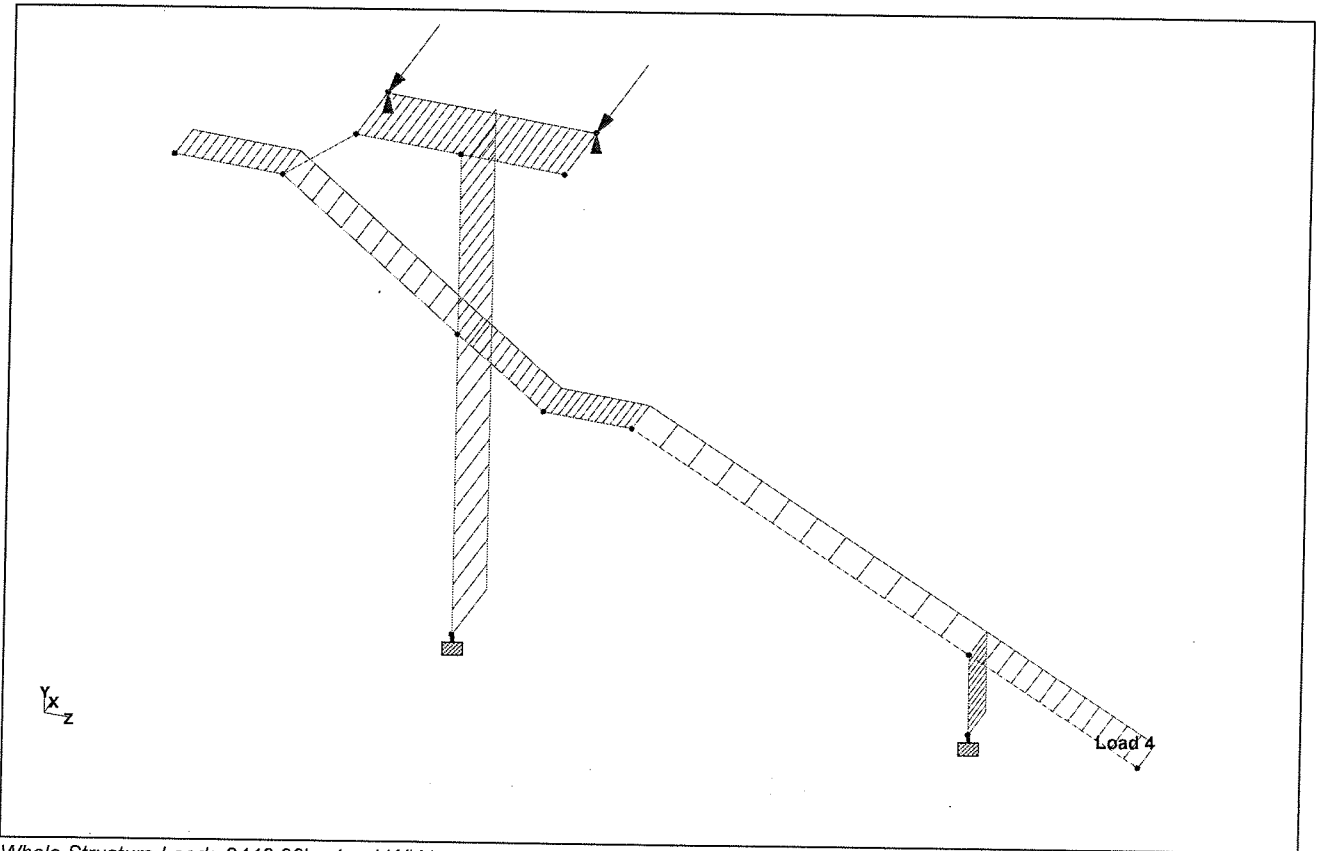
Whole Structure (Input data was modified after picture taken)



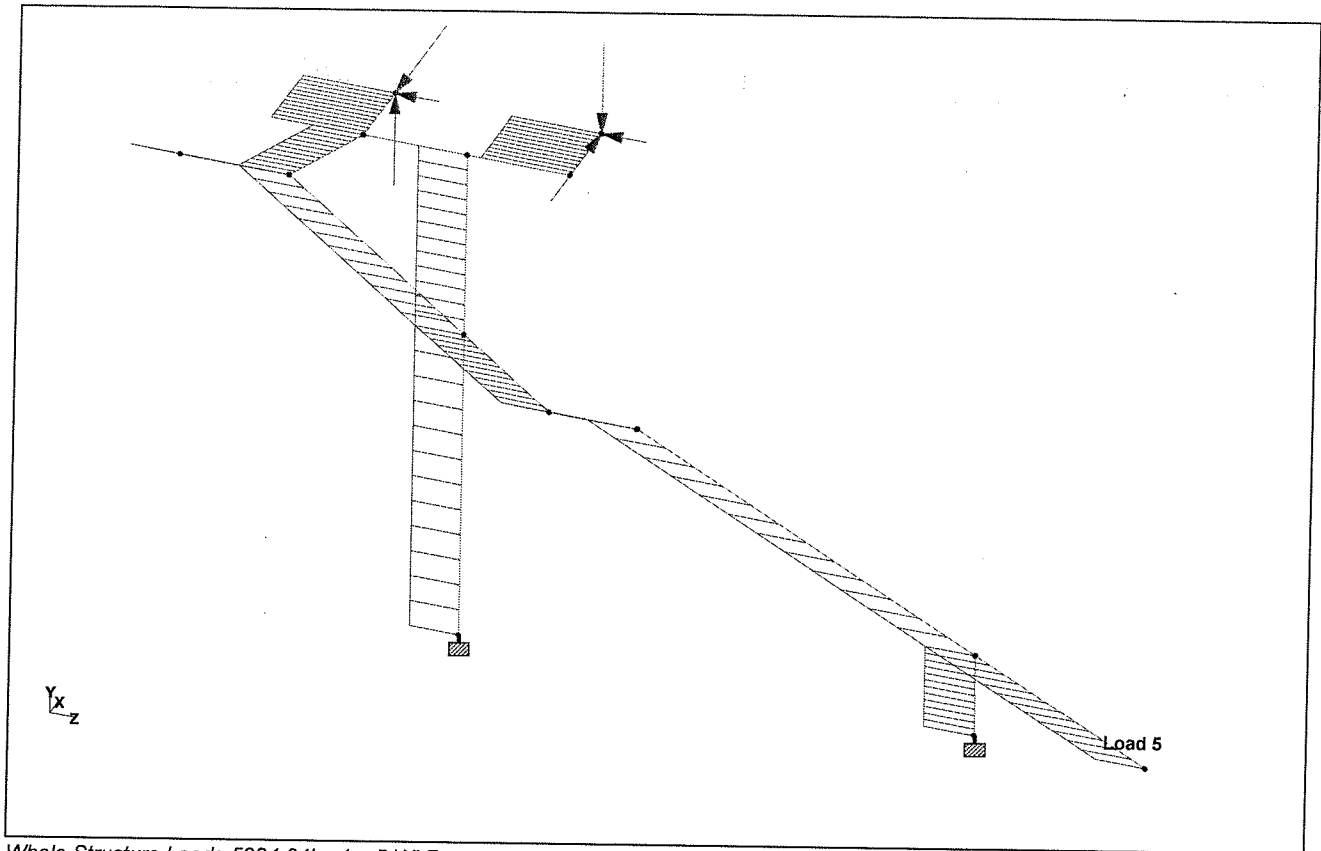
Whole Structure Loads 3.17045Mton: 1m 2 DL (Input data was modified after picture taken)



Whole Structure Loads 9.50039Mton:1m 3 LL



Whole Structure Loads 2446.06kg:1m 4 WLX



Whole Structure Loads 5924.04kg:1m 5 WLZ

**Beam End Force**

Beam	LJC	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon·m)	Moment-Y (MTon·m)	Moment-Z (MTon·m)
101	201	1	147.77	-0.10	-1.44	4.90	-8.53	78.76
		2	-133.07	0.10	1.44	-4.90	15.73	-79.27
202	202	1	240.33	-0.21	-2.98	11.20	-14.11	160.12
		2	-225.63	0.21	2.98	-11.20	28.99	-161.16
203	203	1	77.53	-15.16	-0.77	1.25	-4.50	-72.42
		2	-69.75	14.53	0.77	-1.25	8.33	-1.80
204	204	1	78.93	15.05	-0.76	3.93	-4.53	155.81
		2	-71.15	-14.42	0.76	-3.93	8.33	-82.13
205	205	1	80.55	-1.02	3.60	-56.15	-17.88	38.87
		2	-72.77	1.02	-3.91	56.15	-0.90	-43.98
206	206	1	75.91	0.92	-5.12	61.33	8.84	44.53
		2	-68.13	-0.92	5.44	-61.33	17.56	-39.95
207	207	1	179.44	-17.58	-2.24	6.85	-10.56	-11.58
		2	-168.41	16.86	2.24	-6.85	21.74	-74.53
208	208	1	181.06	17.27	-2.23	9.94	-10.60	251.76
		2	-170.03	-16.55	2.23	-9.94	21.75	-167.21
209	209	1	182.93	-1.27	2.80	-59.38	-26.00	116.83
		2	-171.90	1.27	-3.16	59.38	11.09	-123.20
210	210	1	177.57	0.96	-7.27	76.18	4.83	123.35
		2	-166.54	-0.96	7.63	-76.18	32.40	-118.54
102	201	2	110.48	0.16	10.29	1.59	-22.18	83.68
		3	-101.66	-0.16	-10.29	-1.59	-8.68	-83.19
		2	186.50	0.32	18.56	3.56	-39.59	171.63
202	202	3	-177.68	-0.32	-18.56	-3.56	-16.08	-170.68
		2	57.81	-13.78	5.42	0.84	-11.75	2.98
203	203	3	-53.14	13.41	-5.42	-0.84	-4.51	-43.76
		2	59.16	13.95	5.47	0.84	-11.73	85.62
204	204	3	-54.49	-13.58	-5.47	-0.84	-4.67	-44.32
		2	64.01	2.67	10.85	-57.68	-6.31	48.02
205	205	3	-59.34	-2.67	-11.03	57.68	-26.50	-40.01

RC  
Column  
0.60x1.20

**Beam End Force Cont...**

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon·m)	Moment-Y (MTon·m)	Moment-Z (MTon·m)
206		2	52.96	-2.50	0.05	59.36	-17.18	40.58
		3	-48.29	2.50	0.14	-59.36	17.32	-48.08
207		2	139.10	-15.76	13.89	2.67	-29.71	81.05
		3	-132.48	15.33	-13.89	-2.67	-11.97	-127.69
208		2	140.65	16.24	13.95	2.67	-29.68	176.40
		3	-134.04	-15.80	-13.95	-2.67	-12.15	-128.34
209		2	146.25	3.22	20.15	-64.85	-23.43	133.02
		3	-139.63	-3.22	-20.36	64.85	-37.34	-123.35
210		2	133.50	-2.75	7.69	70.20	-35.96	124.43
		3	-126.88	2.75	-7.47	-70.20	13.22	-132.67
103	201	15	12.24	1.48	-0.10	2.57	-1.02	3.16
		14	-11.26	-1.48	0.10	-2.57	1.16	-1.19
	202	15	19.28	3.04	-0.21	5.93	-3.37	5.81
		14	-18.30	-3.04	0.21	-5.93	3.65	-1.76
	203	15	6.48	0.79	0.70	0.75	-4.91	1.67
		14	-5.96	-0.79	-0.62	-0.75	4.03	-0.63
	204	15	6.48	0.78	-0.81	1.97	3.82	1.67
		14	-5.96	-0.78	0.72	-1.97	-2.80	-0.63
	205	15	4.14	4.79	-1.02	2.84	2.29	6.06
		14	-3.63	-4.87	1.02	-2.84	-0.93	0.37
	206	15	8.82	-3.22	0.92	-0.12	-3.37	-2.71
		14	-8.30	3.31	-0.92	0.12	2.16	-1.63
	207	15	14.46	2.29	0.72	3.74	-7.56	4.36
		14	-13.72	-2.28	-0.62	-3.74	6.68	-1.32
	208	15	14.46	2.28	-1.03	5.15	2.50	4.35
		14	-13.73	-2.28	0.93	-5.15	-1.20	-1.32
	209	15	11.76	6.91	-1.27	6.16	0.74	9.41
		14	-11.03	-7.00	1.27	-6.16	0.96	-0.16
	210	15	17.15	-2.34	0.96	2.73	-5.80	-0.71
		14	-16.42	2.44	-0.96	-2.73	4.52	-2.48
111	201	4	-10.29	-37.28	-0.16	-39.29	-1.34	-6.72
		3	10.29	50.22	0.16	39.29	1.59	-63.27
	202	4	-18.56	-72.36	-0.32	-80.62	-3.06	-12.12
		3	18.56	87.60	0.32	80.62	3.56	-115.85
	203	4	-5.42	-19.41	6.38	-20.98	-0.41	-3.52
		3	5.42	26.26	-6.57	20.98	-9.95	-33.02
	204	4	-5.47	-20.06	-6.55	-20.63	-1.01	-3.59
		3	5.47	26.91	6.74	20.63	11.64	-33.98
	205	4	-5.98	-13.36	13.45	-1.30	3.71	3.76
		3	5.98	20.22	-13.45	1.30	-25.22	-30.62
	206	4	-4.91	-26.10	-13.62	-40.30	-5.12	-10.87
		3	4.91	32.95	13.62	40.30	26.91	-36.38
	207	4	-13.89	-53.89	7.23	-60.67	-1.95	-9.05
		3	13.89	65.33	-7.44	60.67	-9.78	-86.33
	208	4	-13.95	-54.64	-7.70	-60.27	-2.64	-9.13
		3	13.95	66.07	7.91	60.27	15.13	-87.44
	209	4	-14.54	-46.92	15.38	-37.97	2.80	-0.65
		3	14.54	58.35	-15.38	37.97	-27.40	-83.57
	210	4	-13.30	-61.62	-15.85	-82.97	-7.39	-17.53
		3	13.30	73.05	15.85	82.97	32.75	-90.21
112	201	3	0.00	51.44	0.00	43.90	-0.00	71.95
		5	-0.00	-38.50	-0.00	-43.90	-0.00	0.00
202	3	5	0.00	90.08	0.00	90.06	-0.00	131.93
		5	-0.00	-74.83	-0.00	-90.06	0.00	0.00
203	3	5	0.00	26.88	-6.84	22.79	10.80	37.53
		5	-0.00	-20.03	6.66	-22.79	-0.00	0.00
204	3	5	0.00	27.58	6.84	23.70	-10.80	38.65
		5	-0.00	-20.73	-6.66	-23.70	0.00	0.00

RC Column  
 Ø30x0,30

**Beam End Force Cont...**

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon'm)	Moment-Y (MTon'm)	Moment-Z (MTon'm)
	205	3	5.05	39.13	16.12	38.71	-32.46	57.12
		5	-5.05	-32.28	-16.12	-38.71	6.66	0.00
	206	3	-5.05	15.34	-16.12	7.78	32.46	19.06
		5	5.05	-8.49	16.12	-7.78	-6.66	0.00
	207	3	0.00	67.15	-7.89	67.02	12.46	98.30
		5	-0.00	-55.72	7.68	-67.02	-0.00	0.00
	208	3	0.00	67.96	7.89	68.07	-12.46	99.60
		5	-0.00	-56.53	-7.68	-68.07	0.00	0.00
	209	3	5.83	81.28	18.60	85.39	-37.45	120.91
		5	-5.83	-69.85	-18.60	-85.39	7.69	0.00
	210	3	-5.83	53.83	-18.60	49.70	37.45	76.99
		5	5.83	-42.40	18.60	-49.70	-7.69	0.00
121	201	12	0.00	-29.04	-0.00	0.00	-0.00	-0.00
		4	-0.00	38.50	0.00	-0.00	0.00	-43.90
	202	12	0.00	-63.71	-0.00	0.00	-0.00	-0.00
		4	-0.00	74.83	0.00	-0.00	0.00	-90.06
	203	12	6.66	-15.03	-0.00	-0.00	0.00	-0.00
		4	-6.66	20.03	0.00	0.00	-0.00	-22.79
	204	12	-6.66	-15.73	-0.00	0.00	-0.00	-0.00
		4	6.66	20.73	0.00	-0.00	0.00	-23.70
	205	12	16.12	-3.48	5.20	0.00	-0.00	-0.00
		4	-16.12	8.49	-5.05	-0.00	-6.66	-7.78
	206	12	-16.12	-27.27	-5.20	0.00	0.00	-0.00
		4	16.12	32.28	5.05	-0.00	6.66	-38.71
	207	12	7.68	-47.38	-0.00	0.00	0.00	-0.00
		4	-7.68	55.72	0.00	-0.00	-0.00	-67.02
	208	12	-7.68	-48.19	0.00	0.00	-0.00	-0.00
		4	7.68	56.53	-0.00	-0.00	0.00	-68.07
	209	12	18.60	-34.06	6.00	0.00	-0.00	-0.00
		4	-18.60	42.40	-5.83	-0.00	-7.69	-49.70
	210	12	-18.60	-61.51	-6.00	0.00	0.00	-0.00
		4	18.60	69.85	5.83	-0.00	7.69	-85.39
122	201	13	-0.00	-29.04	0.00	0.00	-0.00	-0.00
		5	0.00	38.50	-0.00	-0.00	-0.00	-43.90
	202	13	-0.00	-63.71	0.00	0.00	-0.00	-0.00
		5	0.00	74.83	-0.00	-0.00	-0.00	-90.06
	203	13	6.66	-15.03	0.00	-0.00	0.00	-0.00
		5	-6.66	20.03	-0.00	0.00	-0.00	-22.79
	204	13	-6.66	-15.73	0.00	0.00	-0.00	-0.00
		5	6.66	20.73	-0.00	-0.00	0.00	-23.70
	205	13	-16.12	-27.27	5.20	0.00	-0.00	-0.00
		5	16.12	32.28	-5.05	-0.00	-6.66	-38.71
	206	13	16.12	-3.48	-5.20	0.00	0.00	-0.00
		5	-16.12	8.49	5.05	-0.00	6.66	-7.78
	207	13	7.68	-47.38	0.00	0.00	0.00	-0.00
		5	-7.68	55.72	-0.00	-0.00	-0.00	-67.02
	208	13	-7.68	-48.19	0.00	0.00	-0.00	-0.00
		5	7.68	56.53	-0.00	-0.00	0.00	-68.07
	209	13	-18.60	-61.51	6.00	0.00	-0.00	-0.00
		5	18.60	69.85	-5.83	-0.00	-7.69	-85.39
	210	13	18.60	-34.06	-6.00	0.00	0.00	-0.00
		5	-18.60	42.40	5.83	-0.00	7.69	-49.70
161	201	14	-2.27	4.43	-0.00	-2.43	-0.00	6.46
		11	0.00	0.00	0.00	-0.00	0.00	-0.00
	202	14	-3.76	7.34	-0.00	-5.64	-0.00	10.70
		11	0.00	0.00	0.00	0.00	0.00	-0.00
	203	14	-1.20	2.35	-0.19	-1.29	0.28	3.42
		11	0.00	0.00	0.00	0.00	0.00	-0.00

RC Beam  
0.30x0.60

**Beam End Force Cont...**

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon·m)	Moment-Y (MTon·m)	Moment-Z (MTon·m)
	204	14	-1.20	2.35	0.19	-1.29	-0.28	3.42
		11	0.00	0.00	-0.00	-0.00	0.00	-0.00
	205	14	-1.36	2.26	-0.00	-1.29	0.00	3.30
		11	0.00	0.00	0.00	-0.00	0.00	-0.00
	206	14	-1.04	2.43	0.00	-1.29	-0.00	3.54
		11	-0.00	-0.00	-0.00	0.00	0.00	0.00
	207	14	-2.82	5.50	-0.22	-4.23	0.32	8.02
		11	0.00	0.00	0.00	0.00	0.00	-0.00
	208	14	-2.82	5.50	0.22	-4.23	-0.32	8.02
		11	0.00	0.00	-0.00	-0.00	0.00	-0.00
	209	14	-3.01	5.41	-0.00	-4.23	-0.00	7.88
		11	0.00	0.00	0.00	-0.00	0.00	-0.00
	210	14	-2.64	5.60	-0.00	-4.23	-0.00	8.16
		11	-0.00	-0.00	0.00	0.00	0.00	0.00
162	201	10	-2.97	2.64	-0.10	-5.09	-1.16	-2.92
		14	-1.59	6.25	0.10	0.22	1.75	-7.65
	202	10	-5.60	4.40	-0.21	-10.98	-2.37	-4.84
		14	-1.94	10.32	0.21	-0.33	3.59	-12.46
	203	10	-1.58	1.40	0.05	0.05	0.08	-1.54
		14	-0.84	3.31	-0.43	-2.63	-1.46	-4.05
	204	10	-1.57	1.40	-0.15	-5.45	-1.30	-1.54
		14	-0.84	3.31	0.53	2.87	3.32	-4.05
	205	10	-6.77	1.34	-1.02	-3.39	3.03	-2.50
		14	4.03	3.20	1.02	0.81	2.95	-2.92
	206	10	3.62	1.45	0.92	-2.01	-4.25	-0.59
		14	-5.71	3.42	-0.92	-0.57	-1.10	-5.17
	207	10	-4.21	3.30	-0.04	-5.06	-0.98	-3.63
		14	-1.45	7.74	-0.40	-3.42	-0.07	-9.34
	208	10	-4.20	3.30	-0.27	-11.41	-2.57	-3.63
		14	-1.46	7.74	0.71	2.93	5.45	-9.34
	209	10	-10.20	3.24	-1.27	-9.03	2.43	-4.73
		14	4.16	7.61	1.27	0.55	5.03	-8.04
	210	10	1.79	3.37	0.96	-7.44	-5.98	-2.52
		14	-7.08	7.87	-0.96	-1.04	0.35	-10.64
163	201	9	-1.44	6.01	-0.10	-6.18	1.43	3.64
		10	1.44	-3.70	0.10	5.06	-1.29	2.92
	202	9	-2.98	10.29	-0.21	-13.46	3.18	6.48
		10	2.98	-6.48	0.21	10.85	-2.90	4.84
	203	9	-0.77	3.18	-0.04	-0.51	0.04	1.93
		10	0.77	-1.96	-0.05	-0.08	-0.04	1.54
	204	9	-0.76	3.18	-0.07	-6.04	1.48	1.92
		10	0.76	-1.96	0.15	5.44	-1.33	1.54
	205	9	-5.49	5.50	-1.02	-2.23	5.62	4.10
		10	5.41	-4.28	1.02	1.63	-4.24	2.50
	206	9	3.97	0.86	0.92	-4.32	-4.10	-0.25
		10	-3.88	0.36	-0.92	3.73	2.87	0.59
	207	9	-2.24	7.72	-0.14	-6.91	1.56	4.86
		10	2.24	-4.86	0.04	4.95	-1.44	3.63
	208	9	-2.23	7.72	-0.17	-13.28	3.22	4.86
		10	2.23	-4.85	0.27	11.32	-2.92	3.63
	209	9	-7.69	10.40	-1.27	-8.89	8.00	7.37
		10	7.59	-7.54	1.27	6.93	-6.28	4.73
	210	9	3.23	5.04	0.96	-11.30	-3.22	2.35
		10	-3.13	-2.18	-0.96	9.35	1.92	2.52
164	201	2	-6.44	6.28	-0.10	-7.22	-2.36	12.25
		9	4.73	-3.97	0.10	5.82	2.53	-3.64
	202	2	-11.35	10.32	-0.21	-15.96	-5.10	20.61
		9	8.52	-6.50	0.21	12.71	5.45	-6.48



**Beam End Force Cont...**

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon`m)	Moment-Y (MTon`m)	Moment-Z (MTon`m)
	203	2	-3.41	3.32	-0.15	-1.18	-0.11	6.49
		9	2.51	-2.10	0.04	0.43	0.27	-1.93
	204	2	-3.41	3.32	0.04	-6.47	-2.39	6.48
		9	2.50	-2.10	0.07	5.73	2.41	-1.92
	205	2	-8.68	2.31	-1.02	-5.88	4.91	7.01
		9	7.69	-1.15	1.02	5.13	-3.19	-4.10
	206	2	1.86	4.34	0.92	-1.77	-7.41	5.96
		9	-2.68	-3.05	-0.92	1.03	5.87	0.25
	207	2	-8.51	7.74	-0.27	-8.91	-2.51	15.46
		9	6.39	-4.87	0.14	6.48	2.86	-4.86
	208	2	-8.51	7.74	-0.04	-15.02	-5.14	15.46
		9	6.39	-4.88	0.17	12.59	5.32	-4.86
	209	2	-14.59	6.57	-1.27	-14.34	3.28	16.07
		9	12.37	-3.78	1.27	11.90	-1.14	-7.37
	210	2	-2.43	8.91	0.96	-9.60	-10.93	14.85
		9	0.41	-5.97	-0.96	7.16	9.32	-2.35
165	201	6	12.95	0.10	0.16	-4.50	-2.98	-1.74
		2	-16.54	4.51	-0.16	1.65	2.43	-5.80
	202	6	23.50	0.02	0.32	-9.49	-6.15	-2.99
		2	-29.44	7.62	-0.32	2.88	5.07	-10.01
	203	6	6.82	0.06	0.38	-1.50	-1.42	-0.90
		2	-8.72	2.38	-0.60	-0.01	-0.26	-3.06
	204	6	6.89	0.05	-0.21	-3.27	-1.74	-0.94
		2	-8.79	2.39	0.43	1.76	2.84	-3.08
	205	6	0.05	1.76	2.67	-3.37	-3.10	1.87
		2	-2.12	0.55	-2.67	1.86	-6.04	0.20
	206	6	13.66	-1.65	-2.50	-1.40	-0.06	-3.71
		2	-15.39	4.22	2.50	-0.11	8.62	-6.34
	207	6	17.58	0.02	0.58	-6.10	-4.43	-2.22
		2	-22.04	5.70	-0.83	1.14	2.02	-7.50
	208	6	17.66	0.00	-0.10	-8.14	-4.80	-2.26
		2	-22.12	5.72	0.36	3.18	5.59	-7.52
	209	6	9.77	1.98	3.22	-8.26	-6.37	0.97
		2	-14.42	3.59	-3.22	3.30	-4.65	-3.73
	210	6	25.48	-1.96	-2.75	-5.99	-2.86	-5.46
		2	-29.74	7.83	2.75	1.03	12.26	-11.28
166	201	7	0.00	-0.00	0.00	0.00	0.00	0.00
		6	-0.00	4.22	-0.00	-0.00	0.00	-3.48
	202	7	0.00	0.00	0.00	0.00	-0.00	0.00
		6	-0.00	7.92	-0.00	-0.00	0.00	-6.53
	203	7	0.00	0.00	0.00	0.00	-0.00	-0.00
		6	-0.00	2.23	-0.11	-0.00	-0.09	-1.84
	204	7	0.00	-0.00	-0.00	0.00	0.00	0.00
		6	-0.00	2.23	0.11	-0.00	0.09	-1.84
	205	7	0.00	-0.00	0.00	0.00	0.00	0.00
		6	-0.10	2.23	-0.00	-0.00	-0.00	-1.84
	206	7	0.00	0.00	-0.00	0.00	0.00	0.00
		6	0.10	2.23	0.00	-0.00	0.00	-1.84
	207	7	0.00	0.00	0.00	0.00	-0.00	0.00
		6	-0.00	5.94	-0.12	-0.00	-0.10	-4.90
	208	7	0.00	-0.00	0.00	0.00	0.00	0.00
		6	-0.00	5.94	0.12	-0.00	0.10	-4.90
	209	7	0.00	0.00	0.00	0.00	-0.00	0.00
		6	-0.12	5.94	-0.00	-0.00	-0.00	-4.90
	210	7	0.00	0.00	-0.00	0.00	-0.00	0.00
		6	0.12	5.94	0.00	-0.00	0.00	-4.90
167	201	6	-5.65	9.34	-0.16	3.91	-3.73	5.22
		4	7.19	-7.46	0.16	-2.73	3.96	6.72

**Beam End Force Cont...**

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon·m)	Moment-Y (MTon·m)	Moment-Z (MTon·m)
202		6	-10.25	16.78	-0.32	8.11	-7.89	9.52
		4	12.79	-13.67	0.32	-5.36	8.34	12.12
203		6	-2.99	4.91	-0.27	1.77	-1.08	2.75
		4	3.80	-3.91	0.27	-1.14	1.46	3.52
204		6	-2.99	4.98	0.10	2.37	-2.87	2.78
		4	3.81	-3.99	-0.10	-1.74	2.73	3.59
205		6	-3.06	-2.14	-2.67	3.77	-2.59	-0.03
		4	3.81	3.19	2.67	-3.14	6.39	-3.76
206		6	-2.92	12.02	2.50	0.37	-1.35	5.55
		4	3.80	-11.09	-2.50	0.26	-2.20	10.87
207		6	-7.69	12.54	-0.45	5.74	-4.88	7.12
		4	9.60	-10.21	0.45	-3.68	5.53	9.05
208		6	-7.69	12.63	-0.02	6.43	-6.95	7.16
		4	9.60	-10.29	0.02	-4.37	6.98	9.13
209		6	-7.77	4.42	-3.22	8.04	-6.63	3.92
		4	9.60	-2.02	3.22	-5.98	11.21	0.65
210		6	-7.60	20.75	2.75	4.12	-5.20	10.36
		4	9.59	-18.49	-2.75	-2.06	1.30	17.53

### Beam End Force

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (Mton·m)	Moment-Y (Mton·m)	Moment-Z (Mton·m)
101	101	1	86.93	-0.06	-0.85	2.88	-5.02	46.33
		2	-78.28	0.06	0.85	-2.88	9.25	-46.63
102	102	1	133.21	-0.11	-1.62	6.03	-7.81	87.01
		2	-124.56	0.11	1.62	-6.03	15.88	-87.57
103	103	1	86.39	-11.68	-0.85	1.85	-5.01	-41.45
		2	-77.74	11.20	0.85	-1.85	9.25	-15.73
104	104	1	87.46	11.56	-0.84	3.91	-5.03	134.11
		2	-78.81	-11.08	0.84	-3.91	9.26	-77.52
105	105	1	88.71	-0.80	2.51	-42.30	-15.30	44.16
		2	-80.06	0.80	-2.75	42.30	2.15	-48.18
106	106	1	85.14	0.69	-4.20	48.07	5.26	48.51
		2	-76.49	-0.69	4.44	-48.07	16.36	-45.08
107	107	1	99.50	-8.80	-1.21	3.75	-5.85	-0.58
		2	-93.01	8.44	1.21	-3.75	11.91	-42.51
108	108	1	100.31	8.63	-1.21	5.30	-5.87	131.09
		2	-93.82	-8.27	1.21	-5.30	11.91	-88.85
109	109	1	101.24	-0.64	1.31	-29.36	-13.56	63.62
		2	-94.76	0.64	-1.49	29.36	6.59	-66.84
110	110	1	98.56	0.47	-3.73	38.41	1.85	66.89
		2	-92.08	-0.47	3.91	-38.41	17.24	-64.52
102	101	2	64.99	0.09	6.05	0.94	-13.05	49.22
		3	-59.80	-0.09	-6.05	-0.94	-5.11	-48.94
102	102	2	103.00	0.17	10.19	1.92	-21.75	93.20
		3	-97.81	-0.17	-10.19	-1.92	-8.81	-92.68
103	103	2	64.47	-10.57	6.03	0.94	-13.06	17.44
		3	-59.28	10.28	-6.03	-0.94	-5.04	-48.72
104	104	2	65.51	10.76	6.07	0.94	-13.04	81.00
		3	-60.32	-10.47	-6.07	-0.94	-5.17	-49.15
105	105	2	69.24	2.08	10.20	-44.08	-8.87	52.09
		3	-64.05	-2.08	-10.35	44.08	-21.96	-45.83
106	106	2	60.74	-1.90	1.90	45.95	-17.23	46.36
		3	-55.55	1.90	-1.75	-45.95	11.75	-52.04
107	107	2	76.86	-7.87	7.63	1.44	-16.32	46.06
		3	-72.97	7.65	-7.63	-1.44	-6.56	-69.35
108	108	2	77.64	8.13	7.65	1.44	-16.31	93.74
		3	-73.75	-7.91	-7.65	-1.44	-6.65	-69.67
109	109	2	80.44	1.62	10.76	-32.32	-13.18	72.05
		3	-76.54	-1.62	-10.86	32.32	-19.25	-67.18
110	110	2	74.06	-1.36	4.53	35.20	-19.45	67.75
		3	-70.17	1.36	-4.42	-35.20	6.04	-71.84

### Node Displacement Summary

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	12	108:S8:DL+LL-	74.03	-22.86	-0.73	77.49	-0.00	-0.00	-0.02
Min X	13	103:S3:DL+WL	-7.65	-1.23	-0.88	7.80	-0.00	-0.00	-0.00
Max Y	11	105:S5:DL+WL	-2.86	0.34	-0.11	2.88	-0.00	-0.00	-0.00
Min Y	12	108:S8:DL+LL-	74.03	-22.86	-0.73	77.49	-0.00	-0.00	-0.02
Max Z	13	106:S6:DL-WL	20.77	-10.30	7.91	24.50	-0.00	-0.01	-0.01
Min Z	13	105:S5:DL+WL	40.90	-10.84	-9.45	43.36	-0.00	0.01	-0.01
Max rX	10	102:S2:DL+LL	12.01	-1.08	-0.74	12.08	0.00	-0.00	-0.00
Min rX	7	102:S2:DL+LL	50.43	-2.68	-1.63	50.53	-0.00	-0.00	-0.01
Max rY	13	105:S5:DL+WL	40.90	-10.84	-9.45	43.36	-0.00	0.01	-0.01
Min rY	13	106:S6:DL-WL	20.77	-10.30	7.91	24.50	-0.00	-0.01	-0.01
Max rZ	10	103:S3:DL+WL	-5.10	-0.70	-0.47	5.17	0.00	-0.00	0.00
Min rZ	13	108:S8:DL+LL-	72.28	-21.91	-0.74	75.53	-0.00	-0.00	-0.02
Max Rst	12	108:S8:DL+LL-	74.03	-22.86	-0.73	77.49	-0.00	-0.00	-0.02

## Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
1	101:S1:DL	0.06	86.93	-0.85	5.02	2.88	46.33
	102:S2:DL+LL	0.11	133.21	-1.62	7.81	6.03	87.01
	103:S3:DL+WL	11.68	86.39	-0.85	5.01	1.85	-41.45
	104:S4:DL-WL	-11.56	87.46	-0.84	5.03	3.91	134.11
	105:S5:DL+WL	0.80	88.71	2.51	15.30	-42.30	44.16
	106:S6:DL-WL	-0.69	85.14	-4.20	-5.26	48.07	48.51
	107:S7:DL+LL	8.80	99.50	-1.21	5.85	3.75	-0.58
	108:S8:DL+LL	-8.63	100.31	-1.21	5.87	5.30	131.09
	109:S9:DL+LL	0.64	101.24	1.31	13.56	-29.36	63.62
	110:S10:DL+LI	-0.47	98.56	-3.73	-1.85	38.41	66.89
15	101:S1:DL	-0.06	7.20	0.85	1.86	1.51	-0.61
	102:S2:DL+LL	-0.11	10.73	1.62	3.18	3.18	-1.79
	103:S3:DL+WL	0.52	7.20	0.85	1.86	1.03	-3.96
	104:S4:DL-WL	-0.64	7.20	0.84	1.86	1.99	2.75
	105:S5:DL+WL	-0.80	5.42	3.94	5.23	2.66	1.57
	106:S6:DL-WL	0.69	8.99	-2.24	-1.52	0.36	-2.78
	107:S7:DL+LL	0.35	8.04	1.21	2.39	2.03	-3.86
	108:S8:DL+LL	-0.52	8.04	1.21	2.38	2.75	1.18
	109:S9:DL+LL	-0.64	6.70	3.53	4.92	3.25	0.29
	110:S10:DL+LI	0.47	9.38	-1.11	-0.14	1.53	-2.97

FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600 : LC1 - DL

FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600

Design Data

Column Data	X-Dimension	Y-Dimension	m.	m.	Material Data	Concrete	Steel	250	ksc.
Pile Data	0.60	0.60	m.	m.	Service Load	P	Mx	47.6	t.
Footing	0.50	0.50	m.	m.	Weight of Footing	My	2.6	t-m.	t.
	0.80	0.80	m.	m.	Average Load Factor		1.80		

Pile Coordinate and Loading

Pile No.	X-Coordinate			Y-Coordinate			Pile Service Loading						
	Original	Deviate	Existing	SQRT.	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-1.50	-1.50	0.00	1.50	-1.30	0.00	1.30	1.69	11	3	6	0	20
2	0.00	0.00	0.00	0.00	-1.30	0.00	1.30	1.69	11	3	6	0	21
3	1.50	1.50	0.00	1.50	-1.30	0.00	1.30	1.69	11	3	6	0	21
4	-0.75	-0.75	0.00	0.75	0.00	0.00	0.00	0.00	11	3	0	0	14
5	0.75	0.75	0.00	0.75	0.00	0.00	0.00	0.00	11	3	0	0	15
6	-1.50	-1.50	0.00	1.50	1.30	0.00	1.30	1.69	11	3	-6	0	8
7	0.00	0.00	0.00	0.00	1.30	0.00	1.30	1.69	11	3	-6	0	8
8	1.50	1.50	0.00	1.50	1.30	0.00	1.30	1.69	11	3	-6	0	9
cg.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	115
Total				10.13									

Column Coordinate

Corner	X	Y	Corner	X	Y
1	-0.6	-0.3	1	-2.00	-1.80
2	0.6	-0.3	2	2.00	-1.80
3	0.6	0.3	3	2.00	1.80
4	-0.6	0.3	4	2.00	1.80
			5	2.00	1.80
			6	-2.00	1.80
			7	-2.00	1.80
			8	-2.00	-1.80

Critical Section Line Coordinate

Beam Shear	X1		Y1		X2		Y2		Length		
	X1	Y1	X2	Y2	X1	Y1	X2	Y2			
X-Negative	-1.32	-1.80	-1.32	1.80	3.60	-1.80	-0.68	1.80	3.60		
X-Positive	1.32	-1.80	1.32	1.80	3.60	-1.80	0.68	1.80	3.60		
Y-Negative	-2.00	-1.02	2.00	-1.02	4.00	-0.80	2.00	-0.80	4.00		
Y-Positive	-2.00	1.02	2.00	1.02	4.00	0.80	2.00	0.80	4.00		
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.96	-1.80	-0.96	1.80	3.60	-0.60	-1.80	-0.60	1.80	3.60	
X-Positive	0.96	-1.80	0.96	1.80	3.60	-0.60	-1.80	0.60	1.80	3.60	
Y-Negative	-2.00	-0.66	2.00	-0.66	4.00	-0.30	2.00	-0.30	4.00		
Y-Positive	-2.00	0.66	2.00	0.66	4.00	0.30	2.00	0.30	4.00		

Ultimate Shear and Shear Stress at Critical Section

Pile No.	Beam Shear				Deep Beam Shear				Punching Shear				
	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Perf
1	29	0	35	0	36	0	36	0	36	0	36	0	36
2	0	0	36	0	0	0	37	0	0	0	37	0	37
3	0	30	36	0	0	38	38	0	0	38	38	0	38
4	0	0	0	0	16	0	0	0	4	0	0	0	4
5	11	0	0	0	14	0	0	0	14	0	0	0	14
6	0	0	0	14	0	0	0	15	0	0	0	15	15
7	0	12	0	15	0	16	0	16	0	16	0	16	16
8	0	0	0	0	0	0	0	0	0	0	0	0	0
Shear	40	43	107	43	66	70	111	45	54	57	111	45	163
Moment					43	45	55	22					
Factor					1.26	1.25	1.77	1.77					
Length	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	6.48
Depth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Stress	1.56	1.64	3.72	1.50	2.67	2.69	3.85	1.55	2.10	2.21	3.85	1.55	3.50
Allow			7.12		8.99	8.90	12.58	12.58			14.25		

Ultimate Moment and Reinforcement at Critical Section

Pile Number	X-Negative			X-Positive			Y-Negative			Y-Positive			
	a	V	M	a	V	M	a	V	M	a	V	M	
1	0.90	36	33	-2.10	0	0	1.00	36	36	-1.60	0	0	
2	-0.60	0	0	-0.60	0	0	1.00	37	37	-1.60	0	0	
3	-2.10	0	0	0.90	38	34	1.00	38	38	-1.60	0	0	
4	0.15	26	4	-1.35	0	0	-0.30	0	0	-0.30	0	0	
5	-1.35	0	0	0.15	26	4	-0.30	0	0	-0.30	0	0	
6	0.90	14	13	-2.10	0	0	-1.60	0	0	1.00	14	14	
7	-0.60	0	0	-0.60	0	0	-1.60	0	0	1.00	15	15	
8	-2.10	0	0	0.90	16	14	-1.60	0	0	1.00	16	16	
Moment													45
Length	3.60			3.60			0.72			4.00			0.72
Depth	0.72			0.72			0.72			0.72			0.72
As(Req)				19.1			20.2			43.4			17.3
MinAs(Beam)				90.7			90.7			100.8			100.8
MinAs(Slab)				71.96			71.96			80			80
Conc. Moment				1109			1109			1233			1233

FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600 : LC2 - DL+LL

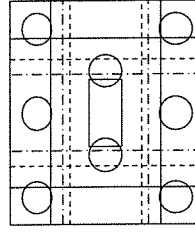
FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600

Design Data		Material Data		Concrete		ksc.	
Column Data	X-Dimension Y-Dimension	1.20 0.60	m. m.	Steel	250	4000	ksc.
Pile Data	Dimension Safe Load	0.60 35	m. t.	Service Load	133	t.	t.
Footing	Edge Distance Thickness Covering	0.50 0.80 0.08	m. m. m.	Weight of Footing Average Load Factor	88.7 2.1	t.-m. t.-m.	t. t.

Pile No.	X-Coordinate			Y-Coordinate			Pile Service Loading					
	Original	Deviate	Existing	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-1.50	-1.50	0.00	2.25	-1.30	1.69	1.77	17	3	11	0	31
2	0.00	0.00	-1.30	0.00	-1.30	1.69	1.77	17	3	11	0	31
3	1.50	1.50	-1.30	2.25	-1.30	1.69	1.77	17	3	11	0	32
4	-0.75	-0.75	0.00	0.00	0.00	0.00	0.00	17	3	0	0	20
5	0.75	0.75	0.00	0.00	0.00	0.00	0.00	17	3	0	0	20
6	-1.50	-1.50	1.30	2.25	1.30	1.69	1.77	17	3	-11	0	8
7	0.00	0.00	1.30	0.00	1.30	1.69	1.77	17	3	-11	0	9
8	1.50	1.50	1.30	2.25	1.30	1.69	1.77	17	3	-11	0	9
cg.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.12	133	28	0	161
Total												

Corner	Column Coordinate		Footing Coordinate	
	X	Y	X	Y
1	-0.6	-0.3	-2.00	-1.80
2	0.6	-0.3	2.00	-1.80
3	0.6	0.3	2.00	1.80
4	-0.6	0.3	-2.00	1.80
5			2.00	1.80
6			-2.00	1.80
7			-2.00	1.80
8			-2.00	-1.80



Critical Section Line Coordinate

Beam Shear	X1		Y1		X2		Y2		Length		
	X1	Y1	X2	Y2	X1	Y1	X2	Y2			
X-Negative	-1.32	-1.80	-1.32	1.80	3.60	-1.80	-0.68	1.80	3.60		
X-Positive	1.32	-1.80	1.32	1.80	3.60	-1.80	0.68	1.80	3.60		
Y-Negative	-2.00	-1.02	2.00	-1.02	-2.00	-0.80	2.00	-0.80	4.00		
Y-Positive	-2.00	1.02	2.00	1.02	-2.00	0.80	2.00	0.80	4.00		
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.96	-1.80	-0.96	1.80	3.60	-0.60	-1.80	-0.60	1.80	3.60	
X-Positive	0.96	-1.80	0.96	1.80	3.60	-0.60	-1.80	0.60	1.80	3.60	
Y-Negative	-2.00	-0.66	2.00	-0.66	4.00	-2.00	-0.30	2.00	-0.30	4.00	
Y-Positive	-2.00	0.66	2.00	0.66	4.00	-2.00	0.30	2.00	0.30	4.00	

Ultimate Shear and Shear Stress at Critical Section

Pile No.	Beam Shear				Deep Beam Shear				Punching Shear				
	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Perf
1	45	0	54	0	56	0	56	0	56	0	56	0	56
2	0	0	55	0	0	0	57	0	0	0	57	0	57
3	0	46	55	0	0	57	57	0	0	57	57	0	57
4	0	0	0	0	22	0	0	0	5	0	0	0	5
5	0	0	0	0	0	23	0	0	0	5	0	0	5
6	12	0	0	15	15	0	0	0	15	0	0	15	15
7	0	0	0	15	0	0	0	16	0	0	0	16	16
8	0	13	0	16	0	16	0	16	0	16	0	16	16
Shear	57	59	164	45	94	96	170	47	77	79	170	47	228
Moment					60	62	85	23					
Factor					1.26	1.25	1.77	1.77					
Length	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	6.48
Depth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Stress	2.20	2.27	5.69	1.57	3.61	3.71	5.90	1.63	2.95	3.04	5.90	1.63	4.88
Allow			7.12		8.97	8.92	12.58	12.58			14.25		

Ultimate Moment and Reinforcement at Critical Section

Pile Number	X-Negative			X-Positive			Y-Negative			Y-Positive			
	a	V	M	a	V	M	a	V	M	a	V	M	
1	0.90	56	50	-2.10	0	0	1.00	56	56	-1.60	0	0	
2	-0.60	0	0	-0.60	0	0	1.00	57	57	-1.60	0	0	
3	-2.10	0	0	0.90	57	51	1.00	57	57	-1.60	0	0	
4	0.15	36	5	-1.35	0	0	-0.30	0	0	-0.30	0	0	
5	-1.35	0	0	0.15	36	5	-0.30	0	0	-0.30	0	0	
6	0.90	15	14	-2.10	0	0	-1.60	0	0	1.00	15	15	
7	-0.60	0	0	-0.60	0	0	-1.60	0	0	1.00	16	16	
8	-2.10	0	0	0.90	16	15	-1.60	0	0	1.00	16	16	
Moment													47
Length													4.00
Depth													0.72
As(Req.)													66.9
MinAs(Beam)													100.8
MinAs(Slab)													80
Conc. Moment													1233

FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600 : LC3 - DL+W/LX

FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600

Design Data

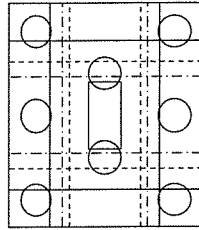
Column Data	X-Dimension	Y-Dimension	1.20	m.	Material Data	Concrete	250	ksc.
Pile Data	0.60	0.60	m.		Steel	4000	ksc.	
Footing	Safe Load	35	t.		Service Load	P	87	t.
	Edge Distance	0.50	m.		Weight of Footing	My	1.03	t.-m.
	Thickness	0.80	m.		Average Load Factor		28	t.
	Covering	0.08	m.				1.80	

Pile Coordinate and Loading

Pile No.	X-Coordinate		Y-Coordinate		Pile Service Loading				
	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-1.50	-1.30	-1.50	1.69	11	3	4	0	19
2	0.00	0.00	-1.30	1.69	11	3	4	0	19
3	1.50	2.25	-1.30	1.69	11	3	4	0	19
4	-0.75	0.56	0.00	0.00	11	3	0	0	14
5	0.75	0.56	0.00	0.00	11	3	0	0	14
6	-1.50	2.25	1.30	1.69	11	3	-4	0	10
7	0.00	0.00	1.30	1.69	11	3	-4	0	10
8	1.50	2.25	1.30	1.69	11	3	-4	0	10
cg.	0.00	0.00	0.00	0.00	10.12	87	28	0	115
Total									

Column Coordinate

Corner	X		Y	
	X1	X2	Y1	Y2
1	-0.6	-0.3	1	-2.00
2	0.6	-0.3	2	2.00
3	0.6	0.3	3	2.00
4	-0.6	0.3	4	2.00
5			5	2.00
6			6	-2.00
7			7	-2.00
8			8	-2.00



Critical Section Line Coordinate

Beam Shear	X1		Y1		X2		Y2		Length		
	X1	X2	Y1	Y2	X1	X2	Y1	Y2			
X-Negative	-1.32	-1.80	-1.32	1.80	3.60	-1.80	-0.68	1.80	3.60		
X-Positive	1.32	-1.80	1.32	1.80	3.60	-1.80	0.68	1.80	3.60		
Y-Negative	-2.00	-1.02	2.00	-1.02	4.00	-0.80	2.00	-0.80	4.00		
Y-Positive	-2.00	1.02	2.00	1.02	4.00	0.80	2.00	0.80	4.00		
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.96	-1.80	-0.96	1.80	3.60	X-Negative	-0.60	-1.80	-0.60	1.80	3.60
X-Positive	0.96	-1.80	0.96	1.80	3.60	X-Positive	0.60	-1.80	0.60	1.80	3.60
Y-Negative	-2.00	-0.66	2.00	-0.66	4.00	Y-Negative	-2.00	0.30	2.00	-0.30	4.00
Y-Positive	-2.00	0.66	2.00	0.66	4.00	Y-Positive	-2.00	0.30	2.00	0.30	4.00

Ultimate Shear and Shear Stress at Critical Section

Pile No.	Beam Shear				Deep Beam Shear				Punching Shear			
	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos
1	27	0	32	0	33	0	33	0	33	0	33	0
2	0	0	32	0	0	0	34	0	0	0	34	0
3	0	27	33	0	0	34	0	0	0	34	0	34
4	0	0	0	0	16	0	0	0	4	0	0	0
5	0	0	0	0	16	0	0	0	4	0	0	0
6	14	0	0	17	18	0	0	18	18	0	0	18
7	0	0	0	17	0	0	0	18	0	0	0	18
8	0	15	0	18	0	18	0	18	0	18	0	18
Shear	41	42	97	52	67	68	101	54	55	56	101	54
Moment					43	44	50	27				
Factor					1.26	1.25	1.77	1.77				
Length	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00
Depth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Stress	1.58	1.61	3.38	1.80	2.59	2.64	3.50	1.87	2.12	2.16	3.50	1.87
Allow			7.12		8.96	8.92	12.58	12.58			14.25	

Ultimate Moment and Reinforcement at Critical Section

Pile Number	X-Negative				X-Positive				Y-Negative				Y-Positive			
	a	V	M	a	V	M	a	V	M	a	V	M	a	V	M	
1	0.90	33	30	-2.10	0	0	1.00	33	33	-1.60	0	0	0	0	0	
2	-0.60	0	0	-0.60	0	0	1.00	34	34	-1.60	0	0	0	0	0	
3	-2.10	0	0	0.90	34	31	1.00	34	34	-1.60	0	0	0	0	0	
4	0.15	26	4	-1.35	0	0	-0.30	0	0	-0.30	0	0	0	0	0	
5	-1.35	0	0	0.15	26	4	-0.30	0	0	-0.30	0	0	0	0	0	
6	0.90	18	16	-2.10	0	0	-1.60	0	0	-1.60	0	0	1.00	18	18	
7	-0.60	0	0	-0.60	0	0	-1.60	0	0	-1.60	0	0	1.00	18	18	
8	-2.10	0	0	0.90	18	16	-1.60	0	0	-1.60	0	0	1.00	18	18	
Moment																
Length	3.60			3.60			0.72						4.00			
Depth	0.72			0.72									0.72			
As(Req)				19.3						19.7			39.4			
MinAs(Beam)				90.7						90.7			100.8			
MinAs(Slab)				71.96						71.96			80			
Conc. Moment				1109						1109			1233			



FOOTING ULTIMATE DESIGN  
 Number of Pile 8  
 8F600 : LC4 - DL+WLZ  
 8F600  
 Number of Pile 8

Design Data

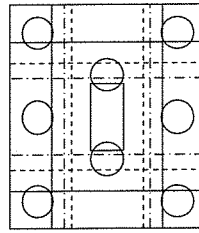
Column Data	X-Dimension	1.20	m.	Material Data	Concrete	250	Asc.
Pile Data	Y-Dimension	0.60	m.	Steel	P	4000	Asc.
	Safe Load	0.60	m.	Service Load	Mx	90.5	t.
	Edge Distance	35	t.	Weight of Footing	My	45.6	t-m.
	Thickness	0.50	m.	Average Load Factor		5.1	t-m.
	Covering	0.80	m.			28	t.
		0.08	m.			1.80	

Pile Coordinate and Loading

Pile No.	X-Coordinate		Y-Coordinate		Pile Service Loading				
	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-1.50	-1.30	-1.50	1.69	11	3	6	-1	20
2	0.00	0.00	-1.30	1.69	11	3	6	0	21
3	1.50	2.25	-1.30	1.69	11	3	6	1	21
4	-0.75	0.56	0.00	0.00	11	3	0	0	14
5	0.75	0.56	0.00	0.00	11	3	0	0	15
6	-1.50	2.25	1.30	1.69	11	3	-6	-1	8
7	0.00	0.00	1.30	1.69	11	3	-6	0	9
8	1.50	2.25	1.30	1.69	11	3	-6	1	10
cg.	0.00	0.00	0.00	0.00	10.12	91	28	0	118
Total									

Column Coordinate

Corner	X	Y	Corner	X	Y
1	-0.6	-0.3	1	-2.00	-1.80
2	0.6	-0.3	2	2.00	-1.80
3	0.6	0.3	3	2.00	1.80
4	-0.6	0.3	4	2.00	1.80
			5	2.00	1.80
			6	-2.00	1.80
			7	-2.00	1.80
			8	-2.00	-1.80



Critical Section Line Coordinate

Beam Shear	X1		Y1		X2		Y2		Length		
	X1	Y1	X2	Y2	X1	Y1	X2	Y2			
X-Negative	-1.32	-1.80	-1.32	1.80	3.60	-1.80	-0.68	1.80	3.60		
X-Positive	1.32	-1.80	1.32	1.80	3.60	-1.80	0.68	1.80	3.60		
Y-Negative	-2.00	-1.02	2.00	-1.02	4.00	-2.00	-0.80	2.00	4.00		
Y-Positive	-2.00	1.02	2.00	1.02	4.00	-2.00	0.80	2.00	4.00		
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.96	-1.80	-0.96	1.80	3.60	X-Negative	-0.60	-1.80	0.60	1.80	3.60
X-Positive	0.96	-1.80	0.96	1.80	3.60	X-Positive	0.60	-1.80	0.60	1.80	3.60
Y-Negative	-2.00	-0.66	2.00	-0.66	4.00	Y-Negative	-2.00	0.30	2.00	-0.30	4.00
Y-Positive	-2.00	0.66	2.00	0.66	4.00	Y-Positive	-2.00	0.30	2.00	0.30	4.00

Ultimate Shear and Shear Stress at Critical Section

Pile No.	Beam Shear				Deep Beam Shear				Punching Shear			
	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos
1	29	0	34	0	36	0	36	0	36	0	36	0
2	0	0	36	0	0	0	37	0	0	0	37	0
3	0	31	37	0	0	38	38	0	38	38	0	38
4	0	0	0	0	16	0	0	0	4	0	0	4
5	0	0	0	0	17	0	0	0	4	0	0	4
6	12	0	0	14	15	0	0	15	15	0	0	15
7	0	0	0	15	0	0	0	16	0	0	16	16
8	0	14	0	17	0	17	0	17	0	17	0	17
Shear	40	45	107	46	67	73	111	48	54	60	111	48
Moment					43	47	56	24				
Factor					1.27	1.24	1.77	1.77				
Length	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00
Depth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Stress	1.56	1.73	3.73	1.61	2.67	2.81	3.87	1.87	2.10	2.31	3.87	1.67
Allow			7.12		9.03	8.86	12.58	12.58			14.25	

Ultimate Moment and Reinforcement at Critical Section

Pile Number	X-Negative				X-Positive				Y-Negative				Y-Positive			
	a	V	M	a	V	M	a	V	M	a	V	M	a	V	M	
1	0.90	36	32	-2.10	0	0	1.00	36	36	-1.60	0	0	0	0	0	
2	-0.60	0	0	-0.60	0	0	1.00	37	37	-1.60	0	0	0	0	0	
3	-2.10	0	0	0.90	38	35	1.00	38	38	-1.60	0	0	0	0	0	
4	0.15	26	4	-1.35	0	0	-0.30	0	0	-0.30	0	0	0	0	0	
5	-1.35	0	0	0.15	27	4	-0.30	0	0	-0.30	0	0	0	0	0	
6	0.90	15	13	-2.10	0	0	-1.60	0	0	-1.60	0	0	1.00	15	15	
7	-0.60	0	0	-0.60	0	0	-1.60	0	0	-1.60	0	0	1.00	16	16	
8	-2.10	0	0	0.90	17	16	-1.60	0	0	-1.60	0	0	1.00	17	17	
Moment															48	
Length	3.60			3.60			0.72			4.00			4.00			
Depth	0.72			0.72						0.72			0.72			
As(Req)				19.1						21.1			43.5		18.7	
MinAs(Beam)				90.7						90.7			100.8		100.8	
MinAs(Slab)				71.96						71.96			80		80	
Conc. Moment				1109						1109			1233		1233	



FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600 : LC5 - DL+LL+W LX

FOOTING ULTIMATE DESIGN  
Number of Pile 8

8F600

Design Data

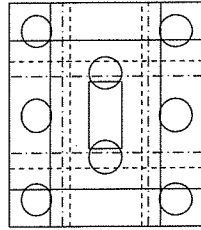
Column Data	X-Dimension	1.20	m.	Material Data	Concrete	250	ksc.
Pile Data	Y-Dimension	0.60	m.	Steel	P	4000	ksc.
Footing	Safe Load	0.60	m.	Service Load	Mx	5.2	t.
	Edge Distance	0.50	m.	Weight of Footing	My	1.6	t.-m.
	Thickness	0.80	m.	Average Load Factor		28	t.
	Covering	0.08	m.			1.80	

Pile Coordinate and Loading

Pile No.	X-Coordinate			Y-Coordinate			Pile Service Loading						
	Original	Deviate	Existing	SQRT.	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total
1	-1.50	-1.50	-1.50	2.25	-1.30	-1.30	1.69	12	3	1	0	0	16
2	0.00	0.00	-1.30	0.00	-1.30	1.69	12	3	1	0	0	16	17
3	1.50	1.50	-1.30	2.25	-1.30	1.69	12	3	1	0	0	16	16
4	-0.75	-0.75	0.00	0.56	0.00	0.00	12	3	0	0	0	16	15
5	0.75	0.75	0.00	0.56	0.00	0.00	12	3	0	0	0	16	15
6	-1.50	-1.50	1.30	2.25	1.30	1.69	12	3	-1	0	0	15	15
7	0.00	0.00	1.30	0.00	1.30	1.69	12	3	-1	0	0	15	15
8	1.50	1.50	1.30	2.25	1.30	1.69	12	3	-1	0	0	15	15
cg.	0.00	0.00	0.00	10.13	0.00	0.00	10.12	99	28	0	0	0	127
Total													

Column Coordinate

Corner	X	Y	Corner	X	Y
1	-0.6	-0.3	1	-2.00	-1.80
2	0.6	-0.3	2	2.00	-1.80
3	0.6	0.3	3	2.00	1.80
4	-0.6	0.3	4	-2.00	1.80
			5	2.00	1.80
			6	-2.00	1.80
			7	-2.00	1.80
			8	-2.00	-1.80



Critical Section Line Coordinate

Beam Shear	X1		Y1		X2		Y2		Length		
	X1	Y1	X2	Y2	X1	Y1	X2	Y2			
X-Negative	-1.32	-1.80	-1.32	1.80	3.60	-1.80	-0.68	1.80	3.60		
X-Positive	1.32	-1.80	1.32	1.80	3.60	-1.80	0.68	1.80	3.60		
Y-Negative	-2.00	-1.02	2.00	-1.02	4.00	-0.80	2.00	-0.80	4.00		
Y-Positive	-2.00	1.02	2.00	1.02	4.00	0.80	2.00	0.80	4.00		
Punching	X1	Y1	X2	Y2	Length	Moment	X1	Y1	X2	Y2	Length
X-Negative	-0.96	-1.80	-0.96	1.80	3.60	-0.60	-1.80	-0.60	1.80	3.60	
X-Positive	0.96	-1.80	0.96	1.80	3.60	-0.60	-1.80	0.60	1.80	3.60	
Y-Negative	-2.00	-0.66	2.00	-0.66	4.00	-2.00	-0.30	2.00	-0.30	4.00	
Y-Positive	-2.00	0.66	2.00	0.66	4.00	-2.00	0.30	2.00	0.30	4.00	

Ultimate Shear and Shear Stress at Critical Section

Pile No.	Beam Shear				Deep Beam Shear				Punching Shear				
	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	Perf
1	23	0	28	0	29	0	29	0	29	0	29	0	29
2	0	0	29	0	0	0	30	0	0	0	30	0	30
3	0	24	29	0	0	30	30	0	0	30	30	0	30
4	0	0	0	0	18	0	0	0	4	0	0	0	4
5	0	0	0	0	0	18	0	0	0	4	0	0	4
6	21	0	0	26	27	0	0	27	27	0	0	27	27
7	0	0	0	26	0	0	0	27	0	0	0	27	27
8	0	22	0	27	0	28	0	28	0	28	0	28	28
Shear	45	46	38	79	74	76	89	82	60	62	89	82	180
Moment					48	49	44	41					
Factor					1.26	1.25	1.77	1.77					
Length	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	6.48
Depth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Stress	1.73	1.79	2.98	2.74	2.85	2.93	3.09	2.84	2.33	2.40	3.09	2.84	3.85
Allow			7.12		8.97	8.92	12.58	12.58			14.25		

Ultimate Moment and Reinforcement at Critical Section

Pile Number	X-Negative			X-Positive			Y-Negative			Y-Positive			
	a	V	M	a	V	M	a	V	M	a	V	M	
1	0.90	29	26	0	0	0	1.00	29	29	-1.60	0	0	
2	-0.60	0	0	-0.60	0	0	1.00	30	30	-1.60	0	0	
3	-2.10	0	0	0.90	30	27	1.00	30	30	-1.60	0	0	
4	0.15	28	4	-1.35	0	0	-0.30	0	0	-0.30	0	0	
5	-1.35	0	0	0.15	29	4	-0.30	0	0	-0.30	0	0	
6	0.90	27	24	-2.10	0	0	-1.60	0	0	1.00	27	27	
7	-0.60	0	0	-0.60	0	0	-1.60	0	0	1.00	27	27	
8	-2.10	0	0	0.90	28	25	-1.60	0	0	1.00	28	28	
Moment													82
Length				3.60			3.60			4.00			4.00
Depth				0.72			0.72			0.72			0.72
As(Req)				21.3			21.9			34.7			31.9
MinAs(Beam)				90.7			90.7			100.8			100.8
MinAs(Slab)				71.96			71.96			80			80
Conc. Moment				1109			1109			1233			1233

**FOOTING ULTIMATE DESIGN**  
Number of Pile 8

8F800 : LC6 - DL+LL+WLZ

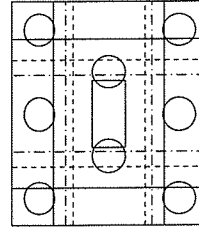
**FOOTING ULTIMATE DESIGN**  
Number of Pile 8

8F800

Design Data		Material Data		Concrete		Steel		250		ksc.	
X-Dimension	1.20	m.							4000		ksc.
Y-Dimension	0.60	m.							102		t.
Safe Load	35	t.							64.9		t-m.
Edge Distance	0.50	m.							3.01		t-m.
Thickness	0.80	m.							28		t.
Covering	0.08	m.							1.80		t.

Pile No.	X-Coordinate		Y-Coordinate		Pile Service Loading						
	Original	Deviate	Existing	SQRT.	P	F	Mx	My	Total		
1	-1.50	-1.50	2.25	2.25	-1.30	1.69	13	3	8	0	24
2	0.00	0.00	-1.30	1.69	13	3	8	0	25		
3	1.50	1.50	2.25	2.25	-1.30	1.69	13	3	8	0	25
4	-0.75	-0.75	0.56	0.56	0.00	0.00	13	3	0	0	16
5	0.75	0.75	0.56	0.56	0.00	0.00	13	3	0	0	16
6	-1.50	-1.50	2.25	2.25	1.30	1.69	13	3	-8	0	7
7	0.00	0.00	0.00	0.00	1.30	1.69	13	3	-8	0	8
8	1.50	1.50	2.25	2.25	1.30	1.69	13	3	-8	0	8
cg.	0.00	0.00	0.00	0.00	0.00	0.00	10.12	102	28	0	130
Total											

Corner	X		Y		X		Y	
	X	Y	Corner	X	Y	Corner	X	Y
1	-0.6	-0.3	1	-2.00	-1.80			
2	0.6	-0.3	2	2.00	-1.80			
3	0.6	0.3	3	2.00	1.80			
4	-0.6	0.3	4	2.00	1.80			
			5	2.00	1.80			
			6	-2.00	1.80			
			7	-2.00	1.80			
			8	-2.00	-1.80			



**Critical Section Line Coordinate**

Beam Shear	X1		Y1		X2		Y2		X1		Y1		X2		Y2		Length		
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	
X-Negative	-1.32	-1.80	-1.32	1.80	3.60	1.80	3.60	-1.80	-0.68	-1.80	-0.68	1.80	3.60	3.60	1.80	3.60	1.80	3.60	3.60
X-Positive	1.32	-1.80	1.32	1.80	3.60	1.80	3.60	-1.80	0.68	-1.80	0.68	1.80	3.60	3.60	1.80	3.60	1.80	3.60	3.60
Y-Negative	-2.00	-1.02	2.00	-1.02	4.00	-1.02	4.00	-2.00	2.00	-2.00	2.00	-0.80	4.00	4.00	-0.80	4.00	-0.80	4.00	4.00
Y-Positive	-2.00	1.02	2.00	1.02	4.00	1.02	4.00	-2.00	0.80	-2.00	0.80	2.00	4.00	4.00	0.80	4.00	2.00	4.00	4.00
Punching																			
X-Negative	-0.96	-1.80	-0.96	1.80	3.60	1.80	3.60	-1.80	-0.60	-1.80	-0.60	1.80	3.60	3.60	1.80	3.60	1.80	3.60	3.60
X-Positive	0.96	-1.80	0.96	1.80	3.60	1.80	3.60	-1.80	0.60	-1.80	0.60	1.80	3.60	3.60	1.80	3.60	1.80	3.60	3.60
Y-Negative	-2.00	-0.66	2.00	-0.66	4.00	-0.66	4.00	-2.00	0.30	-2.00	0.30	2.00	4.00	4.00	-0.30	4.00	-0.30	4.00	4.00
Y-Positive	-2.00	0.66	2.00	0.66	4.00	0.66	4.00	-2.00	0.30	-2.00	0.30	2.00	4.00	4.00	0.30	4.00	2.00	4.00	4.00

**Ultimate Shear and Stress at Critical Section**

Pile No.	Beam Shear				Deep Beam Shear				Punching Shear			
	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos	X-Neg	X-Pos	Y-Neg	Y-Pos
1	35	0	42	0	43	0	43	0	43	0	43	0
2	0	0	43	0	0	0	44	0	0	0	44	0
3	0	36	43	0	0	45	45	0	0	45	45	0
4	0	0	0	0	18	0	0	0	4	0	0	0
5	0	0	0	0	0	18	0	0	0	4	0	0
6	11	0	0	13	13	0	0	13	13	0	0	13
7	0	0	0	14	0	0	0	14	0	0	0	14
8	0	12	0	14	0	15	0	15	0	15	0	15
Shear	45	48	128	41	75	78	132	43	81	64	132	43
Moment					48	51	66	21				
Factor					1.26	1.25	1.77	1.77				
Length	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00	3.60	3.60	4.00	4.00
Depth	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Stress	1.75	1.85	4.44	1.43	2.88	3.03	4.60	1.48	2.36	2.48	4.60	1.48
Allow			7.12		8.99	8.90	12.58	12.58			14.25	

**Ultimate Moment and Reinforcement at Critical Section**

Pile Number	X-Negative				X-Positive				Y-Negative				Y-Positive			
	a	V	M	a	V	M	a	V	M	a	V	M	a	V	M	
1	0.90	43	39	-2.10	0	0	1.00	43	43	1.00	43	43	-1.60	0	0	
2	-0.60	0	0	-0.60	0	0	1.00	44	44	1.00	44	44	-1.60	0	0	
3	-2.10	0	0	0.90	45	40	1.00	45	45	1.00	45	45	-1.60	0	0	
4	0.15	29	4	-1.35	0	0	-0.30	0	0	-0.30	0	0	-0.30	0	0	
5	-1.35	0	0	0.15	30	4	-0.30	0	0	-0.30	0	0	-0.30	0	0	
6	0.90	13	12	-2.10	0	0	-1.60	0	0	-1.60	0	0	1.00	13	13	
7	-0.60	0	0	-0.60	0	0	-1.60	0	0	-1.60	0	0	1.00	14	14	
8	-2.10	0	0	0.90	15	13	-1.60	0	0	-1.60	0	0	1.00	15	15	
Moment																
Length																
Depth																
As(Req)																
MinAs(Beam)																
MinAs(Slab)																
Conc. Moment																

# Column End Force - Service load.

## Beam End Force

Beam	L/C	Node	Axial Force (Mton)	Shear-Y (Mton)	Shear-Z (Mton)	Torsion (MTon·m)	Moment-Y (MTon·m)	Moment-Z (MTon·m)
101	3	1	46.28	-0.05	-0.77	3.15	-2.79	40.68
		2	-46.28	0.05	0.77	-3.15	6.63	-40.95
	4	1	-0.54	-11.62	-0.00	-1.03	0.01	-87.78
		2	0.54	11.14	0.00	1.03	-0.00	30.89
	5	1	1.79	-0.75	3.36	-45.18	-10.28	-2.18
		2	-1.79	0.75	-3.60	45.18	-7.10	-1.55
101	1	86.93	-0.06	-0.85	2.88	-5.02	46.33	
	2	-78.28	0.06	0.85	-2.88	9.25	-46.63	
102	3	2	38.01	0.08	4.14	0.99	-8.71	43.98
		3	-38.01	-0.08	-4.14	-0.99	-3.70	-43.74
	4	2	-0.52	-10.67	-0.02	-0.00	-0.01	-31.78
		3	0.52	10.38	0.02	0.00	0.06	0.22
	5	2	4.25	1.99	4.15	-45.02	4.18	2.86
		3	-4.25	-1.99	-4.30	45.02	-16.85	3.11
	101	2	64.99	0.09	6.05	0.94	-13.05	49.22
		3	-59.80	-0.09	-6.05	-0.94	-5.11	-48.94

Job Title : Nakhonsawan - Pedestrian Bridge	Subject : Analysis of Slender Column in Unbraced Frames
Designed : PSJ Date : ๑๑.๑.-08	By Moment Magnification Factors Method
Checked : Date :	Sheet : Page :

RC Wall : Column 60x120

A) Properties of Materials and Design Parameter

fc'	Ultimated compressive strength of concrete (Cylinder)	=	250 ksc
fy	Yield strength of reinforcement	=	4,000 ksc
Ec	Modulus of elasticity of concrete	=	2.4 <sup>1.5</sup> *4270*SQRT(fc')
	Ec = 2.4 <sup>1.5</sup> *4270*SQRT(fc')	=	2.51E+05 ksc
φ-c	Strength reduction factor ( Spiral = 0.75 , Other = 0.70 )	=	0.70

B) Section Properties of Column

lu	Unsupported Length	=	8.00 m
b	Width	=	0.60 m
D	Depth	=	1.20 m
I	Moment Inertia	=	0.08640 m <sup>4</sup>
Kb	Effective length factor for braced frame	=	1.20
Ks	Effective length factor for unbraced frame	=	1.20
Kb*lu/r		=	26.67
Ks*lu/r		=	26.67

C) Service Loads

Loads	Axial Loads (kg)	Moment at Top (kg-m)	Moment at Bottom (kg-m)
Dead	87,000	14,000	5,000
Live	47,000	4,000	3,000
Lat.	600	-	-

*Windload (x-dir)*

D) Factor Load Combination

- D.1) Gravity Loads : **U1 = 1.4\*Dead+1.7\*Live**  
 Pu = 201,700 kg  
 M1b = 12,100 kg-m  
 M2b = 26,400 kg-m
- D.2) Gravity + Lat. : **U2 = 0.75\*(1.4\*Dead + 1.7\*Live + 1.7\*Lat.)**  
 Pu = 152,040 kg  
 M2b = 19,800 kg-m  
 M2s = - kg-m
- D.3) Dead + Lat. : **U3 = 0.9\*Dead+1.3\*Lat.**  
 Pu = 79,080 kg  
 M2b = 12,600 kg-m  
 M2s = - kg-m

E) Moment Magnification Factors

Braced :	Load Case	β-d	EI-b (kg-cm <sup>2</sup> )	Cm	Pc-b (kg)	δ-b
	u1	0.604	5.4E+11	0.78	5.8E+06	1.000
	u2	0.604	5.4E+11	0.78	5.8E+06	1.000
	u3	0.604	5.4E+11	0.78	5.8E+06	1.000
Unbraced :	Load Case	EI-s (kg-cm <sup>2</sup> )	Pc-s (kg)	δ-s		
	u1	-	-	-		
	u2	8.7E+11	9.3E+06	1.024		
	u3	8.7E+11	9.3E+06	1.012		

F) Required Strength

Load Case	φPn (kN)	φMn (kN-m)	φPn*e-min (kN-m)
u1	1,978.68	258.98	237.44
u2	1,491.51	377.50	178.98
u3	775.77	217.84	93.09

*φMny*  
 e-min = Max (0.10\*D , 0.015+0.03D)

Job Title : Nakhonsawan - Pedestrian Bridge	Subject : Analysis of Slender Column in Unbraced Frames
Designed : PSJ Date : ๙.๙.-08	By Moment Magnification Factors Method
Checked : Date :	Sheet : Page :

RC Wall : Column 60x120

A) Properties of Materials and Design Parameter

fc'	Ultimated compressive strength of concrete (Cylinder)	=	250 ksc
fy	Yield strength of reinforcement	=	4,000 ksc
Ec	Modulus of elasticity of concrete		
	Ec = 2.4 <sup>1.5</sup> *4270*SQRT(fc')	=	2.51E+05 ksc
φ-c	Strength reduction factor ( Spiral = 0.75 , Other = 0.70 )	=	0.70

B) Section Properties of Column

lu	Unsupported Length	=	8.00 m
b	Width	=	1.20 m
D	Depth	=	0.60 m
I	Moment Inertia	=	0.02160 m <sup>4</sup>
Kb	Effective length factor for braced frame	=	1.20
Ks	Effective length factor for unbraced frame	=	1.20
Kb*lu/r		=	53.33
Ks*lu/r		=	53.33

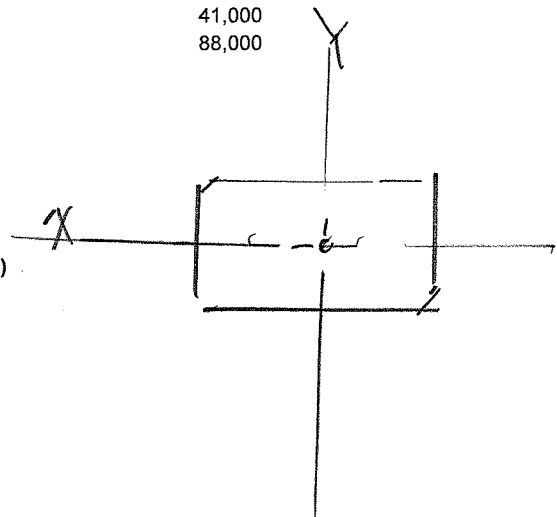
C) Service Loads

Loads	Axial Loads (kg)	Moment at Top (kg-m)	Moment at Bottom (kg-m)
Dead	87,000	50,000	47,000
Live	47,000	44,000	41,000
Lat.	600	220	88,000

*Wind load [x-dir]*

D) Factor Load Combination

- D.1) Gravity Loads : **U1 = 1.4\*Dead+1.7\*Live**  
 Pu = 201,700 kg  
 M1b = 135,500 kg-m  
 M2b = 144,800 kg-m
- D.2) Gravity + Lat. : **U2 = 0.75\*(1.4\*Dead + 1.7\*Live + 1.7\*Lat.)**  
 Pu = 152,040 kg  
 M2b = 108,600 kg-m  
 M2s = 66,000 kg-m
- D.3) Dead + Lat. : **U3 = 0.9\*Dead+1.3\*Lat.**  
 Pu = 79,080 kg  
 M2b = 45,000 kg-m  
 M2s = 114,400 kg-m



E) Moment Magnification Factors

Braced :	Load Case	β-d	EI-b (kg-cm <sup>2</sup> )	Cm	Pc-b (kg)	δ-b
	u1	0.604	1.4E+11	0.97	1.4E+06	1.216
	u2	0.604	1.4E+11	0.97	1.4E+06	1.146
	u3	0.604	1.4E+11	0.97	1.4E+06	1.057
Unbraced :	Load Case	EI-s (kg-cm <sup>2</sup> )	Pc-s (kg)	δ-s		
	u1	-	-	-		
	u2	2.2E+11	2.3E+06	1.103		
	u3	2.2E+11	2.3E+06	1.051		

F) Required Strength

Load Case	φPn (kN)	φMn (kN-m)	φPn*e-min (kN-m)
u1	1,978.68	1,727.77	118.72
u2	1,491.51	2,010.08	89.49
u3	775.77	1,646.14	46.55

*φMnx*

e-min = Max (0.10\*D , 0.015+0.03D)

Job Title : Nakhonsawan - Pedestrian Bridge	Subject : Analysis of Slender Column in Unbraced Frames
Designed : PSJ Date : ๓.๓.-๐8	By Moment Magnification Factors Method
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RC Wall : Column 60x120

A) Properties of Materials and Design Parameter

fc'	Ultimated compressive strength of concrete (Cylinder)	=	250 ksc
fy	Yield strength of reinforcement	=	4,000 ksc
Ec	Modulus of elasticity of concrete		
	Ec = 2.4 <sup>1.5</sup> *4270*SQRT(fc')	=	2.51E+05 ksc
φ-c	Strength reduction factor ( Spiral = 0.75 , Other = 0.70 )	=	0.70

B) Section Properties of Column

lu	Unsupported Length	=	8.00 m
b	Width	=	0.60 m
D	Depth	=	1.20 m
I	Moment Inertia *	=	0.08640 m <sup>4</sup> *
Kb	Effective length factor for braced frame	=	1.20
Ks	Effective length factor for unbraced frame	=	1.20
Kb*lu/r		=	26.67
Ks*lu/r		=	26.67

C) Service Loads

Loads	Axial Loads (kg)	Moment at Top (kg-m)	Moment at Bottom (kg-m)
Dead	87,000	14,000	5,000
Live	47,000	4,000	3,000
Lat.	600	17,000	11,000

D) Factor Load Combination

- D.1) Gravity Loads : **U1 = 1.4\*Dead+1.7\*Live**  
 Pu = 201,700 kg  
 M1b = 12,100 kg-m  
 M2b = 26,400 kg-m
- D.2) Gravity + Lat. : **U2 = 0.75\*(1.4\*Dead + 1.7\*Live + 1.7\*Lat.)**  
 Pu = 152,040 kg  
 M2b = 19,800 kg-m  
 M2s = 12,750 kg-m
- D.3) Dead + Lat. : **U3 = 0.9\*Dead+1.3\*Lat.**  
 Pu = 79,080 kg  
 M2b = 12,600 kg-m  
 M2s = 22,100 kg-m

E) Moment Magnification Factors

Braced :	Load Case	β-d	EI-b (kg-cm <sup>2</sup> )	Cm	Pc-b (kg)	δ-b
	u1	0.604	5.4E+11	0.78	5.8E+06	1.000
	u2	0.604	5.4E+11	0.78	5.8E+06	1.000
	u3	0.604	5.4E+11	0.78	5.8E+06	1.000
Unbraced :	Load Case	EI-s (kg-cm <sup>2</sup> )	Pc-s (kg)	δ-s		
	u1	-	-	-		
	u2	8.7E+11	9.3E+06	1.024		
	u3	8.7E+11	9.3E+06	1.012		

F) Required Strength

Load Case	φPn (kN)	φMn (kN-m)	φPn*e-min (kN-m)
u1	1,978.68	258.98	237.44
u2	1,491.51	377.50	178.98
u3	775.77	343.08	93.09

e-min = Max (0.10\*D , 0.015+0.03D)

Job Title : Nakhonsawan - Pedestrian Bridge	Subject : Analysis of Slender Column in Unbraced Frames
Designed : PSJ Date : ๙.๙.-08	By Moment Magnification Factors Method
Checked : Date :	Sheet : Page :

RC Wall : Column 60x120

A) Properties of Materials and Design Parameter

fc'	Ultimated compressive strength of concrete (Cylinder)	=	250 ksc
fy	Yield strength of reinforcement	=	4,000 ksc
Ec	Modulus of elasticity of concrete	=	2.4 <sup>1.5</sup> *4270*SQRT(fc')
	Ec = 2.4 <sup>1.5</sup> *4270*SQRT(fc')	=	2.51E+05 ksc
φ-c	Strength reduction factor ( Spiral = 0.75 , Other = 0.70 )	=	0.70

B) Section Properties of Column

lu	Unsupported Length	=	8.00 m
b	Width	=	1.20 m
D	Depth	=	0.60 m
I	Moment Inertia	= *	0.02160 m <sup>4</sup>
Kb	Effective length factor for braced frame	=	1.20
Ks	Effective length factor for unbraced frame	=	1.20
Kb*lu/r		=	53.33
Ks*lu/r		=	53.33

C) Service Loads

Loads	Axial Loads (kg)	Moment at Top (kg-m)	Moment at Bottom (kg-m)
Dead	87,000	50,000	47,000
Live	47,000	44,000	41,000
Lat.	600	3,000	3,000

D) Factor Load Combination

- Windload [z-dir]*
- D.1) Gravity Loads : **U1 = 1.4\*Dead+1.7\*Live**  
 Pu = 201,700 kg  
 M1b = 135,500 kg-m  
 M2b = 144,800 kg-m
- D.2) Gravity + Lat. : **U2 = 0.75\*(1.4\*Dead + 1.7\*Live + 1.7\*Lat.)**  
 Pu = 152,040 kg  
 M2b = 108,600 kg-m  
 M2s = 2,250 kg-m
- D.3) Dead + Lat. : **U3 = 0.9\*Dead+1.3\*Lat.**  
 Pu = 79,080 kg  
 M2b = 45,000 kg-m  
 M2s = 3,900 kg-m

E) Moment Magnification Factors

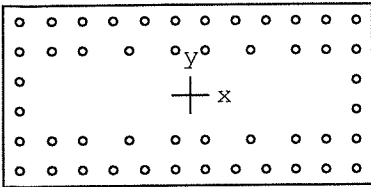
Braced :	Load Case	β-d	EI-b (kg-cm <sup>2</sup> )	Cm	Pc-b (kg)	δ-b
	u1	0.604	1.4E+11	0.97	1.4E+06	1.216
	u2	0.604	1.4E+11	0.97	1.4E+06	1.146
	u3	0.604	1.4E+11	0.97	1.4E+06	1.057
Unbraced :	Load Case	EI-s (kg-cm <sup>2</sup> )	Pc-s (kg)	δ-s		
	u1	-	-	-		
	u2	2.2E+11	2.3E+06	1.103		
	u3	2.2E+11	2.3E+06	1.051		

F) Required Strength

Load Case	φPn (kN)	φMn (kN-m)	φPn*e-min (kN-m)
u1	1,978.68	1,727.77	118.72
u2	1,491.51	1,394.55	89.49
u3	775.77	515.43	46.55

*φMn-x*

e-min = Max (0.10\*D , 0.015+0.03D)



\* 1200 x 600 mm

Code: ACI 318-95

Units: Metric

Run axis: Biaxial

Run option: Investigation

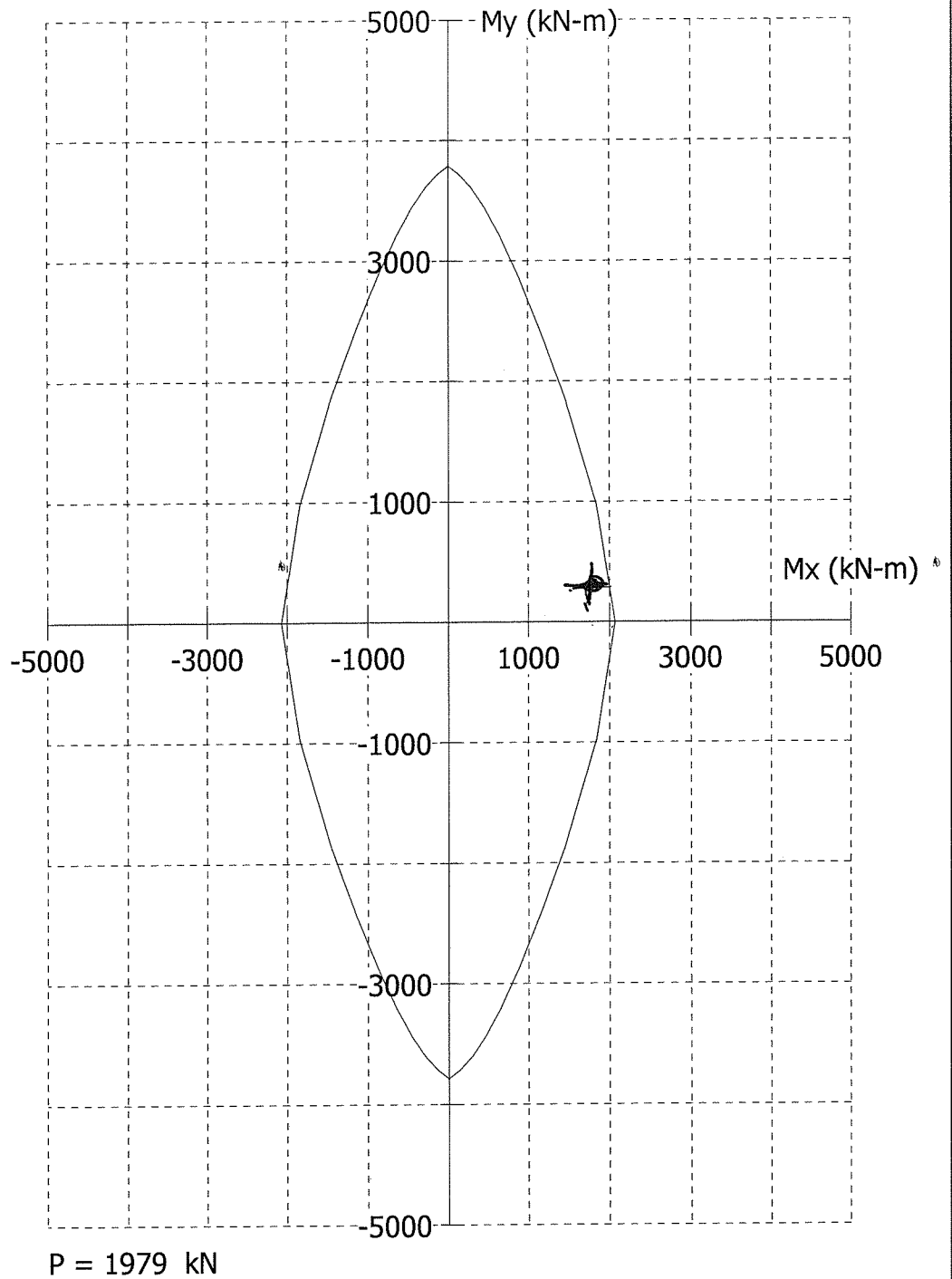
Slenderness: Not considered

Column type: User-defined

Bars: prEN 10080

Date: 10/08/08

Time: 13:43:19



PCACOL V3.00 (PCA 1999) - Licensed to: Epsilon, \*\*\*, \*\*

File: D:\PCA-2\C-2.COL

Project: Nakornsawan

Column: C-1-48db28

Engineer: PSJ

$f_c = 25$  MPa

$f_y = 400$  MPa

$A_g = 720000$  mm<sup>2</sup>

48 #28 bars

$E_c = 23500$  MPa

$E_s = 199955$  MPa

$A_s = 29568$  mm<sup>2</sup>

$Rho = 4.11\%$

$f_c = 21.25$  MPa

$e_{rup} = \text{Infinity}$

$X_o = 0$  mm

$I_y = 2.16e+010$  mm<sup>4</sup>

$e_u = 0.003$  mm/mm

$Y_o = 0$  mm

$I_y = 8.64e+010$  mm<sup>4</sup>

Beta1 = 0.85

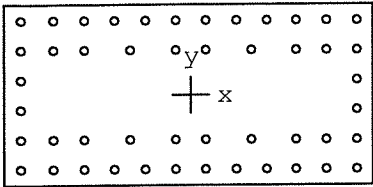
Clear spacing = 71 mm

Clear cover = 39 mm

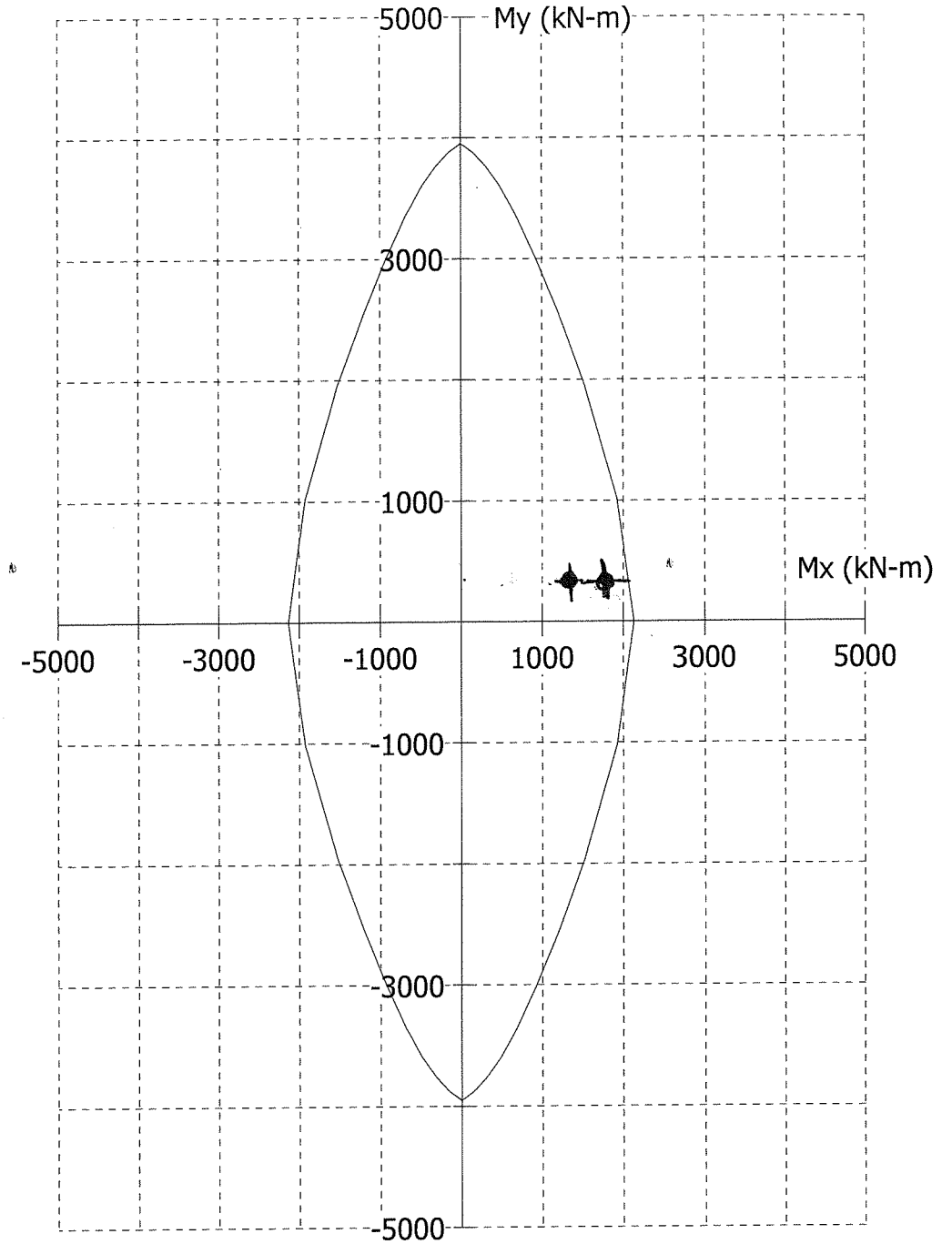
Confinement: Tied

$\phi(a) = 0.8, \phi(b) = 0.9, \phi(c) = 0.7$





1200 x 600 mm



P = 1492 kN

Code: ACI 318-95  
 Units: Metric  
 Run axis: Biaxial  
 Run option: Investigation  
 Slenderness: Not considered  
 Column type: User-defined  
 Bars: prEN 10080  
 Date: 10/08/08  
 Time: 13:43:31

PCACOL V3.00 (PCA 1999) - Licensed to: Epsilon, \*\*\*, \*\*

File: D:\PCA-2\C-2.COL

Project: Nakornsawan

Column: C-1-48db28

Engineer: PSJ

$f_c = 25$  MPa

$f_y = 400$  MPa

$A_g = 720000$  mm<sup>2</sup>

48 #28 bars

$E_c = 23500$  MPa

$E_s = 199955$  MPa

$A_s = 29568$  mm<sup>2</sup>

Rho = 4.11%

$f_c = 21.25$  MPa

$e_{rup} = \text{Infinity}$

$X_o = 0$  mm

$I_y = 2.16e+010$  mm<sup>4</sup>

$e_u = 0.003$  mm/mm

$Y_o = 0$  mm

$I_x = 8.64e+010$  mm<sup>4</sup>

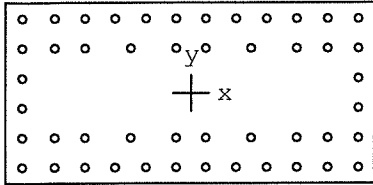
Beta1 = 0.85

Clear spacing = 71 mm

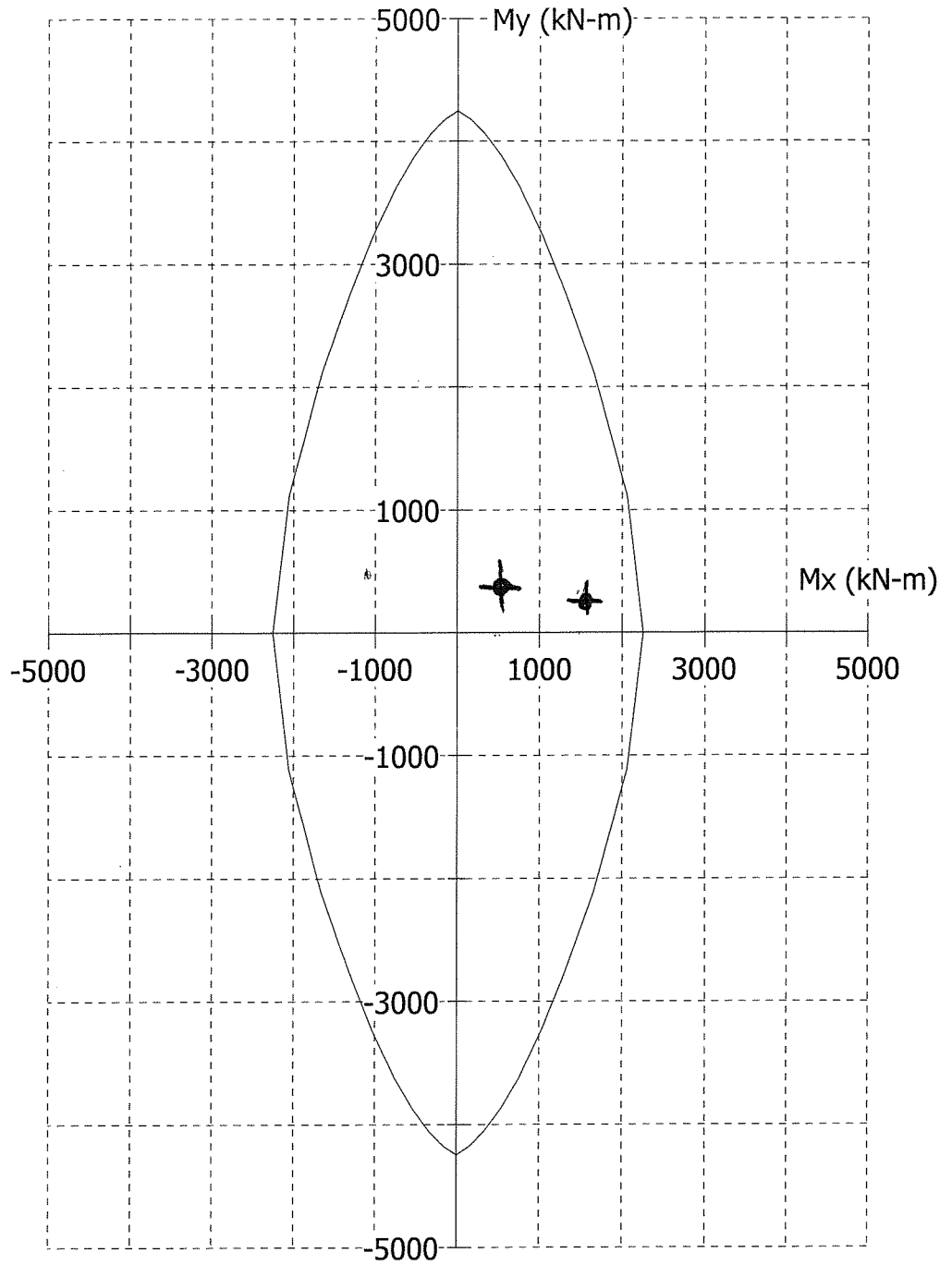
Clear cover = 39 mm

Confinement: Tied

$\phi(a) = 0.8, \phi(b) = 0.9, \phi(c) = 0.7$



1200 x 600 mm



P = 776 kN

Code: ACI 318-95  
 Units: Metric  
 Run axis: Biaxial  
 Run option: Investigation  
 Slenderness: Not considered  
 Column type: User-defined  
 Bars: prEN 10080  
 Date: 10/08/08  
 Time: 13:43:42

PCACOL V3.00 (PCA 1999) - Licensed to: Epsilon, \*\*\*, \*\*

File: D:\PCA-2\C-2.COL

Project: Nakornsawan

Column: C-1-48db28

Engineer: PSJ

$f_c = 25$  MPa

$f_y = 400$  MPa

$A_g = 720000$  mm<sup>2</sup>

48 #28 bars

$E_c = 23500$  MPa

$E_s = 199955$  MPa

$A_s = 29568$  mm<sup>2</sup>

Rho = 4.11%

$f_c = 21.25$  MPa

$e_{rup} = \text{Infinity}$

$X_o = 0$  mm

$I_y = 2.16e+010$  mm<sup>4</sup>

$e_u = 0.003$  mm/mm

$Y_o = 0$  mm

$I_y = 8.64e+010$  mm<sup>4</sup>

Beta1 = 0.85

Clear spacing = 71 mm

Clear cover = 39 mm

Confinement: Tied

$\phi(a) = 0.8, \phi(b) = 0.9, \phi(c) = 0.7$

## Job Information

Engineer

Checked

Approved

Name: PSJ  
Date: 08-Sep-08

Design  
Steel Truss

Structure Type SPACE FRAME

Number of Nodes 100 Highest Node 266  
Number of Elements 246 Highest Beam 712  
  
Number of Basic Load Cases 5  
Number of Combination Load Cases 10

Included in this printout are data for:

All The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Combination	11	S1:DL
Combination	12	S2:DL+LL
Combination	13	S3:DL+WLX
Combination	14	S4:DL-WLX
Combination	15	S5:DL+WLZ
Combination	16	S6:DL-WLZ
Combination	17	S7:DL+LL+WLX
Combination	18	S5:DL+LL-WLX
Combination	19	S5:DL+LL+WLZ
Combination	20	S5:DL+LL-WLZ

## Section Properties

Prop	Section	Area (cm <sup>2</sup> )	I <sub>yy</sub> (cm <sup>4</sup> )	I <sub>zz</sub> (cm <sup>4</sup> )	J (cm <sup>4</sup> )	Material
1	TUBE	240.71	77.5E 3	25.7E 3	59.6E 3	STEEL
2	PIP267.4X7.0	57.27	4860.00	4860.00	9714.59	STEEL
3	PIP355.6X7.9	86.29	13E 3	13E 3	26.1E 3	STEEL
4	PIP267.4X7.0	57.27	4860.00	4860.00	9714.59	STEEL
5	H148X100X6	26.35	150.00	1000.00	5.86	STEEL
6	PIP139.8X4.0	17.07	394.00	394.00	787.46	STEEL
7	PIP139.8X4.0	17.07	394.00	394.00	787.46	STEEL

## Materials

Mat	Name	E (kN/mm <sup>2</sup> )	v	Density (kg/m <sup>3</sup> )	α (1/°K)
1	STEEL	205.00	0.300	7833.41	12E -6
2	ALUMINUM	68.95	0.330	2712.63	23E -6
3	CONCRETE	21.72	0.170	2402.62	10E -6

## Supports

Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN·m/deg)	rY (kN·m/deg)	rZ (kN·m/deg)
101	Fixed	Fixed	Fixed	-	-	-
110	-	Fixed	Fixed	-	-	-
118	Fixed	Fixed	Fixed	-	-	-
127	-	Fixed	Fixed	-	-	-

**Basic Load Cases**

Number	Name
1	SW
2	DL
3	LL
4	WLX
5	WLZ

**Combination Load Cases**

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
11	S1:DL	1	SW	1.00
		2	DL	1.00
12	S2:DL+LL	1	SW	1.00
		2	DL	1.00
		3	LL	1.00
13	S3:DL+WLX	1	SW	1.00
		2	DL	1.00
		4	WLX	1.00
14	S4:DL-WLX	1	SW	1.00
		2	DL	1.00
		4	WLX	-1.00
15	S5:DL+WLZ	1	SW	1.00
		2	DL	4.00
		5	WLZ	1.00
16	S6:DL-WLZ	1	SW	1.00
		2	DL	4.00
		5	WLZ	-1.00
17	S7:DL+LL+WLX	1	SW	0.75
		2	DL	0.75
		3	LL	0.75
		4	WLX	0.75
18	S5:DL+LL-WLX	1	SW	0.75
		2	DL	0.75
		3	LL	0.75
		4	WLX	-0.75
19	S5:DL+LL+WLZ	1	SW	0.75
		2	DL	0.75
		3	LL	0.75
		5	WLZ	0.75
20	S5:DL+LL-WLZ	1	SW	0.75
		2	DL	0.75
		3	LL	0.75
		5	WLZ	-0.75

**Selfweight : 1 SW**

Direction	Factor
Y	-1.000

**Beam Loads : 2 DL**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
201	UNI	MTon/m	GY	-0.140	-	-	-
202	UNI	MTon/m	GY	-0.140	-	-	-
203	UNI	MTon/m	GY	-0.140	-	-	-
204	UNI	MTon/m	GY	-0.140	-	-	-
205	UNI	MTon/m	GY	-0.140	-	-	-
206	UNI	MTon/m	GY	-0.140	-	-	-
207	UNI	MTon/m	GY	-0.140	-	-	-
208	UNI	MTon/m	GY	-0.140	-	-	-
209	UNI	MTon/m	GY	-0.140	-	-	-
210	UNI	MTon/m	GY	-0.140	-	-	-
211	UNI	MTon/m	GY	-0.140	-	-	-
212	UNI	MTon/m	GY	-0.140	-	-	-
213	UNI	MTon/m	GY	-0.140	-	-	-
214	UNI	MTon/m	GY	-0.140	-	-	-
215	UNI	MTon/m	GY	-0.140	-	-	-
216	UNI	MTon/m	GY	-0.140	-	-	-
217	UNI	MTon/m	GY	-0.140	-	-	-
218	UNI	MTon/m	GY	-0.140	-	-	-
219	UNI	MTon/m	GY	-0.140	-	-	-
220	UNI	MTon/m	GY	-0.140	-	-	-
221	UNI	MTon/m	GY	-0.140	-	-	-
222	UNI	MTon/m	GY	-0.140	-	-	-
223	UNI	MTon/m	GY	-0.140	-	-	-
224	UNI	MTon/m	GY	-0.140	-	-	-
225	UNI	MTon/m	GY	-0.140	-	-	-
226	UNI	MTon/m	GY	-0.140	-	-	-
227	UNI	MTon/m	GY	-0.140	-	-	-
228	UNI	MTon/m	GY	-0.140	-	-	-
229	UNI	MTon/m	GY	-0.140	-	-	-
230	UNI	MTon/m	GY	-0.140	-	-	-
231	UNI	MTon/m	GY	-0.140	-	-	-
232	UNI	MTon/m	GY	-0.140	-	-	-
401	UNI	MTon/m	GY	-0.070	-	-	-
402	UNI	MTon/m	GY	-0.070	-	-	-
403	UNI	MTon/m	GY	-0.070	-	-	-
404	UNI	MTon/m	GY	-0.070	-	-	-
405	UNI	MTon/m	GY	-0.070	-	-	-
406	UNI	MTon/m	GY	-0.070	-	-	-
407	UNI	MTon/m	GY	-0.070	-	-	-
408	UNI	MTon/m	GY	-0.070	-	-	-
409	UNI	MTon/m	GY	-0.070	-	-	-
410	UNI	MTon/m	GY	-0.070	-	-	-
411	UNI	MTon/m	GY	-0.070	-	-	-
412	UNI	MTon/m	GY	-0.070	-	-	-
413	UNI	MTon/m	GY	-0.070	-	-	-
414	UNI	MTon/m	GY	-0.070	-	-	-
415	UNI	MTon/m	GY	-0.070	-	-	-
416	UNI	MTon/m	GY	-0.070	-	-	-
417	UNI	MTon/m	GY	-0.070	-	-	-
418	UNI	MTon/m	GY	-0.070	-	-	-
419	UNI	MTon/m	GY	-0.070	-	-	-
420	UNI	MTon/m	GY	-0.070	-	-	-
421	UNI	MTon/m	GY	-0.070	-	-	-
422	UNI	MTon/m	GY	-0.070	-	-	-
423	UNI	MTon/m	GY	-0.070	-	-	-
424	UNI	MTon/m	GY	-0.070	-	-	-
425	UNI	MTon/m	GY	-0.070	-	-	-
426	UNI	MTon/m	GY	-0.070	-	-	-

**Beam Loads : 2 DL Cont...**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
427	UNI	MTon/m	GY	-0.070	-	-	-
428	UNI	MTon/m	GY	-0.070	-	-	-
429	UNI	MTon/m	GY	-0.070	-	-	-
430	UNI	MTon/m	GY	-0.070	-	-	-
431	UNI	MTon/m	GY	-0.070	-	-	-
432	UNI	MTon/m	GY	-0.070	-	-	-
433	UNI	MTon/m	GY	-0.070	-	-	-
434	UNI	MTon/m	GY	-0.070	-	-	-
435	UNI	MTon/m	GY	-0.070	-	-	-
436	UNI	MTon/m	GY	-0.070	-	-	-
437	UNI	MTon/m	GY	-0.070	-	-	-
438	UNI	MTon/m	GY	-0.070	-	-	-
439	UNI	MTon/m	GY	-0.070	-	-	-
440	UNI	MTon/m	GY	-0.070	-	-	-
441	UNI	MTon/m	GY	-0.070	-	-	-
442	UNI	MTon/m	GY	-0.070	-	-	-
443	UNI	MTon/m	GY	-0.070	-	-	-
444	UNI	MTon/m	GY	-0.070	-	-	-
445	UNI	MTon/m	GY	-0.070	-	-	-
446	UNI	MTon/m	GY	-0.070	-	-	-
447	UNI	MTon/m	GY	-0.070	-	-	-
448	UNI	MTon/m	GY	-0.070	-	-	-
449	UNI	MTon/m	GY	-0.070	-	-	-
450	UNI	MTon/m	GY	-0.070	-	-	-
451	UNI	MTon/m	GY	-0.070	-	-	-
452	UNI	MTon/m	GY	-0.070	-	-	-
453	UNI	MTon/m	GY	-0.070	-	-	-
454	UNI	MTon/m	GY	-0.070	-	-	-
455	UNI	MTon/m	GY	-0.070	-	-	-
456	UNI	MTon/m	GY	-0.070	-	-	-
457	UNI	MTon/m	GY	-0.070	-	-	-
458	UNI	MTon/m	GY	-0.070	-	-	-
459	UNI	MTon/m	GY	-0.070	-	-	-
460	UNI	MTon/m	GY	-0.070	-	-	-
461	UNI	MTon/m	GY	-0.070	-	-	-
462	UNI	MTon/m	GY	-0.070	-	-	-
463	UNI	MTon/m	GY	-0.070	-	-	-
464	UNI	MTon/m	GY	-0.070	-	-	-

**Beam Loads : 3 LL**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
201	UNI	MTon/m	GY	-0.560	-	-	-
202	UNI	MTon/m	GY	-0.560	-	-	-
203	UNI	MTon/m	GY	-0.560	-	-	-
204	UNI	MTon/m	GY	-0.560	-	-	-
205	UNI	MTon/m	GY	-0.560	-	-	-
206	UNI	MTon/m	GY	-0.560	-	-	-
207	UNI	MTon/m	GY	-0.560	-	-	-
208	UNI	MTon/m	GY	-0.560	-	-	-
209	UNI	MTon/m	GY	-0.560	-	-	-
210	UNI	MTon/m	GY	-0.560	-	-	-
211	UNI	MTon/m	GY	-0.560	-	-	-
212	UNI	MTon/m	GY	-0.560	-	-	-
213	UNI	MTon/m	GY	-0.560	-	-	-
214	UNI	MTon/m	GY	-0.560	-	-	-
215	UNI	MTon/m	GY	-0.560	-	-	-
216	UNI	MTon/m	GY	-0.560	-	-	-

**Beam Loads : 3 LL Cont...**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
217	UNI	MTon/m	GY	-0.560	-	-	-
218	UNI	MTon/m	GY	-0.560	-	-	-
219	UNI	MTon/m	GY	-0.560	-	-	-
220	UNI	MTon/m	GY	-0.560	-	-	-
221	UNI	MTon/m	GY	-0.560	-	-	-
222	UNI	MTon/m	GY	-0.560	-	-	-
223	UNI	MTon/m	GY	-0.560	-	-	-
224	UNI	MTon/m	GY	-0.560	-	-	-
225	UNI	MTon/m	GY	-0.560	-	-	-
226	UNI	MTon/m	GY	-0.560	-	-	-
227	UNI	MTon/m	GY	-0.560	-	-	-
228	UNI	MTon/m	GY	-0.560	-	-	-
229	UNI	MTon/m	GY	-0.560	-	-	-
230	UNI	MTon/m	GY	-0.560	-	-	-
231	UNI	MTon/m	GY	-0.560	-	-	-
232	UNI	MTon/m	GY	-0.560	-	-	-
401	UNI	MTon/m	GY	-0.070	-	-	-
402	UNI	MTon/m	GY	-0.070	-	-	-
403	UNI	MTon/m	GY	-0.070	-	-	-
404	UNI	MTon/m	GY	-0.070	-	-	-
405	UNI	MTon/m	GY	-0.070	-	-	-
406	UNI	MTon/m	GY	-0.070	-	-	-
407	UNI	MTon/m	GY	-0.070	-	-	-
408	UNI	MTon/m	GY	-0.070	-	-	-
409	UNI	MTon/m	GY	-0.070	-	-	-
410	UNI	MTon/m	GY	-0.070	-	-	-
411	UNI	MTon/m	GY	-0.070	-	-	-
412	UNI	MTon/m	GY	-0.070	-	-	-
413	UNI	MTon/m	GY	-0.070	-	-	-
414	UNI	MTon/m	GY	-0.070	-	-	-
415	UNI	MTon/m	GY	-0.070	-	-	-
416	UNI	MTon/m	GY	-0.070	-	-	-
417	UNI	MTon/m	GY	-0.070	-	-	-
418	UNI	MTon/m	GY	-0.070	-	-	-
419	UNI	MTon/m	GY	-0.070	-	-	-
420	UNI	MTon/m	GY	-0.070	-	-	-
421	UNI	MTon/m	GY	-0.070	-	-	-
422	UNI	MTon/m	GY	-0.070	-	-	-
423	UNI	MTon/m	GY	-0.070	-	-	-
424	UNI	MTon/m	GY	-0.070	-	-	-
425	UNI	MTon/m	GY	-0.070	-	-	-
426	UNI	MTon/m	GY	-0.070	-	-	-
427	UNI	MTon/m	GY	-0.070	-	-	-
428	UNI	MTon/m	GY	-0.070	-	-	-
429	UNI	MTon/m	GY	-0.070	-	-	-
430	UNI	MTon/m	GY	-0.070	-	-	-
431	UNI	MTon/m	GY	-0.070	-	-	-
432	UNI	MTon/m	GY	-0.070	-	-	-
433	UNI	MTon/m	GY	-0.070	-	-	-
434	UNI	MTon/m	GY	-0.070	-	-	-
435	UNI	MTon/m	GY	-0.070	-	-	-
436	UNI	MTon/m	GY	-0.070	-	-	-
437	UNI	MTon/m	GY	-0.070	-	-	-
438	UNI	MTon/m	GY	-0.070	-	-	-
439	UNI	MTon/m	GY	-0.070	-	-	-
440	UNI	MTon/m	GY	-0.070	-	-	-
441	UNI	MTon/m	GY	-0.070	-	-	-
442	UNI	MTon/m	GY	-0.070	-	-	-

**Beam Loads : 3 LL Cont..**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
443	UNI	MTon/m	GY	-0.070	-	-	-
444	UNI	MTon/m	GY	-0.070	-	-	-
445	UNI	MTon/m	GY	-0.070	-	-	-
446	UNI	MTon/m	GY	-0.070	-	-	-
447	UNI	MTon/m	GY	-0.070	-	-	-
448	UNI	MTon/m	GY	-0.070	-	-	-
449	UNI	MTon/m	GY	-0.070	-	-	-
450	UNI	MTon/m	GY	-0.070	-	-	-
451	UNI	MTon/m	GY	-0.070	-	-	-
452	UNI	MTon/m	GY	-0.070	-	-	-
453	UNI	MTon/m	GY	-0.070	-	-	-
454	UNI	MTon/m	GY	-0.070	-	-	-
455	UNI	MTon/m	GY	-0.070	-	-	-
456	UNI	MTon/m	GY	-0.070	-	-	-
457	UNI	MTon/m	GY	-0.070	-	-	-
458	UNI	MTon/m	GY	-0.070	-	-	-
459	UNI	MTon/m	GY	-0.070	-	-	-
460	UNI	MTon/m	GY	-0.070	-	-	-
461	UNI	MTon/m	GY	-0.070	-	-	-
462	UNI	MTon/m	GY	-0.070	-	-	-
463	UNI	MTon/m	GY	-0.070	-	-	-
464	UNI	MTon/m	GY	-0.070	-	-	-

**Node Loads : 4 WLX**

Node	FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
202	0.08	-	-	-	-	-
219	0.08	-	-	-	-	-

**Beam Loads : 4 WLX**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
301	UNI	MTon/m	GX	0.020	-	-	-
302	UNI	MTon/m	GX	0.020	-	-	-
303	UNI	MTon/m	GX	0.020	-	-	-
304	UNI	MTon/m	GX	0.020	-	-	-
401	UNI	MTon/m	GX	0.065	-	-	-
402	UNI	MTon/m	GX	0.065	-	-	-
403	UNI	MTon/m	GX	0.065	-	-	-
404	UNI	MTon/m	GX	0.065	-	-	-
405	UNI	MTon/m	GX	0.065	-	-	-
406	UNI	MTon/m	GX	0.065	-	-	-
407	UNI	MTon/m	GX	0.065	-	-	-
408	UNI	MTon/m	GX	0.065	-	-	-
418	UNI	MTon/m	GX	0.065	-	-	-
419	UNI	MTon/m	GX	0.065	-	-	-
420	UNI	MTon/m	GX	0.065	-	-	-
421	UNI	MTon/m	GX	0.065	-	-	-
422	UNI	MTon/m	GX	0.065	-	-	-
423	UNI	MTon/m	GX	0.065	-	-	-
424	UNI	MTon/m	GX	0.065	-	-	-
425	UNI	MTon/m	GX	0.065	-	-	-
435	UNI	MTon/m	GX	0.065	-	-	-
436	UNI	MTon/m	GX	0.065	-	-	-
437	UNI	MTon/m	GX	0.065	-	-	-
438	UNI	MTon/m	GX	0.065	-	-	-
439	UNI	MTon/m	GX	0.065	-	-	-



**Beam Loads : 4 WLX Cont...**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
440	UNI	MTon/m	GX	0.065	-	-	-
441	UNI	MTon/m	GX	0.065	-	-	-
450	UNI	MTon/m	GX	0.065	-	-	-
451	UNI	MTon/m	GX	0.065	-	-	-
452	UNI	MTon/m	GX	0.065	-	-	-
453	UNI	MTon/m	GX	0.065	-	-	-
454	UNI	MTon/m	GX	0.065	-	-	-
455	UNI	MTon/m	GX	0.065	-	-	-
456	UNI	MTon/m	GX	0.065	-	-	-
501	UNI	MTon/m	GX	0.020	-	-	-
502	UNI	MTon/m	GX	0.020	-	-	-
503	UNI	MTon/m	GX	0.020	-	-	-
504	UNI	MTon/m	GX	0.020	-	-	-
505	UNI	MTon/m	GX	0.020	-	-	-
506	UNI	MTon/m	GX	0.020	-	-	-
507	UNI	MTon/m	GX	0.020	-	-	-
508	UNI	MTon/m	GX	0.020	-	-	-
509	UNI	MTon/m	GX	0.020	-	-	-
510	UNI	MTon/m	GX	0.020	-	-	-
511	UNI	MTon/m	GX	0.020	-	-	-
512	UNI	MTon/m	GX	0.020	-	-	-
513	UNI	MTon/m	GX	0.020	-	-	-
514	UNI	MTon/m	GX	0.020	-	-	-
515	UNI	MTon/m	GX	0.020	-	-	-
516	UNI	MTon/m	GX	0.020	-	-	-
517	UNI	MTon/m	GX	0.020	-	-	-
518	UNI	MTon/m	GX	0.020	-	-	-
519	UNI	MTon/m	GX	0.020	-	-	-
520	UNI	MTon/m	GX	0.020	-	-	-
521	UNI	MTon/m	GX	0.020	-	-	-
522	UNI	MTon/m	GX	0.020	-	-	-
523	UNI	MTon/m	GX	0.020	-	-	-
524	UNI	MTon/m	GX	0.020	-	-	-
525	UNI	MTon/m	GX	0.020	-	-	-
526	UNI	MTon/m	GX	0.020	-	-	-
527	UNI	MTon/m	GX	0.020	-	-	-
528	UNI	MTon/m	GX	0.020	-	-	-
529	UNI	MTon/m	GX	0.020	-	-	-
530	UNI	MTon/m	GX	0.020	-	-	-
531	UNI	MTon/m	GX	0.020	-	-	-
532	UNI	MTon/m	GX	0.020	-	-	-
533	UNI	MTon/m	GX	0.020	-	-	-
534	UNI	MTon/m	GX	0.020	-	-	-
535	UNI	MTon/m	GX	0.020	-	-	-
536	UNI	MTon/m	GX	0.020	-	-	-
537	UNI	MTon/m	GX	0.020	-	-	-
538	UNI	MTon/m	GX	0.020	-	-	-
539	UNI	MTon/m	GX	0.020	-	-	-
540	UNI	MTon/m	GX	0.020	-	-	-
541	UNI	MTon/m	GX	0.020	-	-	-
542	UNI	MTon/m	GX	0.020	-	-	-
543	UNI	MTon/m	GX	0.020	-	-	-
544	UNI	MTon/m	GX	0.020	-	-	-
545	UNI	MTon/m	GX	0.020	-	-	-
546	UNI	MTon/m	GX	0.020	-	-	-
547	UNI	MTon/m	GX	0.020	-	-	-
548	UNI	MTon/m	GX	0.020	-	-	-
549	UNI	MTon/m	GX	0.020	-	-	-

**Beam Loads : 4 WLX Cont...**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
550	UNI	MTon/m	GX	0.020	-	-	-
551	UNI	MTon/m	GX	0.020	-	-	-
552	UNI	MTon/m	GX	0.020	-	-	-
553	UNI	MTon/m	GX	0.020	-	-	-
554	UNI	MTon/m	GX	0.020	-	-	-
555	UNI	MTon/m	GX	0.020	-	-	-
556	UNI	MTon/m	GX	0.020	-	-	-
557	UNI	MTon/m	GX	0.020	-	-	-
558	UNI	MTon/m	GX	0.020	-	-	-
559	UNI	MTon/m	GX	0.020	-	-	-
560	UNI	MTon/m	GX	0.020	-	-	-
561	UNI	MTon/m	GX	0.020	-	-	-
562	UNI	MTon/m	GX	0.020	-	-	-
563	UNI	MTon/m	GX	0.020	-	-	-
564	UNI	MTon/m	GX	0.020	-	-	-
618	UNI	MTon/m	GX	0.065	-	-	-
620	UNI	MTon/m	GX	0.065	-	-	-
621	UNI	MTon/m	GX	0.065	-	-	-
623	UNI	MTon/m	GX	0.065	-	-	-

**Beam Loads : 5 WLZ**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
201	UNI	MTon/m	GZ	0.020	-	-	-
202	UNI	MTon/m	GZ	0.020	-	-	-
203	UNI	MTon/m	GZ	0.020	-	-	-
204	UNI	MTon/m	GZ	0.020	-	-	-
205	UNI	MTon/m	GZ	0.020	-	-	-
206	UNI	MTon/m	GZ	0.020	-	-	-
207	UNI	MTon/m	GZ	0.020	-	-	-
208	UNI	MTon/m	GZ	0.020	-	-	-
209	UNI	MTon/m	GZ	0.020	-	-	-
210	UNI	MTon/m	GZ	0.020	-	-	-
211	UNI	MTon/m	GZ	0.020	-	-	-
212	UNI	MTon/m	GZ	0.020	-	-	-
213	UNI	MTon/m	GZ	0.020	-	-	-
214	UNI	MTon/m	GZ	0.020	-	-	-
215	UNI	MTon/m	GZ	0.020	-	-	-
216	UNI	MTon/m	GZ	0.020	-	-	-
301	UNI	MTon/m	GZ	0.022	-	-	-
302	UNI	MTon/m	GZ	0.022	-	-	-
303	UNI	MTon/m	GZ	0.022	-	-	-
304	UNI	MTon/m	GZ	0.022	-	-	-
401	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
402	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
403	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
404	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
405	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
406	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
407	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
408	UNI	MTon/m	GZ	0.065	-	-	-

**Beam Loads : 5 WLZ Cont...**

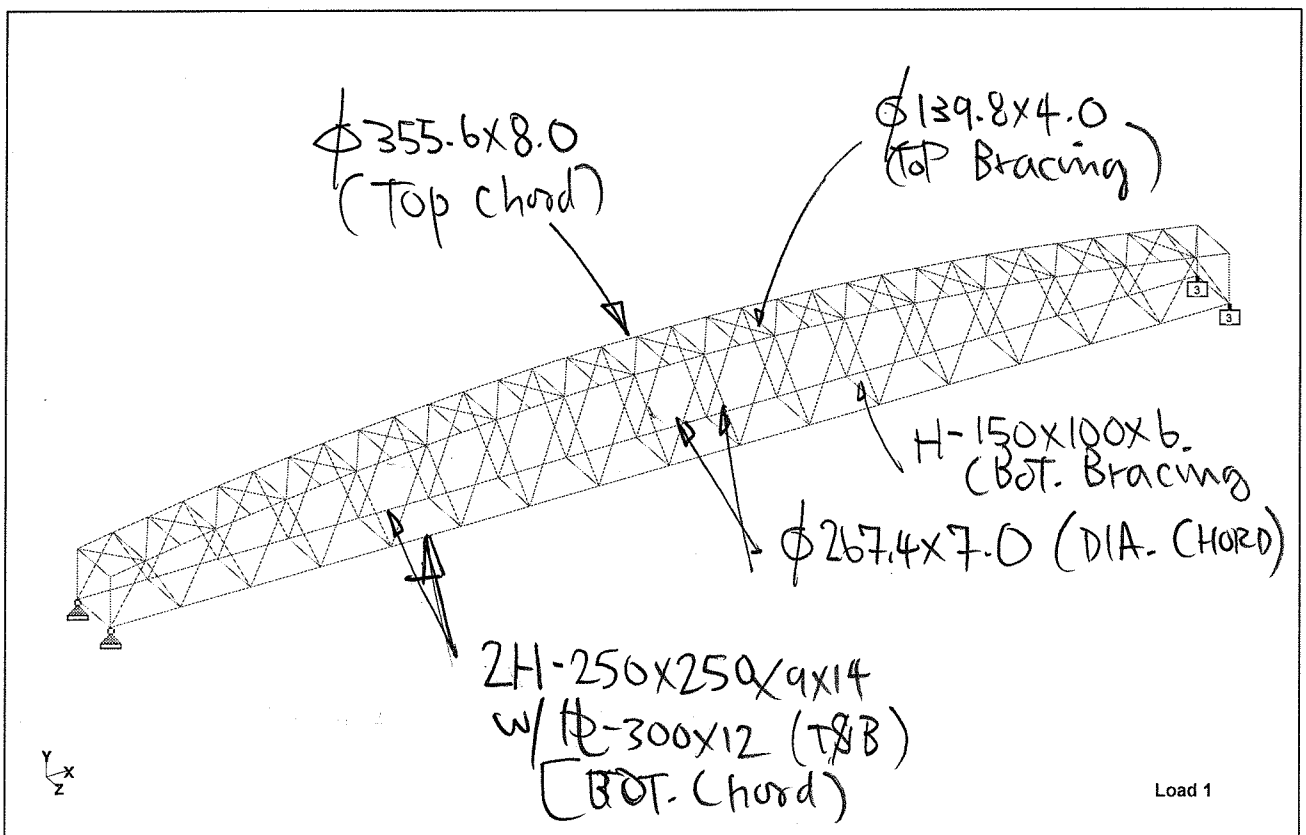
Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
408	UNI	MTon/m	GZ	0.028	-	-	-
409	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
410	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
411	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
412	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
413	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
414	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
415	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
416	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
417	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
418	UNI	MTon/m	GZ	0.028	-	-	-
419	UNI	MTon/m	GZ	0.028	-	-	-
420	UNI	MTon/m	GZ	0.028	-	-	-
421	UNI	MTon/m	GZ	0.028	-	-	-
422	UNI	MTon/m	GZ	0.028	-	-	-
423	UNI	MTon/m	GZ	0.028	-	-	-
424	UNI	MTon/m	GZ	0.028	-	-	-
425	UNI	MTon/m	GZ	0.028	-	-	-
426	UNI	MTon/m	GZ	0.028	-	-	-
427	UNI	MTon/m	GZ	0.028	-	-	-
428	UNI	MTon/m	GZ	0.028	-	-	-
429	UNI	MTon/m	GZ	0.028	-	-	-
430	UNI	MTon/m	GZ	0.028	-	-	-
431	UNI	MTon/m	GZ	0.028	-	-	-
432	UNI	MTon/m	GZ	0.028	-	-	-
433	UNI	MTon/m	GZ	0.028	-	-	-
434	UNI	MTon/m	GZ	0.028	-	-	-
435	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
436	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
437	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
438	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
439	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
440	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
441	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
442	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
443	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
444	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
445	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-

**Beam Loads : 5 WLZ Cont...**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
446	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
447	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
448	UNI	MTon/m	GZ	0.065	-	-	-
	UNI	MTon/m	GZ	0.028	-	-	-
449	UNI	MTon/m	GZ	0.028	-	-	-
	UNI	MTon/m	GZ	0.065	-	-	-
450	UNI	MTon/m	GZ	0.028	-	-	-
451	UNI	MTon/m	GZ	0.028	-	-	-
452	UNI	MTon/m	GZ	0.028	-	-	-
453	UNI	MTon/m	GZ	0.028	-	-	-
454	UNI	MTon/m	GZ	0.028	-	-	-
455	UNI	MTon/m	GZ	0.028	-	-	-
456	UNI	MTon/m	GZ	0.028	-	-	-
457	UNI	MTon/m	GZ	0.028	-	-	-
458	UNI	MTon/m	GZ	0.028	-	-	-
459	UNI	MTon/m	GZ	0.028	-	-	-
460	UNI	MTon/m	GZ	0.028	-	-	-
461	UNI	MTon/m	GZ	0.028	-	-	-
462	UNI	MTon/m	GZ	0.028	-	-	-
463	UNI	MTon/m	GZ	0.028	-	-	-
464	UNI	MTon/m	GZ	0.028	-	-	-
501	UNI	MTon/m	GZ	0.022	-	-	-
502	UNI	MTon/m	GZ	0.022	-	-	-
503	UNI	MTon/m	GZ	0.022	-	-	-
504	UNI	MTon/m	GZ	0.022	-	-	-
505	UNI	MTon/m	GZ	0.022	-	-	-
506	UNI	MTon/m	GZ	0.022	-	-	-
507	UNI	MTon/m	GZ	0.022	-	-	-
508	UNI	MTon/m	GZ	0.022	-	-	-
509	UNI	MTon/m	GZ	0.022	-	-	-
510	UNI	MTon/m	GZ	0.022	-	-	-
511	UNI	MTon/m	GZ	0.022	-	-	-
512	UNI	MTon/m	GZ	0.022	-	-	-
513	UNI	MTon/m	GZ	0.022	-	-	-
514	UNI	MTon/m	GZ	0.022	-	-	-
515	UNI	MTon/m	GZ	0.022	-	-	-
516	UNI	MTon/m	GZ	0.022	-	-	-
517	UNI	MTon/m	GZ	0.022	-	-	-
518	UNI	MTon/m	GZ	0.022	-	-	-
519	UNI	MTon/m	GZ	0.022	-	-	-
520	UNI	MTon/m	GZ	0.022	-	-	-
521	UNI	MTon/m	GZ	0.022	-	-	-
522	UNI	MTon/m	GZ	0.022	-	-	-
523	UNI	MTon/m	GZ	0.022	-	-	-
524	UNI	MTon/m	GZ	0.022	-	-	-
525	UNI	MTon/m	GZ	0.022	-	-	-
526	UNI	MTon/m	GZ	0.022	-	-	-
527	UNI	MTon/m	GZ	0.022	-	-	-
528	UNI	MTon/m	GZ	0.022	-	-	-
529	UNI	MTon/m	GZ	0.022	-	-	-
530	UNI	MTon/m	GZ	0.022	-	-	-
531	UNI	MTon/m	GZ	0.022	-	-	-
532	UNI	MTon/m	GZ	0.022	-	-	-
533	UNI	MTon/m	GZ	0.022	-	-	-
534	UNI	MTon/m	GZ	0.022	-	-	-
535	UNI	MTon/m	GZ	0.022	-	-	-

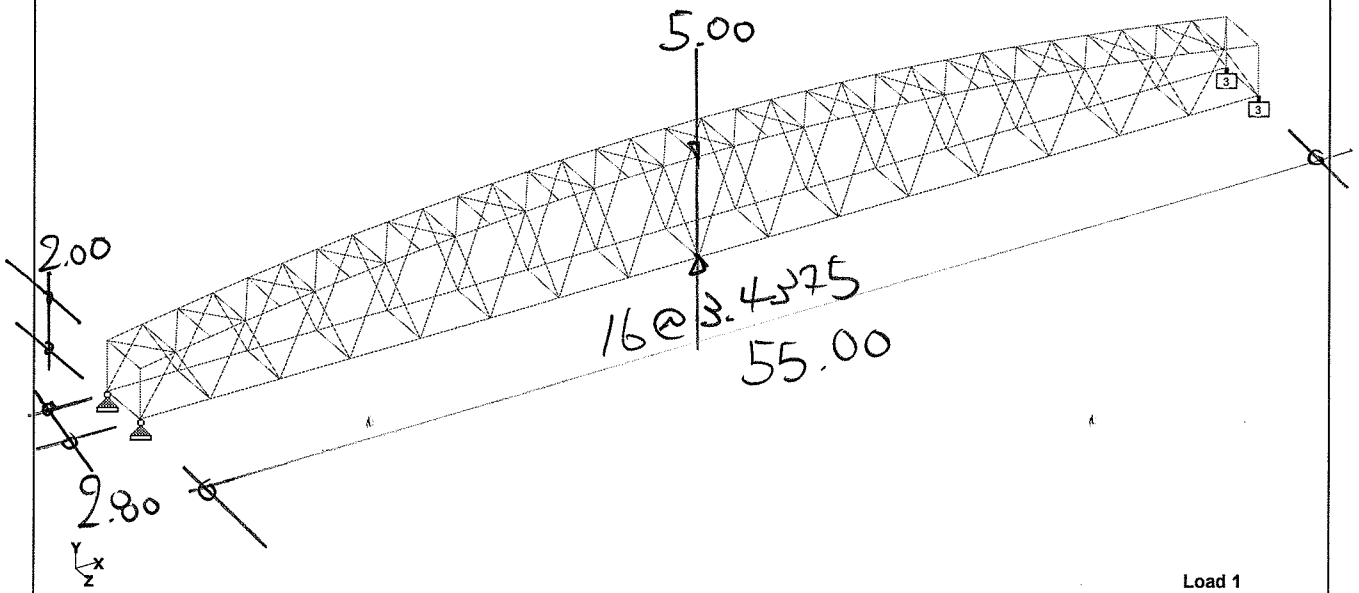
**Beam Loads : 5 WLZ Cont...**

Beam	Type	Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
536	UNI	MTon/m	GZ	0.022	-	-	-
537	UNI	MTon/m	GZ	0.022	-	-	-
538	UNI	MTon/m	GZ	0.022	-	-	-
539	UNI	MTon/m	GZ	0.022	-	-	-
540	UNI	MTon/m	GZ	0.022	-	-	-
541	UNI	MTon/m	GZ	0.022	-	-	-
542	UNI	MTon/m	GZ	0.022	-	-	-
543	UNI	MTon/m	GZ	0.022	-	-	-
544	UNI	MTon/m	GZ	0.022	-	-	-
545	UNI	MTon/m	GZ	0.022	-	-	-
546	UNI	MTon/m	GZ	0.022	-	-	-
547	UNI	MTon/m	GZ	0.022	-	-	-
548	UNI	MTon/m	GZ	0.022	-	-	-
549	UNI	MTon/m	GZ	0.022	-	-	-
550	UNI	MTon/m	GZ	0.022	-	-	-
551	UNI	MTon/m	GZ	0.022	-	-	-
552	UNI	MTon/m	GZ	0.022	-	-	-
553	UNI	MTon/m	GZ	0.022	-	-	-
554	UNI	MTon/m	GZ	0.022	-	-	-
555	UNI	MTon/m	GZ	0.022	-	-	-
556	UNI	MTon/m	GZ	0.022	-	-	-
557	UNI	MTon/m	GZ	0.022	-	-	-
558	UNI	MTon/m	GZ	0.022	-	-	-
559	UNI	MTon/m	GZ	0.022	-	-	-
560	UNI	MTon/m	GZ	0.022	-	-	-
561	UNI	MTon/m	GZ	0.022	-	-	-
562	UNI	MTon/m	GZ	0.022	-	-	-
563	UNI	MTon/m	GZ	0.022	-	-	-
564	UNI	MTon/m	GZ	0.022	-	-	-



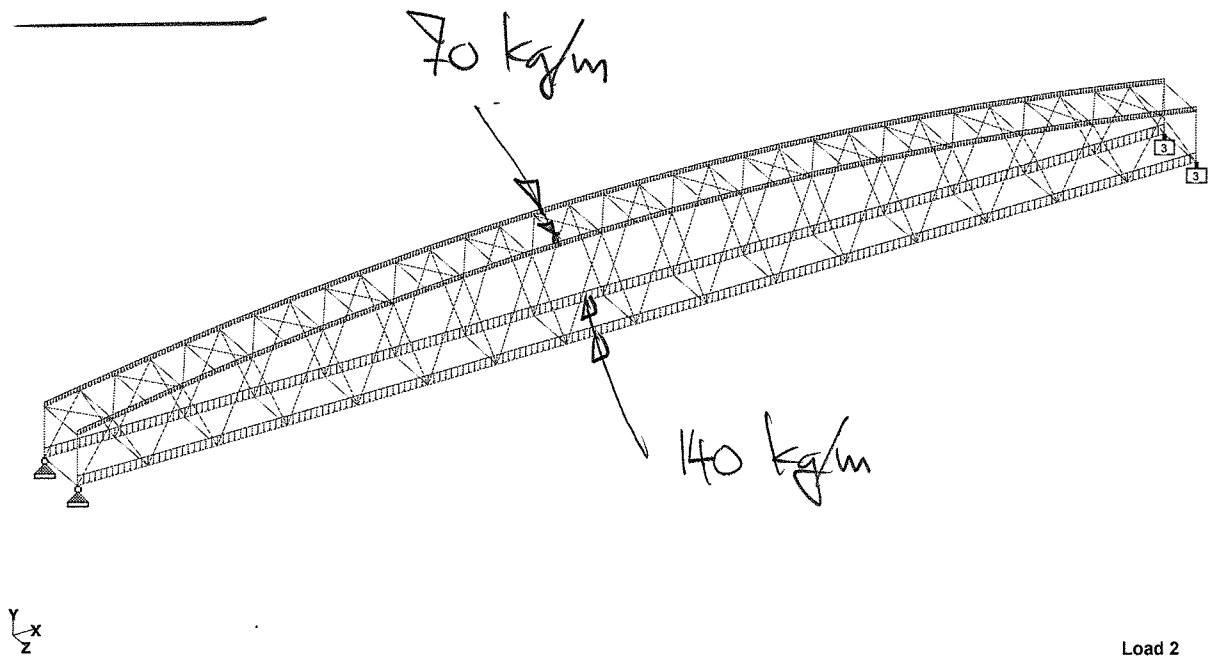
Whole Structure

LC1: SW



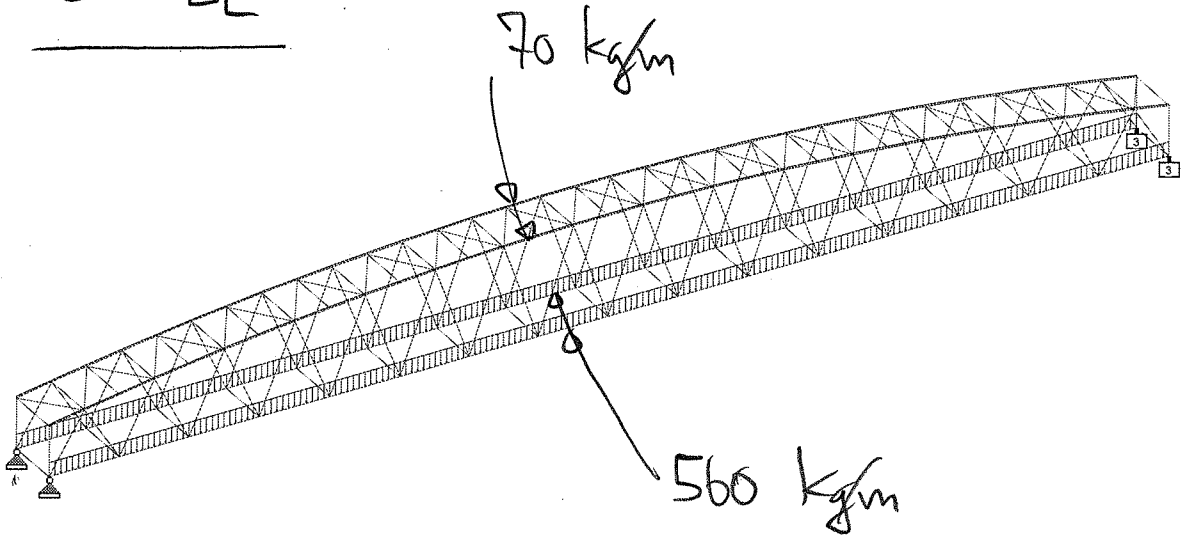
Whole Structure

LC2: DL



Whole Structure Loads 509.858kg:1m 2 DL

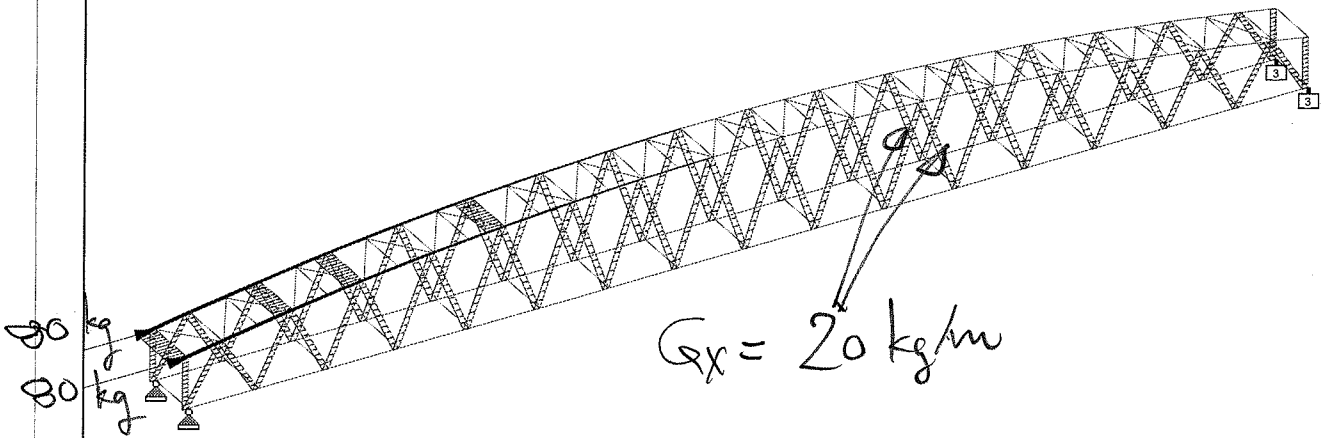
# LC3: LL



Load 3

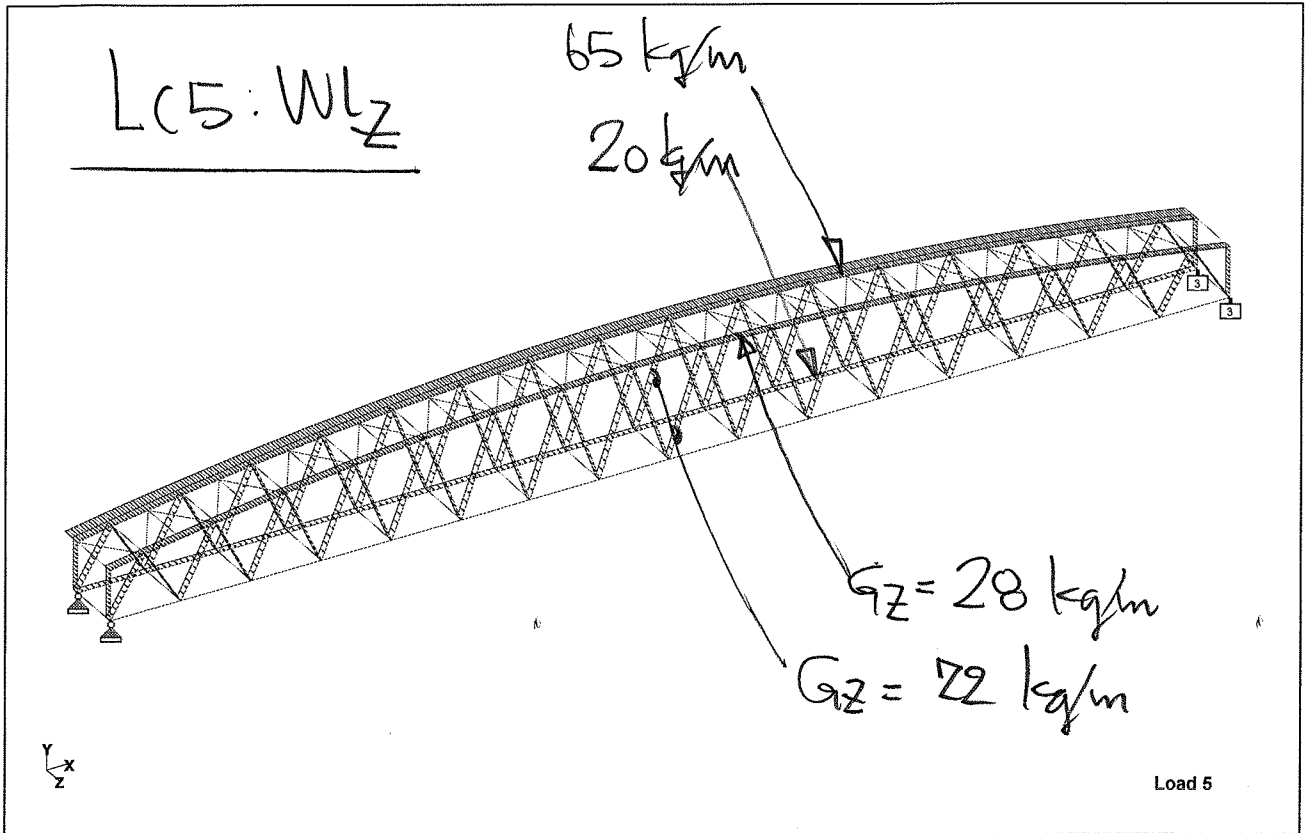
Whole Structure Loads 509.858kg:1m 3 LL

# LC4: WLx

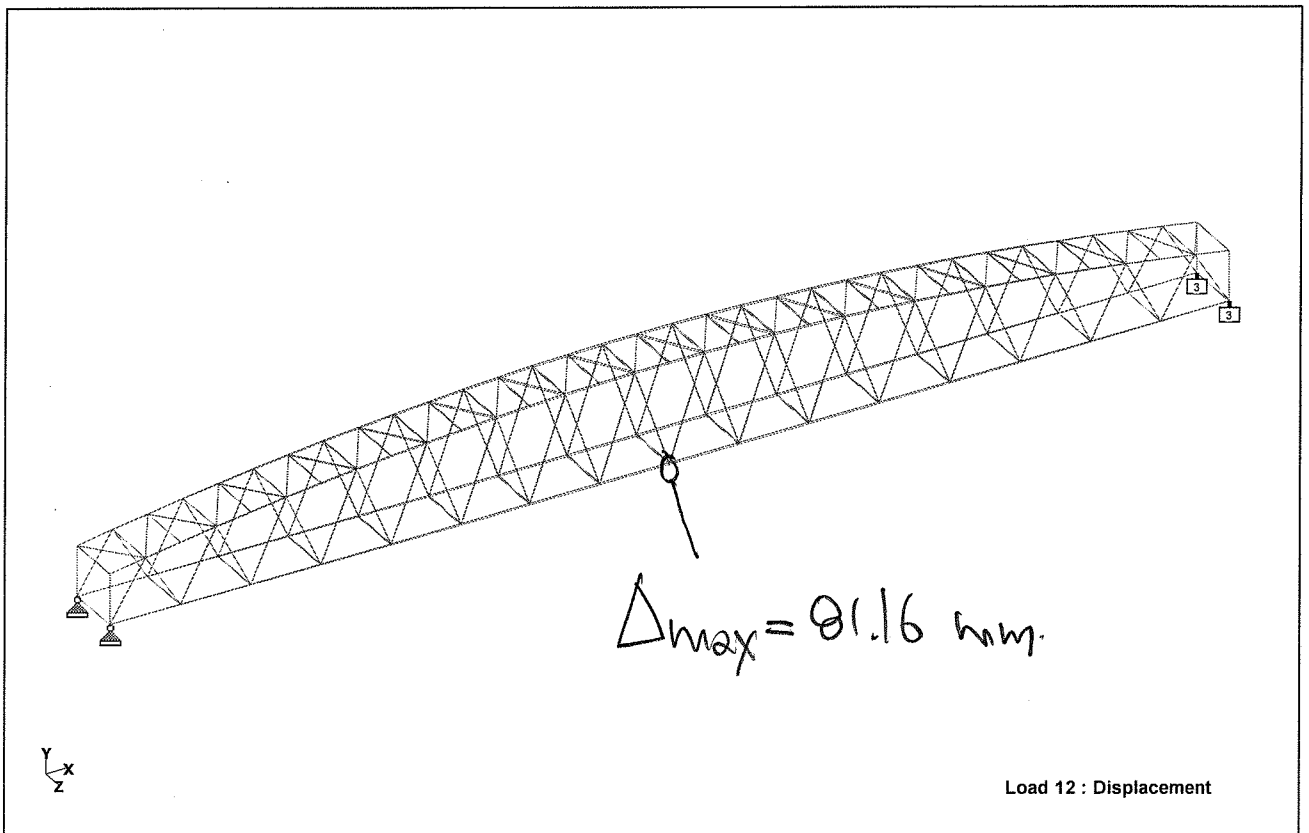


Load 4

Whole Structure Loads 10.8774kg:1m 4 WLX



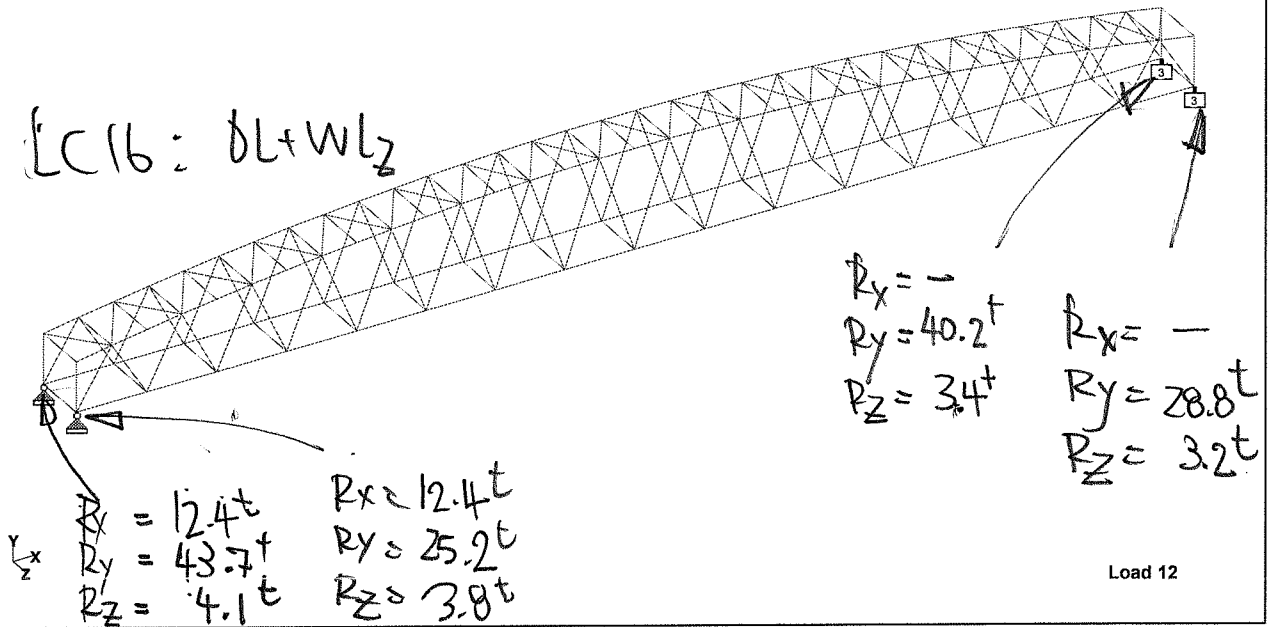
Whole Structure Loads 10.8774kg:1m 5 WLZ



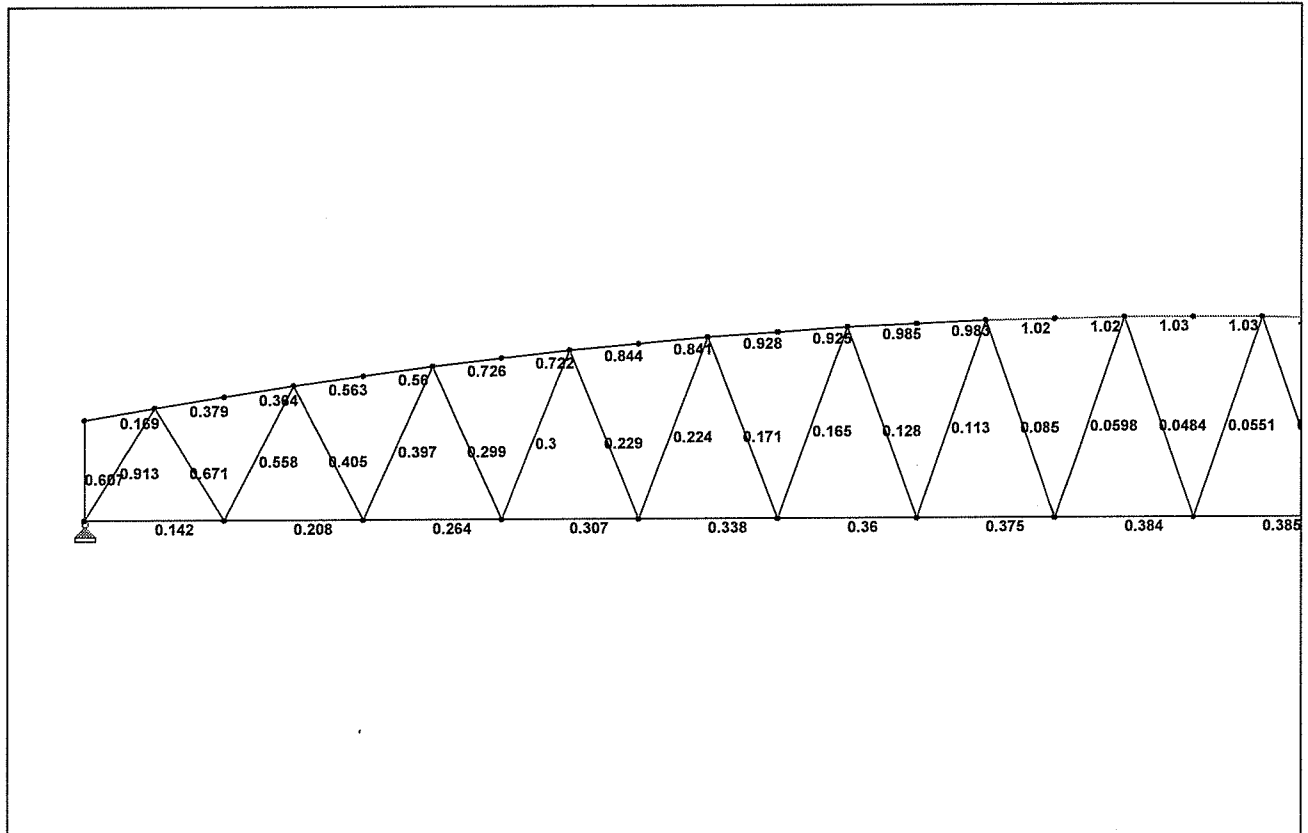
Whole Structure Displacements 650mm:1m 12 S2:DL+LL



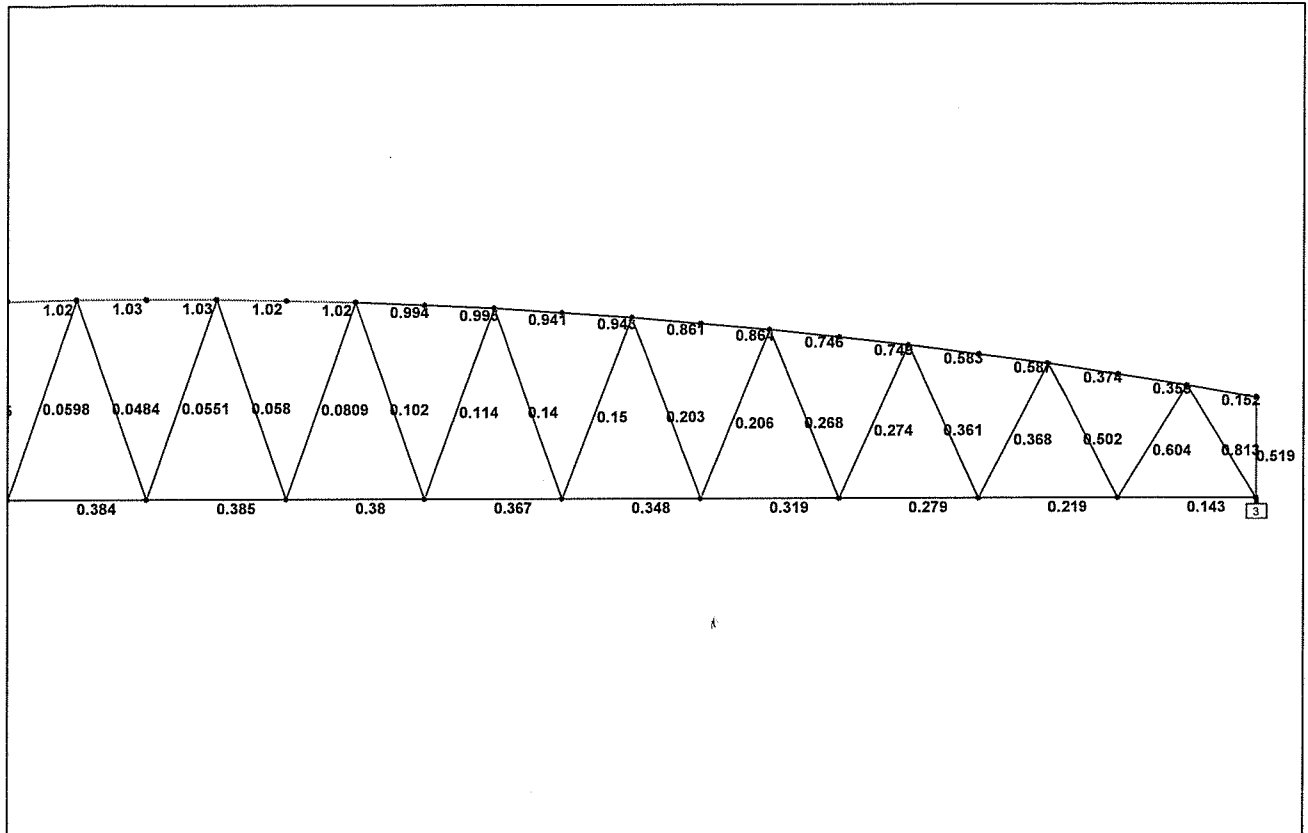
LC 16 : DL + WL<sub>z</sub>



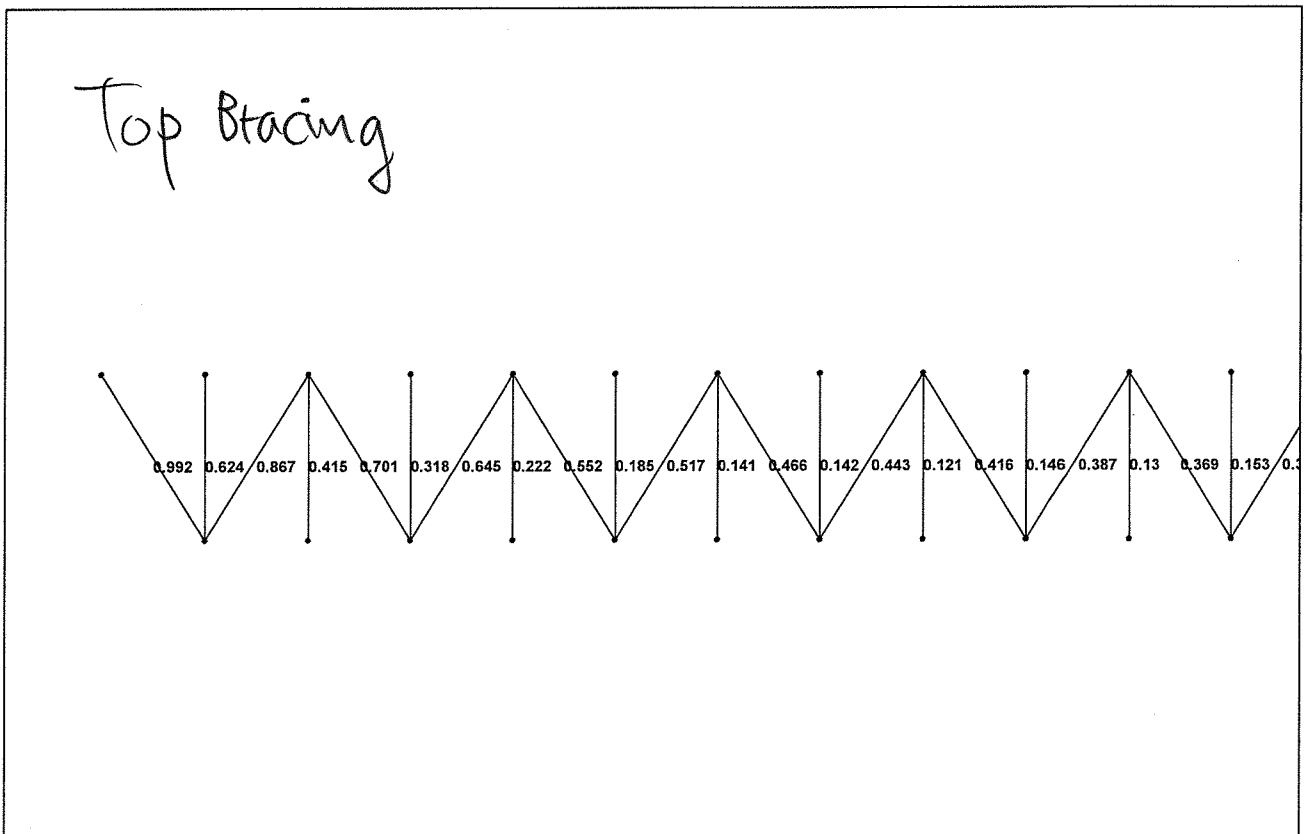
Whole Structure



Unity Check01

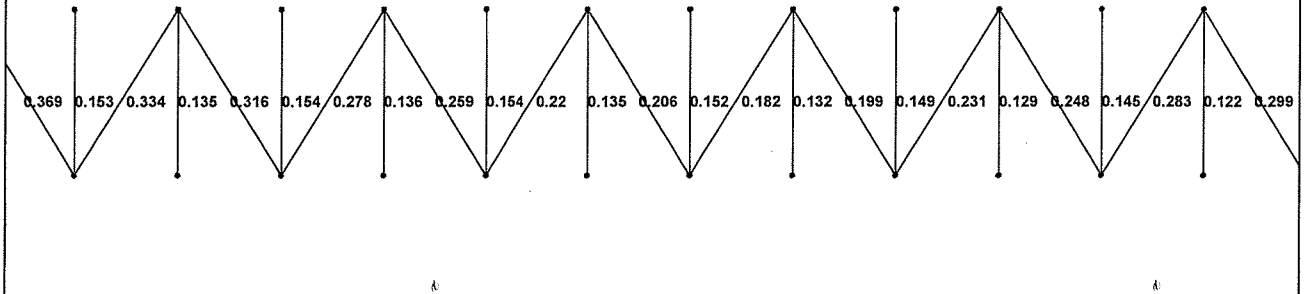


Unity Check02



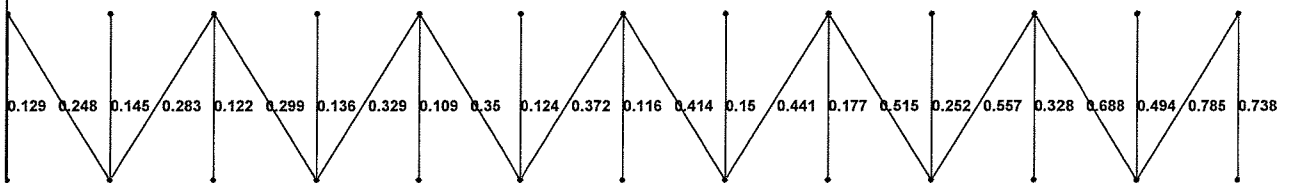
Unity check-Top Chord01

# Top Bracing



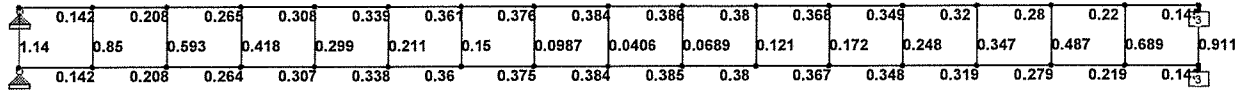
Unity Check-Top Chord02

# Top Bracing



Unity Check-Top Chord 03

Bot. Bracing



Unity Check-Bottom chord

**Node Displacement Summary**

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	222	16:S6:DL-WLZ	11.81	-32.02	-22.29	40.76	0.00	0.00	-0.00
Min X	231	16:S6:DL-WLZ	-4.31	-32.04	-21.22	38.67	0.00	-0.00	0.00
Max Y	101	11:S1:DL	0.00	0.00	0.00	0.00	0.00	0.00	-0.00
Min Y	126	16:S6:DL-WLZ	3.73	-63.12	-50.89	81.16	0.00	-0.00	-0.00
Max Z	102	15:S5:DL+WLZ	3.73	-63.06	50.42	80.83	-0.00	0.00	-0.00
Min Z	102	16:S6:DL-WLZ	4.08	-54.37	-50.89	74.58	0.00	-0.00	0.00
Max rX	219	15:S5:DL+WLZ	6.85	-0.05	12.06	13.87	0.00	-0.00	-0.00
Min rX	219	16:S6:DL-WLZ	8.76	-0.02	-12.05	14.90	-0.00	0.00	-0.00
Max rY	118	16:S6:DL-WLZ	0.00	0.00	0.00	0.00	-0.00	0.00	-0.00
Min rY	118	15:S5:DL+WLZ	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00
Max rZ	229	16:S6:DL-WLZ	-2.56	-7.00	-12.16	14.26	-0.00	-0.00	0.00
Min rZ	101	15:S5:DL+WLZ	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00
Max Rst	126	16:S6:DL-WLZ	3.73	-63.12	-50.89	81.16	0.00	-0.00	-0.00

## Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (Mton)	FY (Mton)	FZ (Mton)	MX (MTon·m)	MY (MTon·m)	MZ (MTon·m)
101	11:S1:DL	-0.00	17.10	0.01	0.00	0.00	0.00
	12:S2:DL+LL	-0.01	34.44	0.01	0.00	0.00	0.00
	13:S3:DL+WL>	-5.12	16.84	0.01	0.00	0.00	0.00
	14:S4:DL-WLX	5.12	17.37	0.01	0.00	0.00	0.00
	15:S5:DL+WLz	-12.44	25.24	-3.98	0.00	0.00	0.00
	16:S6:DL-WLZ	12.43	43.68	4.00	0.00	0.00	0.00
	17:S7:DL+LL+I	-3.84	25.63	0.01	0.00	0.00	0.00
	18:S5:DL+LL-V	3.84	26.03	0.01	0.00	0.00	0.00
	19:S5:DL+LL+I	-9.33	18.91	-2.99	0.00	0.00	0.00
	20:S5:DL+LL-V	9.32	32.74	3.00	0.00	0.00	0.00
110	11:S1:DL	0.00	17.10	0.01	0.00	0.00	0.00
	12:S2:DL+LL	0.00	34.44	0.01	0.00	0.00	0.00
	13:S3:DL+WL>	0.00	17.37	0.01	0.00	0.00	0.00
	14:S4:DL-WLX	0.00	16.84	0.01	0.00	0.00	0.00
	15:S5:DL+WLz	0.00	28.78	-3.34	0.00	0.00	0.00
	16:S6:DL-WLZ	0.00	40.14	3.36	0.00	0.00	0.00
	17:S7:DL+LL+I	0.00	26.03	0.01	0.00	0.00	0.00
	18:S5:DL+LL-V	0.00	25.63	0.01	0.00	0.00	0.00
	19:S5:DL+LL+I	0.00	21.57	-2.50	0.00	0.00	0.00
	20:S5:DL+LL-V	0.00	30.09	2.52	0.00	0.00	0.00
118	11:S1:DL	0.00	17.10	-0.01	0.00	0.00	0.00
	12:S2:DL+LL	0.01	34.44	-0.01	0.00	0.00	0.00
	13:S3:DL+WL>	-5.12	16.84	-0.01	0.00	0.00	0.00
	14:S4:DL-WLX	5.13	17.37	-0.01	0.00	0.00	0.00
	15:S5:DL+WLz	12.44	43.68	-3.84	0.00	0.00	0.00
	16:S6:DL-WLZ	-12.43	25.24	3.82	0.00	0.00	0.00
	17:S7:DL+LL+I	-3.84	25.63	-0.01	0.00	0.00	0.00
	18:S5:DL+LL-V	3.85	26.03	-0.01	0.00	0.00	0.00
	19:S5:DL+LL+I	9.33	32.74	-2.88	0.00	0.00	0.00
	20:S5:DL+LL-V	-9.32	18.92	2.86	0.00	0.00	0.00
127	11:S1:DL	0.00	17.10	-0.01	0.00	0.00	0.00
	12:S2:DL+LL	0.00	34.44	-0.01	0.00	0.00	0.00
	13:S3:DL+WL>	0.00	17.37	-0.01	0.00	0.00	0.00
	14:S4:DL-WLX	0.00	16.83	-0.01	0.00	0.00	0.00
	15:S5:DL+WLz	0.00	40.14	-3.22	0.00	0.00	0.00
	16:S6:DL-WLZ	0.00	28.78	3.20	0.00	0.00	0.00
	17:S7:DL+LL+I	0.00	26.03	-0.01	0.00	0.00	0.00
	18:S5:DL+LL-V	0.00	25.63	-0.01	0.00	0.00	0.00
	19:S5:DL+LL+I	0.00	30.09	-2.41	0.00	0.00	0.00
	20:S5:DL+LL-V	0.00	21.57	2.40	0.00	0.00	0.00

**Job Information**

Engineer Checked Approved

Name: PSJ  
Date: 08-Sep-08

Structure Type SPACE FRAME

Number of Nodes 50 Highest Node 251  
Number of Elements 82 Highest Beam 532

Number of Basic Load Cases 1  
Number of Combination Load Cases 0

Included in this printout are data for:  
All The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	SW

Recheck  
for Pick-up  
Steel Truss,  
Construction Stage

**Section Properties**

Prop	Section	Area (cm <sup>2</sup> )	I <sub>yy</sub> (cm <sup>4</sup> )	I <sub>zz</sub> (cm <sup>4</sup> )	J (cm <sup>4</sup> )	Material
1	TUBE	240.71	77.5E 3	25.7E 3	59.6E 3	STEEL
2	PIP267.4X7.0	57.27	4860.00	4860.00	9714.59	STEEL
3	PIP355.6X7.9	86.29	13E 3	13E 3	26.1E 3	STEEL
4	PIP267.4X7.0	57.27	4860.00	4860.00	9714.59	STEEL

**Materials**

Mat	Name	E (kN/mm <sup>2</sup> )	v	Density (kg/m <sup>3</sup> )	α (1/°K)
1	STEEL	205.00	0.300	7833.41	12E -6
2	ALUMINUM	68.95	0.330	2712.63	23E -6
3	CONCRETE	21.72	0.170	2402.62	10E -6

**Supports**

Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN·m/deg)	rY (kN·m/deg)	rZ (kN·m/deg)
201	-	Fixed	-	-	-	-
209	-	Fixed	-	-	-	-
210	-	Fixed	-	-	-	-
218	-	Fixed	-	-	-	-

**Basic Load Cases**

Number	Name
1	SW

**Combination Load Cases**

There is no data of this type.

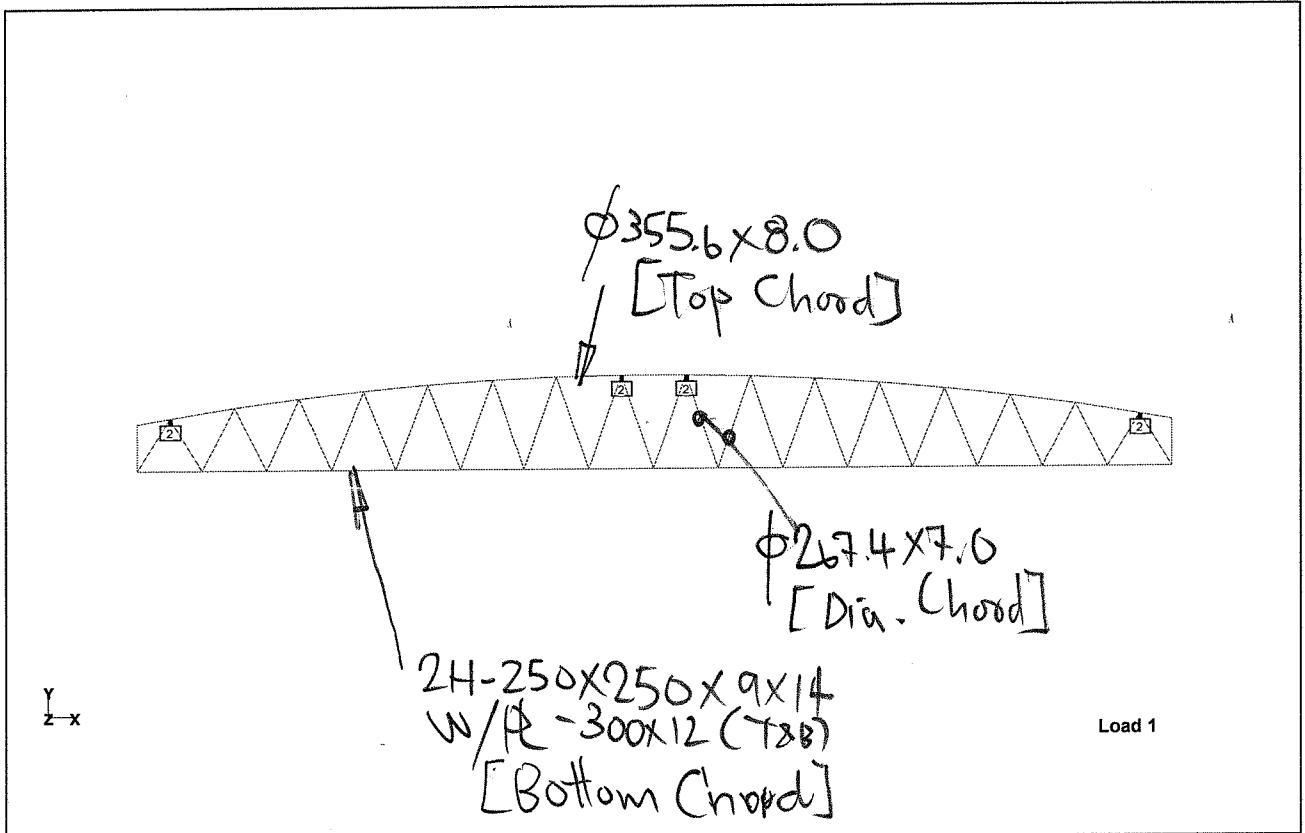
**Wind Load Definition : Type 1**

Intensity (kg/cm <sup>2</sup> )	Height (m)
0.01	10.00

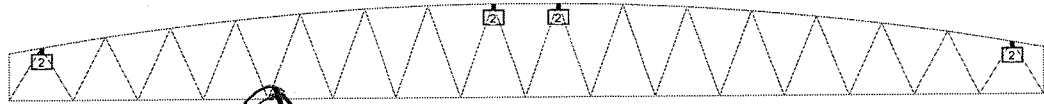
Exposure Factor	Range	Nodes / Height Range (m)
0.100	Height	0.00 to 10.00

**Selfweight : 1 SW**

Direction	Factor
Y	-1.000



Whole Structure

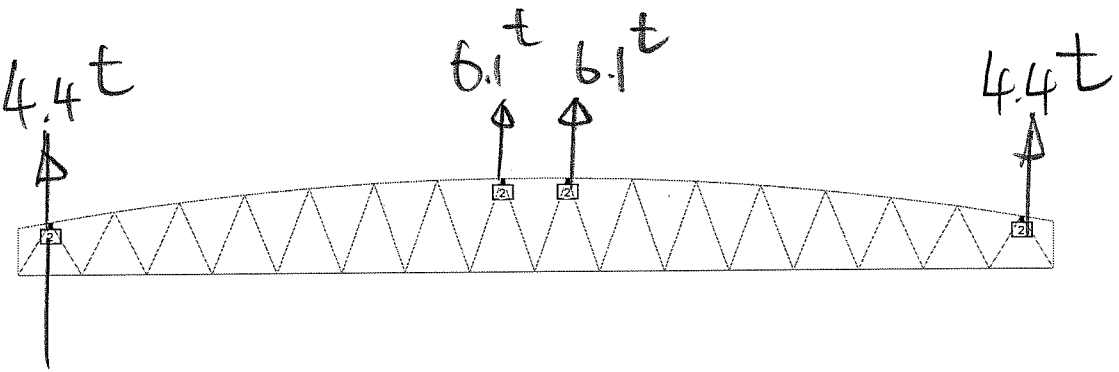


$$\Delta_{max} = 1.12 \text{ mm.}$$

Y  
Z-x

Load 1 : Displacement

Whole Structure Displacements 700mm:1m 1 SW

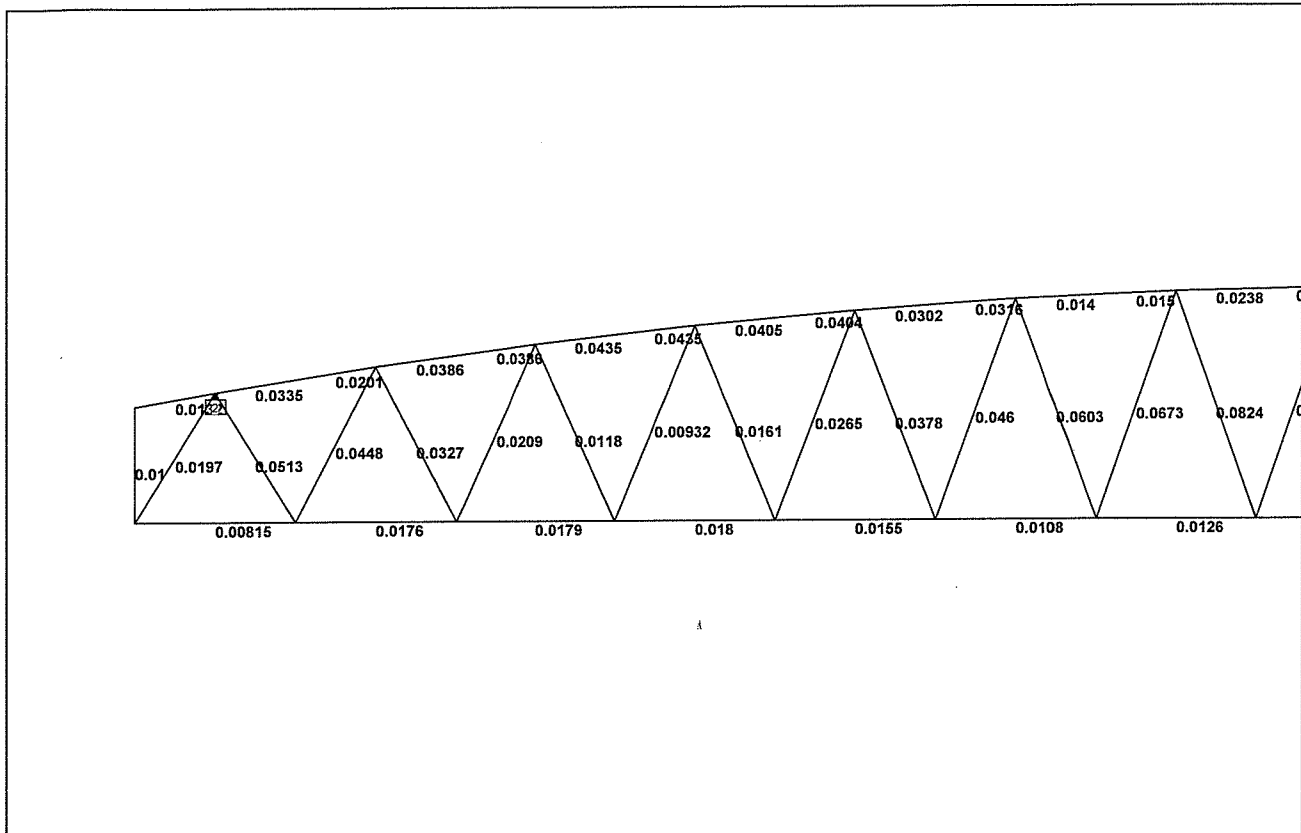


Y  
Z-x

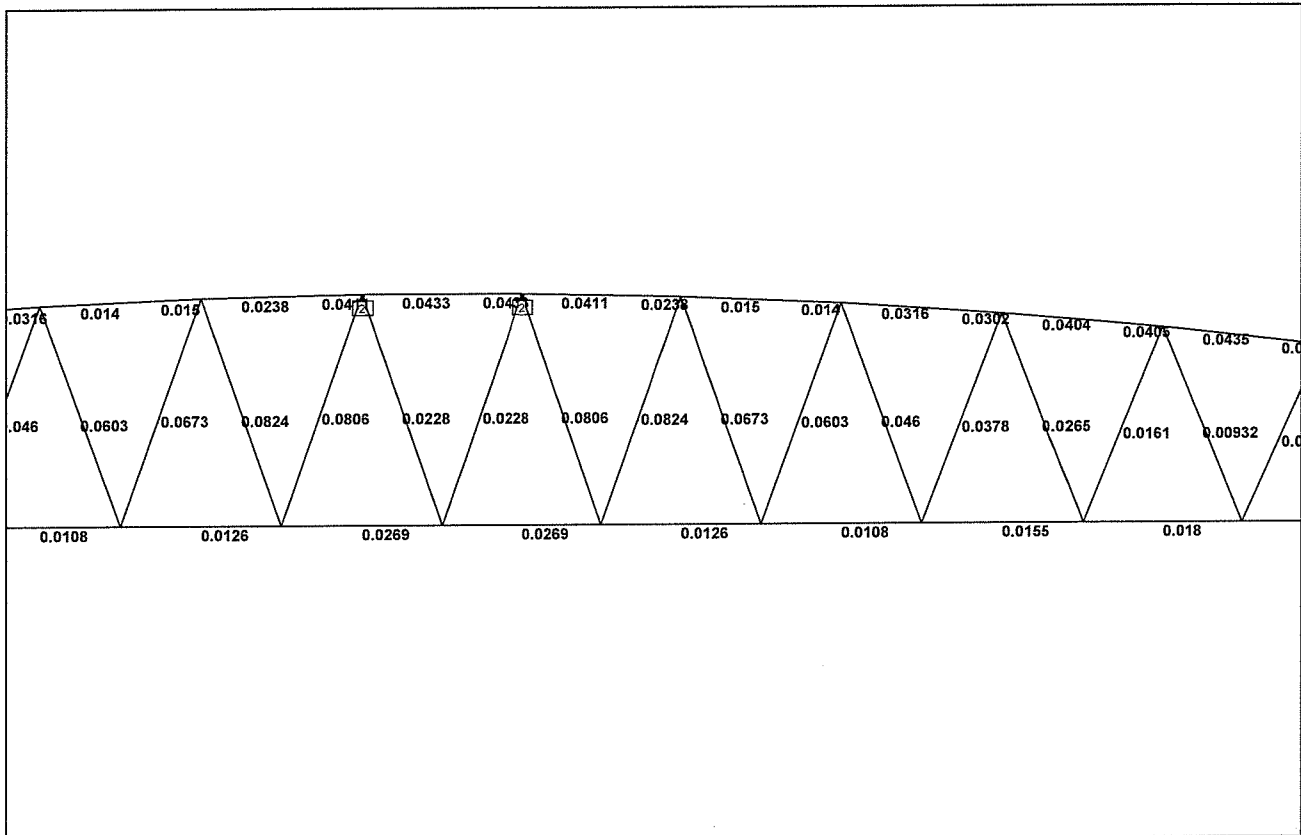
Load 1 : Displacement

Whole Structure Displacements 700mm:1m 1 SW

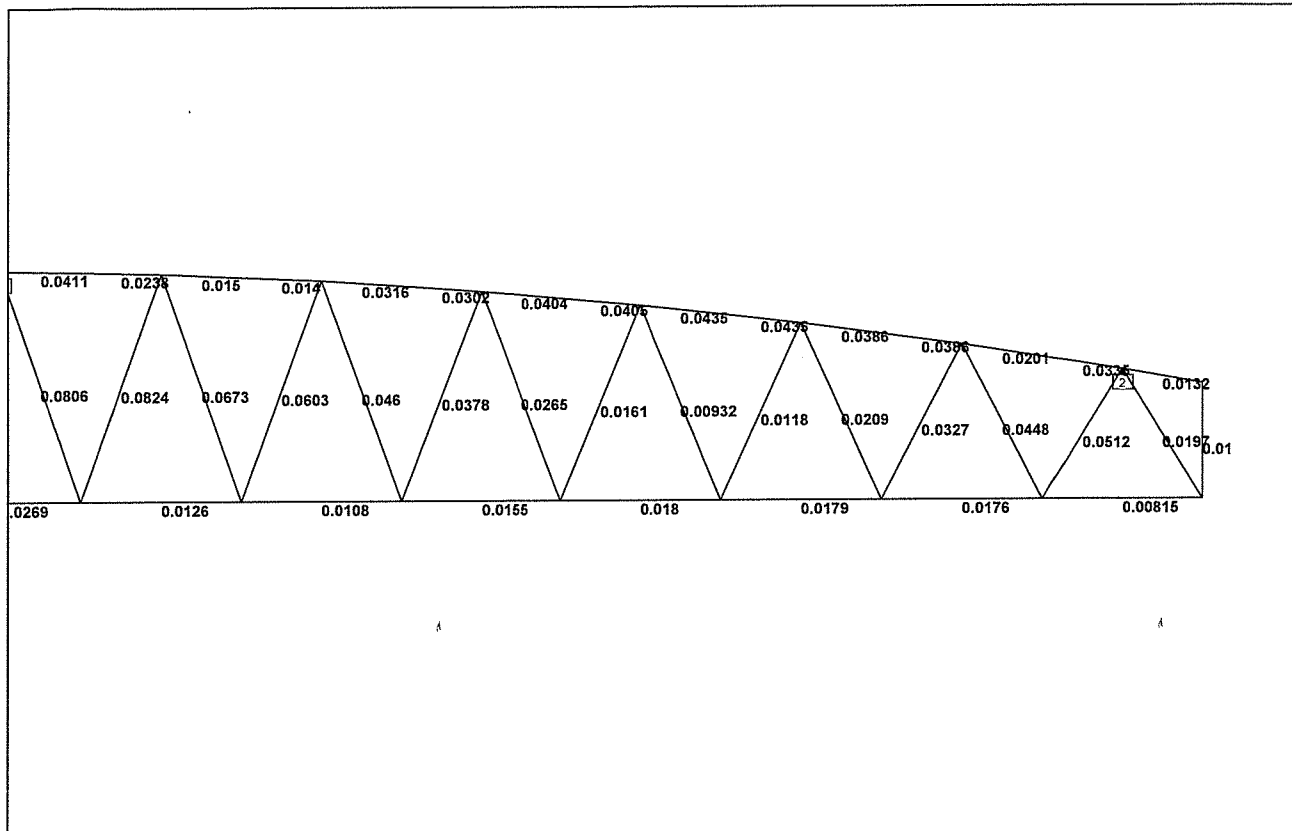




Unity check-01



Unity Check 02



Unity Check-03

**Node Displacement Summary**

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	203	1:SW	0.36	-0.52	0.00	0.63	0.00	0.00	-0.00
Min X	212	1:SW	-0.07	-0.52	0.00	0.53	0.00	0.00	0.00
Max Y	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Min Y	106	1:SW	0.13	-1.10	0.00	1.11	0.00	0.00	0.00
Max Z	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Min Z	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Max rX	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Min rX	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Max rY	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Min rY	101	1:SW	0.05	0.14	0.00	0.15	0.00	0.00	-0.00
Max rZ	251	1:SW	-0.05	-0.27	0.00	0.27	0.00	0.00	0.00
Min rZ	237	1:SW	0.33	-0.27	0.00	0.43	0.00	0.00	-0.00
Max Rst	240	1:SW	0.23	-1.09	0.00	1.12	0.00	0.00	0.00

**Reactions**

Node	L/C	Horizontal FX (kg)	Vertical FY (kg)	Horizontal FZ (kg)	Moment MX (MTon'm)	Moment MY (MTon'm)	Moment MZ (MTon'm)
201	1:SW	0.00	4383.97	0.00	0.00	0.00	0.00
209	1:SW	0.00	6027.27	0.00	0.00	0.00	0.00
210	1:SW	0.00	4383.94	0.00	0.00	0.00	0.00
218	1:SW	0.00	6027.26	0.00	0.00	0.00	0.00

Job Title : Pedestrian Bridge - Nakhonsawan	Subject : Design of Base Plate
Designed : PSJ Date : ๓.๑.-08	Sheet : Page :
Checked : SK Date :	

**Base Plate No.1**

**A) Properties of Materials**

Fy	=	2,400	ksc
Es	=	2.10E+06	ksc
Ultimate Comp. Strength of Concrete, fc'	=	240	ksc

**B) Geometry**

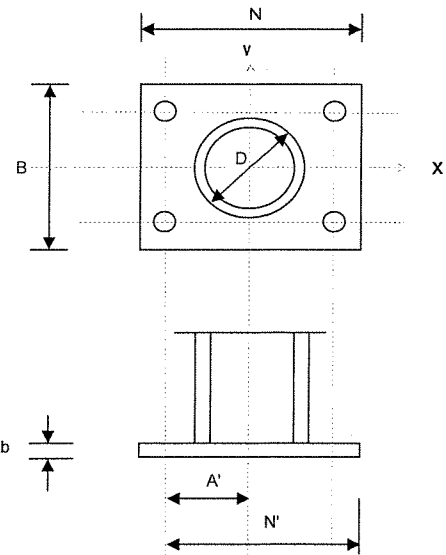
Steel Column :	D	=	26.74	cm
Equivalent Square Section		=	23.70	cm
Base Plate :	B	=	40.00	cm
	N	=	40.00	cm
RC. Column :	Bc	=	40.00	cm
	Nc	=	40.00	cm

**C) Loading**

Axial Load, P	=	43,700	kg
Moment, My-y	=	-	kg.m
Moment, Mx-x	=	-	kg.m

**E) Determining Thickness of Base Plate**

A1=B*N	=	1,600.00	cm <sup>2</sup>
A2=Bc*Nc	=	1,600.00	cm <sup>2</sup>
allowable Bearing Stress, Fp = 0.35fc' * Sqrt(A2/A1)	=	84.00	ksc
Bearing Stress ;			
f1=[P/A1+6*My-y/BN <sup>2</sup> +6*Mx-x/NB <sup>2</sup> ]	=	27.31	ksc
f2=[P/A1-6*My-y/BN <sup>2</sup> -6*Mx-x/NB <sup>2</sup> ]	=	27.31	ksc
n=(B-0.95Le)/2	=	8.74	cm
m=(N-0.95Le)/3	=	8.74	cm
L=Max(n,m)	=	8.74	cm
Mp=0.50*f1*L <sup>2</sup>	=	1,044.03	kg.cm
Fb=0.75*Fy	=	1,800.00	Ksc
tb(req)=Sqrt(6*Mp/Fb)	=	1.87	cm



$< 0.70fc' = 168 \text{ ksc}$

$< Fb \text{ OK.}$

$> 0, \text{ No Tension in Base Plate}$

**PROVIDE Base Plate : 400 x 400 x 30 mm.**

# CALCULATION SHEET

PROJECT	Pedestrian Bridge	JOB ID	
SUBJECT	Nakhonsawan	DESIGNED	<del>AT</del>
		CHECKED	Sep'08
		PAGE	
		SHEET	

## Beam Ledge Design

Provide B.L - 400x400

$$\text{Load from STAND} \begin{cases} F_x = 12400 & \text{kg} \\ F_y = 43700 & \text{"} \\ F_z = 4005 & \text{"} \end{cases}$$

$$F_n = \sqrt{12400^2 + 4005^2}$$

$$= 13030 \text{ kg}$$

$$V_u = 1.6 \times 43700$$

$$= 69920 \text{ kg}$$

$$N_u = 1.6 \times 13030$$

$$= 20,848 \text{ kg}$$

Shear-span for both Shear & Flexure

$$\text{For Shear; } a = 40 \left(\frac{2}{3}\right) + 2.5$$

$$= 30 \text{ cm} \quad \nearrow \frac{1}{2} \phi \text{ stirrup}$$

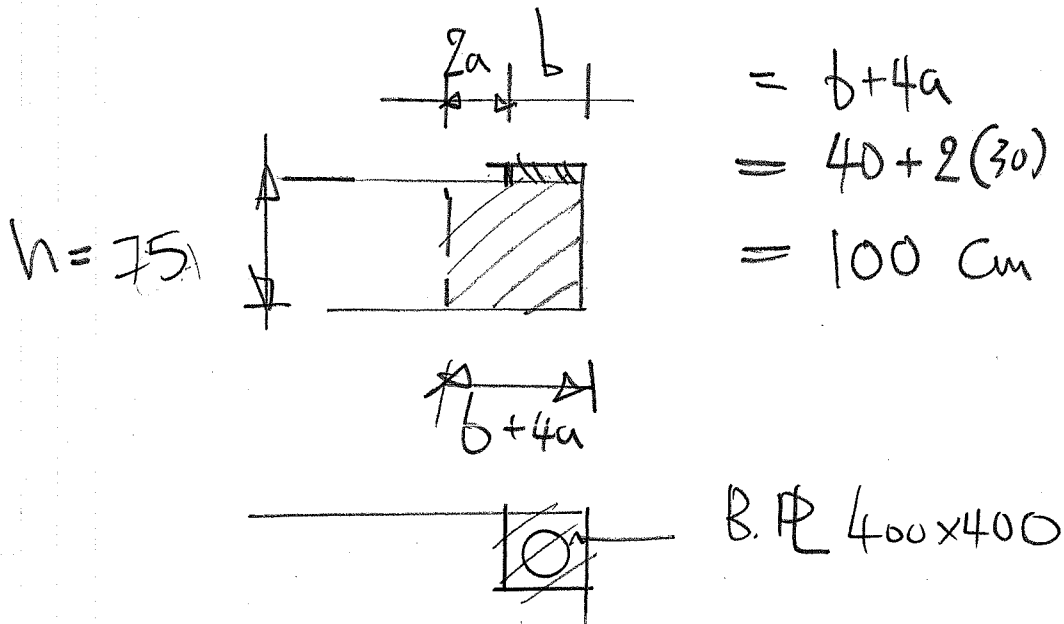
$$\text{For flexure; } a = 40 + 2.5 + 0.8$$

$$= 43.3 \text{ cm}$$

# CALCULATION SHEET

PROJECT	Pedestrian Bridge	JOB ID	
SUBJECT	Nakhon Sawan	DESIGNED	PH
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Determine width of ledge



Check Allowable Bearing & Shear.

$$\begin{aligned}
 \text{Bearing} &= P = \phi * 0.85 * f_c' * A_c ; A_c = (b + 4a) d \\
 &= 0.7 * 0.85 * 250 * 40 * 40 &= 100 * 70 \\
 &= 1238 \text{ t} > V_u \text{ OK} &= 7000
 \end{aligned}$$

$$\begin{aligned}
 \text{Shear} ; V &= \phi * 0.20 * f_c' * A_c \\
 &= 0.85 * 0.20 * 250 * 7000 \\
 &= 297.5 \text{ t} > V_u \text{ OK}
 \end{aligned}$$

$$\begin{aligned}
 V &= \phi * 56 * A_c \\
 &= 0.85 * 56 * 7000 \\
 &= 332.2 \text{ t} > V_u \text{ OK.}
 \end{aligned}$$

# CALCULATION SHEET

PROJECT	Pedestrian Bridge	JOB ID	
SUBJECT	Nakhon Sawan	DESIGNED	15/5
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## Shear-friction reinforcement, $A_{sf}$

$$A_{sf} = \frac{V_u}{\phi f_y \mu} = \frac{69920}{0.85 \times 4000 \times 1.4}$$

$$= \underline{\underline{14.68 \text{ cm}^2}}$$

$\therefore \mu = 1.4$   
for concrete placed monolithically

## Flexural reinforcement

$$M_u = V_u \cdot a + N_u (h - d)$$

$$= 6992 \times 0.433 + 2085 \times (0.75 - 0.70)$$

$$= 31.32 \text{ t.m}$$

$$A_f = \frac{M_u}{\phi \cdot f_y (0.80d)}$$

$$= \frac{31320 \times 100}{0.85 \times 4000 \times 0.8 \times 0.70}$$

$$= \underline{\underline{16.45 \text{ cm}^2}}$$

## Direct Tension Reinforcement

$$A_n = \frac{N_u}{\phi \cdot f_y}$$

$$= \frac{20848}{0.85 \times 4000}$$

$$= 6.14 \text{ cm}^2$$

# CALCULATION SHEET

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SUBJECT	Nakhon Sawan	DESIGNED	[Signature]
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		SHEET	4

Determine primary tension reinforcement,  $A_s$

$$\left(\frac{2}{3}\right) A_{sf} = \frac{2}{3} * 14.68 = 9.79 \text{ cm}^2 < A_f = 16.45 \text{ cm}^2$$

$$A_s = A_f + A_n = 16.45 + 6.14$$

$$= 22.61 \text{ cm}^2$$

$$A_{smin} = 0.04 \left( \frac{f_c'}{f_y} \right) * b * d$$

$$= 0.04 \left( \frac{250}{4000} \right) (100 * 70)$$

$$= 17.50 \text{ cm}^2$$

Determine shear reinforcement,  $A_h$

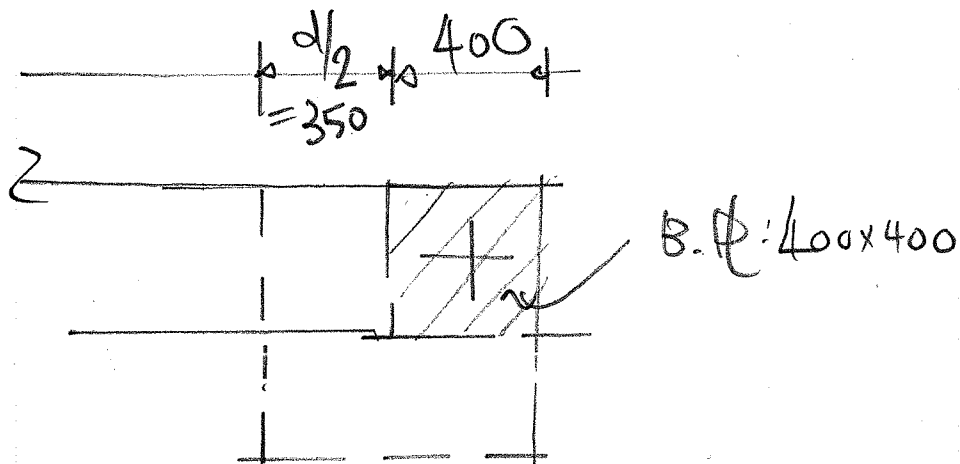
$$A_h = 0.5 (A_s - A_n) = 0.5 (22.61 - 6.14)$$

$$= 8.24 \text{ cm}^2$$

# CALCULATION SHEET

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Determine final size and spacing of Ledge reinforcement.



Distribution of  $A_n$  depends on the punching shear strength around the B.ϕ

$$\begin{aligned} \phi V_n &= 0.85 (1.06 \sqrt{f_c}) b_o d_o \\ &= 0.85 (1.06 \sqrt{25}) (2 \times 75) 70 \\ &= 149.6^t > 69.92^t \quad \underline{OK} \end{aligned}$$

Provided reinforcement along the effective width  $[b + 2a = 100 \text{ cm}]$

$$A_s + A_y = \frac{22.61 + 8.24}{1.0} = 30.85 \text{ cm}^2/\text{m of Ledge}$$

DB20e/100



# CALCULATION SHEET

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Check required area of beam stirrups  
used as "Hanger" reinforcement

$$A_v (\text{one leg}) = \frac{V_u}{\phi f_y} = \frac{69920}{0.85 \times 4000}$$

$$= 20.56 \text{ cm}^2 ; \text{ distributed along effective ledge } [b=1.00\text{m}]$$

