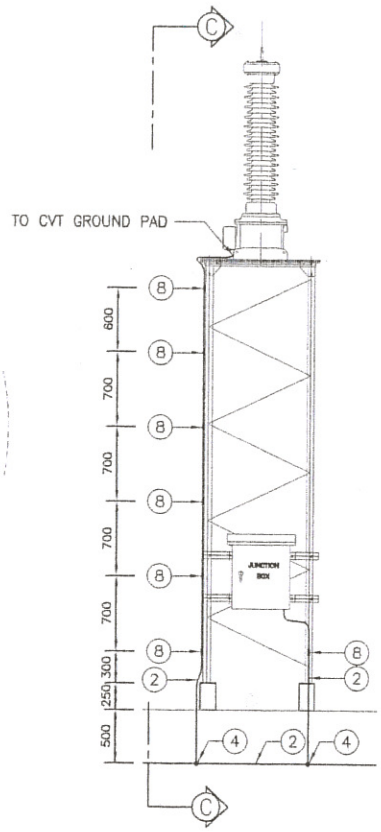
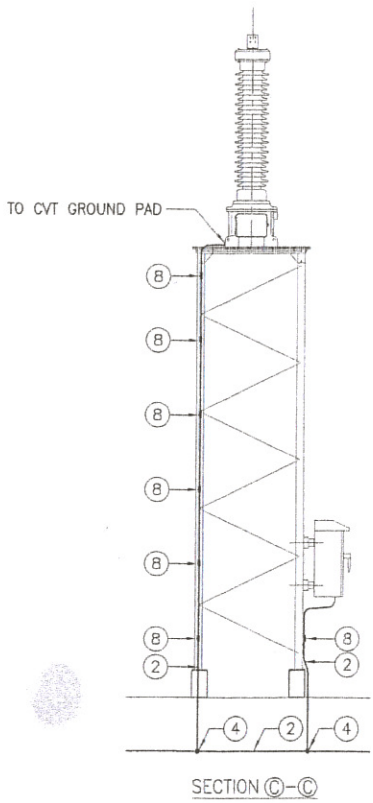
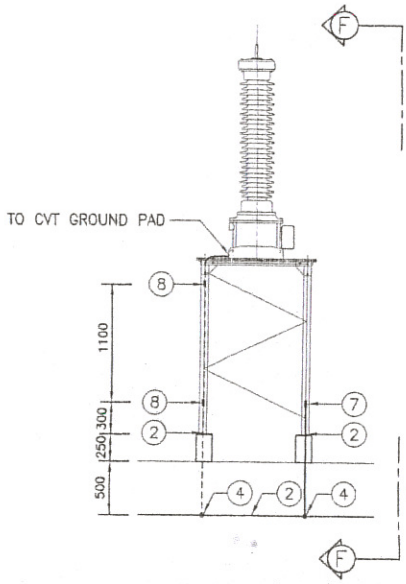


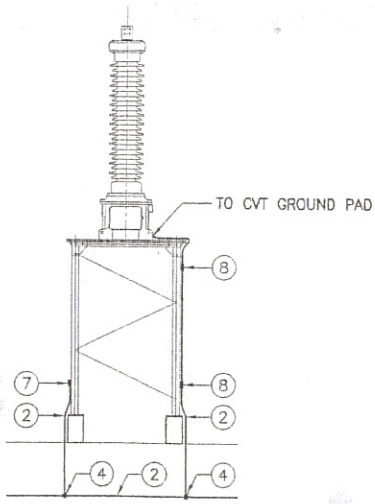
GROUNDING CONNECTION FOR
115 kV. CVT LINE STRUCTURE



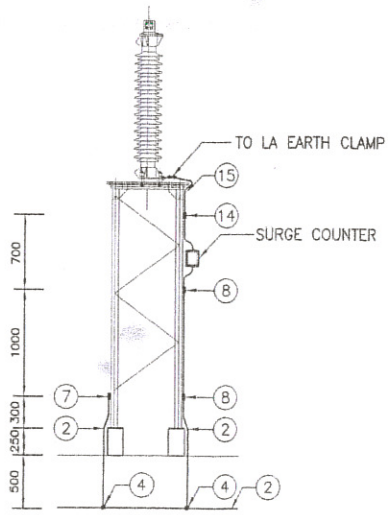
SECTION Ⓒ–Ⓒ



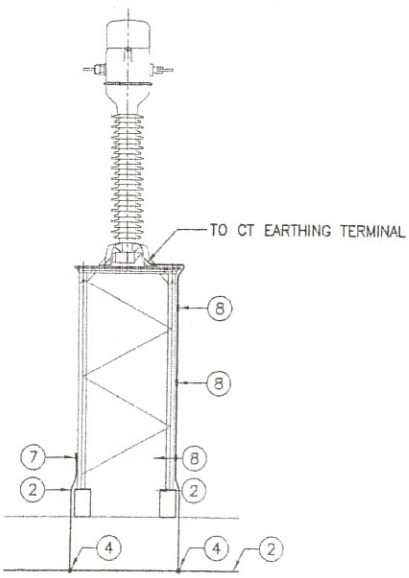
GROUNDING CONNECTION FOR
115 kV. CVT BUS STRUCTURE (WITHOUT JUNCTION BOX)



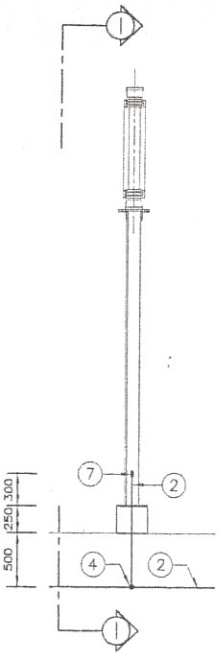
SECTION Ⓕ–Ⓕ

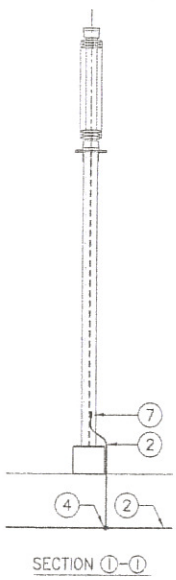


GROUNDING CONNECTION FOR
115 kV. LA. STRUCTURE



SECTION Ⓗ–Ⓗ





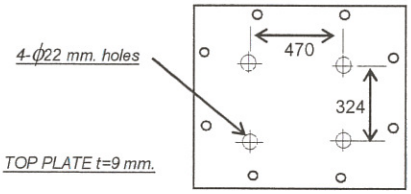
SECTION Ⓘ–Ⓘ

GROUNDING CONNECTION FOR
115 kV. SUPPORT STRUCTURE FOR POST INSULATOR

นายชาย แสงไสว

DESIGNED :		JOB NO.	SUBJECT :115 kV. CAPACITOR VOLTAGE TRANSFORMER STRUCTURE	PAGE
CHECKED :				

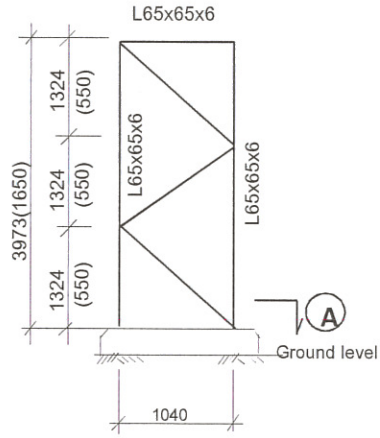
1. STRUCTURAL DESIGN DRAWING



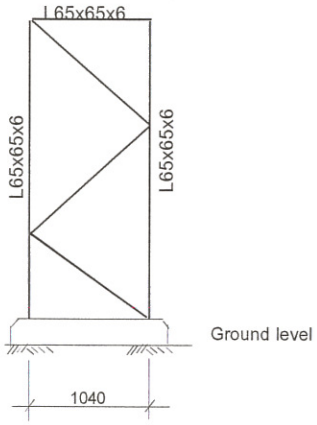
TOP VIEW

NOTES

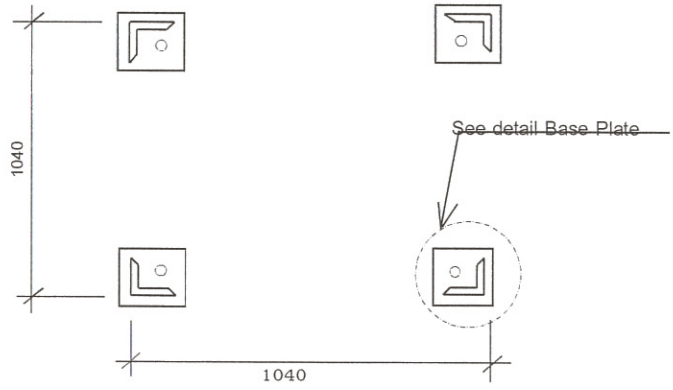
1. BLANK MEMBERS ARE L50x50x4
2. BLANK BOLTS ARE M16-1
3. NO INDICATED BOLT SIZE ARE M16
4. ALL DIMENSION ARE IN MILLIMETERS
5. ALL STRUCTURAL STEEL ARE JIS G3101 SS400
6. ALL BOLTS & NUTS ARE ASTM A394 TYPE 0



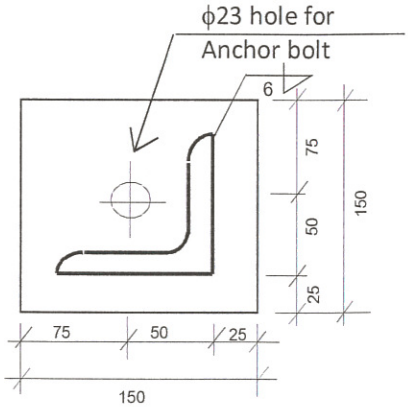
FRONT VIEW



SIDE VIEW



SECTION A-A



BASE PLATE = 15 MM.

Total weight of steel structure = **350** kg.. (Approx. and included weight of bolts, plates nut, zinc)

Wind load on steel structure = 1x100x1.75

= **175** kg. (Shape factor = 1.75)

2. Detail of equipment

Item no.	Total height (mm.)	Height of equipment (mm.)	Height of steel structure (mm.)	Weight of equipment (kg.)
A5.3	5,954 3,631	1,981 (1,981)	3,973 (1,650)	350 (APPROX.)

(นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT :115 kV. CAPACITOR VOLTAGE TRANSFORMER	PAGE
CHECKED :			STRUCTURE,	

Weight of equipment = **350** kg.

Wind load on equipment = 1.981x0.35x67 (Approx. diameter equipment = 350 mm.)

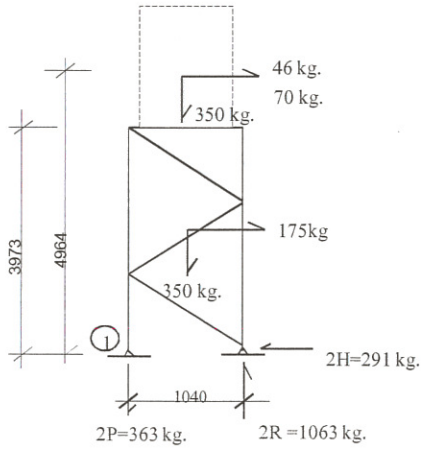
= 46 kg.

Short circuit or dynamic load = 0.2xG

= 0.2x350 = **70** kg.

Center of gravity = **991** mm.

3. Analysis and design



$\sum$M AROUND 1 =0

2Rx1.04 = (350+350)x1.04/2+(46+70)x5.091

+175x3.973/2

2R = **1,238** kg.

$\sum$Fy = 0

2P = 1,238-(350+350)

= 538 kg.

$\sum$Fx = 0

2H = (46+70+175)

= 291 kg.

Maximum compression in bracing = H/(1,040/1,684)

= (291/2)/(1,040/1,684)

= 236 kg./bracing

Maximum compression in post = C

= 1,238/2

= 619 kg./leg

3.1 Design post

Assume post size L65x65x6, unit weight =5.91 kg/m.,sectional area =7.527 cm^2.,

,radius of gyration Rx = 1.98 cm. Rv = 1.27 cm.

Maximum unsupported length Lx = 273 cm. Lv = 273 cm.

Maximum compression in post = **619** kg.

KLx/Rx = (1)(265)/1.98 = 133.84

KLv/Rv = (1)(133)/1.27 = 104.72

Cc = $\sqrt{2\pi^2 E/FY}$ = 126.91 < KL/R

Allowable compressive stress

Fa = 586 ..... ksc. **(AISC 1.5-2)**

Allowable compressive strength = FaxArea = 586x7.527 = **4,411** kg.

> **619** kg.. **OK.**

So we can use post size L65x65x6

(นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT :115 kV. CAPACITOR VOLTAGE TRANSFORMER	PAGE
CHECKED :			STRUCTURE,	

3.2 Design bracing

Assume bracing size L50x50x4, unit weight =3.06 kg/m, sectional area =3.892 cm^2.

,radius of gyration Rx = 1.53 cm. Rv = 0.983 cm.

Maximum unsupported length Lx = 172cm. Lv = 172 cm.

Maximum compression in bracing = 236 kg.

KLx/Rx = (1)(168)/1.53 = 109.8

KLv/Rv = (1)(164)/0.983 = 166.84

Cc = $\sqrt{2\pi^2 E/Fy}$ = 126.91 < KL/R

Allowable compressive stress

Fa = 378 ksc. ..... **(AISC 1.5-2)**

Allowable compressive strength = FaxArea = 378x3.892 = 1471 kg.

> 236 kg. **OK.**

So we can use bracing size L50x50x4

Check bolts connection

Assume use bolt connection size M16-1

Allowable bearing strength (on the contact area) = 0.9x2,500x1.6x0.4

= 1,440 kg. > 236 **OK.**

Allowable shear on bolt = 0.22x5,203xπx$(1.6)^2$/4

= 2,300 kg. > 236 **OK.**

Allowable bearing on bolt = 0.6x5,203x1.6x0.4

= 1,998 kg. > 236 **OK.**

So we can use bolt connection size M16-1

3.3 Design base plate and anchor bolt

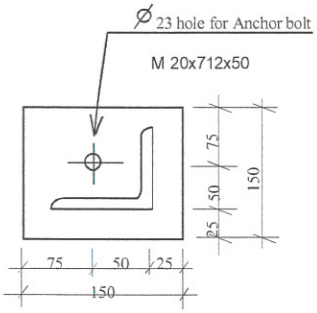
Maximum compression = C = **619** kg./post

Maximum tension = T = **269** kg./post

Allowable bearing stress on cocrete Fc = 43.75 ksc.

Bearing stress on base plate = 619/(15x15) = 2.75 ksc.

< 43.75 **OK.**



Uniform load on base plate (from tension) = 269/(12.5^2) ksc.

= 1.72 ksc.

Max. bending moment = 0.29x1.72x12.5^2

= 77.94 kg-cm/cm.

Min. plate thickness = $\sqrt{6x77.94/(0.75x2500)}$

= 0.50 **cm.**

So we can use base plate 15 mm. Thickness

Assume use anchor bolt size M20x712x50, embeded length = 60 cm.,JIS G3101 SS400 Fu = 4,100 ksc.

Allowable bonding stress = 10 ksc.

Allowable bonding strength = πx2.0x60x10 = 3,768 kg.. > **269** **kg. Ok.**

Allowable tensile strength = 0.33xFuxArea = 0.33x4,100xπx2.0^2/4

= 4,248 kg.. > **269** **kg. Ok.**

So we can use anchor bolt size M20x712x50 per leg.

(นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT :115 kV. CAPACITOR VOLTAGE TRANSFORMER	PAGE
CHECKED :			STRUCTURE,	

Check welding

Assume use welding 6 mm fillet

Max. horizontal force = 291/2 = 146 kg.

Max. tension = 538/2 = 269 kg.

Welding length = 26 cm.

Shearing stress Fv1 = 146/(26x0.6x0.707)

= 13.2 ksc.

Shearing stress Fv2 = 269/(26x0.6x0.707)

= 24.4 ksc.

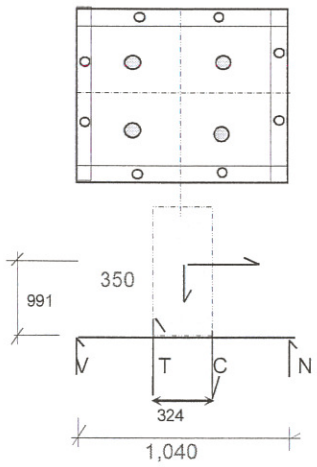
Combine shearing stress = $\sqrt{13.2^2+24.4^2}$

= 27.8 ksc.

Allowable shearing stress Fv = 1260 ksc. > 27.8 ksc. **Ok.**

So we can use 6 mm. Fillet weld

3.4 Design top plate and beam



From load diagram

C = (46+70)x0.991/0.324+350/2 kg.

= 530 kg.

T = (46+70)x0.991/0.324-350/2 kg.

= 180 kg.

Uniform load on top plate = 530/(104x104/2)

= 0.10 ksc.

Bending moment $M=wl^2/8$ $0.10x104^2/8$ kg-cm/cm.

= 135 kg-cm/cm.

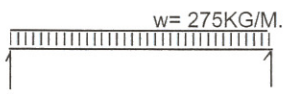
$t = (6x135/(0.75x2,500))^{0.5}$ cm.

= 0.66 cm.

So we can use top plate 9. mm thickness

Assume beam size L65x65x6, unit weight =5.91 kg/m., sectional area =7.527 cm^2.,modulus of section

Zx = Zy = 6.26 cm^3., moment of inertia Ix = Iy =29.4 cm^4.



Uniform load on beam = ((46+70)x0.991/1.04+350/2)/1.04 kg/m

= 275 kg/m

Max. moment = $wL^2/8$ kg/m

= $(275+5.91)x1.04^2/8$ kg-m

= 38 kg-m

Bending stress fb = M/Z = 38x100/6.26 = 607 ksc.

Allowable bending stress Fb = 0.66Fy = 1,650 > 607 **ksc. OK.**

Allowable deflection = L/360 = 104/360 = 0.289 cm.

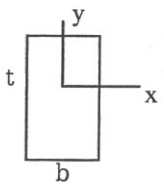
Actual deflection = $5WL^4/384EI$ = $5x(275+5.91)/100x104^4/384EI$

= 0.071 < 0.289 **OK.**

So we can use beam size L65x65x6

(นายชาย แสงไสว)

Structure : CVT Column **Project :**
Date : **Location :** Han Ka Substation



Square Section

INPUT:

Material Properties

Concrete fc' (Cylinder)			210	ksc
Reinforcing Steel	SD 30	and SR 24		

Loading

Axial load , P	400	kg
Moment , Mx	0	kg-m
Moment , My	0	kg-m
Reduction Factor	1.00	

Dimension

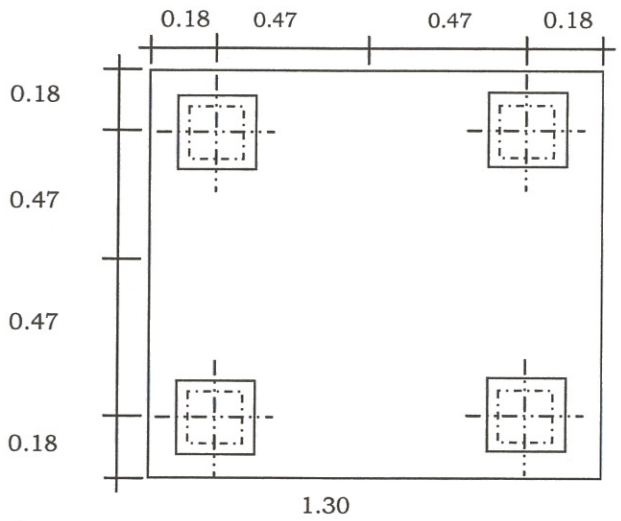
Length of Column	1.25	m
Section		
Thickness; t	0.15	m
Width; b	0.15	m
Ag	0.02	m^2
% steel , pg	0.020	
Total Steel required , Ast	4.5	cm^2
Input: Ast = *4 DB 12*	4.5	cm^2
h/b	8.3	<15

COMPUTATION: <<Consider as Short Column>>

ex=Mx/P	-	cm
ey=My/P	-	cm
ebx=[0.67pgm + 0.17](t - d')	3.96	cm
eby=[0.67pgm + 0.17](b - d')	3.96	cm
eax=Msx(1/Pa - 1/Po)	0.07	cm
eay=Msy(1/Pa - 1/Po)	0.07	cm
Pa=0.85 Ag (0.25 fc' + fs pg)	6,187	kg
Po=Fa Ag	21,489	kg
Ix=1/12 bt^3 + (2n - 1) Ast $(gt)^2/4$	4,691	cm^4
Iy=1/12 tb^3 + (2n - 1) Ast $(gt)^2/4$	4,691	cm^4
Sx=Ix/cx	626	cm^3
Sy=Iy/cy	626	cm^3
Msx=Fb Sx	591	kg-m

(นายชาย แสงไสว)

Structure : CVT Support Foundation
Project : PEA Substations
Location : Han Ka Substation
Date :



Dimension :

Abutment :	bx		0.15	m
	by		0.15	m
	Depth		1.50	m
Piles :	SQ 0.15 x 0.15 x 3.0 m			
	Width / Diameter of Piles		0.15	m

Materials Properties :

Concrete :	fc'	(28-day concrete cylinder)	210	ksc
Reinforcing Steels :	SD 30 and SR 24			
				Ton/m^3

Load :

Column Load		1.25	Ton
Bending Moment		0.50	Ton.m
Horizontal Force		0.00	Ton
Weight of Footing		0.27	Ton
Total		2.05	Ton
Number of Piles		4	Piles
Each Pile Carry Load		0.51	Ton
Compression 1		0.58	Ton : PASS
Compression 2		0.05	Ton

Depth of Footing:

Mmax		1088	kg.m
Required Depth of Footing		10	cm
Use Depth		13	cm
Thickness of Footing		20	cm

Check Overturning:

Overturning Moment		0.50	Ton.m
Resisting Moment			
	Soil Weight Above Footing	2.14	Ton.m
	Footing Weight	0.38	Ton.m
	Pile Friction	5.64	Ton.m
	Compression Load	0.59	Ton.m
Total Resisting Moment		8.75	Ton.m

cvt/HKASF

(นายชาย แสงไสว)

Check Shear:

Beam Type Shear

x	2.0	cm	
P'	0.3	Ton	
V	0.7	Ton	
v	0.39	ksc	< vc : PASS
v_C	4.20	ksc	

Punching Shear

Width of footing at distance d/2 from face of column	28.00	m	
x_1	8.5	cm	
P_1'	0.5	Ton	
V	1.8	Ton	
v	1.24	ksc	< vp : PASS
v_P	7.68	ksc	

Reinforcement:

Long Bar

Min. As	5.20	cm^2	
Req. As	6.33	cm^2	
Allowable Bond Stress	35.20	ksc	
Required Perimeter	2.87	cm	
Use RB 9 @ 0.15			
As	3.82	cm^2	
Total Actual Perimeter	16.96	cm	
Spacing	15.00	cm	
Development Length	4.8	cm	
Actual Anchorage Length	50.5	cm	
		> 1.25Ld : PASS	

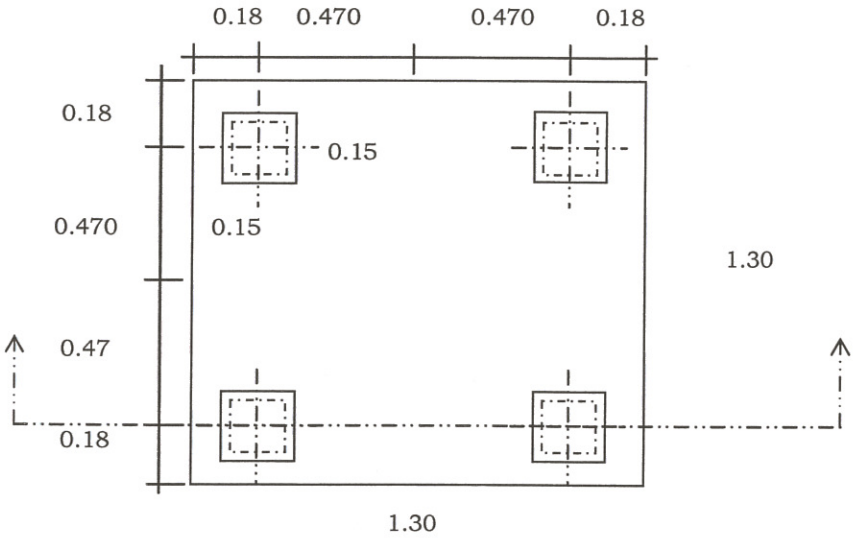
Short Bar

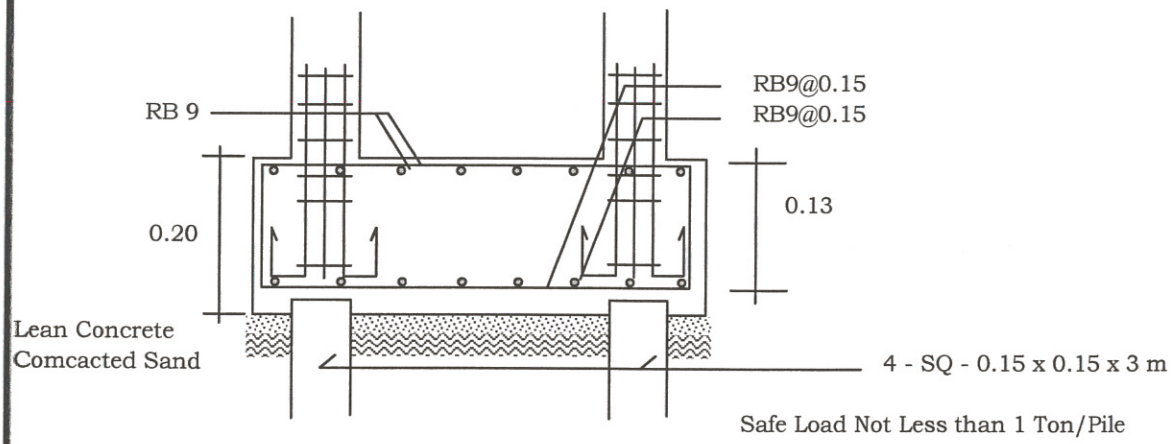
Min As	5.20	cm^2	
Req. As	6.33	cm^2	
Allowable Bond Stress	35.20	ksc	
Required Perimeter	2.87	cm	
Use RB 9 @ 0.15			
As	3.82	cm^2	
Total Actual Perimeter	16.96	cm	
Spacing	15.00	cm	
Development Length	4.8	cm	
Actual Anchorage Length	50.5	cm	
		> 1.25Ld : PASS	

cvt/HKASF

นายชาย แสงไสม

Footing Plan and Section:





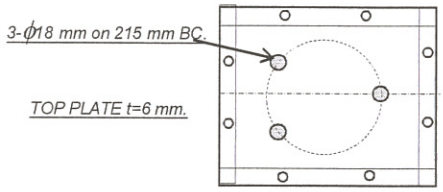
Safe Load Not Less than 1 Ton/Pile

cvt/HKASF

(นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT : LIGHTNING ARESSTER	PAGE
CHECKED :			SUPPORTING STRUCTURE	

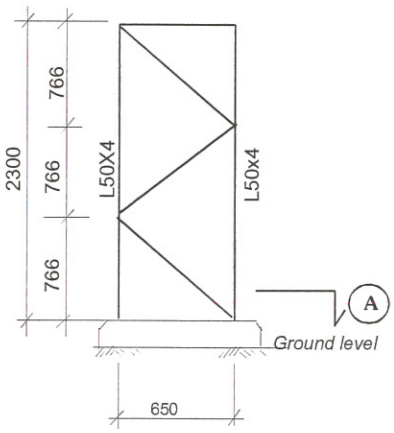
1. STRUCTURAL DESIGN DRAWING

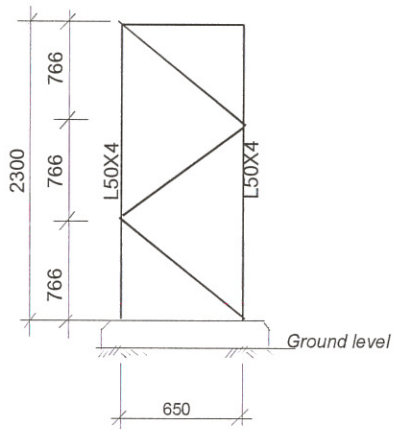


TOP VIEW

NOTES

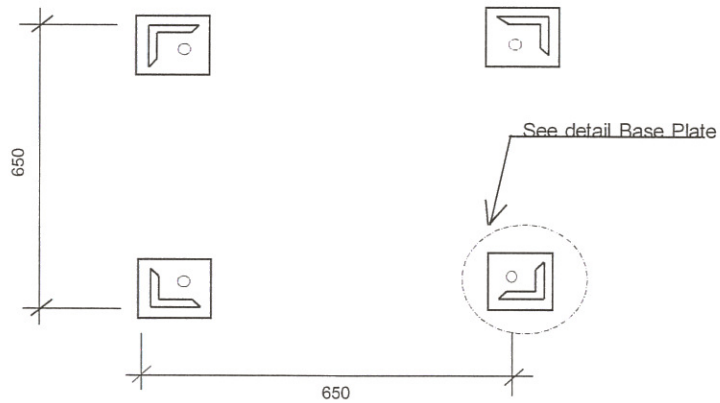
1. BLANK MEMBERS ARE L40x40x3
2. BLANK BOLTS ARE M16-1
3. NO INDICATED BOLT SIZE ARE M16
4. ALL DIMENSION ARE IN MILLIMETERS
5. ALL STRUCTURAL STEEL ARE JIS G3101 SS400
6. ALL BOLTS & NUTS ARE ASTM A394 TYPE 0

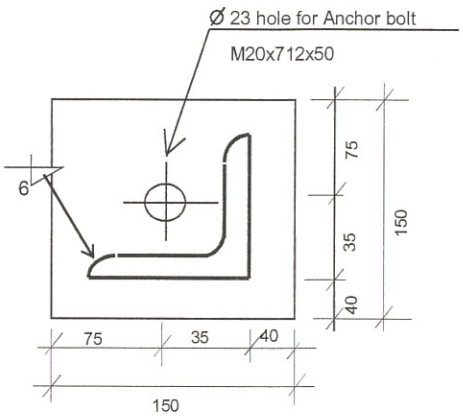




FRONT VIEW

SIDE VIEW





SECTION A-A

BASE PLATE = 9 MM.

Total weight of steel structure = **150** kg.. (Approx. and included weight of bolts, plates nut, zinc)

Wind load on steel structure = 1.0x100x1.75

= **175** kg. (Shape factor = 1.75)

2. Detail of equipment

Item no.	Total height (mm.)	Height of equipment (mm.)	Height of steel structure (mm.)	Weight of equipment (kg.)
A3.2	3,672	1,372	2,300	70 (APPROX.)

นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT : LIGHTNING ARESSTER	PAGE
CHECKED :			SUPPORTING STRUCTURE	

Weight of equipment = **70** kg.

Wind load on equipment = 1.372x0.3x67 (Approx. diameter equipment = 300 mm.)

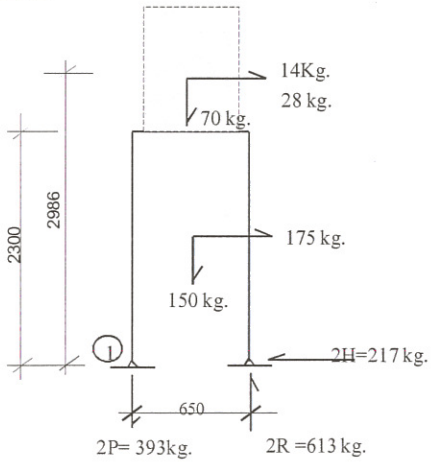
= 28 kg.

Short circuit or dynamic load = 0.2xG

= 0.2x70 = **14** kg.

Center of gravity = 686 mm.

3. Analysis and design



LOAD DIAGRAM

ΣM AROUND 1 =0

2Rx0.65 = (150+70)x0.65/2+(14+28)x2.986

+175x2.3/2

2R = **613** kg.

$\Sigma Fy = 0$

2P = 613-150-70

= **393** kg.

$\Sigma Fx = 0$

2H = 14+28+175

= **217** kg.

Maximum compression in bracing = H/(650/1,005)

= 217/2/(650/1,005)

= 168 kg./bracing

Maximum compression in post = R

= 613/2

= 307 kg./leg

3.1 Design post

Assume post size L50x4 unit weight =3.06 kg/m, sectional area =3.892 cm^2.,

,radius of gyration Rx = 1.53 cm. Rv = 0.983 cm.

Maximum unsupported length Lv = 153 cm.

Maximum compression in post = **307** kg.

KLx/Rx = (1)(153)/(1.53) = 100

KLv/Rv = (1)(77)/0.983 = 78.33

Cc = $\sqrt{2\pi^2 E/FY}$ = 126.91 > KL/R

Allowable compressive stress

Fa = **907** ..... ksc. **(AISC 1.5-1)**

Allowable compressive strength = FaxArea = 907x3.892 = **3,530** kg

> **307** kg. **OK.**

So we can use post size L50x50x4

(นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT : LIGHTNING ARESSTER	PAGE
CHECKED :			SUPPORTING STRUCTURE	

3.2 Design bracing

Assume bracing size L40x40x3, unit weight =1.83 kg/m.., sectional area =2.336 cm^2.

,radius of gyration , Rv = 0.790cm.

Maximum unsupported length . Lv = 100.5 cm.

Maximum compression in bracing = 168 kg.

KLv/Rv = (1)(100.5)/0.790 = 127.22

Cc = $\sqrt{2\pi^2 E/Fy}$ = 126.91 < KL/R

Allowable compressive stress

Fa = 649 ksc. ..... **(AISC 1.5-2)**

Allowable compressive strength = FaxArea = 649x2.336 = **1516** kg.

> **168** kg. **OK.**

So we can use bracing size L40x40x3

Check bolts connection

Assume use bolt connection size M16-1

Allowable bearing strength (on the contact area) = 0.9x2,500x1.6x0.3

= 1,080 kg. > **168** **OK.**

Allowable shear on bolt = 0.22x5,203xπx$(1.6)^2$/4

= 2,300 kg. > **168** **OK.**

Allowable bearing on bolt = 0.6x5,203x1.6x0.3

= 1,498 kg. > **168** **OK.**

So we can use bolt connection size M16-1

3.3 Design base plate and anchor bolt

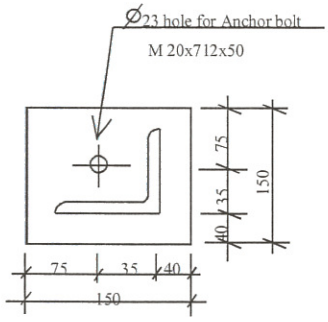
Maximum compression = C = **307** kg./post

Maximum tension = T = 197 kg./post

Allowable bearing stress on concrete fc = 43.75 ksc.

Bearing stress on base plate = 307/(15x15) = 1.36 ksc.

< 43.75 **OK.**



Uniform load on base plate (from tension) = 197/(11^2) ksc.

= 1.6 ksc.

Max. bending moment = 0.29x1.6x11^2

= 56 kg-cm/cm.

Min. plate thickness = $\sqrt{6x56/(0.75x2500)}$

= 0.42 **cm.**

So we can use base plate 9 mm. Thickness

Assume use anchor bolt size M20x712x50, embeded length =60 cm.,JIS G3101 SS400 Fu = 4,100 ksc.

Allowable bonding stress = 10 ksc.

Allowable bonding strength = πx2.0x60x10 = 3,768 kg.. > **197** **kg. Ok.**

Allowable tensile strength = 0.33xFuxArea = 0.33x4,100xπx2.0^2/4

= 4,248 kg.. > **197** **kg. Ok.**

So we can use anchor bolt size M20x712x50 per leg.

(นายชาย แสงไสว)

DESIGNED :		JOB NO.	SUBJECT : LIGHTNING ARESSTER	PAGE
CHECKED :			SUPPORTING STRUCTURE	

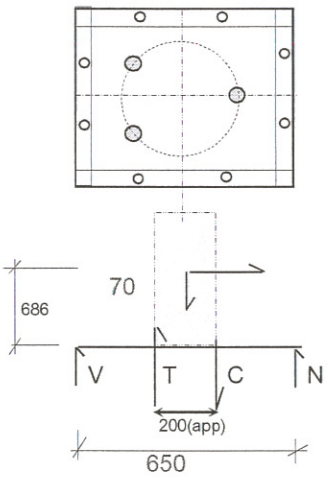
Check welding

Assume use welding 6 mm fillet

Max. horizontal force	=	217/2	= 109	kg.		
Max. tension	=	393/2	= 197	kg.		
Welding length			= 20	cm.		
Shearing stress Fv1			= 109/(20x0.6x0.707)			
			= 12.8	ksc.		
Tensile stress Fv2			= 196/(20x0.6x0.707)			
			= 23.2	ksc.		
Combine shearing stress			$=\sqrt{12.8^2+23.2^2}$			
			= 26.5	ksc.		
Allowable shearing stress Fv			= 1260	ksc. >	26.5	ksc. **Ok.**

So we can use 6 mm. Fillet weld

3.4 Design top beam



From load diagram

C	=	(28+14)x0.686/0.20+70/2		
	=	179		kg.
T	=	(28+14)x0.686/0.20-70/2		
	=	109		kg.

Uniform load on top plate = 179/(65x65/2)

= 0.08 ksc.

Bending moment M = $0.08x65^2/8$ kg-cm/cm.

= 25 kg-cm/cm.

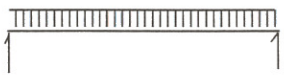
t = $(6x25/(0.75x2,500))^{0.5}$ cm.

= 0.28 cm.

So we can use top plate 6 mm thickness

Assume beam size L40x40x3 unit weight 1.83 kg/m., sectional area =2.336 cm^2.,modulus of section

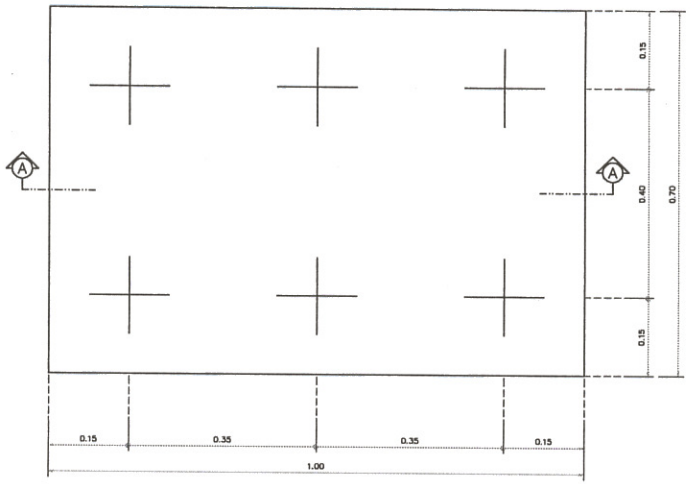
Zx = Zy = 1.21 cm^3., moment of inertia Ix = Iy =3.53 cm^4.



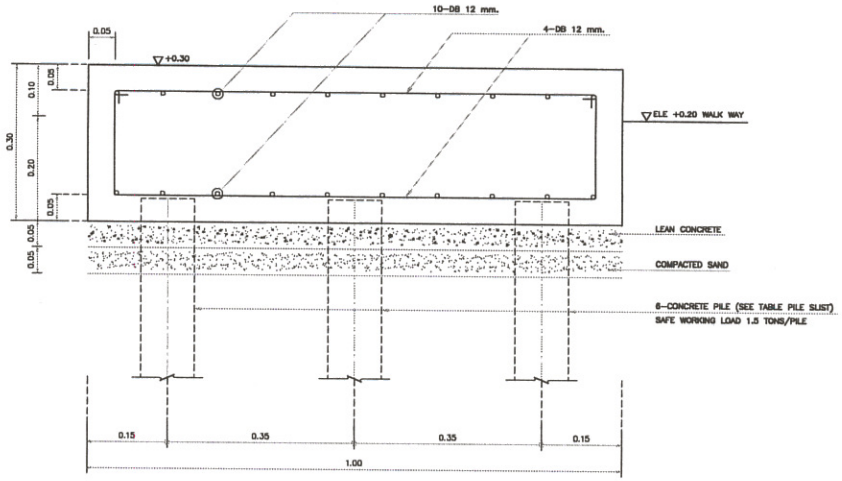
Uniform load on beam			=	((28+14)x0.686/0.65+70/2)/0.65			kg/m
			=	122			kg/m
Max. moment			=	$wL^2/8$			kg-m
			=	$(122+1.83)x0.65^2/8$			kg-m
			=	6.54			kg-m
Bending stress fb	=	M/Z	= 11x100/1.21	=	540		ksc.
Allowable bending stress	Fb		= 0.66Fy	=	1,650	> 540	**ksc. OK.**
Allowable deflection	=	L/360	= 65/360	=	0.181		cm.
Actual deflection	=	$5WL^4/384EI$	= $5x(122+1.83)/100x65^4/384EI$				
			= 0.040	<	0.181		**OK.**

So we can use beam size L40x40x3

(นายชาย แสงไสว)



PLAN
SCALE 1:5



SECTION Ⓐ – Ⓐ
SCALE 1:5

TABLE.

LIST OF STATION SERVICE TRANSFORMER FOUNDATION.	
SUBSTATION	SIZE OF PILE
KHU KHAN	□-0.18x0.18x4.00m.
BORABU	□-0.18x0.18x3.00m.
PRASAT	□-0.18x0.18x4.00m.
NANG RONG	□-0.18x0.18x4.00m.

NOTES

1. STRENGTH OF CONCRETE IS NOT LESS THAN 210 KSC.(AFTER 28 DAYS AGING' CYLINDER TEST)
2. STRENGTH OF LEAN CONCRETE = 1:3:5 BY VOLUME
3. ALL DIMENSIONS ARE IN METER,EXCEPT OTHERWISE SHOWN.
4. THE REINFORCEMENT BARS SHALL CONFORM TO TIS 24 GRADE SD30

REV.	DATE	DESCRIPTION	REF.
1	12-10-05	REVISED AS PEA'S COMMENT	MM.5302.6/18924
0	05-10-05	FIRST ISSUE	

POSITION	NAME	SIGNATURE	DATE
DRAWN	WEERA K.		12-10-05
CIVIL ENGINEER.	PRATEEP K. วศ. 38603		
PROJECT ENGINEER.	SONGCHAI T. ภพท. 12024		
PROJECT MANAGER.	SURAPOL M. ภพท. 455		

OWNER: PROVINCIAL ELECTRICITY AUTHORITY
200 NGAMWONGWAN ROAD, CHATUCHAK, BANGKOK 10900, THAILAND

PROJECT: TSD.7.1.P-3.2/2548

CONTRACTOR: PICNIC CORPORATION PUBLIC COMPANY LIMITED
805 SRINAKHARIN RD.,SUANLUANG, SUANLUANG DISTRICT BANGKOK 10250 TEL. 0-2721-3600 FAX. 0-2721-3501

SUBSTATION: KHU KHAN, BORABU, PRASAT, NANG RONG

TITLE: STATION SERVICE TRANSFORMER FOUNDATION

SCALE: 1:5

DWG. STATUS: FOR CONSTRUCTION

DWG. SIZE: A1

DWG.NO: STD-SWY-A-004

SHEET 1 OF 1

REV. 1

DISK\FILE NAME :

Structure : Station ServiceTransformer Foundation
Project :
Location : Han Ka Substation
Date :

Material Properties:

Concrete fc' (Cylinder)		210	ksc	
Reinforcing Steel				
	SD 30 SR 24			
Pile	□ 0.15 x 0.15 m	x 3.00	m	

Loading :

Equipment Load	600	Kg	
Maximum Bending Moment	7	kg.m	
Maximum Shear Force	110	kg	

Dimension :

No. of Pile	6	Piles	
Distance between pile	0.55	m	
Width	40	cm	
Required Depth of Footing	1	cm	
Use	23	cm	
Thickness of Footing	30	cm	

Punching Shear :

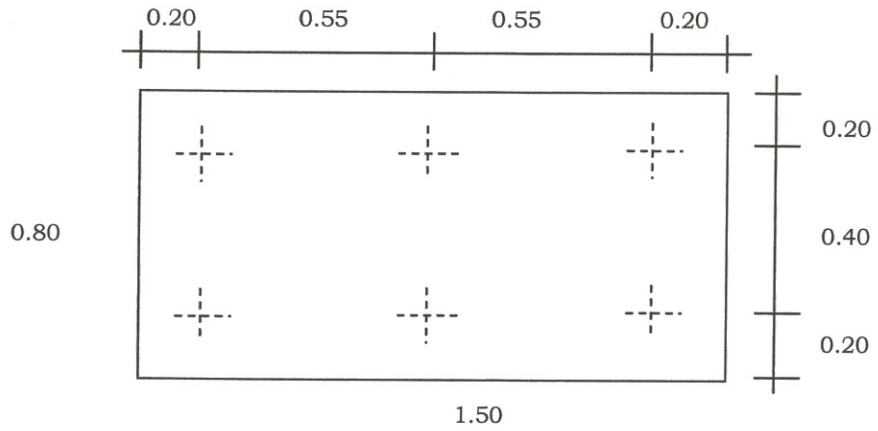
Perimeter	152	m	
v'	0.031	ksc	Pass

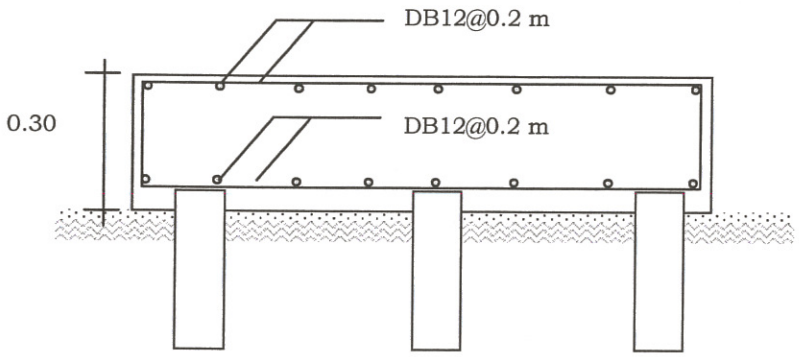
Reinforcement :

M_R	3155	kg.m	
Single Reinforcement			
Main Reinforcement :			
A_{SR}	0.02	cm^2	
Required A_{ST}	0.02	cm^2	
Use DB 12 @ 0.20		m	
	5.65	cm^2	
Reinforcement Ratio	0.006		

(นายชาย แสงไสว)

Footing Plan and Section :



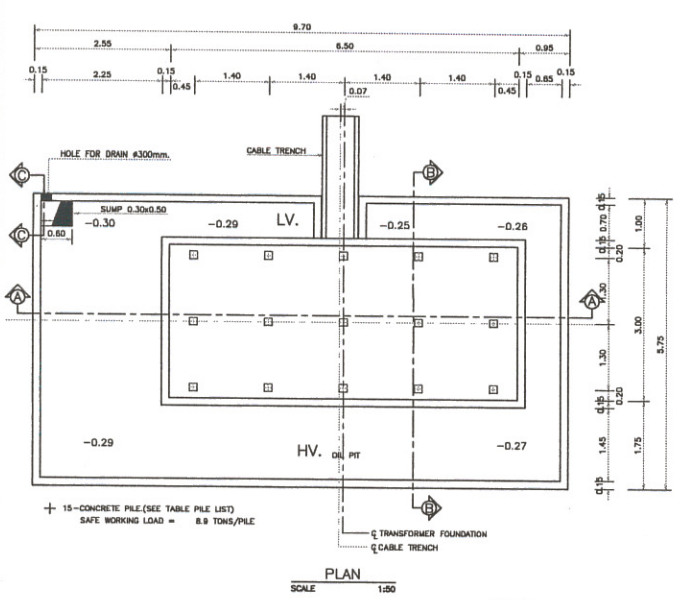


6 - SQ 0.15 x 0.15 x 3 m

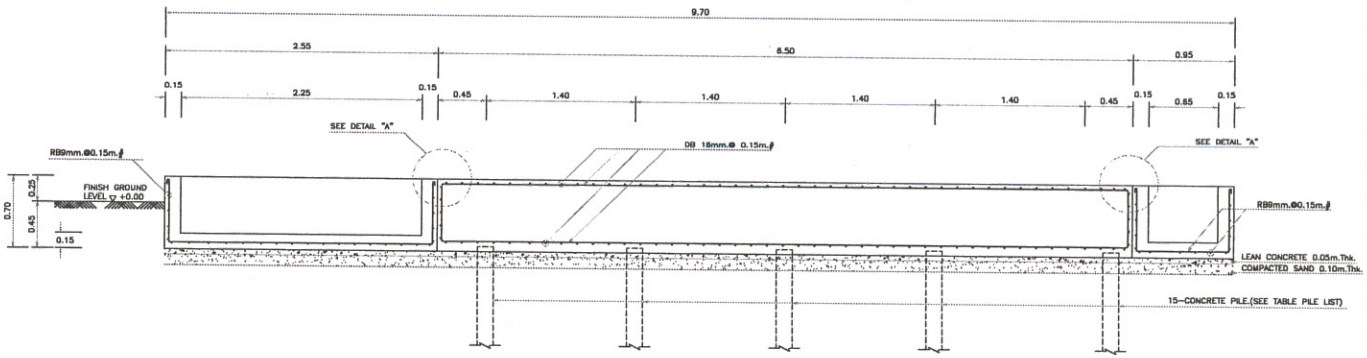
Transformer/HKASF

(นายชาย แสงไสว)

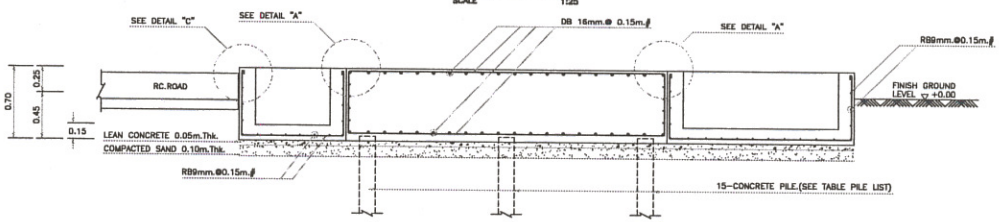
POWER TRANSFORMER FOUNDATION WITH OIL GUTTER

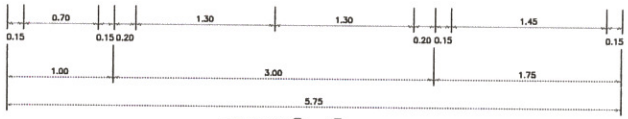


PLAN
SCALE 1:50

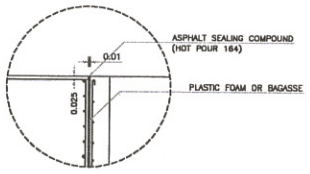


SECTION Ⓐ – Ⓐ
SCALE 1:25

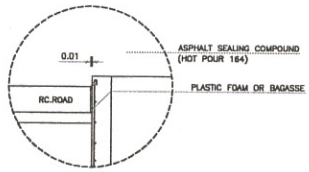




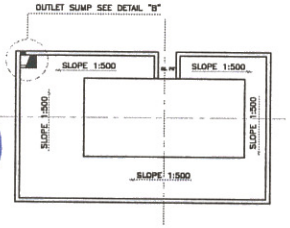
SECTION Ⓑ – Ⓑ
SCALE 1:25



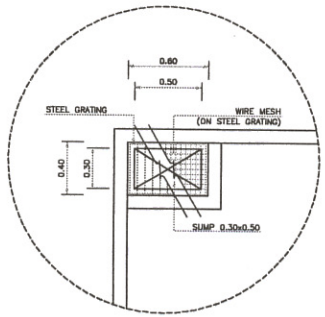
DETAIL "A"
SCALE 1:20



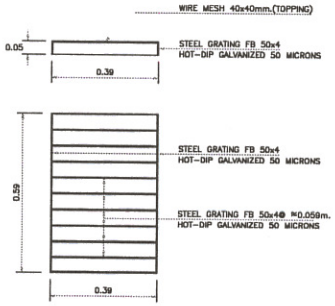
DETAIL "C"
SCALE 1:20



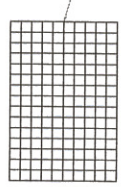
SLOPE DETAIL
NOT TO SCALE

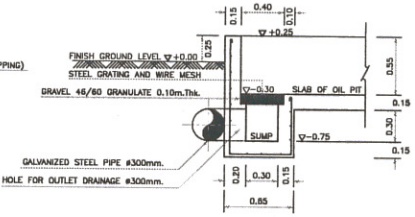


DETAIL "B"
SCALE 1:20



DETAIL "C"
SCALE 1:10





SECTION Ⓒ – Ⓒ
SCALE 1:25

TABLE

LIST OF TRANSFORMER FOUNDATION	
SUBSTATION	SIZE OF PILE
KHU KHAN	□-0.18x0.18x9.00m.
BORABU	□-0.18x0.18x5.00m.
PRASAT	□-0.18x0.18x9.00m.
NANG RONG	□-0.18x0.18x6.00m.

NOTES:

1. OUTLET SUMP COULD BE LOCATED AT ONLY ONE CORNER OF OIL PIT. (SEE GENERAL PLAN)
2. BOTTOM SLAB OF OIL PIT SHALL BE KEEP SLOPE 1:200 TO OUTLET SUMP.
3. POSITION AND DIRECTION OF OUTLET PIPE (GALVANIZED STEEL PIPE ø300 mm.) HAVE BEEN SHOWN IN GENERAL PLAN.
4. 28 DAY CONCRETE COMPRESSIVE STRENGTH (Fc') NOT LESS THAN 210 Ksc (CYLINDER)
5. YIELD STRENGTH OF REINFORCING STEEL IS 3000 Ksc FOR DEFORMED BAR AND 2400 Ksc FOR ROUNDED BAR
6. STEEL GRATING AND WIRE MESH SHALL BE HOT-DIP GALVANIZED LESS THAN 50 μm

REV.	DATE	DESCRIPTION	REF.
1	12-10-05	REVISED AS PEA'S COMMENT	ม.ม.5302.6/18924
0	05-10-05	FIRST ISSUE	

POSITION	NAME	SIGNATURE	DATE
DRAWN	WEERA K.		12-10-05
CIVIL ENGINEER.	PRATEEP K.	ใบ.ว. 38603	
PROJECT ENGINEER.	SONGCHAI T.	ภพก. 12024	
PROJECT MANAGER.	SURAPOL M.	ภพก. 455	

OWNER: PROVINCIAL ELECTRICITY AUTHORITY
200 NGAMWONGWAN ROAD, CHATUCHAK, BANGKOK 10900, THAILAND

PROJECT: TSD.7.1.P-3.2/2548

CONTRACTOR: PICNIC CORPORATION PUBLIC COMPANY LIMITED
805 SRINAKHARIN RD.,SUANLUANG, SUANLUANG DISTRICT BANGKOK 10250 TEL. 0-2721-3600 FAX. 0-2721-3501

SUBSTATION: KHU KHAN, BORABU, PRASAT, NANG RONG

TITLE: POWER TRANSFORMER FOUNDATION

SCALE: 1:50,1:25, 1:20,1:10, NTS.

DWG. STATUS: FOR CONSTRUCTION

DWG. SIZE: A1

DWG.NO: STD-SWY-A-002

SHEET 1 OF 1

REV. 1

DISK\FILE NAME :

Structure : Transformer Foundation 25 MVA
Project :
Location : Han Ka Substation
Date :

Material Properties:

Concrete fc' (Cylinder)		210	ksc	
Reinforcing Steel				
	SD 30 SR 24			
Pile	□ 0.15 x 0.15 m	x 4.00	m	

Loading :

Equipment Load		64000	Kg
Maximum Bending Moment		581	kg.m

Dimension :

No. of Pile		15	Piles
Distance between pile		0.83	m
Width		95	cm
Required Depth of Footing		5	cm
Use		63	cm
Thickness of Footing		70	cm

Punching Shear :

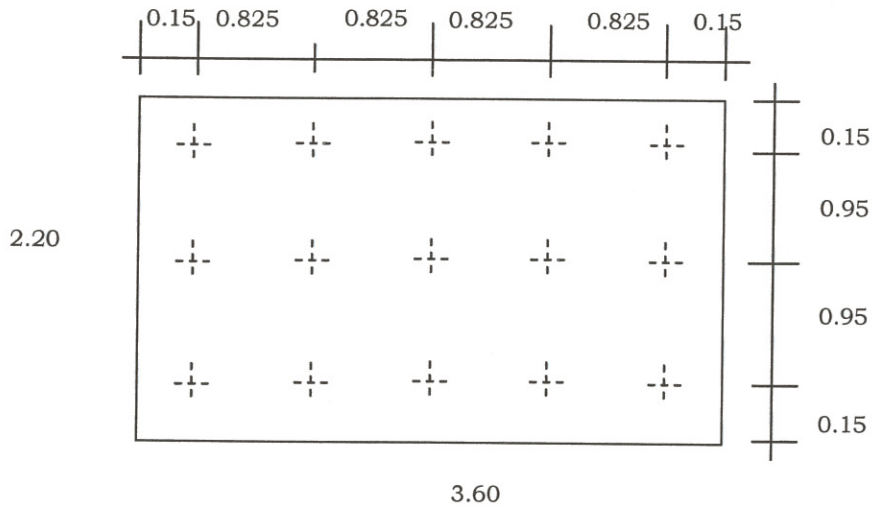
Perimeter		312	m
v'		0.322	ksc Pass

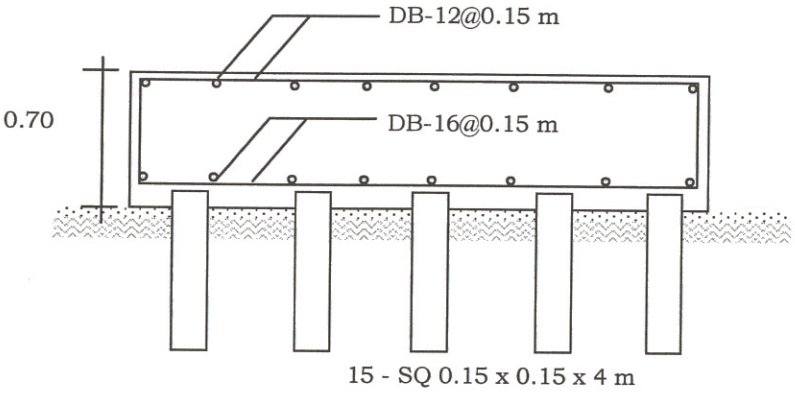
Reinforcement :

M_R		56225	kg.m
Single Reinforcement			
Main Reinforcement :			
A_{SR}		0.70	cm^2
M'		0	kg.m
fs'		0	ksc
A_{S1}		0.00	cm^2
Required A_{SC}		0.00	cm^2
Required A_{ST}		0.70	cm^2
Use A_{SC} :	2 DB 16 :	4.02	cm^2
Reinforcement Ratio		0.0007	
Use	DB 16 @ 0.15		m
		14.07	cm^2
Reinforcement Ratio		0.002	

(นายชาย แสงไสว)

Footing Plan and Section :





Transf25/HKASF

(นายชาย แสงไสว)

Structure : Oil Gutter
Project :
Location : Han Ka Substation
Date :

Material Properties:

Concrete fc' (Cylinder)	210	ksc
Reinforcing Steel		
SD 30 SR 24		

Gutter Slab

Loading :

Maximum Bending Moment	200	kg.m
Maximum Shear Force	250	kg

Dimension of Beam :

Width of Gutter	145	cm
Required Depth of Gutter Slab	2	cm
Use	10	cm

Reinforcement :

M_R	2162	kg.m

Main Reinforcement :

A_{SR}	1.51	cm^2
M'	0	kg.m
Required A_{ST}	1.51	cm^2
A_{ST} : RB - 9 :	1.91	cm^2
Reinforcement Ratio	0.001	
USE RB - 9 @ 0.15		m

Gutter Wall

Loading :

Maximum Bending Moment	200	kg.m
Maximum Shear Force	250	kg

Dimension of Beam :

Required Depth of Gutter Wall	3	cm
Use	10	cm

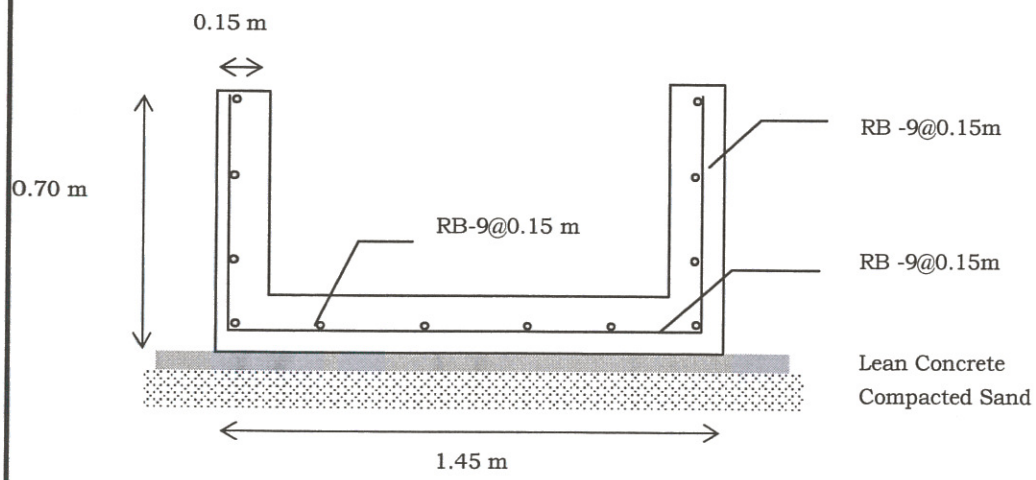
Reinforcement :

M_R	1491	kg.m

Main Reinforcement :

A_{SR}	1.51	cm^2
M'	0	kg.m
Required A_{ST}	1.51	cm^2
A_{ST} : RB - 9 :	1.91	cm^2
Reinforcement Ratio	0.002	
RB - 9 @ 0.15		m

Section :



(นายชาย แสงไสว)