DESIGN NOTES

Design Code of Practice

E.I.T. Standard 1007-34 (Working Stress Design)
AISC ; Manual of Steel Construction Allowable Stress Design

Properties of Materials

Concrete :

fc'	Ultimate compressive strength		:	173	173 ksc
Factor			:	0.375	0.375
fc	=	Factor x fc'	:	65	65 ksc
Ec	=	$4{,}270w^{1.5}$ Sqrt[f'c]	:	2.1E+05	2.1E+05 ksc

Reinforcemment :

			Rounded	Deformed
	Steel Grade	:	SR-24	SD-40
fy	Yield strength	:	2,400	4,000 ksc
fs	Allowable strength	:	1,200	1,700 ksc
Es	Modulus of elasticity	:	2.04E+06	2.04E+06 ksc

Steel Structure :

fy	Yield strength	:	2,400 ksc

PC Pile

I - 0.35 x 0.35 x 12.00 m. Safe load — 12 ton/piles

Design Parameter

n		= Es/Ec	10	10
k		= 1/[1+fs/(n*fc)]	0.346	0.272
j		= 1 - k/3	0.885	0.909
R		= fc * j * k/2	9.92	8.01 ksc
vc	Beam Shear	= 0.29 * Sqrt(fc')		3.81 ksc
vp	Punching Shear	= 0.53 * Sqrt(fc')		6.97 ksc
vc (d/4)	Beam Shear rebar @ < d/4	= 0.795 * Sqrt(fc')		10.46 ksc
vmax	Shear max Allowable	= 0.53 * Sqrt(fc')		17.36 ksc

Design Loading

Dead Load :

Steel	:	7,850 Kg/m^3
Concrete	:	2,400 Kg/m^3
Compact Sand	:	2,000 Kg/m^3
Sign Board Sheet	:	10 Kg/m^2

Live Load :

Catwalk	:	50 Kg/m^2
Wind Load	:	50 Kg/m^2

Job Information

	Engineer	Checked	Approved
Name:	PSJ		
Date:	15-Jun-12		

Design of Steel Gantry Frame

Structure Type SPACE FRAME

Number of Nodes	100	Highest Node	114
Number of Elements	282	Highest Beam	310

Number of Basic Load Cases	5
Number of Combination Load Cases	4

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 FROM SIGN BROAD
Primary	3	DL FROM CAT WALK (5-C100X50X3.2)
Primary	4	LL
Primary	5	WIND LOAD
Combination	11	TOTAL DL
Combination	12	DL+LL
Combination	13	DL+WL
Combination	14	DL+LL+WL

Section Properties

Prop	Section	Area (cm^2)	I_{yy} (cm^4)	I_{zz} (cm^4)	J (cm^4)	Material
1	PIP139.8X4.0	17.070	394.000	394.000	787.455	MATERIAL1
2	PIP48.6X2.3	3.345	8.990	8.990	17.973	MATERIAL1
3	PIP34.0X2.3	2.291	2.890	2.890	5.785	MATERIAL1
4	PIP76.3X3.2	7.349	49.200	49.200	98.361	MATERIAL1
5	PIP48.6X2.3	3.345	8.990	8.990	17.973	MATERIAL1
6	PIP34.0X2.3	2.291	2.890	2.890	5.785	MATERIAL1
7	PIP48.6X2.3	3.345	8.990	8.990	17.973	MATERIAL1
8	PIP34.0X2.3	2.291	2.890	2.890	5.785	MATERIAL1
9	PIP34.0X2.3	2.291	2.890	2.890	5.785	MATERIAL1

Materials

Mat	Name	E (kN/mm^2)	ν	Density (kg/m^3)	α (1/°K)
1	STEEL	205.000	0.300	7.83E 3	12E-6
2	ALUMINUM	68.948	0.330	2.71E 3	23E-6
3	MATERIAL1	205.000	0.300	7.85E 3	12E-12
4	CONCRETE	21.718	0.170	2.4E 3	10E-6

Supports

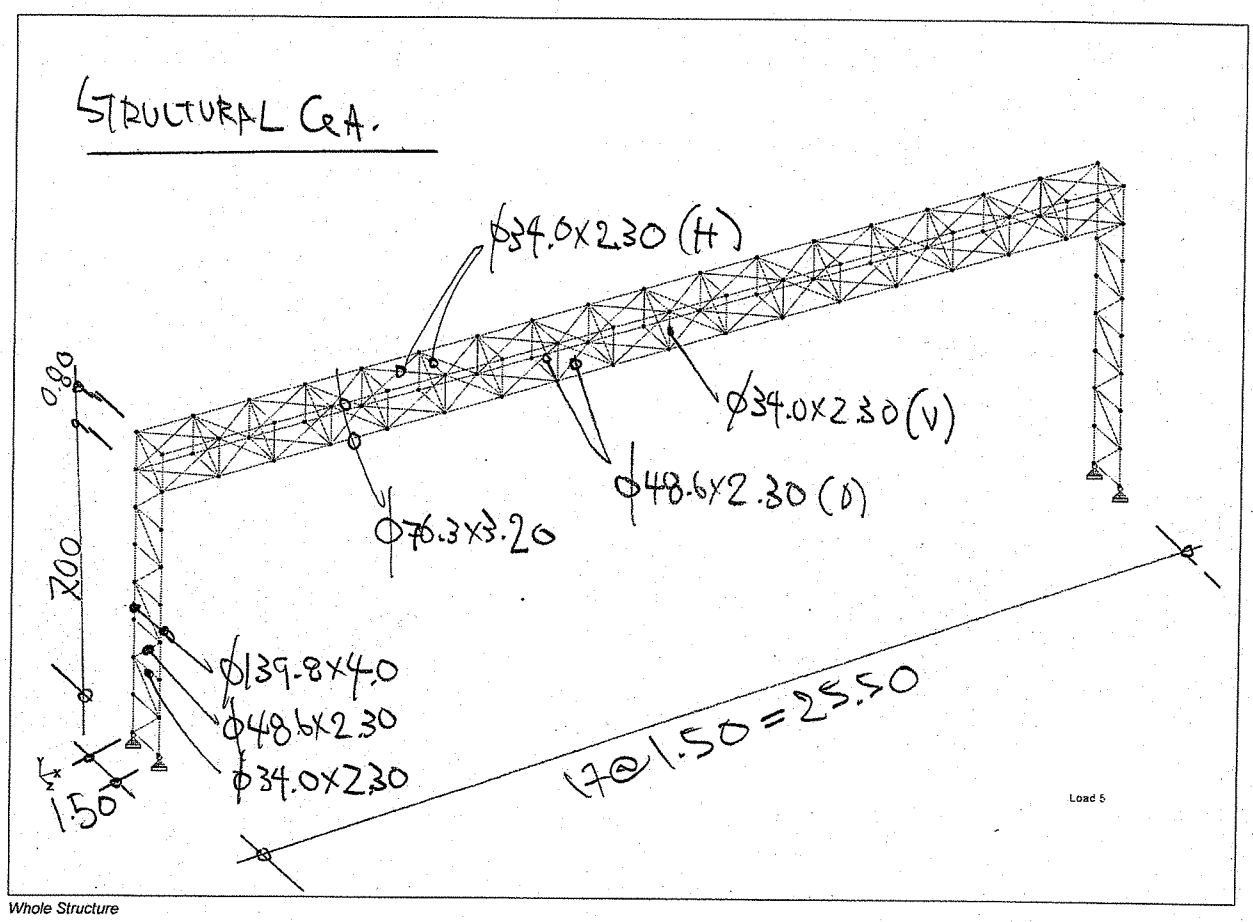
Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN-m/deg)	rY (kN-m/deg)	rZ (kN-m/deg)
65	Fixed	Fixed	Fixed	-	-	-
66	Fixed	Fixed	Fixed	-	-	-
97	Fixed	Fixed	Fixed	-	-	-
98	Fixed	Fixed	Fixed	-	-	-

Basic Load Cases

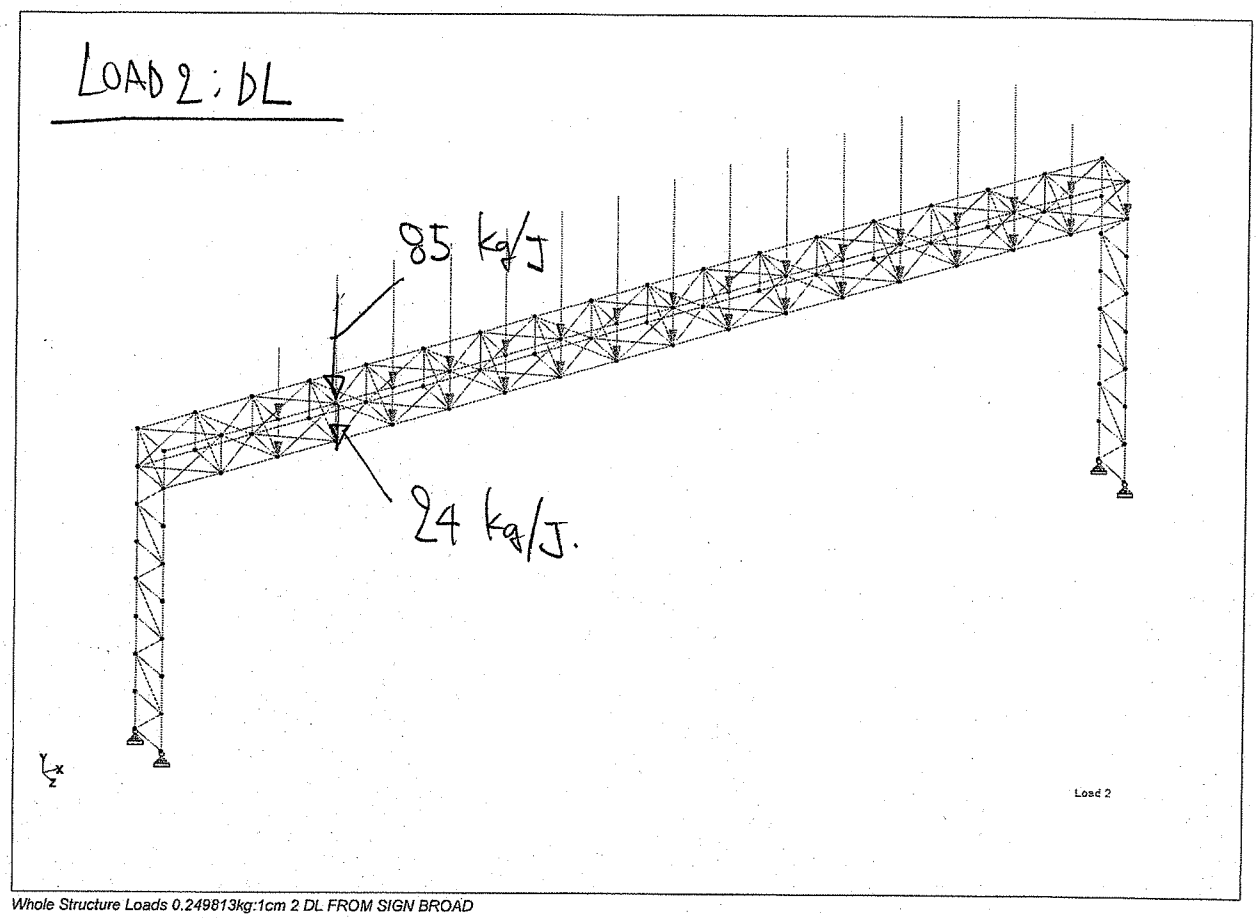
Number	Name
1	SW
2	DL FROM SIGN BROAD
3	DL FROM CAT WALK (5-C100X50X3.2)
4	LL
5	WIND LOAD

Combination Load Cases

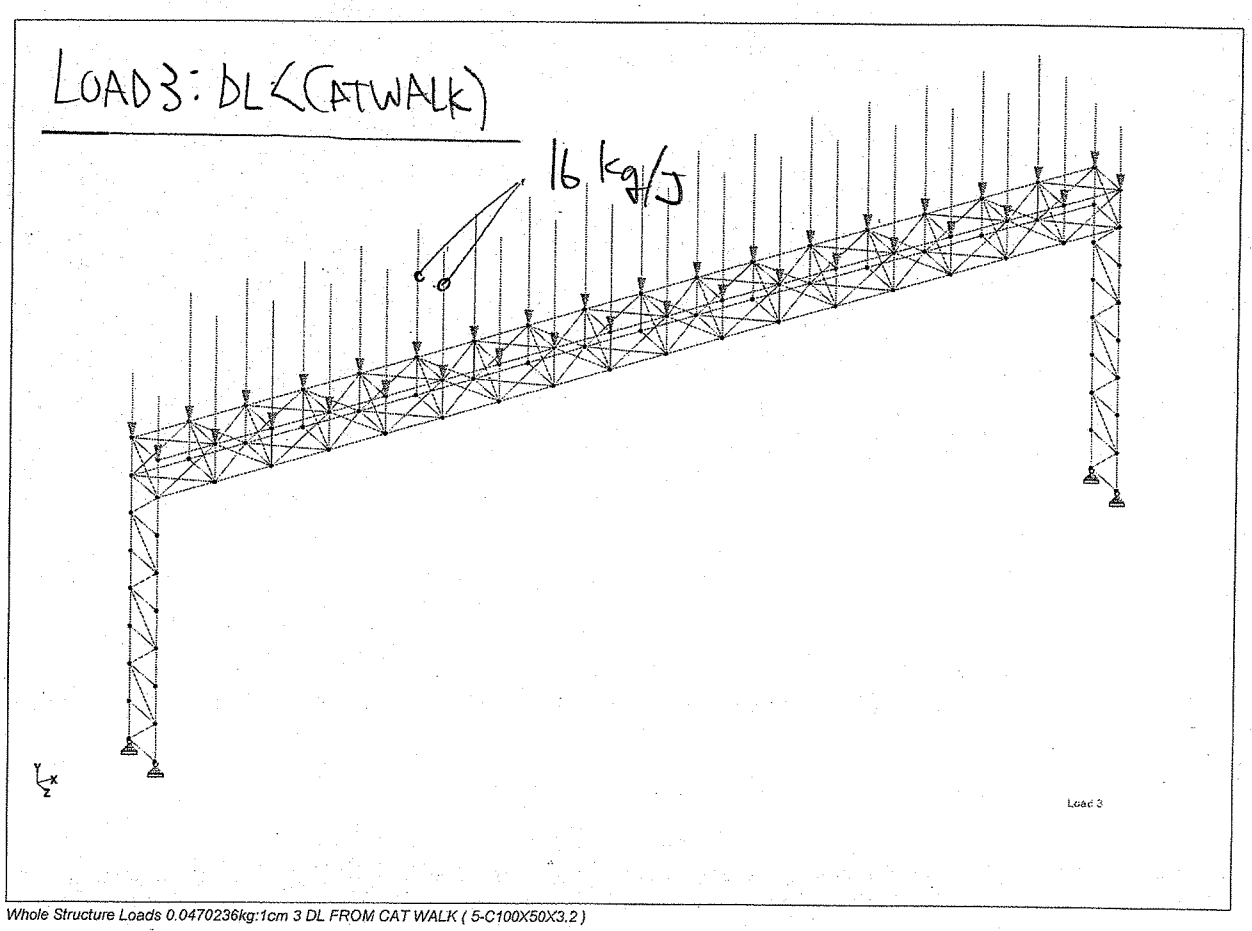
Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
11	TOTAL DL	1	SW	1.00
		2	DL FROM SIGN BROAD	1.00
		3	DL FROM CAT WALK (5-C100X50X3.2)	1.00
12	DL+LL	1	SW	1.00
		2	DL FROM SIGN BROAD	1.00
		3	DL FROM CAT WALK (5-C100X50X3.2)	1.00
		4	LL	1.00
13	DL+WL	1	SW	1.00
		2	DL FROM SIGN BROAD	1.00
		3	DL FROM CAT WALK (5-C100X50X3.2)	1.00
		5	WIND LOAD	1.00
14	DL+LL+WL	1	SW	0.75
		2	DL FROM SIGN BROAD	0.75
		3	DL FROM CAT WALK (5-C100X50X3.2)	0.75
		4	LL	0.75
		5	WIND LOAD	0.75



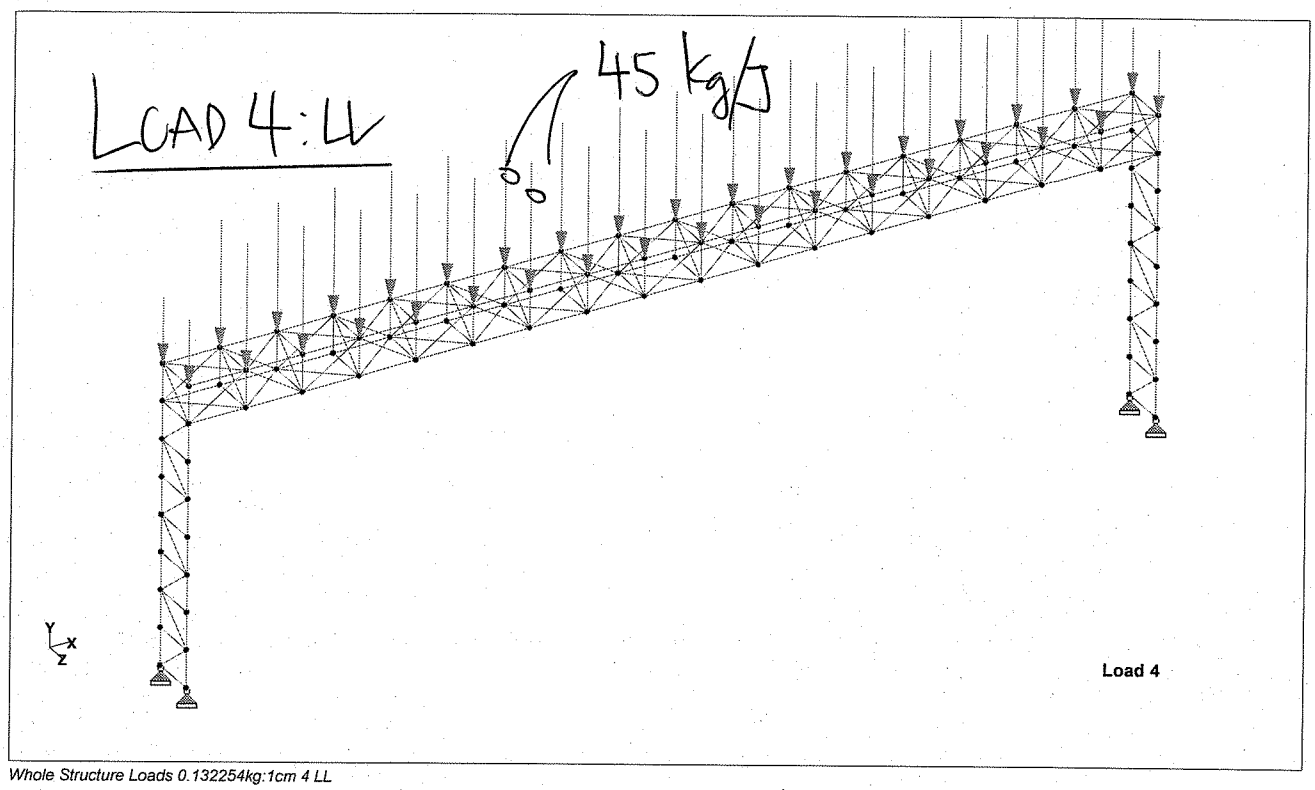
Whole Structure



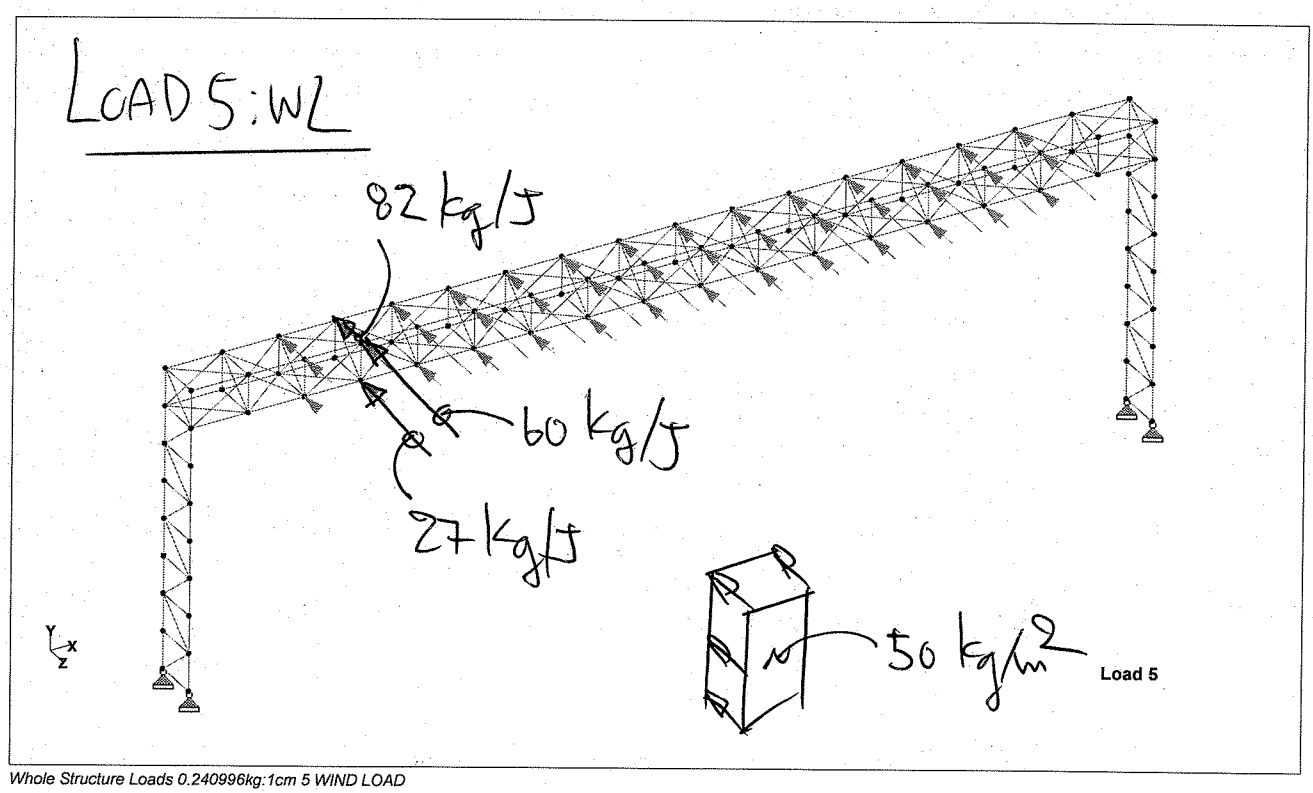
Whole Structure Loads 0.249813kg:1cm 2 DL FROM SIGN BROAD



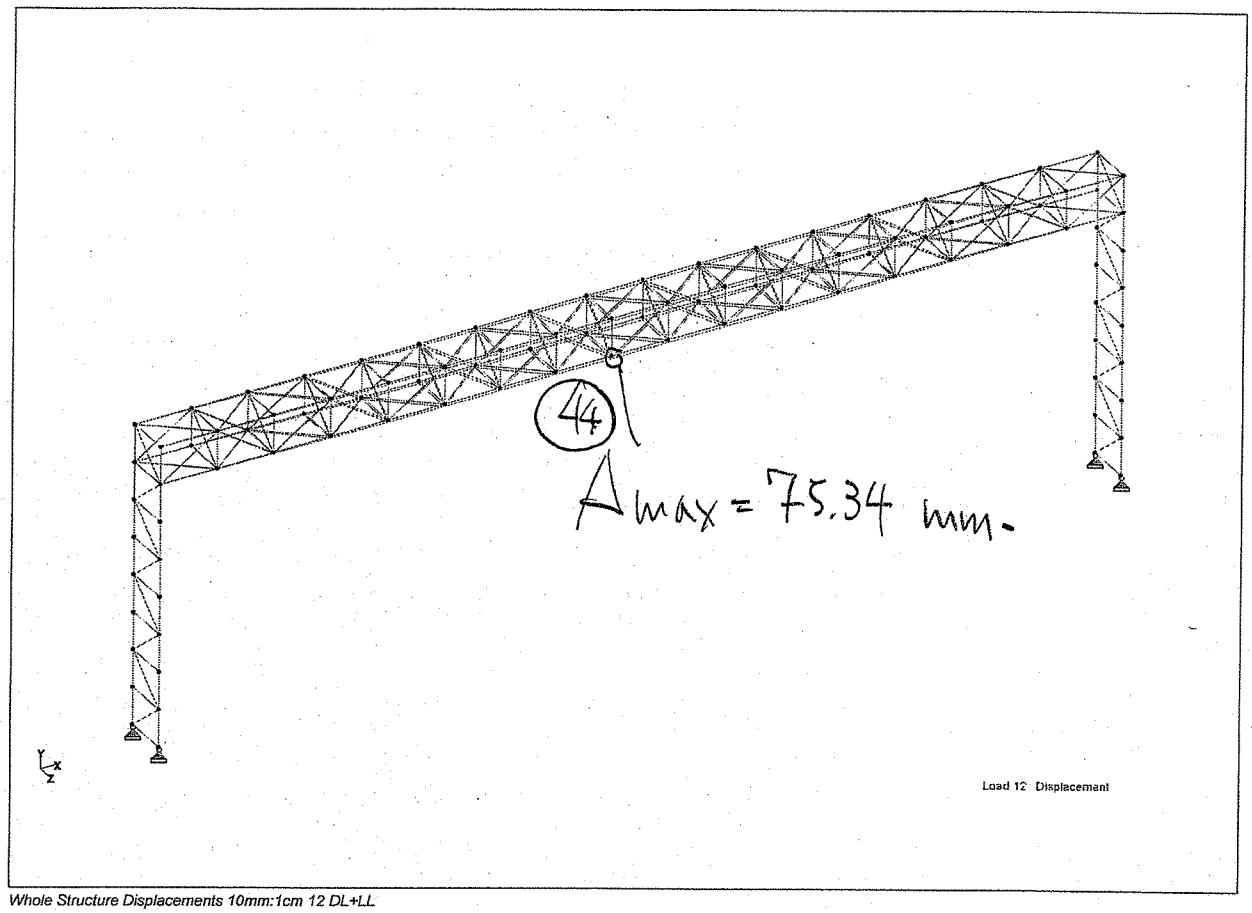
Whole Structure Loads 0.0470236kg:1cm 3 DL FROM CAT WALK (5-C100X50X3.2)



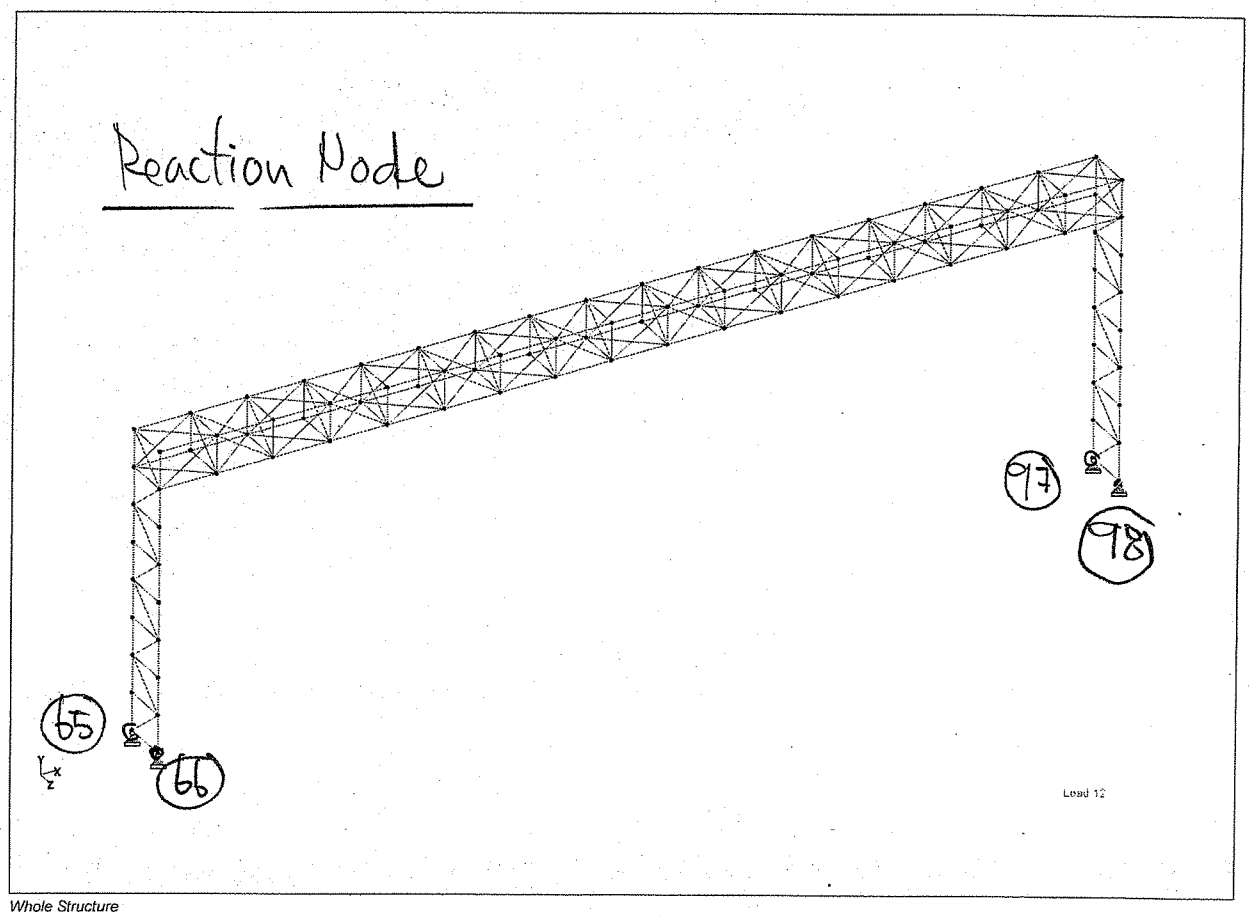
Whole Structure Loads 0.132254kg:1cm 4 LL



Whole Structure Loads 0.240996kg:1cm 5 WIND LOAD



Whole Structure Displacements 10mm:1cm 12 DL+LL



Whole Structure

Node Displacement Summary

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	27	5:WIND LOAD	**3.95**	0.80	-8.83	9.71	0.00	0.00	0.00
Min X	27	12:DL+LL	**-8.89**	-0.31	0.45	8.91	0.00	0.00	0.00
Max Y	50	5:WIND LOAD	1.80	**2.46**	-39.50	39.62	0.00	0.00	0.00
Min Y	44	12:DL+LL	-4.05	**-75.23**	0.16	75.34	0.00	0.00	0.00
Max Z	50	12:DL+LL	-4.78	-75.12	**2.75**	75.32	0.00	0.00	0.00
Min Z	24	5:WIND LOAD	2.12	-1.56	**-39.58**	39.67	-0.00	0.00	0.00
Max rX	1	1:SW	-1.90	-0.07	0.01	1.90	**0.00**	0.00	0.00
Min rX	11	5:WIND LOAD	0.31	-1.26	-25.96	25.99	**-0.00**	0.00	0.00
Max rY	1	1:SW	-1.90	-0.07	0.01	1.90	0.00	**0.00**	0.00
Min rY	1	1:SW	-1.90	-0.07	0.01	1.90	0.00	**0.00**	0.00
Max rZ	1	1:SW	-1.90	-0.07	0.01	1.90	0.00	0.00	**0.00**
Min rZ	1	1:SW	-1.90	-0.07	0.01	1.90	0.00	0.00	**0.00**
Max Rst	44	12:DL+LL	-4.05	-75.23	0.16	**75.34**	0.00	0.00	0.00

Reactions

Node	L/C	Horizontal FX (kg)	Vertical FY (kg)	Horizontal FZ (kg)	Moment MX (MTon-m)	MY (MTon-m)	MZ (MTon-m)
65	1:SW	0.00	405.93	-0.00	0.00	0.00	0.00
	2:DL FROM SI	0.00	-2.62	0.00	0.00	0.00	0.00
	3:DL FROM CA	0.00	138.28	0.00	0.00	0.00	0.00
	4:LL	0.00	389.57	0.00	0.00	0.00	0.00
	5:WIND LOAD	0.00	7259.82	1109.06	0.00	0.00	0.00
	11:TOTAL DL	0.00	541.59	-0.00	0.00	0.00	0.00
	12:DL+LL	0.00	931.16	-0.00	0.00	0.00	0.00
	13:DL+WL	0.00	7801.41	1109.06	0.00	0.00	0.00
	14:DL+LL+WL	0.00	6143.23	831.79	0.00	0.00	0.00
66	1:SW	0.00	405.82	0.00	0.00	0.00	0.00
	2:DL FROM SI	0.00	726.85	0.00	0.00	0.00	0.00
	3:DL FROM CA	0.00	138.42	0.00	0.00	0.00	0.00
	4:LL	0.00	389.96	0.00	0.00	0.00	0.00
	5:WIND LOAD	0.00	-7259.82	0.00	0.00	0.00	0.00
	11:TOTAL DL	0.00	1271.10	0.00	0.00	0.00	0.00
	12:DL+LL	0.00	1661.06	0.00	0.00	0.00	0.00
	13:DL+WL	0.00	-5988.72	0.00	0.00	0.00	0.00
	14:DL+LL+WL	0.00	-4199.07	0.00	0.00	0.00	0.00
97	1:SW	0.00	405.82	-0.00	0.00	0.00	0.00
	2:DL FROM SI	0.00	2.62	0.00	0.00	0.00	0.00
	3:DL FROM CA	0.00	141.72	0.00	0.00	0.00	0.00
	4:LL	0.00	399.43	0.00	0.00	0.00	0.00
	5:WIND LOAD	0.00	7540.18	1154.94	0.00	0.00	0.00
	11:TOTAL DL	0.00	550.16	-0.00	0.00	0.00	0.00
	12:DL+LL	0.00	949.59	-0.00	0.00	0.00	0.00
	13:DL+WL	0.00	8090.34	1154.94	0.00	0.00	0.00
	14:DL+LL+WL	0.00	6367.98	866.21	0.00	0.00	0.00
98	1:SW	0.00	405.93	0.00	0.00	0.00	0.00
	2:DL FROM SI	0.00	836.15	0.00	0.00	0.00	0.00
	3:DL FROM CA	0.00	141.58	0.00	0.00	0.00	0.00
	4:LL	0.00	399.04	0.00	0.00	0.00	0.00
	5:WIND LOAD	0.00	-7540.18	0.00	0.00	0.00	0.00
	11:TOTAL DL	0.00	1383.65	0.00	0.00	0.00	0.00
	12:DL+LL	0.00	1782.69	0.00	0.00	0.00	0.00
	13:DL+WL	0.00	-6156.53	0.00	0.00	0.00	0.00
	14:DL+LL+WL	0.00	-4316.12	0.00	0.00	0.00	0.00

Comp. Max.

Tension Max

Job Title : OverHead Sign			Subject :	Estimation of Pile Bearing Capacity
Designed : PSJ	Date :	Jun-12		
Checked :	Date :	Jun-12	Sheet :	Page :

Pile : I - 0.35x0.35

Plie Configulation :

Cross Section Area of Pile , Ap	=	0.078	m^2
Parimeter of Pile , P	=	1.79	m
Groung Water Table , GWT	=	1.00	m
Factor of Safety , FS	=	3.00	

Depth	Soil Parameter and Effective Overburden Pressure							Ultimate Skin Friction Capacity of Pile								Ultimate End Bearing Capacity of Pile				Qult	Qa	Depth
								Clay		Sand						Clay	Sand					
(m)	Soil Type	γt(avg) (T/m³)	γe (T/m³)	σ_{VOE} (T/m²)	σ_{VOF} (T/m²)	Su (T/m²)	SPT (Blows/ft)	α	αc (T)	ϕ	C_N	N'	Ks	Qfs (T)	Qf (T)	Qec (T)	Nq	Qes (T)	Qeb (T)	(T)	=Qult/FS (T)	(m)
1.00	1.00	1.80	0.80	0.80	0.40	0.70	-	1.10	1.38	-	-	-	-	-	1.38	1.29	-	-	1.29	2.67	0.89	1.00
2.00	1.00	1.80	0.80	1.60	0.80	0.70	-	1.10	2.76	-	-	-	-	-	2.76	2.09	-	-	2.09	4.86	1.62	2.00
3.00	1.00	1.80	0.80	2.40	1.20	0.82	-	1.09	4.36	-	-	-	-	-	4.36	2.98	-	-	2.98	7.33	2.44	3.00
4.00	1.00	1.80	0.80	3.20	1.60	0.95	-	1.07	6.18	-	-	-	-	-	6.18	3.87	-	-	3.87	10.04	3.35	4.00
5.00	1.00	1.80	0.80	4.00	2.00	1.07	-	1.05	8.19	-	-	-	-	-	8.19	4.75	-	-	4.75	12.94	4.31	5.00
6.00	1.00	1.80	0.80	4.80	2.40	1.19	-	1.04	10.39	-	-	-	-	-	10.39	5.64	-	-	5.64	16.03	5.34	6.00
7.00	1.00	1.80	0.80	5.60	2.80	1.32	-	1.02	12.80	-	-	-	-	-	12.80	6.53	-	-	6.53	19.32	6.44	7.00
8.00	1.00	1.80	0.80	6.40	3.20	1.44	-	1.00	15.38	-	-	-	-	-	15.38	7.41	-	-	7.41	22.79	7.60	8.00
9.00	1.00	1.80	0.80	7.20	3.60	1.56	-	0.98	18.12	-	-	-	-	-	18.12	8.30	-	-	8.30	26.42	8.81	9.00
10.00	1.00	1.80	0.80	8.00	4.00	1.68	-	0.97	21.03	-	-	-	-	-	21.03	9.18	-	-	9.18	30.21	10.07	10.00
11.00	1.00	1.80	0.80	8.80	4.40	1.81	-	0.95	24.11	-	-	-	-	-	24.11	10.07	-	-	10.07	34.18	11.39	11.00
12.00	1.00	1.80	0.80	9.60	4.80	1.93	-	0.93	27.33	-	-	-	-	-	27.33	10.95	-	-	10.95	38.28	12.76	12.00
13.00	1.00	1.80	0.80	10.40	5.20	2.05	-	0.92	30.69	-	-	-	-	-	30.69	11.84	-	-	11.84	42.53	14.18	13.00
14.00	1.00	1.80	0.80	11.20	5.60	2.18	-	0.90	34.19	-	-	-	-	-	34.19	12.73	-	-	12.73	46.92	15.64	14.00
15.00	1.00	2.00	1.00	12.20	6.10	2.30	-	0.88	37.82	-	-	-	-	-	37.82	13.81	-	-	13.81	51.64	17.21	15.00
16.00	1.00	2.00	1.00	13.20	6.60	5.60	-	0.49	42.74	-	-	-	-	-	42.74	17.13	-	-	17.13	59.87	19.96	16.00
17.00	1.00	2.00	1.00	14.20	7.10	5.60	-	0.49	47.66	-	-	-	-	-	47.66	18.13	-	-	18.13	65.79	21.93	17.00
18.00	1.00	2.00	1.00	15.20	7.60	5.60	-	0.49	52.58	-	-	-	-	-	52.58	19.13	-	-	19.13	71.71	23.90	18.00
19.00	1.00	2.00	1.00	16.20	8.10	9.40	-	0.40	59.29	-	-	-	-	-	59.29	22.80	-	-	22.80	82.09	27.36	19.00
20.00	1.00	2.00	1.00	17.20	8.60	9.40	-	0.40	65.99	-	-	-	-	-	65.99	23.80	-	-	23.80	89.79	29.93	20.00
21.00	1.00	2.00	1.00	18.20	9.10	9.40	-	0.40	72.70	-	-	-	-	-	72.70	24.80	-	-	24.80	97.50	32.50	21.00

LEGEND:-

1)	Soil Type,1	=	Cohesive Soil	9)	α	=	Adhesion Factor
	Soil Type,2	=	Cohesionless Soil	10)	ϕ	=	Angle Of Shearing Resistance (degree)
2)	γt	=	Total Unit Weight (T/m³)	11)	Ks	=	Coefficient of Shaft Skin Friction
3)	γe	=	Effective Unit Weight (T/m³)	12)	Nq	=	Bearing Capacity Factor (Bangkok Soil)
4)	σ_{VOE}	=	Effective Stress End of Layer(T/m²)	13)	Qf(c,s) = Σα*Su*As	=	Ultimate Skin Friction Load (clay,sand)-(T)
5)	Su	=	Shear Strength (T/m²)	14)	Qe(c,s) = (Su*Nc + σ_{VOE})*Ap	=	Ultimate End Bearing Load (clay , sand) (T)
6)	SPT	=	Standard Penetration Test (blows/ft)	15)	NF	=	Negative Skin Friction (T)
7)	C_N = 0.77*Log(195.3/σ_{vce})	=	Corrected Factor	16)	Qult	=	Ultimate Bearing Capacity Load (T)
8)	N'	=	Corrected Standard Penetration Test (blows/ft)	17)	Qa	=	Allowable Bearing Capacity (T)

NOTE:- Negative skin friction is not considered and Positive skin friction in soft clay is considered

Notes: 1. Allowable Bearing Capacity = 12.76 t

2. Allowable Tension Capacity = 27.33/3.0 = 9.11 t

CALCULATION SHEET

PROJECT	JOB ID	
SUBJECT	DESIGNED	PAGE
	CHECKED	SHEET

Pilecap.

Provided Pilecap : 1.20 x 2.10 x 0.50dp

Max. Comp. on PC Pile = 8.10^t < 12.76^t ok.

Max. Ten. on PC Pile = 6.20^t < 9.11^t ok.

$A_{st(tens)} = \frac{6200}{0.4 \times 4000} = 2.58 \text{ cm}^2$

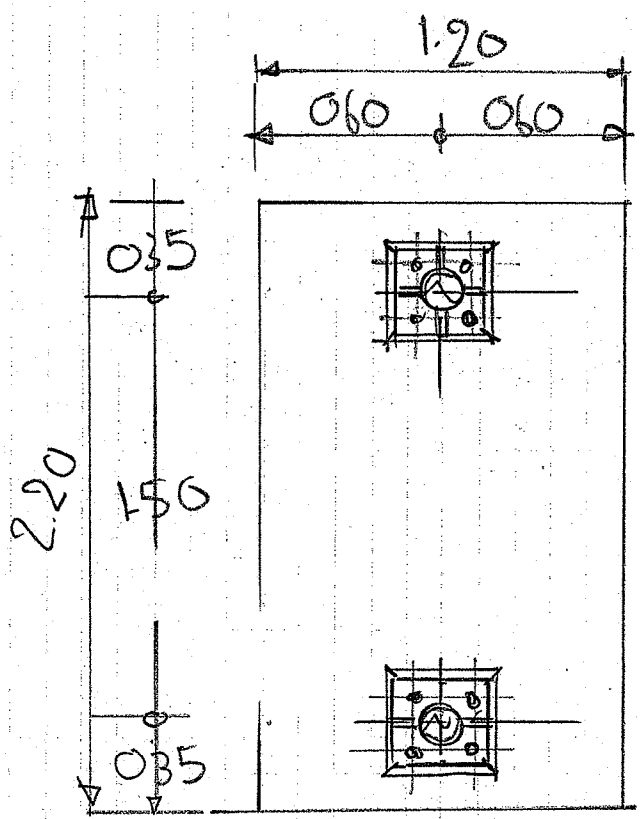
Provided = 4-#16 POWEL BARS

$A_{st\,min} = 0.0018 \times 100 \times 50$

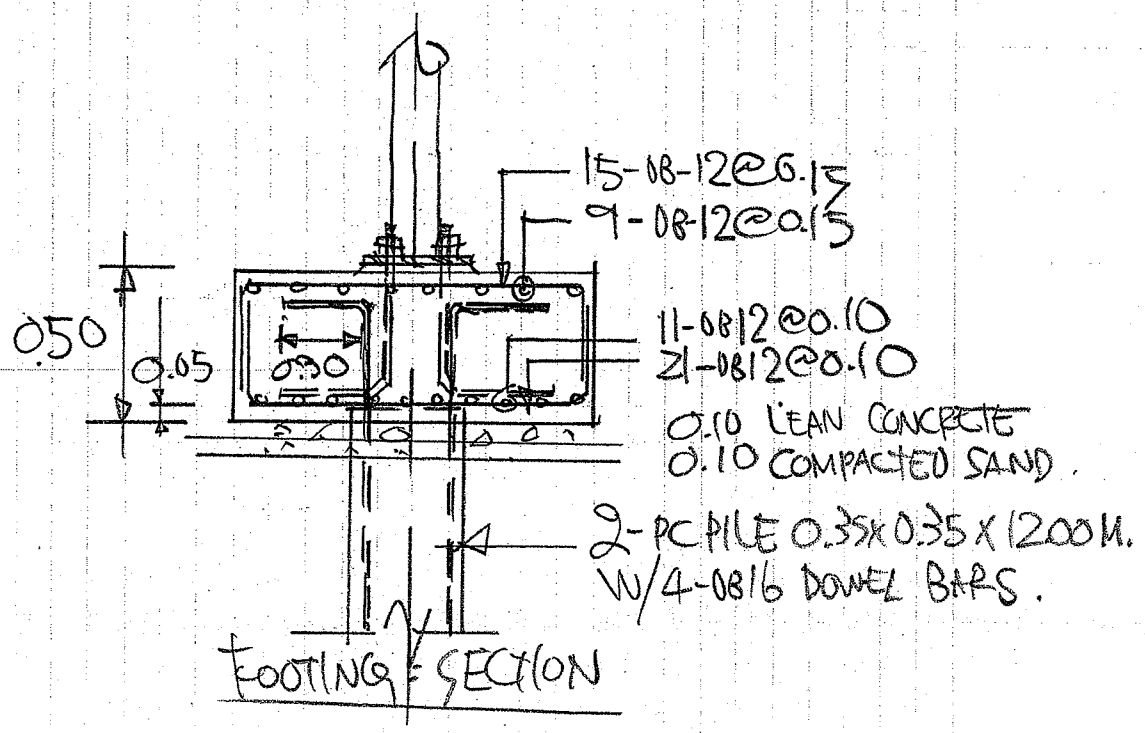
$= 9.0 \text{ cm}^2/\text{m} =$ #12@0.17

CALCULATION SHEET

PROJECT	JOB ID	
SUBJECT	DESIGNED	PAGE
	CHECKED	SHEET



FOOTING PLAN



FOOTING SECTION